DRAFT REPORT
ON
ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
&
ENVIRONMENTAL MANAGEMENT PLAN (EMP)

FOR

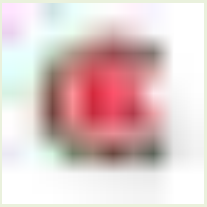
MODERNIZATION & EXPANSION OF IRON & STEEL PLANT TO FINAL CAPACITY OF SPONGE IRON – 3,72,900 TPA, BILLETS (MILD & ALLOY STEEL) - 2,70,000 TPA, ROLLED PRODUCTS – 2,70.000 TPA, CAPTIVE POWER – 58 MW, PELLETS – 8,00,000 TPA AND SLAG CEMENT – 4,16,000 TPA.

AT

LOCATED AT VILLAGE KULEI, PARJANG IN DHENKANAL DISTRICT, ODISHA

Project Proponent:

M/s GM IRON & STEEL Co, Ltd.



Environment Consultant:

Visiontek Consultancy Services Pvt. Ltd

(Committed for Better Environment)



(QCI-NABET Accredited for Category 'A' Projects)

QCI- NABET Accreditation No.: NABET/EIA/2023/RA 0209

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JULY 2021

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Ref: ..... *Date:* .....

UNDERTAKING

This is to certify that Visiontek Consultancy Services Pvt. Ltd. has carried out Environmental Impact Assessment (EIA) & Environmental Management Plan (EMP) for "proposed expansion of iron & steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA. The present report is an Environmental Impact Assessment (EIA) report for the Expansion of iron & steel plant by **M/s GM Iron & Steel Co, Ltd.** at village Kulei, Parjang in Dhenkanal district, Odisha.

The primary baseline data collected by VCSPL during winter seasons i.e from December 2020 to February 2021 in the study area supported by the secondary data collected from the Govt. Agencie e.g. SPCB, Odisha Meteorological Department were used for the prediction of impacts for Air. Noise, soil Land, biology/ecology, and socio-economic environments. Analysis of data indicates that the project will not have any major negative impact on the environment.

Visiontek Consultancy Services Pvt. Ltd. has an in-house laboratory that is NABL certified. VCSPL has QCI-NABET accreditation under the "EIA Consultant Organizations Accreditation Scheme" of Quality Council of India under Sl. No. 3 (Material Production), Project Activity '3 (a)' Metallurgical Industries (Ferrous & Non-ferrous) and 3(b)' Cement Plants; Category – A.

ToR COMPLIANCE

ToR. No. F.No. J-11011/286/2020-IA.II(I) date: 24th November, 2020
M/s GM Iron and Steel Co, Limited

ToR Point No.	ToR Point	Compliance	Reference in Final EIA Report
1.	**Executive Summary**	Executive Summary of the project has been incorporated in this EIA/EMP Report.	Chapter -11
2.	**Introduction**		
i	Details of the EIA Consultant including NABET accreditation	Details of the EIA Consultant including NABET accreditation has been incorporated in this EIA/EMP Report.	Chapter -12
ii	Information about the project proponent	Information about the project proponent has been incorporated in this EIA/EMP Report.	Chapter -I Section 1.2
iii	Importance and benefit of the project	M/s. GMISCL has been performing the CSR activity and the other social development/benefits from the Expansion project have been incorporated.	Chapter -VIII Section 8.1 Page no 8.2
3.	**Project Description**		
i	Cost of project and time of completion	The total investment for the proposed project works out to approximately **Rs 607.52 Crore .**	Chapter -II Section 2.4 Page no 2.44
ii	Products with capacities for	Expansion of existing Integrated steel plant to final	Chapter –I,

