RUNGTA MINES LIMITED

ADDENDUM
ENVIRONMENTAL MANAGEMENT PLAN
FOR

ENHANCEMENT OF PRODUCTION FROM 0.105 TO 0.127 MTPA BY ENHANCEMENT IN SMS, BILLETS / SLAB/ BLOOM CASTER AND ROLLING MILL

OF

KARAKHENDRA STEEL PLANT
AT

VILLAGE KARAKHNENDRA, DISTRICT KEONJHAR, ODISHA

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Prepared by:

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ADDENDUM ENVIRONMENTAL MANAGEMENT PLAN FOR EXPANSION FROM 0.105 MTPA TO 0.127 MTPA STEEL PRODUCTION AT KARAKENDHRA STEEL PLANT

1.0 BACKGROUND

Rungta Mines Ltd. (RML) has been working in the mining business since the last 6 decades and has established several steel & power plants in Odisha & Jharkhand and has remained debt-free. The plant obtained EC for 0.10 MTPA Steel vide letter no. J-11011/230/2016-IA.II(I) dated 15.01.2018

2.0 IDENTIFICATION OF THE PROJECT

Manufacturing facilities as per EC dated 15.01.2018 includes Steel Melting Shop (SMS) comprising of 2X15 tonnes Induction Furnace (IF), 2 strand Continuous Casting Machine (CCM), Billets/ slab/ bloom caster and TMT/ Round/ wire rod/ Flat/ structural mill / other with capacities as shown in **Table 1**

TABLE 1
MANUFACTURING FACILITIES OF THE PROJECT AS PER EC DATED 15.01.2018

Sl. No.	Facilities	Production Capacity
1	Steel Melting Shop comprising: Induction Furnace (2X15 T) with CCM (2 strand)	105,600 TPA
	Billet / Bloom/ Slab caster	103,488 TPA
2	TMT/ Flat/Round/Wire Rod/ Structural Mill / other	101,418 TPA

Salient features of the project before and after expansion is given in **Table 2**.

TABLE 2
SALIENT FEATURES OF THE PROJECT

Description	Existing as per EC dated 15.01.2018	After Expansion
Location	Village Karakhendra, District Keonjhar, Odisha	Same
	Latitude :-22° 8’ 17’ to 22° 8’ 28’’ N Longitude : - 85° 24’ 45’’ to 85° 24’ 58’’ E	Same
Total Area	13.20 Acres	Same
Product	Billets/ Bloom/ Slab and TMT/ Flat/ Round/ Wire rod/ Structural steel/ other	Same

Description	Existing as per EC dated 15.01.2018	After Expansion
Working days	330 days	Same
Manpower	250	260
Implementation Schedule	-	24 month
Cost of the project	Rs. 83 crores	Rs 85 crores
Recirculating Water requirement	758 KLD	1226 KLD
Daily make up water requirement	Not estimated	104.6, say, 105 KLD
Waste water generation	42.2 KLD (including initial losses to clean the system)	4.7 KLD
Source of water	Industrial water - harvested rain water and deficit from Karo River, if required. Ground water sourced for domestic.	Same
Power requirement	15 MW	20 MW
Power source	Proposed 22 MW power plant within existing premises of Sponge iron plant of the company at village Karakolha at a distance of 0.50 km from proposed Karakhendra Steel Plant	Same & grid

Now it is proposed to have the following Amendment/ Enhancement:

i) Amendment by addition of further refining facility i.e. 1X20 T LRF to process 1,26,720 TPA in consonance with the proposed enhancement of 2X15 T IF

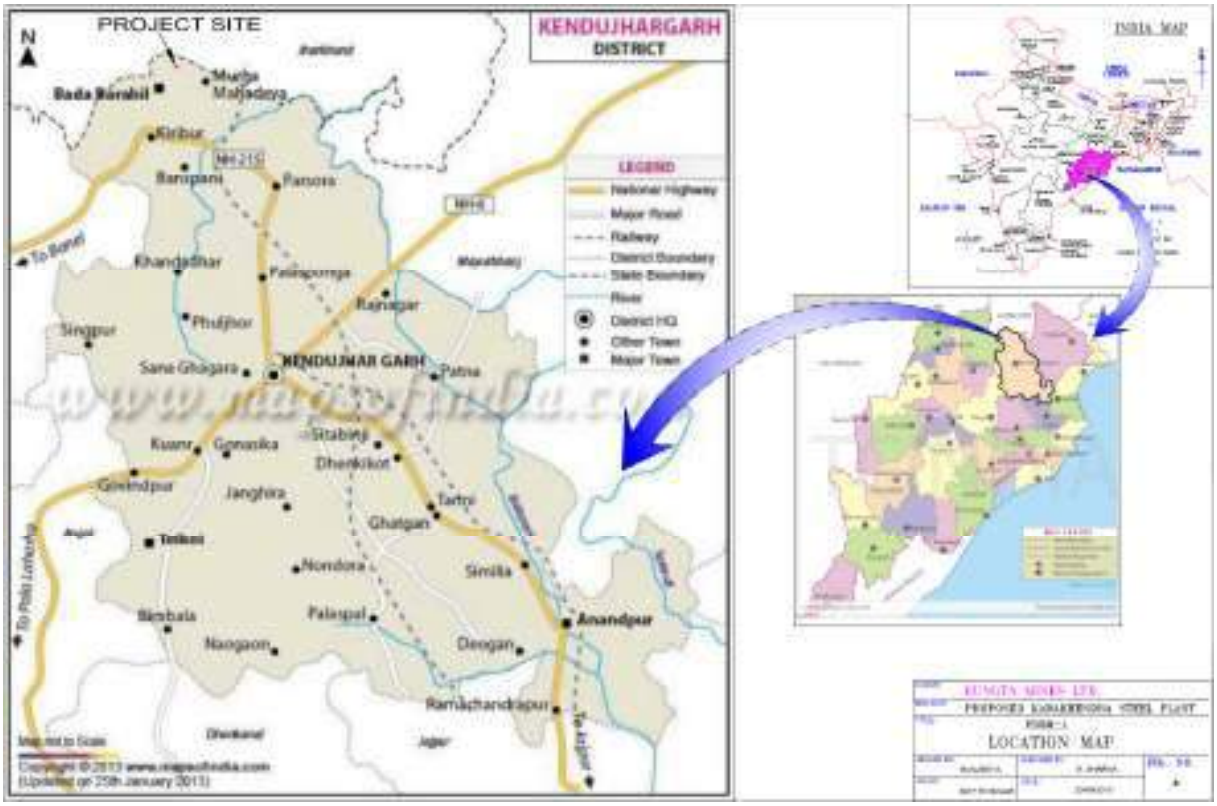
(ii) Capacity enhancement of SMS, Billets/ bloom/ slab casters and Rolling mill for Flat/ Round/ Wire rod/ Structural in consonance with the proposed enhancement of 2X15 T IF as given in **Table 3.**

TABLE 3
PRODUCTION AS PER EC & PROPOSED EXPANSION

S. No.	Plant Facilities	Production as per EC dated 15.01.2018 TPA	Proposed Production, TPA	Total Production, TPA	% increase
1.0	**Steel Melting Shop comprising:** Induction Furnace 2x15 T, LRF 1x20T (proposed in above amendment)	105,600	21,120	126,720	20%
2.0	Billets/ Bloom Caster/Slab Caster CCM (2 strand)	103,488	20,698	124,186	20%
3.0	Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill/ others)	101,418	20,284	121,702	20%

The proposed site for plant is located in Village Karakhendra, District Keonjhar, Odisha and is shown in **Fig 1.**

FIG 1: LOCATION MAP



3.0 PLANT LAYOUT

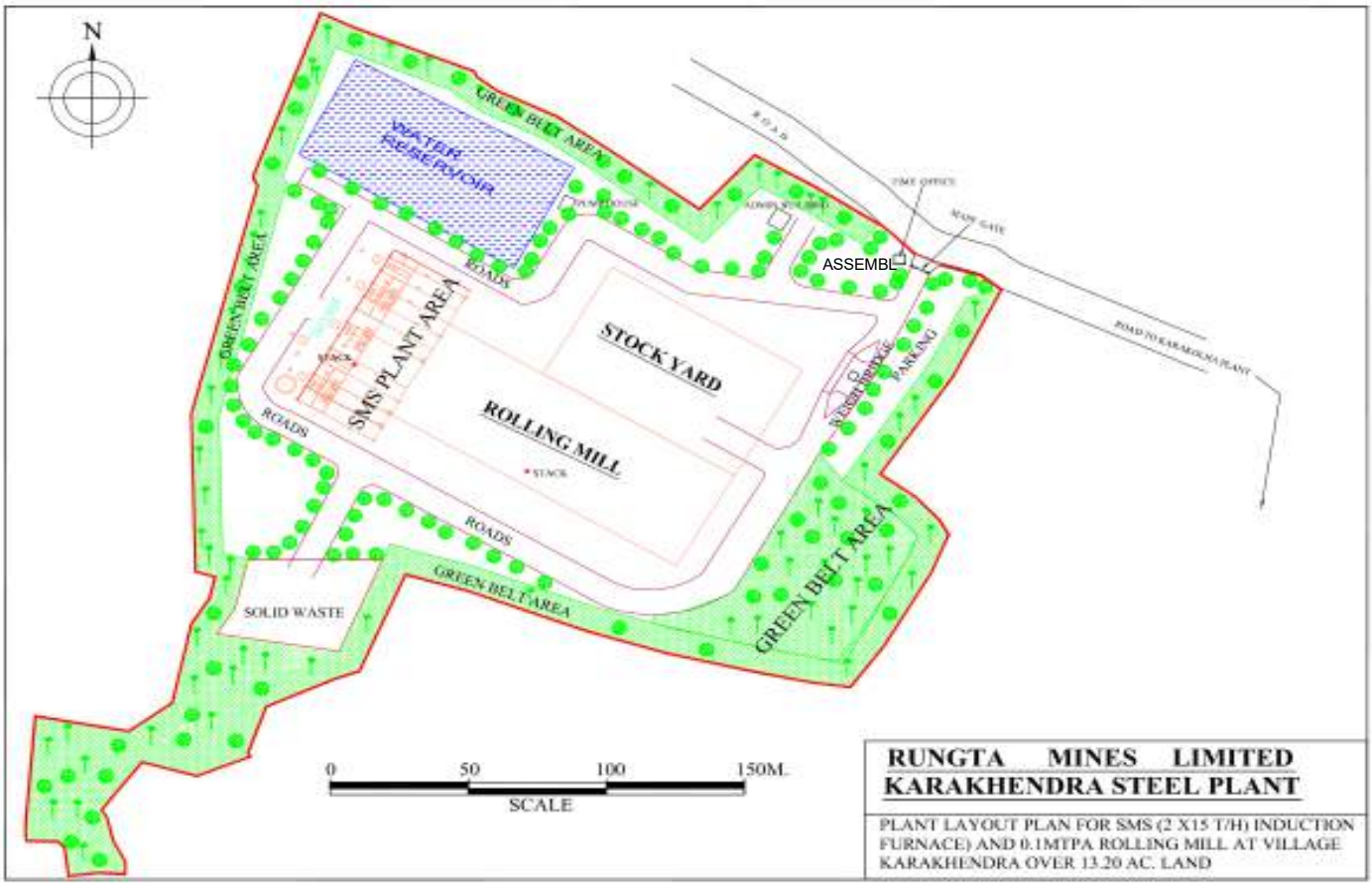
The Plant area is 13.20 acres . Total land has been purchased directly from land owners and converted to industrial use. Boundary wall has been constructed .Break-up of land utilization of proposed plant is given in **Table 4**.

TABLE 4
PROPOSED BREAK UP OF TOTAL PLOT AREA

Sl. No.	Description	Area (Acres)	Percent
1.	Plants & facilities	4.0	30.30
2.	Stock yards	1.0	3.79
3.	Area for solid waste	0.40	3.03
4.	Green belt & plantation	4.356	33.00
5.	Administration building	0.01	0.08
6.	Water reservoir	3.0	22.7
7.	Roads	0.434	3.29
	Total	**13.20**	**100**

The plant layout with proposed units, greenbelt, utilities, etc. is shown in **Fig 2**. There will be construction of buildings, sheds, roads, storage etc. within the plot.

FIG 2: PLANT LAYOUT MAP



There are two interlinked projects to the proposed 0.1 MTPA steel plant at Karakhendra as follows:

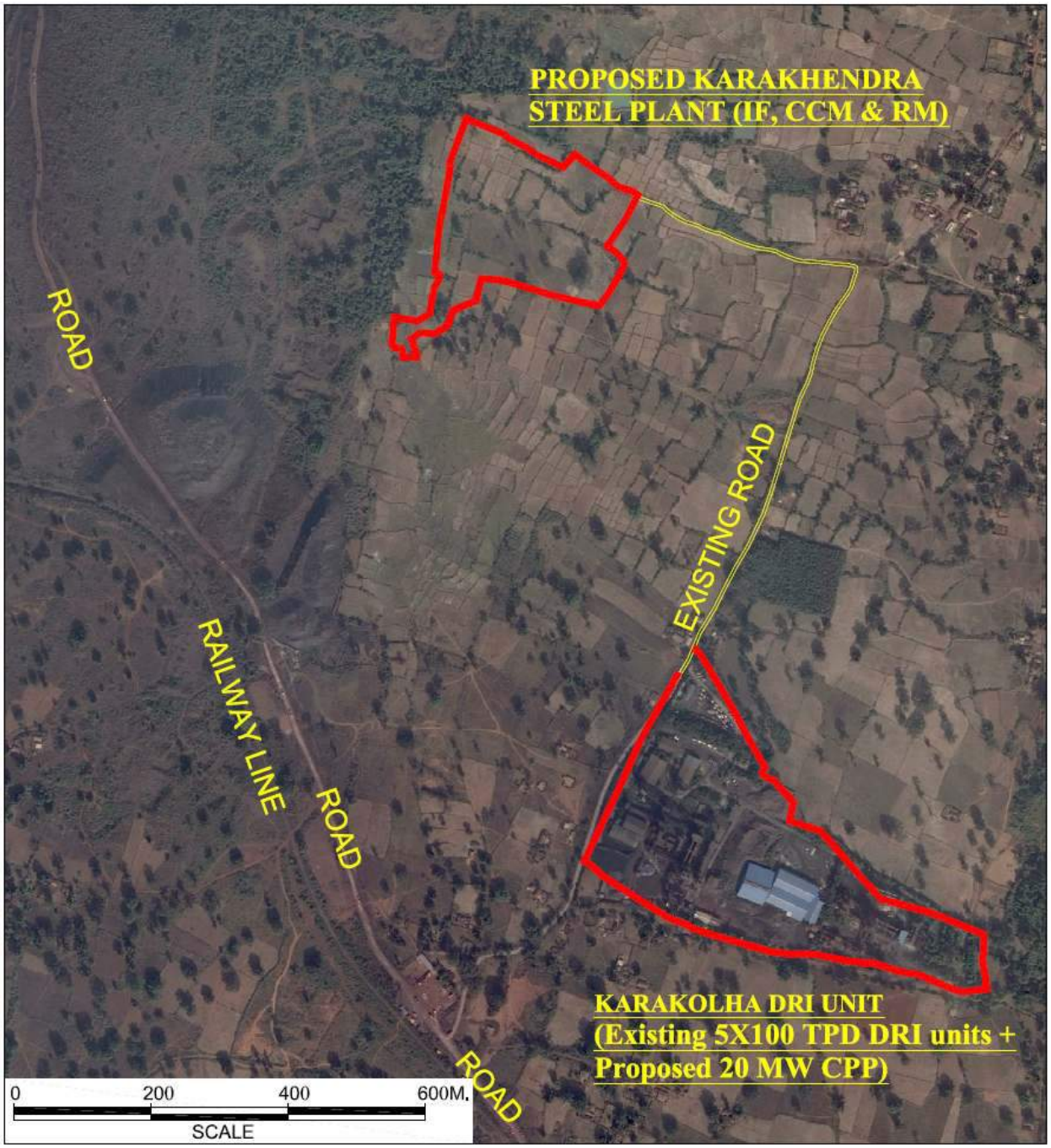
(i) The existing sponge iron plant of 0.18 MTPA with 5X100TPD kilns in village Karakolha at a distance of 0.5 km (aerial) from the proposed steel plant. The sponge iron from this unit will serve as source of 100% of DRI (80% of the raw material) for the 0.127 MTPA steel plant at Karakhendra.