	the proposed project	capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel)- 2,70,000 TPA, Rolled Products – 2,70,000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA, Slag Cement – 4,16,000 TPA	Section: 1.3.2 Page no 1.9
iii	If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	The existing facilities will be enhanced by modernization and high-grade Raw material feeding. DRI Kiln of 1 x 100 TPD & 1 x 350 TPD will be enhanced to 1 x 130 TPD & 1 x 450 TPD respectively. Induction furnace of 2 x 10 T will be enhanced to 2 x 12 T, TMT 1 X 100 TPD to 1 x 400 TPD, Structure 1 x 100 TPD to 1 x 250 TPD.	Chapter II, Section 2.3 Page no 2.8
iv	List of raw materials required and their source along with mode of transportation.	Raw materials required for the project are Iron Ore Fines, Coke, Bentonite, Limestone, Coal. Ferro alloys, HM scrap, slag, clinker, Gypsum etc. Fuel: FO/LDO List of raw materials required, their source along with their mode of transportation has been incorporated in this EIA/EMP Report.	Chapter -II Section 2.3.1, Page no 2.8
v	Other chemicals and materials required with quantities and storage capacities	Details of chemical & materials required is provided in Ch-2	Chapter -II Section 2.3.8, Page no 2.40

<table>
<tr><td>vi</td><td>Details of Emission, effluents, hazardous waste generation and their management.</td><td colspan="3">The detailed study regarding this have been performed and incorporated in Chapter II of EIA Report.</td><td>Chapter -II Section 2.6.4, Page no 2.48</td></tr>
<tr><td rowspan="4">vii</td><td rowspan="4">Requirement of water, power with source of supply, status of approval (energy balance with provision of renewable energy), material balance, water balance diagram for different purposes with water harvesting, man-power requirement (regular and contract)</td><td>Particular</td><td>Total Requirement</td><td>Source</td><td rowspan="4">Chapter-II , Section 2.3.4, 2.3.5, 2.3.6 Page no 2.38</td></tr>
<tr><td>Water</td><td>Existing: 672 KLD Total: 2,890.8 KLD</td><td>Brahmani River</td></tr>
<tr><td>Power</td><td>Existing: 17.7 MW Total: 63 MW</td><td>From Captive Power Plant and the short fall of 5 MW will be sourced from GRIDCO</td></tr>
<tr><td>Manpower</td><td>Existing:250</td><td>Unskilled /Semi-Skilled</td></tr>
</table>

			Total: 842	From Local Area	
viii.	Process description along with major equipment and machineries, process flow sheet (quantitative) from raw material to products to be provided	❖ Process description along with major equipments and machineries has been incorporated in this EIA/EMP Report ❖ Process flow sheet (quantitative) from raw material to products / mass balance has also been incorporated in this EIA Report.			Chapter -II Section2.3, Fig. No.2.6 – 2.13, Page no 2.8 Chapter -II Section 2.3.8,
ix.	Hazard identification and details of proposed safety systems.	Hazard identification and details of proposed safety systems has been incorporated in this EIA/EMP Report.			Chapter –VII Section 7.3.2, Page no 7.2
x.	Expansion /modernization proposals: a. Copy of all the Environmental clearances(s) including Amendments thereto obtained for the project from MoEF&CC/SEIAA shall be attached as an Annexure. A certified copy of the latest	CTE- 14933/Ind-II-NOC-3435 dated 09.05.2005 CTO- 3790/ IND-I-CON-4699 on dated 21.03.2020 & valid till 31.03.2021.			All documents are attached as annexure.

	monitoring Report of the Regional Office of the Ministry of Environment, Forest and Climate Change as per circular dated 30th May, 2012 on the status of compliance of Consent to Operate for the ongoing /existing operation of the project from SPCB/PCC shall be attached with the EIA-EMP Report. b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and /or EIA Notification 2006 shall be provided. Copies of Consent to Establish /No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY2005-2006)		

	obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.		
4	**Site Details**		
i	Location of the project site covering village, taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	The proposed project is located at Village: Kulei , District: Dhenkanal , Odisha. Location map showing the project site has been incorporated in this EIA/EMP Report. As it is an expansion project alternative sites have not been considered.	Chapter I Page no 1.4
ii	A toposheet of the study area of radius of 10 km and site location on 1,50,000/1,25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places)	Map showing project site and 10 km radius study area on toposheet of 1:50,000 scale has been incorporated in this EIA/EMP Report.	Chapter – I Page no 1.7 Chapter –II Page no 2.6
iii	Details w.r.t. option analysis for selection of site	Not required, as it's an Expansion Project	Chapter -V
iv	Co-ordinates (lat-long) of all four corners of the site.	Corner Co-ordinates of the project site will be provided in Final EIA/EMP Report.	Chapter II Page no 2.7

v	Google map- Earth downloaded of the project site	Google Earth downloaded map of the project site is given in this EIA/EMP Report.	Chapter –I Page no 1.8
vi	Layout map indicating existing unit as well as proposed unit indicating storage area, plant area, green belt area, utilities etc. If located within an Industrial area/Estate/Complex layout of Industrial area indicating location of unit within the industrial area/Estate.	Plant Layout showing proposed grinding unit, storage area, greenbelt area, other utilities etc. is incorporated in this EIA/EMP Report.	Chapter –II Page no 2.8
vii	Photographs of the proposed and existing (if applicable) plant site. If existing show photographs of plantation / greenbelt in particular.	Photographs of proposed project site have been incorporated in this EIA/EMP Report.	Chapter –II Page no 2.7
viii	Land use break-up of total land of the project site (identified and acquired) govt/private -agricultural, forest, wasteland, water bodies, settlements etc shall	Land use break-up of total land of the proposed project site has been incorporated in this EIA/EMP Report.	Chapter –II Page no 2.6

	be included (not required for industrial area). Land schedule to be furnished.		
ix	A list of major industries with name and type within study area (10 km radius) shall be incorporated. land use details of the study area.	List of major industries with name and type within the study area (10 km radius) has been incorporated in this EIA / EMP Report. Land use details of the study area have also been incorporated in this EIA/EMP Report.	Chapter –II Page no 2.5
x	Geological features and Geo-hydrological status of the study shall be included.	Details regarding Geological features and Geo-hydrological status of the study area have been given in Hydro-geological study report incorporated in this EIA/EMP Report.	Chapter-III Page no 3.27
xi	Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of flood level of the project site and maximum flood level of the river shall also be provided	Map showing drainage of the project site and 10 km radius study area has been given in Hydro-geological study report incorporated in this EIA/EMP Report. Plant Site fall within 1 km radius of any major River. (Brahmani River 0.90 km, SW)	Chapter –III

	(mega green field projects)		
xii	Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	58.20 Ac of land is in possession of the company, and the company is in the process of acquiring balance land of 48.30 Ac	Annexure II
xiii	R & R details in respect of land in time with state Govt policy.	R & R is not applicable;	Chapter –VII Section 7.2 Page no 7.1
5	**Forest and wildlife related issues (if applicable):**		
i	Permission and approval for the use of forest land (forestry clearance) if any and recommendation of the State Forest Department (if applicable)	Total forest land is 29.29 acres (11.85 Ha),	Annexure II
ii	Land use map based on High resolution satellite imagery (GPS) of the proposed site	Total forest land is 29.29 acres (11.85 Ha) involved in the project, which is less than 40 Ha	----

	delineating the forestland (in case of projects involving forest land more than 40 ha)		
iii	Status of application submitted for obtaining the stage forestry clearance along with latest status shall be submitted.	-	-----
iv	The projects to be located within 10 km of the national Parks, Sanctuaries, Biosphere Reserves, migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and recommendations or comments of the Chief Wildlife Warden – thereon.	Anantapur Reserved Forest - 7.30km, (North). Talcher Border RF - 7.04km, (NNW) Paturia Reserved Forest - 7.70km, (West)	-----