(ii) The proposed power plant in the premises in the above existing sponge iron plant at Karakolha. It will consist of 10 MW WHRB and 12 MW CFBC. The WHRB will be based on the Waste Heat Recovery from flue gas of existing 5 nos. X 100 TPD kilns. The CFBC will be based on dolochar (part fuel), which is generated from DRI kilns. The energy generated from this power plant will meet the requirements of the existing DRI plant at Karakolha as well as part requirement of the proposed 0.127 MPTA steel plant at Karakhendra. The EC for Karakolha plant has been received from MOEF&CC vide letter no. J-11011/229/2016-IA.II(I) dated 15.01.2018 and enhancement dated 28.08.2018

The location of the proposed steel plant at Karakhendra on google earth image dated 21.12.2016 is given in **Fig 3**. The location of the steel plant along with the existing sponge iron plant at Karakolha can be seen in **Fig 4**.

FIG 3: GOOGLE IMAGE OF PROJECT SITE

FIG 4: GOOGLE IMAGE OF PROJECT SITE AND INTERLINKED PROJECT



4.0 MANUFACTURING PROCESS

4.1 STEEL MELTING SHOP (VIA IF-LRF- CCM)

The configuration for existing and proposed SMS is given in **Table 5.** A brief description of the manufacturing process is given in subsequent paragraphs.

TABLE 5
CONFIGURATION OF SMS

Assumptions	Plant Capacity as per EC dated 15.01.2018		Proposed Enhancement	Enhanced Capacity
	Unit	Quantity	Quantity	Quantity
Induction Furnace Nos.	Nos.	2	0	2
Crucibles in operation at a time	Nos.	2	1	3
Crucibles in standby	Nos.	2	-1	1
Capacity of Furnace	Tonne	15	15	15
Output per crucible	Tonne	16	16	16
No. of working days	Days/Annum	330	132	330
No. of working hours	Hours /Day	24	24	24
Heat Timing	Minutes/Heat	135	135	135
No. of Heats	Heats/Day	10	10	10
Total Production	**TPA**	**105600**	**21120**	**126720**
% of Total Enhancement	**%**	**0**	**20%**	
Production in TPH		**13.33**	**6.67**	**20**

4.1.1 Induction Furnace

An induction furnace is powered by an electrical source that is designed to deliver high frequency alternating current, AC, at the proper frequency required to create the electromagnetic field. The AC power is conducted through a coil of copper tubing so that it can generate the magnetic field. Water is pumped through the coil to help keep it cool. The molten metal in an Induction Furnace is circulated automatically by the electromagnetic action so that when alloy additions are made, a homogeneous product is ensured in minimum time. The time between tap and charge, the charging time, power delays etc. are items of utmost importance. They are meeting the objective of maximum output in t/hour at a low operational cost. The process for manufacturing steel may be broadly divided into the following stages:

Melting the Charge

The furnace is switched on, current starts flowing at a high rate at a comparatively low voltage through the induction coils of the furnace, producing an induced magnetic field in the central space of the coils where the crucible is located.

As the magnetic fluxes generate throughout the scrap and complete the circuit, they generate and induce eddy current in the scrap. This induced

eddy current, as it flows through the highly resistive bath of scrap, generates tremendous heat and melting starts. It is thus apparent that the melting rate depends primarily on two things (1) the density of magnetic fluxes and (2) compaction of the charge. The magnetic fluxes can be controlled by varying input of power to the furnace, especially the current and frequency.

In a medium frequency furnace, the frequency range normally varies between 150-10K cycles/second. This heat is developed mainly in the outer rim of the metal in the charge, but is carried quickly to the center by conduction. Soon a pool of molten metal forms at the bottom causing the charge to sink. At this point, any remaining charge mix is added gradually. The eddy current, which is generated in the charge, has other uses. It imparts a molten effect on the liquid steel, which is thereby stirred and mixed and heated more homogeneously. This stirring effect is inversely proportional to the frequency of the furnace.

The melting continues till all the charge is melted and the bath develops a convex surface. However, as the convex surface is not favorable to slag treatment, the power input is then naturally decreased to flatten the convexity and to reduce the circulation rate when refining under a reducing slag. The reduced flow of the liquid metal accelerates the purification reactions by constantly bringing new metal into close contact with the slag. Before the actual reduction of steel is done, the liquid steel which might contain some trapped oxygen is first treated with some suitable deoxidizer.

As soon as the charge has melted and de-oxidizing ions have ceased, any objectionable slag is skimmed off, and the necessary alloying elements are added. When these additives have melted and diffused through the path of the power, input may be increased to bring the temperature of metal up to the point most desirable for pouring. The current is then turned off and the furnace is tilted for pouring into a ladle. As soon as pouring has ceased, any slag adhering to the wall of the crucible is and the furnace is readied for charging again.

As the furnace is equipped with a cover over the crucible, very little oxidation occurs during melting. Another advantage of the induction furnace is that there is hardly any melting loss compared with the arc furnace. Material balance of SMS is given **Table 6.**

TABLE 6
MATERIAL BALANCE OF SMS

	Sanctioned as per EC dated 15.01.2018		Additional enhancement		Total	
Raw Material Inputs	**Quantity (TPA)**	**Specific Consumption (T/T)**	**Quantity (TPA)**	**Specific Consumption (T/T)**	**Quantity (TPA)**	**Specific Consumption (T/T)**
DRI	99388	0.941	19878	0.941	119266	0.941

Pig Iron / Hot Metal	11478	0.109	2296	0.109	13774	0.109
Steel Scrap	11478	0.109	2296	0.109	13774	0.109
Total	**122345**	1.159	**24469**	1.159	**146813**	1.159
Outputs	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**
Liquid metal to LRF &thereafter CCM	105600	1.000	21120	1.000	126720	1.000
BF dust	2447	0.023	489	0.023	2936	0.023
Slag	14298	0.135	2860	0.135	17157	0.135
Total	**122345**	**1.159**	**24469**	**1.159**	**146813**	**1.159**

Brief justification of capacity enhancement of Induction Furnace :

By using alumina based neutral lining (life-100 heats) in induction furnaces instead of the conventionally used silica based acidic lining (life- 20 heats) in Company's other plants, the downtime is reduced. Furthermore, 100 heat life of neutral lining can be further increased to 350 heats by hot patching. The longer life of lining will reduce downtime and increase availability of working hours as given in **Table 7.**

TABLE 7
DOWNTIME AND INCREASE IN AVAILABILITY OF WORKING HOURS

Lining	No. of heats before relining	Tap to tap time	Total time available before relining	Downtime for relining after (d)	No. of downtimes in 225 hrs	Extra heating time available in 225 hrs
(a)	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**
Acidic	20	2.25 hrs	45 hrs	24 hrs	5	Nil
Neutral	100	2.25 hrs	225 hrs	24 hrs	1	24 X (5-1) = 96 hours

Hence, increase of production by 20% is easily feasible by utilising the 90 hours extra working time available to operate one of the two standby furnaces in addition to the two operational furnaces above. For operation of a standby furnace simultaneously, additional electrical, bush bars and panel shall be installed.

4.1.2 Ladle Refining Furnace

The LF installation will be single station system with provision for heating, inert gas stirring, and addition of ferroalloys and additives. The LF will be complete with the transformer, Ladle stirring System, Aluminum wire feeder, Carbon injecting device, additives storage and addition system, Sampling

and temperature measuring device. A fume extraction and cleaning system consisting of bag filters, ID fan and chimney with the related ductwork will be provided. The specification of the ladle furnace is given in **Table 8**.

TABLE 8
ADDITIONAL FACILITY PROPOSED FOR LADLE FURNACE

Facilities	As per EC dt 15.01.2018	Additional proposed
Ladle Refining Furnace SMS	NIL	1 X 20 T

The LRF will serve as a further refining steps after IF and its production will be in consonance with the IF. Therefore 1,26,720 TPA hot metal from IF will be processed in LRF before sending to CCM

4.1.3 Continuous Casting Machine (Billet Caster/Slab Caster / Blooms Caster)

The CCM shall be complete with ladle stand, mould assembly, Strand guide segments and supports withdrawal and straightening system, mould cooling system, Cut- off equipment incl. length measuring device, Marking Machine etc. Requisite dummy bar and facilities for Dummy bar disconnecting and a dummy bar receiver will be included. Material balance of CCM is given in **Table 9.**

TABLE 9
MATERIAL BALANCE FOR CCM

	Sanctioned as per EC dated 15.01.2018		Additional enhancement		Total	
Raw Material Inputs	**Quantity (TPA)**	**Specific Consumption (T/T)**	**Quantity (TPA)**	**Specific Consumption (T/T)**	**Quantity (TPA)**	**Specific Consumption (T/T)**
Liquid Metal from IF	105600	1.02	21120	1.02	126720	1.02
Total	**105600**	**1.02**	**21120**	**1.02**	**126720**	**1.02**
Outputs	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**
Semi-Finished Product from CCM	103488	1.00	20698	1.00	124186	1.00
Slag	2112	0.02	422	0.02	2534	0.02
Total	**105600**	**1.02**	**21120**	**1.02**	**126720**	**1.02**

Justification: Commensurate with the output from the induction furnace, Continuous Casting Machine (CCM) will operate for increased hours to cater to the higher output from IF-LRF. There will be no other change.

4.2 Rolling Mill Plant Facilities

The capacity sanctioned as per EC dated 15.01.2018 and the proposed enhancement of capacity is summarised below:

Facilities	Sanctioned as per EC dt 15.01.2018)	Enhancement (TPA)	Total , TPA
Rolling Mill (TMT/ Flat/ Round/ Wire Rod/ Structural Mill)	101,418	20,284	121,702

The process involves the re-heating of the steel billets to a temperature of almost 1050^{o}C to get them into malleable shape, where after it shall be possible to roll them into bars of the required diameter. Apart from the re-heating furnace, the rolling mill comprises of a number of roll bearing stands. This process continues until the bar reaches its required diameter.

The TMT process exposes the bar to an intense cooling after the last rolling pass, providing excellent strength combined with good toughness, thanks to the hardening of the surface layer and subsequent tempering by residual heat flowing from the core. The fast cooling of the core leads to a very fine ferritic -pearlitice structure. Hence the mechanical properties required by several technical standards like ABNT, BSI, AFNOR, ASTM, JIS, DIN etc. regarding high strength bars may safely be reached.

The TMT process consists of a set of cooling elements in series, located after the last rolling pass. Every cooling element is provided with water inlet, which allows the homogeneous cooling of the bar. The water undergoes intensive turbulence caused by a series of circular grooves perpendicular to the bar axis. The turbulence eliminates the steam from the bar surface which leads to improved heat transmission. This provides an advantage over existing configuration in both the current drilled hole and slot designs and are typically prone to contamination. The amount of spring gap and the number of spring coils (spring gaps) is determined after an iterative analysis of the specific cooling requirement and the resulting water flow rates.

The entry spring is instrumental in achieving high cooling rates as it causes the initial water contact to contain a very high kinetic energy and impact perpendicular to the product axis. The high kinetic energy prevent the initial steam jackets forming around the bar surfaces. Laminar water flow, with high heat transfer characteristics, then occurs inside the guide bushings. Experimental data shows that the cooling effectiveness quickly diminishes after approx. 4-6 inches of travel (steam boundary layer formation), where in the system, the water is quickly and efficiently vented. The water flow rates are regulated in via the pyrometer feedback over the length of the bar. The

water flow regulation is controlled manually on the control desk by a pulpit operator.

Justification of enhancement of Rolling Mill:

The smallest 'direct' rolling mills that are currently manufactured by suppliers are 28 TPH. This configuration can easily cater to the increased output from IF-LRF-CCM by increasing the number of operating hours from average 11-12 hrs/day to 15 hours/day. There will be no other change. Material balance is given in **Table 10**.

TABLE 10
MATERIAL BALANCE OF ROLLING MILL

	Sanctioned as per EC dated 15.01.2018		**Additional enhancement**		**Total**	
Raw Material Inputs	**Quantity (TPA)**	**Specific Consumption (T/T)**	**Quantity (TPA)**	**Specific Consumption (T/T)**	**Quantity (TPA)**	**Specific Consumption (T/T)**
Semi Finished Product from CCM	103488	1.02	20698	1.02	124186	1.02
Total	**103488**	**1.02**	**20698**	**1.02**	**124186**	**1.02**
Outputs	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**	**Quantity (TPA)**	**Specific Production/ Generation (T/T)**
Rolled Product	101418	1.000	20284	1.000	121702	1.000
Reject	931	0.009	186	0.009	1118	0.009
Mill Scale	1138	0.011	228	0.011	1366	0.011
Total	**103488**	**1.02**	**20698**	**1.02**	**124186**	**1.02**

5.0 RAW MATERIAL

The detail of raw material with their sources & details of products after expansion are given in **Table 11**.

TABLE 11
DETAIL OF RAW MATERIAL AND THEIR SOURCES

Sl. No.	**Facilities**	**Raw Material**	**Unit**	**Required**	**Own Source**	**From outside Purchased**
1	Steel Melt Shop					
	I.F.	DRI	TPA	119266	119266	-
		Pig Iron	TPA	13774	-	13774
		Scrap	TPA	13774	-	13774
		product		**Produced**		**Sold to market**
2	Rolling mill	TMT	TPA	121702		121702

Raw material and product will be transported through Rail/ Road. The nearest railway station is Barajamda at 2.4 km. The Railway station at Barbil also nearby at 2.9 km aerially.

6.0 WATER

Consumption of industrial water in different operations can be broadly classified under the following heads:

a) Evaporation losses in raw water reservoir

b) Losses in water treatment

c) Dust suppression

d) Horticulture and green belt

e) Service water, e.g. floor washing, make-up to fire water system, etc.

f) Makeup water for induction furnace, LRF and rolling mill for cooling purposes

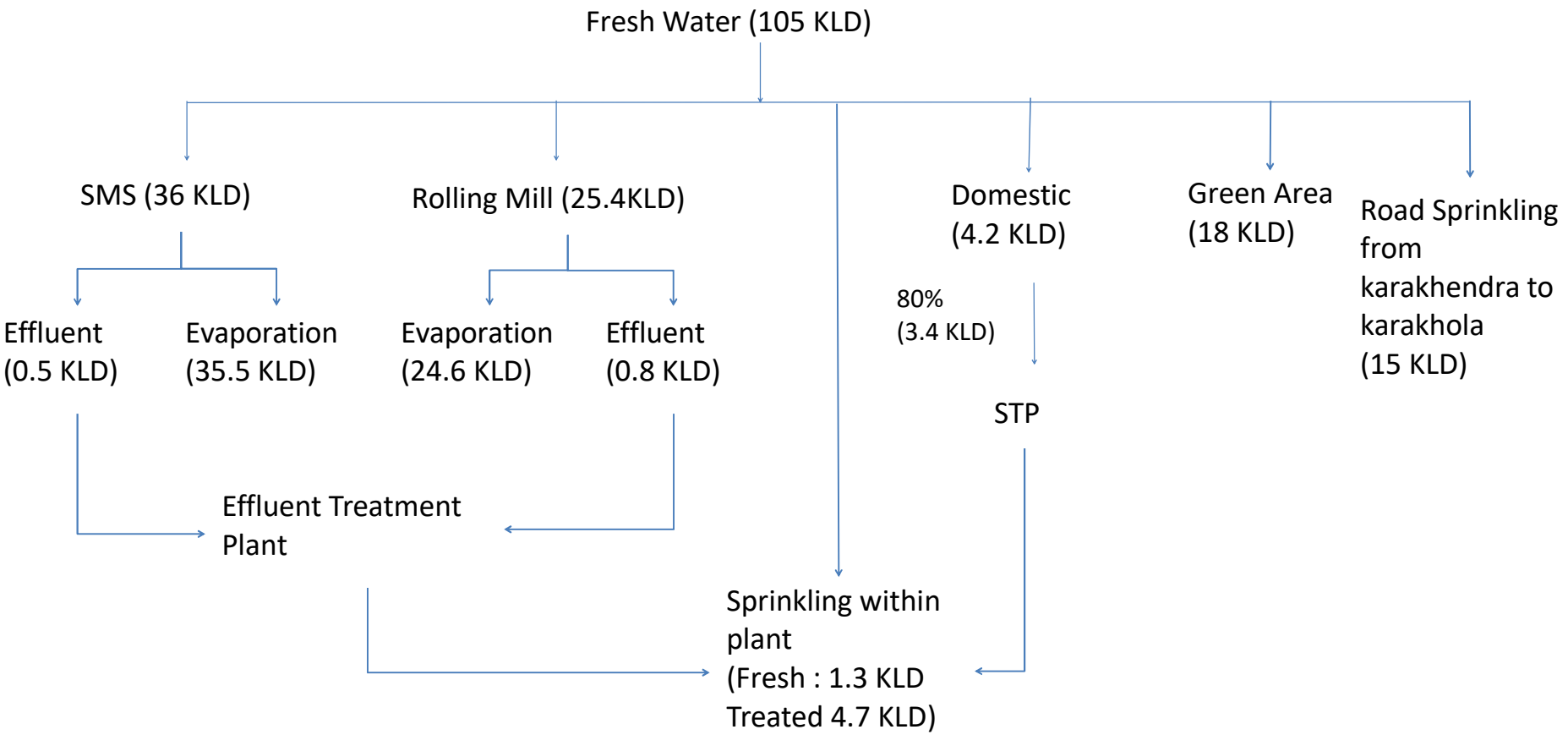
The total daily recirculating water will be 1226 KLD while the daily make-up water consumption shall be 105 KLD after expansion of the project. The project design encompasses optimum water consumption through the concept of recycling and reuse. The waste water generated from various units will be treated to meet the stipulated norms and then reused within the plant for process use, dust suppression (within and outside plant) and gardening. Break-up of water requirement for the proposed project is given in **Table 12**.

TABLE 12
BREAK UP OF WATER REQUIREMENT (KLD)

		Initial water requirement to start the plant						After Expansion, total daily make up water requirement						
Sl. No.	Particulars		Source		Waste water generated	Reused within plant	Reused outside plant	Recirculating water, KLD	Make up water, KLD	Source		Water Loss (evaporation/ consumption), KLD	Discharge, KLD	Remarks
			Fresh Water	Treated water						Fresh Water, KLD	Treated water, KLD			
1.	SMS (IF, CCM)	384	384	-	15*		15	720	36.0	36.0		35.5	0.5**	*100% dust suppression (8 KLD) & avenue plantation watering (7 KLD) along Karakolha-Karakhedra road (1 km) ** 100% reused for sprinkling within plant
2.	Rolling Mill	338	338	-	24#	24		506	25.4	25.4		24.6	0.8##	#6 KLD Dust suppression (0.18 ha roads & 0.4 ha stockyard) and 18 KLD in internal green belt (1.76 ha) ## 100% reused for sprinkling within plant
3.	Green area	18	-	18@	-			0	18	18		18		@From RM settling tank
4.	Sprinkling (within plant)	6	-	6@	-			0	6	1.3	4.7**,##,^^^	6		@From RM settling tank
5.	Karakhendra-Karakolha road	8 (sprinkling only)	-	8^ (sprinkling) + 7^ (avenue plantation)	-			0	15	15		15		^From SMS common sump
6.	Domestic use	4	4		3.2	3.2^^		0	4.2	4.2		0.8	3.4^^^	^^Stored in raw water reservoir ^^^100% reused for sprinkling within plant
	Total	758	726	39	42.2	27.2	15	1226	104.6	99.9	4.7	99.9	4.7	

- *Make up water has been considered 5% of the total recirculating water*

FIG 5 : WATER BALANCE DIAGRAM



The waste water generated from canteen, washrooms and toilets in plant will be treated in STP.

Industrial water shall be sourced first from harvested rain water and deficit from Karo River, if required. Ground water will be sourced for domestic consumption. Water received from various sources will be stored in a raw water reservoir proposed over 3 acres in the north western portion of the plant.

Fire water system: Water requirement for fire protection system shall be met from the raw water reservoir and separate pumps shall be provided for the said application.

7.0 MANPOWER

The manpower requirement after expansion shall be 260 persons, an increase of 10 persons. Three shifts working for 330 days are planned.

Facilities to manpower

Infrastructure facilities such as sanitation, fuel, restrooms, etc. shall be provided to the labour force during construction as well as to the casual workers including truck drivers. Same facilities shall be extended to workers and drivers during operation phase.

8.0 POWER

The power requirement for the proposed plant shall be 20 MW which shall be majorly sourced from proposed power plant proposed at a distance of 0.5 km (aerial). The power plant will be located inside the premises of the existing sponge iron plant of the company at village Karakolha. There will be a likely deficit of 3-5 MW, which will be met from the State's power grid.

9.0 ENVIRONMENT MANAGEMENT PLAN

9.1 INTRODUCTION

Rungta Mines Limited proposes to install 0.105 MTPA Steel Melting shop at Village Karakhendra, District Keonjhar, Odisha. The plant is proposed to undergo expansion to 0.127 MTPA. Due to increase in production, the plant may have an additional impact on land, air, water, noise, soil, ecology, socio-economics, etc.

The environment management plan includes the evaluation of additional impacts after superimposing the predicted impacts over base line data, which had been monitored and submitted with the EIA report of 0.105 MTPA in Nov, 2017. This helps in incorporating proper mitigation measures wherever necessary for preventing deterioration in environmental quality. Keeping in mind the environmental baseline scenario as detailed in Chapter 3 of the EIA of 0.105 MTPA in November 2017 and the proposed project

activity described in Sections 3.0 to 8.0 earlier, it is attempted to assess the likely impact and its extent on various environmental parameters in this chapter.

The important environmental parameters associated with this kind of a project are as follows:

- Topography and drainage
- Climate
- Air environment
- Land environment
- Water environment
- Solid waste
- Noise environment
- Traffic density
- Ecology
- Socio-economic environment
- Occupational health and safety
- Historical Monuments

The beneficial impacts anticipated from an industrial project, irrespective of their relevance to the proposed project, would be the employment opportunity available.

9.2 TOPOGRAPHY AND DRAINAGE

9.2.1 TOPOGRAPHY

Impact: The core zone represents flat land but with low lying area on the north western side (about 448 m to 454 AMSL). It is devoid of any natural drainage or topographical features. Change in topography shall occur due to the construction of the buildings such as walls, buildings, stock yards and excavation of raw water reservoir, etc for the 0.105 MTPA steel plant for which EC was granted on 15.01.2018. The construction of the plant was started in April 2018. The same buildings will be utilised for 0.127 MTPA by using the same equipment and installing the additional LRF with the same industrial shed of SMS. Within the core zone, the construction of units of 0.105 MTPA will lead to creation of buildings on unutilised land but no additional building construction will be required for 0.127 MTPA. This will be

a permanent change in the topography. There will be no impact on topography of the buffer zone.

Management: The change in topography in the core zone will lead to changes in the sheet flow pattern of rain water within the core zone. For that provision of storm water drains shall be made. The excavated material shall be used in landscaping and filling low lying areas in surroundings.

9.2.2 DRAINAGE- IMPACT & MITIGATION

A perusal of the toposheet, Google earth image and site visit showed there is no perennial river or water body in the project area. As discussed in the section related to topography, the sheet flow of rain water shall get affected within the core zone due to construction of buildings of 0.105 MTPA. No additional impact will occur due to expansion to 0.127 MTPA. Impact on the drainage in the buffer zone is not anticipated as no construction will be taking place outside plant boundary. As the sheet flow runoff from plant site is going into natural drain at present, there will be marginal change in the volume of flow as some of the water from the plant area will get captured and harvested in surface water reservoir or recharged to ground.

9.3 CLIMATE AND METEOROLOGY- IMPACT AND MITIGATION

A) CONSTRUCTION PHASE

The plant will have marginal impact on climate or meteorology during construction phase of 0.105 MTPA as mostly civil/ mechanical work concerning erection of plant will be carried out. There will be use of fossil fuel in the vehicles bringing raw material, DG sets used during construction or any specific diesel based machinery such as JCB, dozer, etc. The emissions will be insignificant and temporary to have any impact on the long term climate of the region. The additional impact that will occur due to expansion to 0.127 MTPA will be due to the fossil fuel consumption in civil works and installation of the 1X20 T LRF.

B) OPERATION PHASE

The project envisages installation of Induction Furnace, LFR, CCM and rolling mill. It will require cooling. This will add substantial heat and increase the ambient temperature locally. Thus, during operational phase, slight variation on temperature is likely on account of heat generation from various units and their cooling requirement. Approximately 20% extra heat will need to be dissipated due to increase in production from 0.105 to 0.127 MTPA.

Due to concrete buildings, heat island phenomenon will occur which will be localized and manifest itself in the premises of the plant. Therefore impact on climate will be small and insignificant. No additional impact will occur due to expansion to 0.127 MTPA as no new buildings are proposed.

The other activity, which can be considered in this context is the stack emissions and thermal pollution. The thermal pollution will be restricted to the plant site while the stack emissions will only contribute incremental values of pollutants. The climate is controlled by the pressure depression in the Bay of Bengal and is not anticipated to be affected by local activities under discussion. Therefore no mitigation measures are need to be taken. The annual total stack emissions will increase due to increase in production from 0.105 to 0.127 MTPA and has been discussed in subsequent section.

Further, carbon dioxide (green house gas) contributing fossil fuels will be in the form of diesel and furnace oil used to operate the trucks, vehicles and rolling mill, which will be a necessity. In order to sequester CO_2, plantation is a suitable method. Hence, 33% of the plant area shall be under greenbelt.

9.4 AIR QUALITY

9.4.1 IMPACT ON AIR QUALITY

a) Construction phase

The construction and erection of proposed 0.105 plant and equipment will generate dust resulting in higher SPM levels in surrounding area. Further due to deployment of various mechanical equipment and transport vehicle, enhanced SO_2 and NO_2 levels are expected. Thus, air quality is likely to be effected marginally which may require some mitigation measures of considerable magnitude. Moreover, the impact on the air quality during construction phase will be localized, temporary and reversible in nature. No additional impact on surrounding aire will occur due to expansion to 0.127 MTPA as the additional LRF to be installed will be within the SMS shed.

Dust emissions from non-residential and commercial construction are a function of the total area of land disturbed and the duration of activities done. Based on field studies, the AP-42 (Compilation of Air Pollutant Emission Factors*,* US EPA, Section 13.2.3) gives the total suspended particulate emission factor estimate as 2.69 megagrams (Mg)/hectare/month of activity.

B) OPERATION PHASE

Two types of generation and discharge of pollutants, viz., fugitive emissions and stack emissions, have been considered.

(I) Stack emission of gases from the various units and the associated facilities will add pollutants to the atmosphere, which will require mitigation measures.

(II) Fugitive emissions comprise mostly of dust generated due to handling of raw material/ pollution control equipment dust and solid waste. The products will be finished steel and not contribute to dust generation.

The details of stacks and stack emissions for the units snactioned in EC dated 15.01.2018 and the proposed enhancement are summarized in **Table 13**.

TABLE 13
STACK DATA

Sl. No	Stack name	Height (m)	Dia (m)	Temp (°C)	Exit gas Vol. (m^3/s)	Exit gas Vel. (m/s)	Emission rate (mg/Nm^3)		
							PM	SO_2	NO_2
FOR 0.105 MTPA STEEL PLANT SANCTIONED AS PER EC DATED 15.01.2018									
1	SMS bag filter (2 crucibles X 15 T IF)	30	1.7	100	25.050	11.04	6	-	-
2	Roll. Mill bag filter	60	3.0	365	60.170	8.51	30	211	48
FOR PROPOSED EXPANSION (0.105 MTPA TO 0.127 MTPA) STEEL PLANT									
1	SMS bag filter (3 crucibles X 15 T IF + 1 X 20 T LRF)	30	2.5	100	37.953	7.73	12	-	-
2	Roll. Mill bag filter	60	3.0	365	60.170	8.51	35	189	58

Justification for change in emissions :-

- ***PM emissions from SMS*** - The emissions were assumed on the basis of observed values in the operational units in other SMS units at Chaliyama, Jharkhand and Kamanda, Odisha of the Company. Compared to 0.105 MTPA when 2 crucibles of 15T IF would have been operational, now for 0.127 MTPA an additional crucible of 15 T IF and one of 20 T LRF will become operational, thus, doubling up the pollution load. As per CTE dated 29.03.2018, the unit is permitted to air emissions as per the limits prescribed in GSR 277(E) dt. 31.03.2012. The limit is prescribed as 150 mg/Nm^3 for Induction furnace. For assessing GLC in terms of PM10 and PM2.5, fractions of total PM have been considered. PM10 has been considered as 35-40%, avg 37.5% of PM and PM2.5 has been considered 55-60%, avg 57.5% of PM10.
- ***PM & NO_2 emissions from rolling mill*** - Average hourly production has increased in consonance with increase in daily production from 313.6 TPD to 368.8 TPD. The PM emissions have proportionately increased as have the NO_2 emissions. Basis of PM emissions are observed values at operational units of the company at other locations. As per CTE dated 29.03.2018, the unit is permitted to air emissions as per the limits prescribed in GSR 277(E) dt. 31.03.2012. The limit for PM is prescribed as 150 mg/Nm^3 for Rolling Mill. Basis of NO_2 is "Environmental, Health, and Safety Guidelines- Integrated Steel Mills, Dated 30 April 2007 of IFC" with values from 0.08 to 0.35 Kg/T production.
- ***SO_2 emissions from rolling mill*** - While calculating SO_2 for 0.105 MTPA plant, the fuel assumed was FO with 2% sulphur and calorific value 9520

Kcal/kg. However, now while modelling for 0.127 MTPA steel plant, the fuel considered in RM has been changed to LSHS, which has a higher calorific value, leading to lower consumption per tonne of production. Also it has a sulphur content of 1%, half of that of FO. Hence, sulphur emissions are anticipated to decrease.

The gases coming out from the SMS shall be predominantly having particulate matter while the emissions from reheating furnace of rolling mill will comprise of particulate matter, SO_2 and NO_2. These two units and their associated stacks will be the major source of air pollution, if control/ mitigation measures are not incorporated. Major portion of the particulate matter in the gas stream will be separated in the De-dusting units and Bag filters. The gas stream, exiting from the bag filters shall contain particulate matter in concentrations below the permissible limits.

9.4.2 Simulation model for prediction of ground level concentrations due to stack emissions

The following options were considered while modeling to predict the incremental ground level concentrations of pollutants due to emissions from the proposed units.

- The stack and emission details for Proposed unit have been adopted from **Table 13.**
- The prediction has been done to estimate concentration value over a radial distance of 10 km from the source.
- Combination of Cartesian and polar receptor network has been considered.
- Emission rate was considered constant throughout the averaging period.
- Ground level concentrations were computed without any decay co-efficient.
- The micro-meteorological observations made during the study period have been taken as input meteorological data. Calm wind conditions recorded during study period were also considered.