v	Wildlife conservation plan duly authenticated by the Chief Wildlife Warden of the State Government f o r conservation o f Schedule I fauna, if any exists in the study area.	Anantapur Reserved Forest - 7.30km, (North). Talcher Border RF - 7.04km, (NNW) Paturia Reserved Forest - 7.70km, (West)	-----
vi	Copy of application submitted for clearance under the Wildlife (protection) Act, 1972 to be standing Committee of the National Board for Wildlife.	-	------
6	**Environmental Status**		
i	Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	Details of atmospheric inversion level have been incorporated in this EIA/EMP Report. Site-specific micro-meteorological data (temperature, relative humidity, wind speed and direction) were collected during Winter Season (Dec 2020 to Feb 2021) Details of the same have been incorporated in this EIA/EMP Report. Meteorological data has been given in EIA/EMP Report.	Chapter -III Section. 3.3, Page no 3.8

ii	AAQ data (except monsoon) at 8 locations for PM 10, PM 2.5, SO2, NOx, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests	AAQ monitoring was carried out Winter Season (Dec 2020 to Feb 2021)within 10 km radius study area. AAQ monitoring for proposed project was carried out at 11 locations. The monitoring stations were selected taking into account the dominant wind direction, population zone and sensitive receptors etc. Detail of the same has been incorporated in this EIA/EMP Report.	Chapter -III Section 3.4, Page no 3.12
iii	Raw data or all AAQ measurement for 12 weeks of all stations as per frequency given In the NAQQM Notification of Nov. 2009 along with – min, max, average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	Raw data of all AAQ measurement / detailed AAQM Tables of all AAQ stations along with min., max., average and 98% values for each of the AAQ parameters have been given in EIA/EMP Report.	Enclosed as Annexure -VI
iv	Surface water quality or nearby River (60m upstream and downstream)	Details regarding surface water quality of nearby river have been incorporated in this EIA/EMP Report.	Chapter -III Section 3.09, Page no 3.39

	and other surface drains at eight locations as per CPCB/MoEF &CC guidelines		
v	Whether the site falls near to polluted stretch of river Identified by the CPCB/MoEF &CC.	Not Applicable,	Not Applicable
vi	Ground water monitoring at minimum at 8 locations shall be included	Ground water monitoring was carried out at 8 locations in the study area during Winter Season (December 2020- Feb 2021) Details of the same have been incorporated in this EIA/EMP Report.	Chapter -III Section 3.9 Page no 3.39
vii	Noise levels monitoring at 8 locations within the study area.	Noise level monitoring was carried out at 10 locations during Winter Season (December 2020- Feb 2021) within 10 km radius study area. Details of the same have been incorporated in this EIA/EMP Report.	Chapter -III Section 3.5 Page no 3.21
viii	Soil Characteristic as per CPCB guidelines	Soil sampling was carried out for 6 locations within the study area during Winter Season (December 2020- Feb 2021) Details of the same have been incorporated in this EIA/EMP Report.	Chapter -III Section 3.7 Page no 3.32
ix	Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	Traffic study of the area in respect of existing traffic, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc. was conducted and details for the same will be incorporated in Final EIA/EMP Report.	Chapter -III

x	Detailed description of flora and fauna(terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	Details of the flora and fauna found within the study area have been given in this EIA/EMP Report.	Chapter III
xi	Socio-economic status of the study area.	Details regarding Socio-economic status of the study area has been incorporated in this EIA/EMP Report.	Chapter –III & IV
7	**Impact Assessment and Environment Management Plan**		
i	Assessment of ground level concentration of pollutants from the stack emission based on site- specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific	The incremental ground level concentration of pollutants from the stack emissions based on site-specific meteorological features has been predicted via computation done through mathematical modeling and incorporated in this EIA/EMP Report. The impact of all the sources of emissions on the AAQ of the area was assessed. Details of the same along with details of the model used and the input data used for modeling have been incorporated in this EIA/EMP	Chapter -IV Section. 4.3

	terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be well assessed Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, aens1trve receptors, if any.	Report. Isopleths showing air quality contours plotted on location map have also been incorporated in this EIA/EMP Report.	
ii	Water Quality modelling - in case of discharge in water body	Not Applicable	------
iii	Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of	There will be no major impact of the transport of the raw materials and end products on the surrounding environment due to proposed project as proper mitigation measures will be adopted. Details regarding impact of the transport of the raw materials and end products on the surrounding environment along with option for rail transport	Chapter -IV Section 4.13

	raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor- cum-rail transport shall be examined.	have been incorporated in this EIA/EMP Report.	
iv	A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.	Details of Waste water generated during different phases like construction operation have been incorporated in this EIA/EMP Report.	Chapter -IV
v	Details of stack emission and action plan for control of emissions to meet Standards	The proposed stack emission details have been incorporated in this EIA/EMP Report. Efficient Air Pollution Control Equipment (APCE) will be installed for the control of emissions from all the sources within the prescribed limit. Details of the same have been incorporated in this EIA/EMP Report.	Chapter -IV Section 4.3,
vi	Measures for fugitive emission control.	Measures for control of fugitive emission have been incorporated in this EIA/EMP Report.	Chapter -IV Section 4.3.2
vii	Details of hazardous waste	It has been included in the EMP and details reg. the	Chapter -IV

	generation and their storage, utilization and disposal Copies of MOU regarding uttilization of solid and hazardous waste shall also be included EMP shall include the concept ofwaste-minimization,recycle/ reuse/recover techniques, Energy conservation and natural resource conservation.	same have been incorporated in this EIA/EMP Report.	Section 4.8
viii	Proper utilization of fly ash shall be ensured as per Fly Ash Notification,2009. A detailed plan of action shall be provided		Chapter -IV Section 4.8
ix	Action plan for the green belt development plan in 33% area i.e land with not less than 1500 trees per ha Giving details of species, width of plantation, planning schedule etc. shall be included the green belt Shall be around the project boundary and a scheme for	About 35.20 acres (33.05%) of the total project area will be covered under green belt & plantation. Action Plan for greenbelt development along with details of species, width of plantation, etc. has been incorporated in this EIA / EMP Report.	Chapter -II

	greening of the roads used for the project shall also be incorporated.		
x	Action plan for rain water harvesting measures at plant Site Shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the Project site to conserve fresh water and reduce the water requirement from other sources.	Details of the same have been incorporated in this EIA/EMP Report.	Chapter -VII Section 7.4
xi	Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.	Cost for Environmental Protection Measures: Capital Cost: 30.30 Crore Recurring Cost: 150 Lakhs	Chapter -IX
xii	Action plan for post project environmental monitoring shall be submitted.	Action plan for post-project environmental monitoring has been incorporated in this EIA/EMP Report.	Chapter -VI Section 6.3
xiii	Onsite and offsite disaster (natural and man-made) preparedness and	Onsite and Offsite Disaster (natural and Man- made) Preparedness and Emergency Management Plan including Risk Assessment and damage control has	Chapter -VII Section 7.3.3

	EmergencyManagement Plan including Risk Assessment and damage control Disaster management plan should be linked with District Disaster Management Plan.	been incorporated in this EIA/EMP Report.	
8	**Occupational health**		
i	Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers.	Plan and fund allocation to ensure the occupational health and safety of all contract and casual workers have been incorporated in this EIA/EMP Report.	Chapter -X Section 10.14
ii	Details of exposure specific health status evaluation of worker. If the workers health is being evaluated by designed format, chest, X rays, Audiometry, spirometry, Vision testing (Far & near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month	This is a proposed expansion project. Specific health status evaluation of workers will be done as guidelines and Factory act, 1948.	Chapter -VII Section 7.5