Inputs and results of dispersion modeling for 0.105 MTPA were given in **Annexure XVII** of EIA/EMP report, November 2017. The highest computed concentrations in the three dominant wind directions are given in **Table 14** and that at ambient air quality locations is given in **Table 15**.

TABLE 14
CALCULATED MAXIMUM GROUND LEVEL CONCENTRATION (µg/m³)

	Incremental Ground Level Concentrations (µg/m³)							
Direction	PM_{10}		$PM_{2.5}$		SO_2		NOx	
	GLC	Distance	GLC	Distance	GLC	Distance	GLC	Distance
FOR 0.105 MTPA STEEL PLANT (EC dt. 15.01.2018)								
E	0.02	4.0 km	0.01	1.8 km	0.10	10 km	0.02	7-10 km
SW	0.01	0.9 km	0.01	1.5 km	0.09	10 km	0.02	3-10 km
NE	0.02	3.0 km	0.01	0.6 km	0.09	10 km	0.02	10 km
FOR PROPOSED EXPANSION OF STEEL PLANT TO 0.127 MTPA								
E	0.04	4-5 km	0.02	2.5-10 km	0.09	10 km	0.03	7-10 km
SW	0.03	2.5-7 km	0.02	3-7 km	0.08	10 km	0.02	2.5-10 km
NE	0.04	3-7 km	0.02	2.5-10 km	0.08	10 km	0.02	5-10 km
INCREASE IN EMISSIONS								
E	0.02		0.01		-0.01		0.01	
SW	0.02		0.01		-0.01		0.00	
NE	0.02		0.01		-0.01		0.00	

TABLE 15
CALCULATED MAXIMUM INCREMENTAL GLC DUE TO STACK EMISSIONS (µg/m³) AT AMBIENT AIR QUALITY STATIONS

	Due to 0.105 MTPA				Due to 0.127 MTPA				Increase			
AAQ Station	PM10	PM2.5	SO_2	NO_2	PM10	PM2.5	SO_2	NO_2	PM10	PM2.5	SO_2	NO_2
BA1 - Kara	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BA2 - Karakhendra	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00
BA3 - Karakhendra near Pandrasali P.F.	0.01	0.00	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.00	0.00
BA4 - Dalki	0.01	0.00	0.01	0.00	0.02	0.01	0.01	0.00	0.01	0.01	0.00	0.00
BA5 - Belkundi	0.01	0.01	0.04	0.01	0.02	0.01	0.04	0.01	0.01	0.00	0.00	0.00
BA6 - Bara Jamda	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00
BA7 - Uliburu	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00

9.4.3 SIMULATION MODEL FOR PREDICTION OF GROUND LEVEL CONCENTRATIONS DUE TO FUGITIVE EMISSIONS FROM STORAGE AREAS

For estimating the increase in the air pollutants due to raw material stock yard and solid waste storage yard, FDM model is being used. Fugitive Dust Model (FDM), which is a computerized air quality model specifically designed for computing concentration and deposition impacts from fugitive dust sources. The sources may be point, line or area sources. The model has not been designed to compute the impacts of buoyant point sources, thus it contains no plume rise algorithm.

The model is generally based on the well known Gaussian Plume formulation for computing concentrations, but the model had been specifically adapted to incorporate an improved gradient transfer deposition

algorithm. Emissions for each source are apportioned by the user into a series of particle size classes. A gravitational setting velocity and a deposition velocity are calculated by FDM for each class. Concentration and deposition are computed at all user selectable receptor location.

The assumptions, input data and other details were submitted earlier in **Annexure XVIII** of EIA/EMP report for 0.105 MTPA, November 2017 along with the GLC contour maps in Fig 1 to 3 of the same Annexure for the project.

Table 16 given the top ten values for particulate matter as a result of emissions from raw material stock yard and Solid waste storage area.

TABLE 16

TOP 10 TABLE FOR 24 HOUR AVERAGES DUE TO 0.105 MTPA STEEL PLANT

Rank	Receptor No	Co-ordinates		PM_{10}		$PM_{2.5}$	
		X	Y	GLC	Deposition	GLC	Deposition
1	47	10059.2	10117.1	1.6344	0.0345	0.8989	0.0189
2	46	10052.9	10131.5	0.8131	0.0171	0.4472	0.0094
3	48	10050.9	10099.2	0.6888	0.0133	0.3788	0.0073
4	45	10052.4	10151.5	0.4691	0.0084	0.2580	0.0046
5	49	10046.6	10079.7	0.3772	0.0057	0.2075	0.0031
6	64	10098.0	10077.1	0.3371	0.0055	0.1854	0.0030
7	2	10131.1	10122.0	0.3101	0.0054	0.1705	0.0030
8	63	10079.7	10069.0	0.3065	0.0050	0.1686	0.0028
9	65	10114.8	10086.2	0.2680	0.0046	0.1474	0.0025
10	66	10122.7	10104.6	0.2237	0.0031	0.1230	0.0017

24 HOUR AVERAGES INCREMENTAL GLC AT AIR QUALITY STATIONS DUE TO 0.105 MTPA STEEL PLANT

Rank	Receptor		Co-ordinates		PM_{10}		$PM_{2.5}$	
	No.	Name	X	Y	GLC	Deposition	GLC	Deposition
1	179	BA1	10308.3	9107.7	0.0008	0.0000	0.0004	0.0000
2	180	BA2	11414.1	10216.0	0.0011	0.0000	0.0006	0.0000
3	181	BA3	11491.5	11760.1	0.0004	0.0000	0.0002	0.0000
4	182	BA4	10205.0	7152.0	0.0002	0.0000	0.0001	0.0000
5	183	BA5	9079.0	9122.2	0.0010	0.0000	0.0006	0.0000
6	184	BA6	10256.6	13052.4	0.0001	0.0000	0.0001	0.0000
7	185	BA7	6698.0	10515.5	0.0001	0.0000	0.0001	0.0000

A decrease is expected in the fugitive emissions due to material handling when going for expansion from 0.105 to 0.127 MTPA due to following reasons:

- During modelling for 0.105 MTPA, the raw material are was assumed as an open area (for DRI & scrap storage), while now, after detailed engineering, it has been decided to keep both DRI and scrap under covered sheds. This effectively eliminates the fugitive emissions from raw material storage area
- The solid waste generation will increase in consonance with the production but the increase in waste material handling & area disturbed

in solid waste storage yard will be offset reduction in raw material fugitive emission. The increase in solid waste due to expansion is estimated to be only 14% of the increase in DRI & scrap

- Hence, the fugitive dust might actually decrease, hence, no remodelling has been carried out and no change in fugitive emission has been assumed

9.4.4 RESULTANT GLC DUE TO PLANT

The predicted ground level concentration obtained due to stack emissions and fugitive emissions when superimposed on baseline concentration is within the National Ambient Air Quality Standards for Residential Areas as can be seen in **Table 17**.

TABLE 17
CUMULATIVE IMPACT DUE TO INCREMENTAL GLC FROM STACKS EMISSIONS & STOCK YARDS ON AMBIENT CONCENTRATION (µg/m^3)

Pollutant	Sampling Station	Base line value	Incremental Values due to 0.105 MTPA		Total Resultant due to 0.105 MTPA	Incremental Values due to 0.127 MTPA		Total Resultant due to 0.127 MTPA	Increase in resultant due to expansion
			Stack emissions (Table 15)	Fugitive emissions (Table 16)		Stack emissions (Table 15)	Fugitive emissions (Table 16)		
PM2.5	BA1 - Kara	37.7	0.00	0.0004	37.7004	0.00	0.0004	37.7004	0.00
	BA2 - Karakhendra	35.9	0.00	0.0006	35.9006	0.01	0.0006	35.9106	0.01
	BA3 - Karakhendra near Pandrasali P.F.	34.3	0.00	0.0002	34.3002	0.01	0.0002	34.3102	0.01
	BA4 - Dalki	36.1	0.00	0.0001	36.1001	0.01	0.0001	36.1101	0.01
	BA5 - Belkundi	35.4	0.01	0.0006	35.4106	0.01	0.0006	35.4106	0.00
	BA6 - Bara Jamda	38.9	0.01	0.0001	38.9101	0.01	0.0001	38.9101	0.00
	BA7 - Uliburu	31.6	0.00	0.0001	31.6001	0.01	0.0001	31.6101	0.01
PM10	BA1 - Kara	64.6	0.00	0.0008	64.6008	0.00	0.0008	64.6008	0.00
	BA2 - Karakhendra	61.1	0.01	0.0011	61.1111	0.01	0.0011	61.1111	0.00
	BA3 - Karakhendra near Pandrasali P.F.	58.7	0.01	0.0004	58.7104	0.02	0.0004	58.7204	0.01
	BA4 - Dalki	62.2	0.01	0.0002	62.2102	0.02	0.0002	62.2202	0.01
	BA5 - Belkundi	58.5	0.01	0.001	58.5110	0.02	0.001	58.5210	0.01
	BA6 - Bara Jamda	67.8	0.01	0.0001	67.8101	0.02	0.0001	67.8201	0.01
	BA7 - Uliburu	54.5	0.01	0.0001	54.5101	0.02	0.0001	54.5201	0.01
SO_2	BA1 - Kara	12.6	0.00	-	12.6000	0.00	-	12.6000	0.00
	BA2 - Karakhendra	8.8	0.01	-	8.8100	0.01	-	8.8100	0.00
	BA3 - Karakhendra near Pandrasali P.F.	9.7	0.02	-	9.7200	0.02	-	9.7200	0.00
	BA4 - Dalki	10.7	0.01	-	10.7100	0.01	-	10.7100	0.00
	BA5 - Belkundi	12.7	0.04	-	12.7400	0.04	-	12.7400	0.00

Pollutant	Sampling Station	Base line value	Incremental Values due to 0.105 MTPA		Total Resultant due to 0.105 MTPA	Incremental Values due to 0.127 MTPA		Total Resultant due to 0.127 MTPA	Increase in resultant due to expansion
			Stack emissions (Table 15)	Fugitive emissions (Table 16)		Stack emissions (Table 15)	Fugitive emissions (Table 16)		
	BA6 - Bara Jamda	19.0	0.00	-	19.0000	0.00	-	19.0000	0.00
	BA7 - Uliburu	8.1	0.00	-	8.1000	0.00	-	8.1000	0.00
NO_2	BA1 - Kara	15.4	0.00	-	15.4000	0.00	-	15.4000	0.00
	BA2 - Karakhendra	12.8	0.00	-	12.8000	0.00	-	12.8000	0.00
	BA3 - Karakhendra near Pandrasali P.F.	11.6	0.01	-	11.6100	0.01	-	11.6100	0.00
	BA4 - Dalki	13.6	0.00	-	13.6000	0.00	-	13.6000	0.00
	BA5 - Belkundi	15.1	0.01	-	15.1100	0.01	-	15.1100	0.00
	BA6 - Bara Jamda	23.7	0.00	-	23.7000	0.00	-	23.7000	0.00
	BA7 - Uliburu	11.8	0.00	-	11.8000	0.00	-	11.8000	0.00

A perusal of above table shows that the pollutant concentrations in the ambient air will remain well below the National Ambient Air Quality Standard prescribed by CPCB. The highest resultant values at ambient air quality stations are likely to be 67.82 µg/m^3, 38.91 µg/m^3, 19.00 µg/m^3 and 23.70 µg/m^3 for PM10, $PM_{2.5,}$ SO_2 and NO_2 respectively which will be well within the permissible limits for residential and rural areas after adding to the baseline values. (Standards for PM_{10} is 100 µg/m^3, $PM_{2.5}$ is 60 µg/m^3, SO_2 80 µg/m^3 and NO_2 80 µg/m^3 as per CPCB).

The likely impacts on air quality during the construction phase are comparatively low and reversible, and managed through proper maintenance and operation of construction/erection equipment as well as periodic sprinkling. However, during operation phase, the various operations would discharge huge quantities of particulates and gaseous pollutions, which must be controlled before discharge into atmosphere.

9.4.5 SIMULATION MODEL FOR PREDICTION OF GROUND LEVEL CONCENTRATIONS DUE TO TRANSPORTATION

The anticipated traffic volume to and from the plant is expected to be in the range of 118 trips of the trucks per day, considering trucks of 10, 15 & 18 T capacity as calculated in section 9.10.1.

For estimating the increase in the air pollutants due to transportation of raw material and finished products FDM model is being used. The assumptions, input data and other details were given in **Annexure XIX** along with GLC isopleth maps in EIA of 0.105 MTPA, November 2017. On the same basis the calculations have been done for 118 trips of trucks per day and the results are summarised in **Table 18**.

TABLE 18
INCREMENTAL GLC DUE TO TRANSPORTATION (µg/m^3)

Rank	Receptor No.	Distance from road (m)	Co-ordinate		PM_{10}		$PM_{2.5}$		SO_2		NO_2	
			X	Y	Concentration	Deposition	Concentration	Deposition	Concentration	Deposition	Concentration	Deposition
DUE TO 0.105 MTPA STEEL PLANT												
1	203	20	10028.9	8968.8	0.0629	0.0011	0.0361	0.0006	0.8337	0.0147	8.3814	0.1476
2	172	20	7936.7	8907.1	0.0538	0.0009	0.0309	0.0005	0.7138	0.0119	7.176	0.1198
3	186	20	9071.1	10501.3	0.053	0.001	0.0304	0.0005	0.7024	0.0126	7.0608	0.127
4	3	20	10623.7	10116.8	0.0492	0.001	0.0283	0.0005	0.6532	0.0126	6.5666	0.1267
5	210	20	10570.2	9790	0.0488	0.0009	0.0281	0.0005	0.6471	0.0116	6.5055	0.1162
6	211	20	10627.6	9928.6	0.0486	0.0009	0.028	0.0005	0.6447	0.0116	6.4815	0.1168
7	171	20	7805	8835.3	0.0484	0.0008	0.0278	0.0005	0.6423	0.0108	6.4566	0.1082
8	116	20	7435.9	1063.9	0.0483	0.0009	0.0278	0.0005	0.6403	0.0118	6.4365	0.1187
9	2	20	10486.5	10177.5	0.0482	0.0009	0.0277	0.0005	0.6387	0.0123	6.4207	0.1235
10	1	20	10349.3	10238.1	0.0481	0.0009	0.0276	0.0005	0.6375	0.0123	6.4089	0.1232
DUE TO 0.127 MTPA STEEL PLANT												
1	203	20	10028.9	8968.8	0.0786	0.0014	0.0452	0.0008	1.0425	0.0184	10.48	0.1845
2	172	20	7936.7	8907.1	0.0673	0.0011	0.0387	0.0006	0.8923	0.0149	8.97	0.1498
3	186	20	9071.1	10501.3	0.0662	0.0012	0.0381	0.0007	0.878	0.0158	8.826	0.1588
4	3	20	10623.7	10116.8	0.0633	0.0012	0.0364	0.0007	0.8397	0.0162	8.4412	0.1629
5	210	20	10570.2	9790	0.0627	0.0011	0.036	0.0006	0.8313	0.0149	8.3569	0.1494
6	211	20	10627.6	9928.6	0.0625	0.0011	0.0359	0.0006	0.8285	0.0149	8.3292	0.1502
7	2	20	10486.5	10177.5	0.0619	0.0012	0.0356	0.0007	0.821	0.0158	8.2535	0.1588
8	1	20	10349.3	10238.1	0.0618	0.0012	0.0355	0.0007	0.8195	0.0158	8.2381	0.1584
9	171	20	7805	8835.3	0.0605	0.001	0.0348	0.0006	0.8028	0.0135	8.0708	0.1352
10	116	20	7435.9	1063.9	0.0603	0.0011	0.0347	0.0006	0.8003	0.0148	8.0457	0.1484
INCREASE IN INCREMENTAL VALUES												
1	203	20	10028.9	8968.8	0.0157	0.0003	0.0091	0.0002	0.2088	0.0037	2.0986	0.0369
2	172	20	7936.7	8907.1	0.0135	0.0002	0.0078	0.0001	0.1785	0.0030	1.7940	0.0300
3	186	20	9071.1	10501.3	0.0132	0.0002	0.0077	0.0002	0.1756	0.0032	1.7652	0.0318
4	3	20	10623.7	10116.8	0.0141	0.0002	0.0081	0.0002	0.1865	0.0036	1.8746	0.0362
5	210	20	10570.2	9790	0.0139	0.0002	0.0079	0.0001	0.1842	0.0033	1.8514	0.0332
6	211	20	10627.6	9928.6	0.0139	0.0002	0.0079	0.0001	0.1838	0.0033	1.8477	0.0334
7	2	20	10486.5	10177.5	0.0137	0.0003	0.0079	0.0002	0.1823	0.0035	1.8328	0.0353
8	1	20	10349.3	10238.1	0.0137	0.0003	0.0079	0.0002	0.1820	0.0035	1.8292	0.0352
9	171	20	7805	8835.3	0.0121	0.0002	0.0070	0.0001	0.1605	0.0027	1.6142	0.0270
10	116	20	7435.9	1063.9	0.0120	0.0002	0.0069	0.0001	0.1600	0.0030	1.6092	0.0297

9.4.6 MANAGEMENT OF AIR QUALITY

The likely impacts on air quality during the construction phase are comparatively low. It requires preventive maintenance of all trucks, earth movers and construction equipment, spraying of water on disturbed areas, water spraying during loading and unloading operations and transportation to be carried out in covered trucks.

However, during operation phase, the various operations would discharge particulates and gaseous pollution, which must be controlled before discharge into atmosphere. Following mitigation measures shall be taken:

A) CONSTRUCTION PHASE

Major sources of air pollution are dust and fumes from construction operation and equipment, welding fumes, and radiation during non-destructive testing of weld joints. Water spraying on material to be handled before beginning work and spraying on unpaved surfaces twice a day will improve the working conditions and minimize dust pollution. The designated areas for roads and parking spaces shall be black topped at the earliest. Transport vehicles shall be maintained leak proof to avoid spillage of rubble and soil. Welding operations shall be carried out within cordoned areas.

As per AP-42 of US EPA, the recommended measures for various activities during construction phase are summarised in **Table 19.**

TABLE 19
RECOMMENDED MEASURES FOR CONTROL OF FUGITIVE EMISSIONS DURING CONSTRUCTION

Emission Source	Recommended Control Method(s)
Debris handling	Wind speed reduction, Wet suppression#
Truck transport##	Wet suppression, Paving Chemical stabilization^
Bulldozers	Wet suppression^^
Pan scrapers	Wet suppression of travel routes
Cut/fill material handling	Wind speed reduction, Wet suppression
Cut/fill haulage	Wet suppression, Paving, Chemical stabilization
General construction	Wind speed reduction, Wet suppression Early paving of permanent roads

 # Dust control plans should contain precautions against watering programs that confound track out problems.

Loads could be covered to avoid loss of material in transport, especially if material is transported offsite.

^ Chemical stabilization usually cost-effective for relatively long-term or semi-permanent unpaved roads.

^^ Excavated materials may already be moist and not require additional wetting. Furthermore, most soils are associated with an" optimum moisture" for compaction.

B) DURING OPERATION PHASE

The air quality prediction exercise carried out for stack emission gave resultant ground level concentrations of 0.04 µg/m^3 for PM10, 0.02 µg/m^3

for PM2.5, 0.09 µg/m^3 for SO_2 and 0.03 µg/m^3 for NO_2. The results for fugitive dust modelling for solid waste yards showed ground level concentrations of 0.0011 µg/m^3 for PM10 and 0.0006 µg/m^3 for PM2.5. The transportation route vehicular exhaust air pollutant emission estimation gave ground level concentrations of 0.0786 µg/m^3 for PM10, 0.0452 µg/m^3 for PM2.5, 1.0425 µg/m^3 for SO_2 and 10.48 µg/m^3 for NO_2. When superimposed over the existing ground level concentrations, the resultant concentrations are within the required standards.

Following control measures shall be adopted:

- Keeping stack height as per CPCB norms i.e. 30 m (in SMS) and 60 m (in RM)
- Fume extraction system with PTFE bag filters shall be provided at Induction Furnaces & Ladle Refining Furnace to exhaust PM level below 50 mg/Nm^3, even though as per CTE dated 29.03.2018, the unit is permitted to PM emissions as per the limits prescribed in GSR 277(E) dt. 31.03.2012. The limit is prescribed as 150 mg/Nm^3 for Induction furnace.

  In order to control the air pollution in the induction furnace and ladle refining furnace, a fume extraction system will be installed. It consists of a suction hood, a cyclone and a bag filter. The suction hood is mounted on the head of furnace, the flue gases will be sucked through the hood. Hoods will be provided over all the operational induction furnaces and the ladle refining furnace. The blower sucks the flue gases through the hood along with pipe, which is connected to the cyclone and filter. The blower sucks the flue gases through hood along with pipe, which is connected to the cyclone. The cyclone and filter separate the solid particles, which fall down in the bottom, are collected and removed. The clean air is exhausting through the Air Vent, in which the dust concentration is less than 50 mg/Nm^3.

- When the reheating furnace at the rolling mill will be in use, PTFE bag filters shall be made operational to exhaust PM level below 50 mg/Nm^3, even though as per CTE dated 29.03.2018, the unit is permitted to PM emissions as per the limits prescribed in GSR 277(E) dt. 31.03.2012. The limit is prescribed as 150 mg/Nm^3 for Induction furnace.
- Leakage from the equipment, ducts and transfer points shall be regularly checked and stopped.
- Development of green belt will help to check air pollution
- All fugitive emissions will be minimized.
- Regular monitoring and awareness among workers will help in controlling air pollution

- Summary of air pollution control systems used and their efficiency is given below:

Sl. No.	Name of Unit	Air Pollution Control Device	% Efficiency (approx)
1.	SMS - IF & LRF	FES and Bag Filter	99
3.	Reheating furnace of rolling mill	Bag filter	99.5%

Abbreviation: Fume extraction system

FUGITIVE EMISSIONS CONTROL

Control and mitigation measures for abatement of fugitive dust emissions are as follows:

1. Fume extraction systems, with bag filters will be provisioned at SMS and rolling mill. The clean air will be discharged into the atmosphere.

2. Raw materials and finished product are stored in covered sheds.

3. Water sprinkling will be done regularly over all open unpaved areas, internal roads and road from Karakhendra to Karakolha
4. In order to prevent the spread of fugitive dust, green belt of adequate width will be developed all along the plant boundary.

9.5 LAND ENVIRONMENT

The present status of the project land is given below:

	Acres	Ha	Percent
Total land of project	13.20	5.432	
Acquired (through direct purchase)	13.20	5.432	100
Pre-project land ownership: Private land	13.20	5.432	100
Pre-project land use: Agriculture	13.20	5.432	100
Current land use (as on 12.2.2017): Industrial(ROR land use changed as per OLR U/s 8(A) Case no. 102/2013)	13.20	5.432	100

9.5.1 IMPACT ON LAND & ITS MANAGEMENT

Construction phase: The 0.105 MTPA plant which was sanctioned as per EC dated 15.01.2018, is now under construction. The construction was started in April 2018. The possible impact on landform of the area occur due to land grading, cutting, filling, excavation of earthworks, making roads, boundary wall and plant related civil construction activity. Exact volume of excavated earthworks is difficult to estimate at this preliminary stage. The plant layout has been designed after considering the slope of the land. No earth is/ will be brought from outside or disposed outside the premises. In case filling is required in any portion of the land, it shall be done by using

solid waste from other plants of the Company. Any excavated earth is/will be stored at earmarked place with proper slopes and utilized for leveling and landscaping purpose within the plant premises. The surplus earth generated during excavation will used for grading work, utilized in making approach road and landscaping activities. Compaction of the reclaimed land will be done and the area will be regenerated with trees and bushes. Excavation work will be carried out during dry season and avoided during rainfall events to prevent soil erosion and washout of excavated materials.

There will not be any additional impact due to the expansion to 0.127 MTPA as there will be no new construction of buildings or storage areas.

Operation: The land use of the core area will be changed during the construction and the operation phases. Land use of the pre-project agricultural area has been changed to industrial. The plant will be spread over 13.20 acres land. During construction phase, parts of the project area will be converted into internal roads, water reservoir, buildings, green belt and plantation, etc. The features of the plot will undergo changes due to construction. The resultant land uses within the plot is shown in **Table 20**.

TABLE 20
PROPOSED BREAK UP OF TOTAL PLOT AREA

Sl. No.	Description	Area (Acres)	Percent
1.	Plants & facilities	4.0	30.30
2.	Stock yards	1.0	3.79
3.	Area for solid waste	0.40	3.03
4.	Green belt & plantation	4.356	33.00
5.	Administration building	0.01	0.08
6.	Water reservoir	3.0	22.7
7.	Roads	0.434	3.29
	Total	**13.20**	**100**

Dense Greenbelt (10 m wide) will be developed all along the plant boundary so that the visual aesthetics is improved and disturbance to fugitive dust is avoided.

9.6 SOIL QUALITY

Impact: Soil quality might change during construction phase due to handling of construction material but may also change during operation due to open yard storage of raw materials like sponge iron and scrap. Further, even temporary dumping of solid wastes like slag, mill scales on land would also deteriorate soil quality, if appropriate control and mitigation measures will not be implemented.

The 0.105 MTPA plant which was sanctioned as per EC dated 15.01.2018, is now under construction. The construction was started in April 2018. There will not be any additional impact due to the expansion to 0.127 MTPA as there will be no new construction of buildings or storage areas.

Management: During construction, the topsoil generated during construction is being preserved and spread over the area and utilize for development of green belt and afforestation. The establishment of peripheral green belt has also been accomplished.

During operation, the waste disposal area shall be lined by impervious material. The raw material stack yard will also be having concrete impervious base to protect the soil below it along with a shed to protect from rain. All stock piles will have a stable liner to avoid leaching of materials to ground water. The run off and leachates from the raw materials stack yard and solid waste disposal yard, respectively shall not be allowed to mix with storm water drainage. Runoff will be collected in a garland drain around the stock yard, settled and treated in a batch type ETP prior to reuse in sprinkling or horticulture.

9.7 WATER ENVIRONMENT

9.7.1 WATER CONSUMPTION

Total water requirement of the entire 0.127 MTPA complex, under envisaged operating conditions, is estimated as 1265 KLD including recirculating water. The daily make up water requirement will be 105 KLD. Industrial water shall be sourced first from harvested rain water and deficit from Karo River, if required. Ground water will be sourced for domestic use. The entire waste water generated from the project shall be used for sprinkling inside the plant area plant area. The water balance has already been covered in **Table 12** earlier.

9.7.2 WASTE WATER GENERATION FROM VARIOUS SOURCES

Details of effluent generation from each plant is given in **Table 21**.

TABLE 21
WASTE WATER GENERATION AND REUSE FOR 0.127 MTPA PLANT

Sl. No.	Waste water generation Unit	Total	Reused within plant	Remarks
1	SMS (I.F.-LRF-CCM)	0.5	0.5	100% reused for sprinkling within plant
2	TMT/Flat/ Round/ Wire/ Rod/ Strl Mill	0.8	0.8	100% reused for sprinkling within plant
3	Drinking Water and Sanitary	3.4	3.4	100% reused for sprinkling within plant
	Total	**4.7**	**4.7**	**No discharge to environment**

The discharge from SMS (and its cooling system) shall be to the common sump and from rolling mill and casters will be to their respective settling tanks, wherafter water will be further utilised

The waste water will be be fully utilised within the existing plant for sprinkling.

Run off (during rainfall days and monsoon) from solid waste storage area will be routed through catch pits of sufficient volume to settle out suspended solids present in the storm water runoff. Batch type ETP shall be provided to treat the run off, if required, prior to reuse of the water.

The list of water pollution control systems envisaged are summarised in **Table 22**.

TABLE 22
LIST OF WATER POLLUTION CONTROL SYSTEMS ENVISAGED

Source	Pollutants	Control systems	Remark
Raw materials/ solid w aste storage yards	Suspended Solids	Garland drains, Catch pits and settling tanks	catch pit 5 X2 X 1.5 m
Induction furnace and LRF cooling system	TDS	Common sump	300 m^3 capacity
Slab caster, Boom cas ter and Billet caster	Suspended Solids	Settling tank & sump	400 m^3 capacity
Rolling mill	Suspended Solids	Settling tank & sump	Mill - 300 m^3 capacity TMT- 428 m^3 capacity
Workshop	Oil &Grease , SS	OWS & settling tank	OWS- 0.2 m^3
Canteens, toilets	pH, BOD, S S, COD	STP	5 KLD, MBR

9.7.3 PLANT WISE EFFLUENT TREATMENT SYSTEMS

A. COOLING WATER OF IF, LRF AND RM

The prevention and control of water pollution aims at conserving the make-up water by recycling more than 95% of the circulating water. Estimated make-up water requirement for IF-LRF-CCM will be 36 KLD while for rolling mill it will be 25.3 KLD, at full capacity of 0.127 MTPA steel production. However, occasionally small quantities of effluents have to be discharged to prevent build up of excess dissolved solids. Blow down water from the cooling tower will be reused as sprinkling water for dust suppression.

B. DE-MINERALIZED PLANT EFFLUENTS

In the chemical water treatment plant, acidic and alkaline effluents are generated during the generation of cation /anion and the mixed bed exchangers. The effluents from the chemical water treatment plant will be led to a properly sized impervious, neutralization pit. Normally these effluents are self-neutralizing. But, provision will be made for dosing lime into the neutralizing pit to ensure the sufficiently high pH value before these

effluents are reused. Approximately 1% of the daily make-up water requirement will be DM plant effluent.

C. DOMESTIC EFFLUENT

The plant sanitary sewage from ablution blocks etc will be segregated from industrial waste and routed to the sewage treatment plant (STP) through sewer network. The STP shall constitute of Bar screens, Oil and grease Trap, Equalization tank, Aeration tank, Clarifier tank, Filter feed tank, Pressure sand Filter, Tertiary Treatment and treated effluent water tank. Details of the STP were submitted with the EIA of 0.105 MTPA steel plant in November 2017.

D. MAINTENANCE, WORKSHOP & PLANT CLEANING

Oil & grease during repair and maintenance of machinery and vehicles will get spilled for which the water collected in the workshop will be passed through oil-water separator (OWS) to remove oil & grease. The water from plant washing or maintenance work will also be passed through OWS to collect oil & grease, which will be stored in a separate container and disposed to authorized recycling vendor.

9.7.4 GROUND WATER POLLUTION AND MANAGEMENT PLAN

The company does not propose to use ground water for any purpose, hence, no adverse impact on account of industrial activity is foreseen. However the company proposes to enhance ground water recharge by adopting artificial recharge practice.

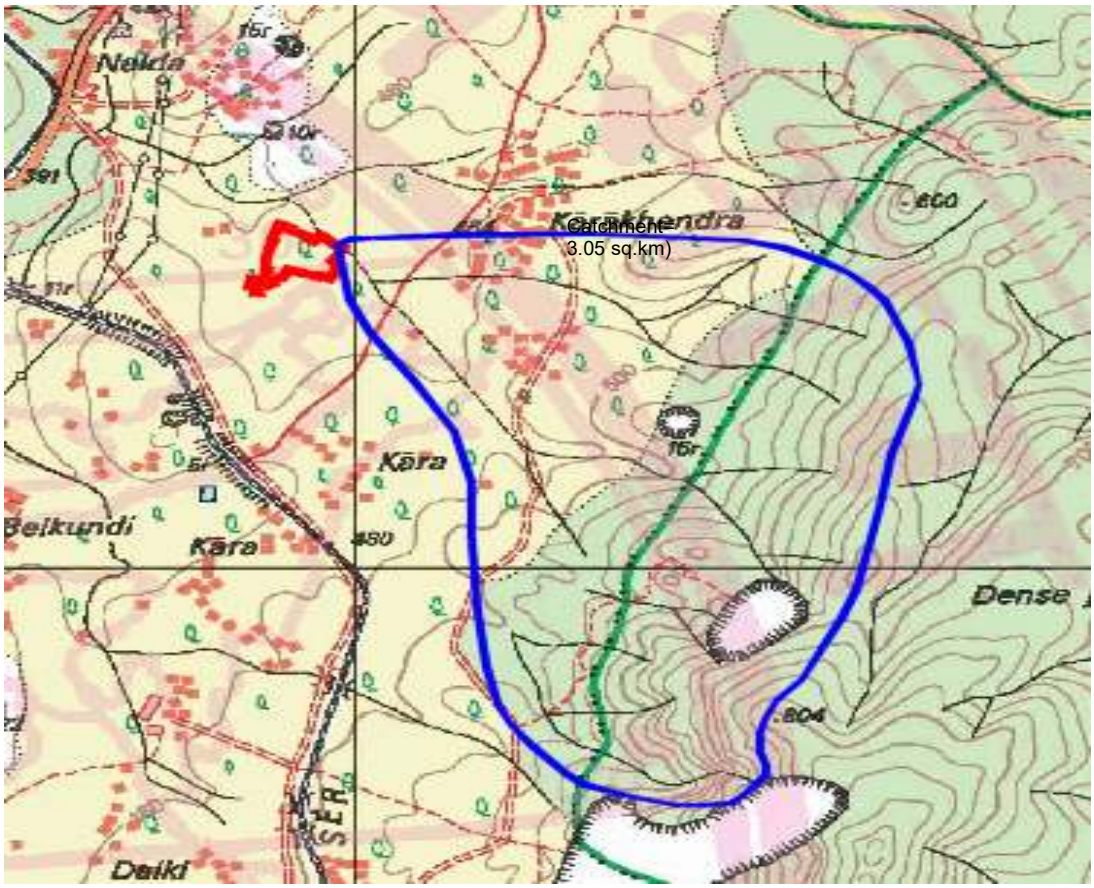
No effluent is anticipated to contaminate the aquifer as the treated water will be all reused on the surface and evaporate.

9.7.5 RAIN WATER HARVESTING

It is planned to harvest rain water from (i) the plot area as well as (ii) from out of it and will be collected and stored in the surface water reservoir for plant use. Harvested water to be collected and stored in the surface water reservoir in plant of 3 acres area, depth 6 m (excluding freeboard) and capacity 72845 cum. As the construction of the 0.105 MTPA steel plant has already commenced in April 2018, the rain water reservoir construction had already been started, but in a smaller area. Water was also collected in it and is being used for construction.

This plant will be dependent on rain water to meet its entire industrial fresh water demand. The first day water requirement was estimated as 726 KLD for 0.105 MTPA plant. Out of this 4 KLD was for drinking, which was to be sourced from ground water. However, the daily make up water was not estimated separately, which would be much lower and the water availability assessment was done on the basis of 726-4=722 KLD requirement. The water harvested from the plant area (excluding green belt) would not have

been sufficient to meet the water demand. A perusal of the toposheet shows that there are hills on the eastern side of the plant and the rain water flows though seasonal channels to the foothills. One such channel passes adjoining to the northern boundary of the plant, from where it is intended to harvest it and store within the plant. An anicut or a gabion structure will have to be constructed on the seasonal nala, with permission from the Water Resources Department. The identified nala and its catchment can be seen below:



The runoff water is available in sufficient quantity, however, due to dearth of land, the size of the water reservoir can at most be 3 acres, assuming a depth of 6 m (excluding freeboard). The month wise availability of water can be seen below:

Month	Rainfall, mm	Runoff, cum/ month	No. of working days	Water Requirement, cum/month	Capacity of reservoir, cum	Evapora-tion in cum, @1 cm/day	Seepage loss for lined tanks in cum, @60 cm/yr	Monthly storage in reservoir, cum
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(8)**	**(9)**	**(10)**	**(11)**
Jan	11.6	7367	29	20938	72845	3521	579	19933
Feb	32	20322	27	19494	72845	3278	539	16944
March	31.1	19750	29	20938	72845	3521	579	11657

April	40.2	25529	28	20216	72845	3399	559	13012
May	76.3	48455	19	13718	72845	2307	379	45062
June	202.9	128852	28	19712	72845	3399	559	72845
July	243.8	154826	29	20416	72845	3521	579	72845
August	300.9	191088	29	20416	72845	3521	579	72845
September	242.2	153810	28	20216	72845	3399	559	72845
October	80.5	51122	27	19494	72845	3278	539	72845
November	17.5	11113	28	20216	72845	3399	559	59784
December	4.5	2858	29	20938	72845	3521	579	37604
Total	**1283.5**	**815092**	**330**	**236712**		**40064**	**6585**	

Notes:

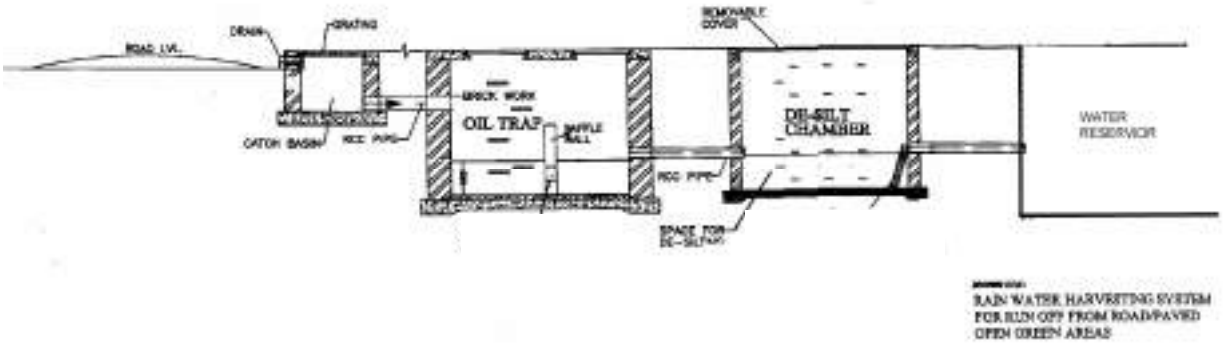
- *Catchment in plant = 35,791 sq.m., RC= 0.7; Catchment outside plant= 30,50,000 sq.m., RC = 0.2*
- *Total Annual water harvesting = 8,15,092 cum*
- *Total Annual water requirement = plant + seepage loss+ evaporation loss = 2,62,470 cum*

Thus, 3.0 acre water reservoir will be able to store water during high rainfall months to be able to meet the water demand during low or no rainfall months.

The daily make up water has been estimated for 0.127 MTPA plant as 105 KLD, which is 14.5% of the day 1 industrial water requirement of 0.105 MTPA plant. Since the above reservoir can meet the requirement of 722 KLD, it will easily be able to meet the requirement of 105 KLD, after expansion.

The surface run off water shall be passing through settling chambers before reaching the reservoir to reduce suspended particulate load. The typical settlement system is shown in **Fig 6.**

FIG 6
RAIN WATER OIL TRAP AND DESILTING CHAMBER PRIOR TO RESERVOIR



9.8 SOLID WASTE - GENERATION AND MANAGEMENT

A. CONSTRUCTION PHASE:

- The construction of the 0.105 MTPA steel plant has already commenced in April 2018 and is expected to take 36 months approximately to be completed. The subsequent points are already being followed and will be followed in future also. The only additional construction envisaged for the expansion to 0.127 MTPA is the civil woks for the ladle furnace inside the SMS building.

- Construction wastes will be segregated as much as possible at site itself to increase the feasibility of recycling concrete and masonry as filling material and steel pieces as saleable scrap.

- Litter disposal and collection points will be established around the work sites.

- Empty packaging materials, drums, glass, tin, paper, plastic, pet bottles, wood, thermocol and other packaging materials, solder butts, etc will be disposed through recyclers (locally called kabadis).

- The construction spoils, muck generated from drains and sedimentation pits, etc. will be temporarily stored at designated dumpsite located inside the plant premises. Later on these wastes will be used for landfilling / leveling work within the plant premises.

- Careful design, planning and good site management would minimize muck mixed with soil, concrete, mortars and cement grouts. Such waste shall be stored at earmarked place and used as filler for plinth raising purpose.

B. OPERATION PHASE:

The principal solid waste likely to be produced by the proposed project is slag, scrap, mill scale and BF dust.

The quantum of solid waste generation from the different units of proposed plant of 0.124 MTPA steel plant along with its management is given in **Table 23**.

TABLE 23
SOLID WASTE GENERATION AND MANAGEMENT FOR 0.127 MTPA

Sl. No.	Source	0.105 MTPA		0.127 MTPA		Remarks	Balance for Disposal (TPY)	Increase, TPY (%age)
		Total (TPY)	Reuse / Sale (TPY)	Total (TPY)	Reuse/ Sale (TPY)			
1	Waste Oil & Lubricant	2 KL	2 KL	2.5 KL	2.5 KL	Shall be sold to SPCB authorised recycling vendors	0	0.5 KL
2	DM plant resin	1 KL	1KL	1 KL	1KL	Shall be disposed in properly constructed pit as per CPCB norms	0	Negligible
3	Slag	14298	14289	17157	17157	Given for metal recovery, converted to aggregates (special balls) and used in road making and/or sold in open market	0	2859 (20%)
4	BF dust	2447	2447	2936	-	Shall be disposed in solid waste area	2936	489 (20%)
5	Mill scale	1138	1138	1366	1366	100% sent to Kamanda Steel Plant for reuse in Ferro Alloys plant and/or sold in open market	0	228 (20%)

The characteristics of IF Slag will be CaO 40-60%, SiO 12-18%, MgO 4-7%, Fe_2O_3 5-7%.

Other wastes:

a) Scrap generated at rolling mill will be 100% reused in the IF.

b) Electronic wastes and used batteries will be collected at designated spot and given to authorized recyclers.

c) The municipal solid waste (domestic) will be segregated. The biodegradable component will be composted and used as manure inside the premises; recyclable materials like packaging materials, empty drums, bottles, glass, metals, paper, plastic, etc will be given to recyclers & non-biodegradable component will be disposed in sanitary landfill site at Barbil on weekly basis.

d) Biomedical waste from dispensary shall be given to CPCB/ SPCB authorised biomedical waste management agency from Rourkela

9.8.1 DETAILS OF DUMPING AREA

Company has earmarked 0.40 acres for dumping and stacking the solid wastes of the steel plant. This will serve more as temporary storage yard as most of the waste is recyclable or reusable.

However, keeping due precautions, the dumping area will be well protected with garland drain all around the stacking area. The garland drain would have slope from all sides so that the rain water can travel by gravity through the slope up to collection pit. This garland pit will be constructed with pitch stones. Vertical baffle walls will be constructed at suitable intervals at the bend points of garland drain in both side of the vertical wall in alternate manner to settle the solid waste that flow along with water in the garland drain. The deposited material is manually drawn out from the garland drain to minimize the silting at water collection tank.

Stacking / dumping of different solid wastes shall be done on separate dumping areas identified for them within the solid waste disposal yard.

9.9 NOISE

9.9.1 IMPACT

Construction phase: During construction phase, the equipment used for construction will be the main noise sources which will have temporary and reversible impact on the noise level of the area. The movement of vehicles bringing construction material and plant components for installation will also generate noise. Construction activities such as cutting, welding, use of vibration machines, etc shall also generate noise. The workers in the vicinity of construction activities, construction machinery, vehicles, etc will be exposed to noise during working hours. No increase in the magnitude of noise impact at a given point of time is anticipated due to expansion from 0.105 to 0.127 MTPA as there will be no additional building construction.

Operation phase: During operation phase, plant equipments & traffic will be the major noise concerned areas. However, after implementation of proposed project, number of noise generating sources will increase. No increase in the magnitude of noise impact at a given point of time is anticipated due to expansion from 0.105 to 0.127 MTPA as there will be only increase in the number of hours of utilisation of the facilities.

The sources of noise generation during operation phase will be follows:

a) Operation of the furnaces

b) Material handling operations

c) Trucks, dumpers, loaders, scrappers and earth-movers etc.

Operation of plant equipments will continuously generate noise, which will have adverse impact on the ambient noise levels. However, the adverse impact is anticipated to be limited to the plant area and its immediate surroundings. The adverse impact can be more within the project area, and may cause hearing loss and other related problems to the workmen, if mitigation through protective measures are not taken.

Noise propagation through mathematical model and impacts of noise with distance from source has been studied and brought out below.

As the equipment generate noise generally in the range of 100 dB(A) at source it can be safely assumed that the ambient noise levels on any point of boundary line of plant are not higher than 100 dB(A). It has, also been assumed that the area within the expansion units within an imaginary line running at a distance of 3-5 m (say) from noise generating machines will be termed as point noise source to avoid complication in the absence of availability of exact location of various noise generating units, their arrangements and shapes.

Taking extreme case of two machines each generating 100 dB(A) working at a point will add upto 103 dB(A) overall noise level. Such source noise level has been considered here for anticipating the impacts. Noise attenuation with distance in all directions over flat open bare ground is given by

Sound level dB(A) = $Lw - 20 \log_{10} R - 8$

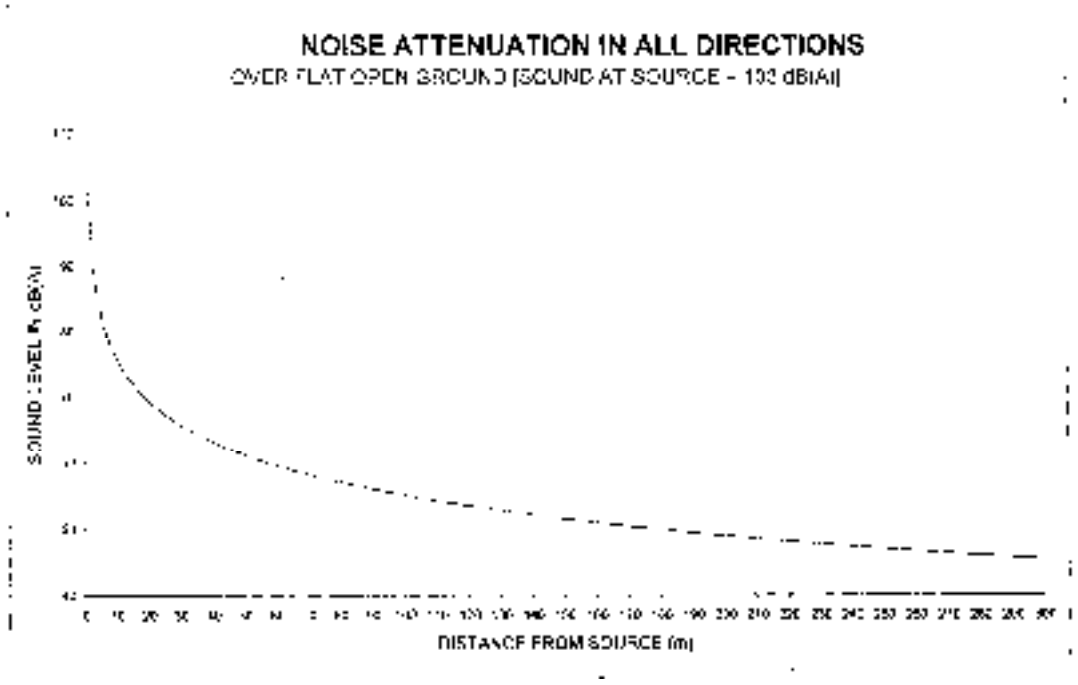
Where :

L_W = Sound level of source, dB(A) assumed 103 dB(A)

R = Source distance, m

The same has been plotted in **Fig 7**. Assuming source noise level as 103 dB(A).

FIG 7: NOISE ATTENUATION WITH DISTANCE IN ALL DIRECTIONS OVER FLAT OPEN BARE GROUND



A perusal of graph shows that the sound levels attenuate to value as shown in **Table 24**.

TABLE 24
NOISE ATTENUATION WITH DISTANCE ON FLAT BARE GROUND WITHOUT AND WITH GREEN BELT
COMBINED NOISE OF MORE THAN ONE SOURCE = 103 dB(A)

Distance from source (m)	Noise level reduced from 103 dB(A)	
	Without green belt, dB(A)	With green belt, dB(A)
20	70.0	68.5
60	60.0	55.5
100	56.0	49.0
150	52.0	41.0
180	50.0	33.0
300	45.0	<33.0

It means that after distance of about 300 m, the machine noise will merge into the background noise in the day time. This noise level is same as the limit [45 dB(A)] prescribed by GSR 742 (E) dt. 30th August 1990 at night time for residential areas. Due to plantation around the plant site, it will be possible to further lower the noise levels below the prescribed limits. It may be noted that the combined noise from various sub-plants cannot be more than 103 dB(A) at any point considering the distance between their relative locations. Hence, by combination of such control measures, it will be possible to keep the noise levels below the prescribed limits.

Negligible impact will be there to local people as the plant will develop a thick peripheral greenbelt (which has already been planted) which will act as a noise absorbing medium and the nearest village is Karakhendra in the

east. With respect to the plant boundary, the nearest habitation in Karakhendra is at a distance of more than 270 m from boundary. The distance between the operation plant area and this habitation will be further more by nearly 30 m along with intervening greenbelt. Thus, anticipated sound levels will be in the vicinity of 49 dB(A) which are well within the National Ambient Air Quality Standards for Noise of 55 dB(A) during day time.

The noise level data recorded at various places in the study area is well within the desired limit. But, the future establishment of noise due the proposed project activity may pose some problem, if project management will not adopt appropriate control measures.

9.9.2 NOISE POLLUTION CONTROL MEASURES

Construction phase: Modern and well maintained machinery is being /will be used for construction activities such that noise levels will be minimized at source itself. The equipment will be kept in good condition to keep noise level well below limits at work place. The onsite workers exposed to high noise equipment and noisy area is/will be provided with protective devices like ear muffs/plugs. Also traffic will be monitored, vehicles will have PUC certificates and the heavy vehicles carrying construction material will not be allowed during peak traffic hours.

Operation phase: The following measures is being /will be taken up to keep the noise levels within permissible limits:

a) Provision and maintenance of green belt. The plant will develop 4.356 acres area under green, which will help to prevent noise generated within the plant from spreading beyond the plant boundary. Peripheral green belt has already been planted with over 5000 trees.

b) Periodic maintenance of noise generating machinery including transportation vehicles

c) The noise generation will be reduced at source by erecting noise dampening enclosures or acoustic enclosures and by maintaining the machines and greasing them regularly.

d) Provision made for special vibration dampners, rubber packing etc to prevent propagation of noise and vibration to surrounding areas.

e) Provision of air silencers to modulate the noise generated by the machines/ equipments/ vehicles

f) All the workers engaged at and around high noise generating sources will be provided with ear protection devices like ear mufflers/plugs. Their place of attending the work will be changed regularly so as to reduce their exposure duration to high levels. They will be regularly subjected to medical check-up for detecting any adverse impact on the

ears. Proper encasement of noise generating sources to control noise level.

g) The damage risk criteria as enforced by OSHA and CPCB to reduce hearing loss, stipulates the noise levels up to 90 dB(A) as acceptable limits for 8 hour working shift per day. Noise levels may, however, exceed the prescribed limits in certain work places. At these work places, workers will be posted for shorter durations only.

9.10 TRANSPORTATION

9.10.1 IMPACT

Main raw material i.e. Sponge iron will be sourced from Company's own DRI Plant at Karakolha at a distance of 0.5 km (aerial) from the plant. By road, the distance travelled by trucks would be 1 km.

The material to be transported and their truck requirement is **Table 25**. Other raw material that will come from Rourkela and the finished product transportation will also take place towards Rourkela via Barbil and Koira. The route of transportation is shown in **Fig 8**.

TABLE 25
TRANSPORTATION OF RAW MATERIAL AND PRODUCT

Sl. No.	Material	Existing		Expansion		Total		Truck size (T)	Approx. Daily Trucks	Trucks to & fro per day	Max. Trucks On Route 1 (part of Route 2)- Karakolha to Karakhendra	Max. Trucks on Route 2- Karakolha to Raurkela via Karakhendra, Barbil & Koira
		TPA	TPD	TPA	TPD	TPA	TPD					
a.	**Raw Material**											
1	Sponge Iron	99388	301	19878	60	119266	361	15	25	50	25	
2	Scrap (minus rejects)	11478	32	2296	6	13774	38	10	4	8	4	4
3	Pig iron	11478	35	2296	7	13774	42	18	3	6	3	3
4	Furnace Oil, KL	4564	14	649	1.97	3894	11.8	18	1	2	1	1
	Sub-Total								33	66	33	8
b.	**Solid waste**											
1	Slag	2112	6	2860	9	17157	52	18	3	6	3	3
2	BF Dust	2447		489	1	2936	9	18	1	2	1	1
3	Mill Scale	1138	3	650	2	1366	4	18	1	2	1	1
	Sub-Total								5	10	5	5
c.	**Product**											
	Rolled product	101418	307	20284	61	121702	369	18	21	42	21	21
	Grand Total								**59**	**118**	**59**	**34**

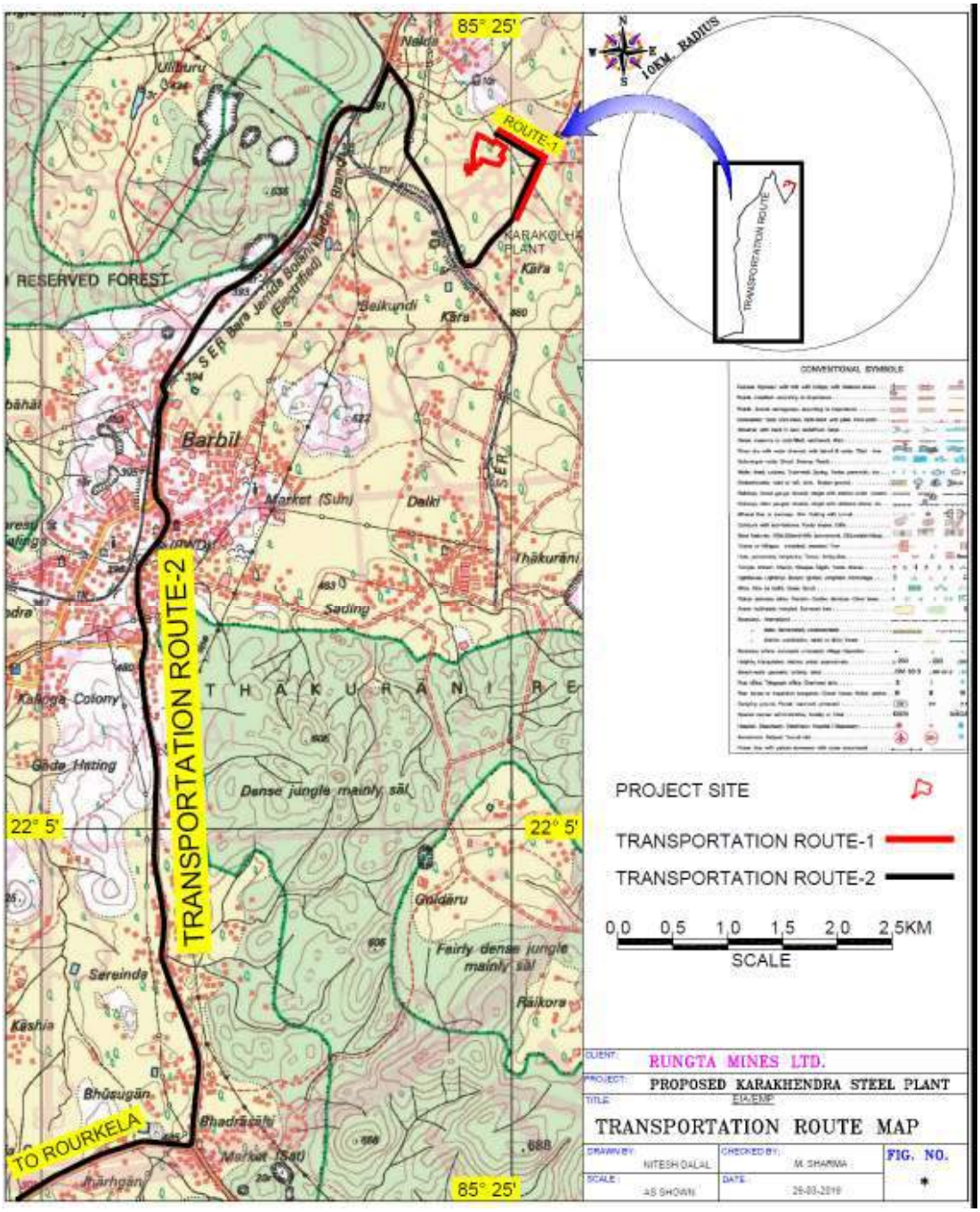
Note: Route 1 is a part of Route 2, hence the stretch covered under Route 1 will bear the traffic of Route 2 also.

For transportation of the above volume, the increase in traffic with respect to 0.105 MTPA plant will be 118-90= 28 trucks/day. The total number of HMV was 1812 per day during monitoring. There will be an increase from 4.9%

increment of 0.105 MTPA plant to 6.5% for 0.127 steel plant, which is a low impact on the traffic density. The impact shall be in terms of increase is pollutant gases due to vehicular emissions and dust on road becoming air-borne. This impact has been already estimated under section of air pollution.

It may be further noted that the traffic calculations have been done for the maximum possible traffic scenario assuming that a truck brings in raw material to the plant will go empty while an empty truck will come to pick the products. However, in reality the transporters operate in such a manner that the truck bringing in the raw material can take away solid waste or finished product also.

FIG 8: PROPOSED TRANSPORTATION ROUTES



9.10.2 Mitigation

Vehicular pollution control and management plan:

a) All trucks used for transportation of raw material and finished product will be covered with tarpaulin, maintained, optimally loaded and have PUC certificates.

b) Maintenance shall be as per the periodicity and procedure specified by the manufacturer

c) Trucks will be weighed at the weigh bridge to ensure optimal loading, which in turn optimizes emissions

d) Annual statutory Fitness certification for commercial vehicles will be ensured.

e) Pollution Under Control (PUC) certificates will be obtained every three months for all categories of vehicles. In case of petrol vehicles idling CO measurements will be taken and in case of diesel vehicles, free acceleration smoke will be measured.

f) Vehicles will be Euro-III or IV compliant, as applicable

g) Old vehicles will be phased out to ensure lower emissions by newer vehicles

h) Water sprinkling on roads and parking area within plant

i) Speed breakers and caution signs along roads

j) Training and sensitisation of drivers as part of safety week awareness programs

No alternate method of raw material transportation has been studied as maximum possible material is already moving and will move through roads and railways, as already optimised.

The local infrastructure of the area such as road network is adequate to handle the additional traffic and no additional infrastructure needs to be constructed. The width of the SH-10B from Bhadrasahi to Gua is approximately 15 m to 18 m. It is a black topped, well maintained road. The width of the village road from Karakolha joining SH-10B is approximately 10 m to 12m. Large number of trucks are plying on it from the mine on the south east side towards the state highway. The road joining Karakhendra plant to Karakohla plant varies from 2.5 m to 4.5 m. Negligible traffic is there on this road. However, this road will have to be developed the company to make it suitable for truck transportation.

9.11 ECOLOGY

9.11.1 IMPACT ON ECOLOGY

Construction Phase: Total area of the plant is 13.20 acres. To undertake the construction, top soil is / will be rehandled. Vegetation over this area will also be disturbed. Few plants, which will be up-rooted, will be compensated through future plantation during operation. 4.356 acres (33%) of the above mentioned area is proposed for green belt and plantation. Hence, negligible impact is anticipated on the flora in the plant area. The peripheral green belt has already been established in the last one year, since the commencement of construction in April 2018 with plantation of 5000 trees.

The buffer area has floral species, which are commonly found species. Agricultural crops and fruit trees form a part of the commonly found flora in the study area. Impact due to airborne dust from construction activities and transportation are envisaged. Impact can be there in terms of tree cutting for firewood by construction labour in case control measures are not adopted.

There are fourteen forest namely Uliburu R.F., Pandrasali PF, Thakurani RF, Siddhamath RF, Karo RF, Tabiba PF, Gua PF, Kurti PF, Noamundi PF, Gundijora PF, Nuia PF, Ghatkuri RF and Karapada RF. However, no forest of any type falls within the core area. Therefore, direct impact on flora is not envisaged. Bio-diversity status of plant species is medium within the study area. There are no wildlife sanctuaries or fragile ecosystems within the study area. Hence, adverse impact on wildlife or fragile eco-system is not envisaged. However, it may be noted that the entire Singhbhum district has been declared as the habitat of Elephant/ Elephant reserve, part of which falls in 10 km radius at a distance of 2 km from the project.

Some increase in the ground level concentration of PM10, PM2.5 and NO_2 in the study area is envisaged due to expansion from 0.105 to 0.127 MTPA. Concentrations of $SO_2$are expected to decrease. Fugitive dust emissions are not expected to increase as project management is opting for covered sheds for raw material. Adequate control measures in the management plan have to be implemented. These increased concentrations will have adverse secondary impacts on the eco-system if control/ mitigation measures are not implemented.

Availability of water and food wastes during the day will attract some birds and animals towards the site. During construction phase, no impact on terrestrial eco-system comprising birds and animals is envisaged. On the contrary, with progressive growth of greenery, terrestrial microhabitats have developed in the long run.

During construction phase, there are trees planted by farmers in the agricultural land, which will have to be removed as per the proposed layout. Mitigation of the impact is discussed in subsequent section.

Operation Phase: Company has undertaken plantation in the project area which has started to serve as a residence of common avifauna, few mammals, reptiles and butterflies. The air quality modeling shows that negligible impact will be caused on the forest.

The impact on the surrounding ecology during the operation of the project will mainly occur from the deposition of air pollutants. Chronic and acute effects on plants and animals may be induced when the concentration of air pollutants exceeds threshold limits. The incremental emissions of air pollutants are not likely to induce any significant changes in the ecology because the national ambient air quality standards will remain within the limits. However deposition of small amount of pollutants may also affect the surrounding ecosystem. Thus, the project is planned with most efficient air pollution control systems for achieving dust emission levels below 50 mg/Nm^3 from all the stacks so that the impact on nearby ecosystem are minimized. Most of the fugitive dust emission generation points will also be fitted with efficient air pollution control systems (fume extraction systems and bagfilters). Water sprinkling will be used to suppress the generation of fugitive dust, where necessary.

USEPA air quality criteria for SO_2 stipulates 0.2 ppm (524 $\mu g/m^3$) level when visible injury to sensitive vegetation in humid regions after 3 hours exposure is observed. In another case, level 0.5 ppm SO_2 level (1310 $\mu g/m^3$) for 1 hour exposure results in visible injury to sensitive vegetation in humid regions. At higher SO_2 concentration of 10 ppm (26214 $\mu g/m^3$), visible injury to vegetation in arid regions is observed. Such high ambient air concentration of sulphur dioxide, is not likely to occur in the area.

USEPA air quality criteria for NO_2 stipulates 2 ppm (3760 $\mu g/m^3$) level when foliar injury to vegetation at 4 hours exposure is observed. At a lower NO_2 concentration of 0.25 ppm (470 $\mu g/m^3$) during the growing period, decrease of growth and yield of tomatoes and oranges are observed. Such high ambient air concentration of nitrogen dioxide is unlikely in the study area.

9.11.2 MANAGEMENT OF ECOLOGY

Construction phase: The top soil removed prior to construction is being /will be stored and laid back on the area identified for further plantation. Any tree or plant remove will be compensated manifold.

For trees that will have to be removed as per the proposed layout, the endeavour will be to conserve them to the extent possible. However, if tree needs to be cut, due permission will be sought from the concerned authority and compensatory plantation carried out. Transplantation of tree will be preferred, if possible.

There was no resident fauna, but the development of proposed green belt and plantation will provide food and habitat for fauna. Under the proposed green belt and plantation programme, approximately 4.356 acres of land

within premises (about 33.0 % area) shall be provided with green cover in the form of green belt and plantation.

Current status of green belt:

- Total proposed green belt - 4.356 acres (33.0 %)
- Width ranges from 10 m to 50 m
- Trees have already been planted all along periphery and will be planted in open spaces also
- Avenue plantation along roads shall be done.
- Plantation scheme : within 1 year, peripheral green belt has been completed. The avenue plantation and plantation in open areas shall be carried out as the roads & buildings get completed
- No. Of trees planted : 5000
- The trees & shrubs species planted area - 2.5-3 ft saplings of Neem, Mahaneem, Bada Chakunda, Siris, Karani, Sissoo, Nali Chakunda, Simuli, Simarouba, Gamhari, Amla, Chhattian, etc.

Operation phase: The main consideration during development of green belt and plantation are effective trapping of fugitive emission, adequate dilution of accidental releases, noise control, balancing eco environment, waste water reuse and aesthetics.

Plants act as natural sink for a variety of pollutants as well as replenish air with fresh oxygen. The plant species should be fast growing, evergreen having large crown. As a single plant does not have all the qualities, a mixture of several varieties of plants has been chosen.

9.12 WILDLIFE CONSERVATION PLAN

A “Site Specific Conservation Plan” has been approved by PCCF wildlife Bhubaneshwar. The salient management and mitigation strategies are given below:

(A) WITHIN CORE ZONE:

1) **Free Distribution of Seedlings:** Provision for distributing 2000 seedlings/ year for 10 years, preferably of fuel wood species to the stake holders of the adjoining villages for planting in their back ward and/or vacant places which in future will meet their bonafied need.

2) **Avenue plantation:** It is proposed to make 01 km of Avenue plantation (Single Row) on both sides of the Barbil and Karakhendra road. On each side the plantation will be done in staggered manner. The distance from plant to plant in a row will be 4m. Therefore, a total 250 x 2 x1 = 500 plant will be planted. This species chosen for this plantation will be Sunari (*Cassia fistula*), Patuli (*Lagerstronea praviflora*), Radha Chuda (*Peltoforum ferrigemum*), Neem (*Azadirachta indica*), Bel (*Aegle marmelos*), Kadamb (*Anthocephalus kadamba*), Champa (*Michelia champaka*), Nageswar (*Mesua ferrea*), Baula (*Mimosops elengi*), Jamun

(*Syzygium cumini*), Mango (*Mangifera indica),* Amla (*Emblica officilnalis*) etc.

3) **Promotion of awareness:** Villagers of adjacent area will be instructed to keep the noise levels to the barest minimum, take all precaution against fire, prevent damage to trees etc. Drivers will be directed to control speed so as not to run over slow moving creatures. Behavioural change will be expected from each worker on the above points and use of garbage bins. In case of any sick or injured animal seen near to the project area immediate information should be given to the nearest forest official for necessary action. It is also suggested to hold meetings in Schools inviting Resource Personnel to appraise the Students regarding the value of forest, wildlife and their conservation.

4) **Incentive to local villagers:** It is also proposed to pay incentive to the adjoining villagers for co-operating forest field executives in detecting illicit felling, poaching, fire fighting measures and anti depredation of wildlife coming out of their home range to vicinity of villages.

5) **Immunisation to Cattle:** In order to prevent the spreading of diseases from cattle to wildlife, periodical vaccination to village cattle is essential.

(B) WITHIN BUFFER ZONE

1) **AR Plantation 800 per Ha:** It is suggested to develop AR Plantation over 2.00 ha in Siddhamatha RF with 800 plants per ha.

2) **Creation of Water Hole:** It is proposed to create 01 no. of water hole (40m x 30m x 4m) in the buffer zone of this project area in consultation with Range Officer Barbil.

3) **Fire Watchers:** 05 nos. of fire watchers will be engaged selecting from local villages on the suggestion of Gram Sabha or VSS for a period of 5 months (February to June) annually.

4) **Fire Line:** 02 km of fire-line shall be maintained in 10m width inside protected forest (which is mostly fire prone in the buffer zone of this project) in consultation with the Range Officer, Barbil.

5) **Compassionate Payment Grant:** It is proposed to create a compassionate fund with DFO, Keonjhar from which at the time of exigency, he can immediately pay to the victims of crop damage/kill/injury to avoid law and order situation.

Budgetary provision have been made by the Company for execution of the wildlife conservation in consultation with the DFO. Rs. 23.641 lakhs have been allocated for plantation, awareness and cattle immunisation within core zone and Rs. 46.966 lakhs have been allocated for wildlife habitat improvement, fire protection, wildlife protection and anti depredation measures in buffer zone. Some activities of wildlife conservation plan may be undertaken under CSR.

9.13 SOCIO-ECONOMICS - IMPACT AND MANAGEMENT

DEMOGRAPHY

During operation phase, total manpower requirement will increase from 250 to 260 persons for various activities like loading, unloading, handling, transportation, general cleaning, horticulture and other miscellaneous works inside the Plant. Three shifts working for 330 days is planned. Many more persons will be indirectly engaged either on contract basis or in transportation of materials in provision of different services associated with the project. As majority of unskilled and semi-skilled persons will be from the surrounding villages, the net in-migration on account of the job opportunities will be for the highly skilled and supervisory/managerial level posts. Therefore, no significant impact on demographic profile is foreseen.

EMPLOYMENT AND OCCUPATION

As stated above, the proposed project will provide direct and indirect job opportunities to a significant number of persons in the rural and under-developed areas. Therefore, the project will have significant positive impact on employment and economies of the study area. Major portion of the wages earned by the employees and other workers will find its way into the study area in form of cost of services and local food products. This will improve the economic conditions of local inhabitants.

AMENITIES AND HEALTH

With the commencement of operation, amenities for communication, education, health, entertainment, canteen, etc would be developed in and around the project area. These amenities will be available to local people also, who are directly associated with the plant. Even those not associated in the project related activities are benefited by these amenities.

AGRICULTURE

Part of the land acquired for the project was low yield agricultural land without irrigation facilities. This is a very small fraction of total agricultural land falling in study area; hence, no significant adverse impact on agriculture is envisaged.

ECONOMY

With the commencement of plant, there will be substantial improvement in the overall economy of the local people in the form of additional income through employment, development of infrastructure in surrounding areas such as transport facility, health and education, shops and ancillary industries. The details of the project benefits through CSR have been given in Chapter 8 of the EIA prepared for 0.105 MTPA in Nov 2017.

R&R

Entire land has been purchased from one owner. They also have other agricultural land left in their ownership and, thus, are having multiple sources of income. Job will be offered to the land owner or his interested family members

9.14 OCCUPATIONAL HEALTH AND SAFETY

The "Code of practice on safety and health in the iron and steel industry" has been published by International Labour Organisation, Geneva in 2005. It is proposed to comply to the code to ensure safety and health of the workers in the plant.

9.14.1 OCCUPATIONAL & SAFETY HAZARDS

The proposed plant is an steel manufacturing unit. The table below summarises the main injury causes and the corresponding prevention strategies. These prevention strategies are proposed in daily plant management:

Injury Causes:	**Prevention:**
a) Slip, Trips & Falls	a) Housekeeping, clear designated walkways
b) Falling/Moving Objects	b) Guards on Machines and elevated areas
c) Lifting & Overload	c) Manual Handling Training
Injury Types	d) Proper use of PPE
d) Arms and Hands	e) Proper use of PPE
e) Legs and Feet	f) Lifting gear, forklifts
f) Back Injuries	

9.14.2 IMPACT ON WORKERS

The occupational safety and health are very closely related to productivity and healthy relation between employer and employees. The main factors of occupational health in the operations are dust, gases and noise, and those for safety are exposure to excessive heat, accidental contact with hot materials, contact with moving parts of machines & equipment, etc. The health and safety of personnel is the primary consideration during operation to achieve uninterrupted production and compliance with statutory requirements. Workers in a steel plant are exposed to many health hazards. The common health hazards are:

i. Exposure to high temperature operations

ii. Exposure to fugitive dust in material handling and operations, which may cause respiratory diseases

iii. Direct contact with moving machines and equipment.

All these can cause adverse impact if appropriate control measures are not adopted. Exposure problems to noise, dust, heat and gases are the major occupational hazards. Bronchitis, asthama and Noise induced hearing loss are the typical occupational health hazards identified from an SMS & RM Plant.

9.14.3 Mitigation measures for protection of health of workers

Measures to be implemented to reduce the dust generation at the originating point are by installing control devices and / or regular water sprinkling. Plant personnel working in dust prone areas will be required to wear personnel protective equipment like air filters over their nose. Job rotation schemes shall be practiced for over-exposed persons.

Personal Protective Equipments (PPE) like earplugs and muffs will be provided and administrative pressure shall be applied for using them. Auditory examination by qualified doctors upon the first employment and thereafter periodic examination will be conducted which include determination of auditory threshold for pure tones.

Following general measures shall be implemented for protection of health of workers:

a) Maintenance of pollution control system such as dust suppression system, safety appliances;

b) Regular maintenance of equipment;

c) Regular checking and up keeping of break down or leakage;

d) Use of personal protection equipment wherever needed;

e) Display of relevant safety norms to be followed in different operational areas;

f) Use of ‘Safety Permit’ system for all maintenance jobs;

g) Provision of ear plugs or muffs to workers exposed to high noise levels;

h) Rotation of duties of workers;

i) Creating awareness amongst workers concerning health, pollution and safety through posters, discussion, slogan etc.;

j) Periodical medical examination of workers;

k) Provision of suitable civil amenities such as plain drinking water, good service in canteen, etc.;

l) Assessment of risk from health hazards at work place;

m) Monitoring of different factors leading to occupational health hazards and taking timely action to mitigate the impact, etc.

9.14.4 SPECIFIC MEASURES FOR ENSURING SAFETY

The practices to be followed in the plant are as follows:

Electrical safety – All the electrical installations will have rain protection shed, earth pit, three pin industrial plug top, rubber mat in front of panels, fire extinguishers. All the electrical equipment like welding machines, light points, portable electrical tools etc will be connected through ELCBs. In case of defects found during checking will be replaced immediately. Also the earth resistance value will be checked at regular intervals.

Display of Safety Posters/ Slogans/ Warnings – It will be displayed at conspicuous locations to spread awareness amongst the workers at site.

Work Permit System – Before starting of any critical/ hazardous work (excavation/ radiography/ working at height/ confined space/ electrical maintenance, etc.) it will be mandatory to take prescribed work permit which will be in the knowledge of authorized persons as they sign in that format.

Valid Test Certificate – It will be mandatory to have valid load test certificate by Competent Person for all the cranes, lifts, hoists, lifting tools/tackles used at site and displayed on the machine.

PPEs & Safety Gadgets – Use of PPEs will be necessary for all staffs/ workers of Komando Steel Plant and contracting agencies.

License for all drivers/operators – All the drivers/ operators inside the premises will have to have valid license with the, and should be produced when asked. The speed limit inside the premises will be 20km/hr displayed at various locations.

Fire Management System – Portable fire extinguishers/ fire buckets at various fire prone locations will be provided.

9.14.5 OHS FACILITY

DRI plant is already present and operational in Karakolha at a distance of about 0.5 km from the proposed steel plant. An OHS centre is present at this plant. The same OHS shall be used by the employees of this plant. It includes a first aid center which is well equipped and manned by competent person and safety officer. Qualified MBBS doctor with assistant has been hired to run the centre.

The following tests will be conducted at the OHS centre along with technical support from private clinical laboratory, for the proposed project:

Pre-employment medical examination: A detail history with through physical examination will be done prior to induction. The purpose of this examination is to place right man in right job and for future reference.

Periodic Medical Examination: periodic medical examination will be carried out and maintained in expansion phase also as per Factories Act & Jharkhand Factories Rule.

Specific Examination: Of workers returning to work after long illness or injury. This will be done in special cases only.

Supervision and Notification: The activities are:

i) To ensure cleanliness and good quality of food in the canteen.

ii) Notification of any Occupational Health problems to the management, if encountered.

iii) Maintenance of Health Records and its analysis

OTHER MEASURES FOR OHS

- As per requirement, 4 nos of First-aid boxes shall be provided and maintained in different locations of plant.

- ***Safety Induction*** – all the new staffs/ workers will go through safety induction before engagement at site. A prescribed format will be filled and signed by Safety Officer as an evidence of induction.

- ***Safety Tool Talk*** – It will be organized every month for the workers in the presence of site supervisor, site engineer, SO. Job related safety precautionary measures, good safety practices, case studies etc. will be discussed.

- ***Site Safety Inspection*** – Safety Officer appointed by Rungta Mines Limited & Contracting agencies will take daily round in site and the unsafe conditions as well as the unsafe actions noticed will be informed to the immediate supervisor/ engineer for an early rectification. Apart from the above activity, every week a selected area will be inspected jointly like agency Safety Officer, area engineer, workmen etc. and the unsafe points observed will be sent to the concerned site in-charge in the prescribed format for an early compliance. Follow-up will be made by SOs for timely compliance.

- ***Reporting of incidents/ near miss case*** – It will be mandatory to report all the incidents & near miss cases in the prescribed format by the contracting SO within 12 hours of incident to Plant Head

- ***Safety Committee Meeting*** – Company will conduct safety review meeting with all the contracting agencies once in every month. The project head and the SO of the contacting agency will be present in the

meeting. Various issues related to incidents, non-complied unsafe points, good safety practices, improvements, incident trend & near misses will be discussed religiously with target date. The minutes of meeting will be circulated to all members for their compliance.

- ***Safety Awareness/ Motivational Program*** – Company will conduct the National Safety Week, Road Safety Week, World Environment Day, National Fire Service Week etc. and distributes prizes to the winners of the contests organized among the staffs/ workers for the purpose. Apart from this contracting agencies will also organize safety competitions among their workers quarterly and distribute prizes to the best safety conscious workers to motivate.

- ***Safety Pledge*** – Safety Pledge will be administered at site first day of every month where the entire worker gather and safety messages will also delivered them by SOs.

- ***Fire & Safety Training*** – Site based safety training programs will be arranged time to time for the staffs and workmen to educate and make conscious. Best safety practices, case studies on incidents and root causes will also be discussed to make them aware. Demonstrations like rescue, effective use of PPEs will also be organized by various PPEs and safety gadget suppliers for their optimum use.

- ***Penalty* system**– Company will have a penalty system for those who violate safety norms repeatedly after various instruction verbally and written. The amount will be debited from the Running Bill of the concerned contractor.

- ***Good House Keeping***- Company will maintain good house keeping and will reward the contractors who maintain the best house keeping.

- ***Self Containing Breathing Apparatus (SCBA)*** – Company will procure the SCBA for emergency use

- ***Safety Reward Scheme*** – Company will plan to award the best safety performing contractors' quarterly/yearly.