	analysed data of above mentioned parameters as per age, sex,duration of exposure and department wise.		
iii	Details of existing Occupational & safety Hazards. What are the exposure levels of abovementioned hazards and whether they are within permissible exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved.	This is a proposed expansion project. Details regarding Occupational and Safety Hazards along with exposure levels including pre-placement and periodical examinations have been incorporated in this EIA/EMP Report.	Chapter -VII Section 7.5
iv	Annual report of health status of workers with special reference to Occupational Health and Safety.	This is a proposed expansion project. Specific health status evaluation of workers will be done as guidelines and Factory act, 1948.	Chapter -VII Section 7.5
9	**Corporate Environment Policy**		
i	Does the company have a well laid down Environment Policy	.	will be incorporated in Final EIA/EMP

	approved by its Board of Directors? If so, it may be detailed in the EIA report.		Report
ii	Does the Environment Policy prescribe for standard operating process/ procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? if so, it may be detailed in the EIA.		
iii	What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.		
iv	Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of		Chapter -X Section 10.10

	Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report.		
10	**Details regarding infrastructure facilities such as sanitation, fuel, restroom etc to be Provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.**	Details regarding infrastructure facilities to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase have been incorporated in this EIA/EMP Report.	Chapter -X Section 10.11 page no. 27
11	**Corporate Environment Responsibility (CER)**		
i	Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item wise details along with time bound action plan shall be included. Socio-economic development activities need to be elaborated upon.		Chapter -VIII Section 8.5.1

12	Any litigation pending against the project and /or any direction passed by any court of lawagainst the project, if so, details thereof shall also be included. Has the unit received any notice under section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance / ATR to the notice(s) and present status of the case.	No litigation is pending against the project and/or any direction/order passed by any Court of Law against the project. The unit has not received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts.	-------
13	A tabular chart with index for point wise compliance of above TORs.	Noted.	------
B	**SPECIFIC TERMS OF REFERECE FOR EIA STUDIES FOR CEMENT PLANTS**		

1	Limestone and coal linkage documents along with the status of environmental clearance of limestone and coal mines along with quantum of production of coal and limestone from coal & limestone mines and the projects they cater to	Not applicable as it is a proposed Cement Grinding Unit.	-----
2	Quantum of production of coal and limestone from coal & lime stone mines and the projects they cater to	Not applicable	Not applicable
3	Present land use shall be prepared based on satellite imagery. High-resolution satellite image data having 1m – 5m spatial resolution like quick bird, Ikonos, IRS P-6 pan sharpened etc. for the 10 km radius area from proposed site. The same	Sentinel 2A, European Space Agency Satellite free data has been used for Land use/Land Cover analysis.	Chapter -III Section.3.2 page no. 3 to 5

	shall be used for land used/land-cover mapping of the area.		
4	If the raw materials used have trace elements, an environment management plan shall also be included.	Raw material to be used does not have trace elements.	------
5	Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines must be prepared.	Plan for the implementation of the recommendations made for the cement plants in the CREP guidelines done.	Chapter -X Section 10.14 Table no. 10.3 page no. 19 to 20
6	Energy consumption per ton of clinker and cement grinding	Since, this is a proposed grinding unit project; thus, energy consumption per ton of clinker is not applicable.	----
7	Provision of Waste heat recovery boiler	Not applicable	Not applicable
8	Arrangement for co-processing of hazardous waste in cement plant	Not Applicable	--
9	Trace metals in waste material especially slag	Not Applicable	--

CHAPTER-I

INTRODUCTION

1.1 PURPOSE OF THE REPORT

In pursuance of Government of India policy vide Environment (Protection) Act, 1986 new projects or expansion of any existing plant necessitates statutory prior environmental clearance in accordance with the objectives of National Environmental Policy as approved by the Union Cabinet on 18th May, 2006 and MoEF EIA Notification dated 14.09.2006, by preparing Environmental Impact Assessment (EIA) report.

In view of above, the EIA report has been prepared for environmental clearance from Ministry of Environment and Forests, Govt. of India for the proposed expansion of iron & steel plant project. The present report is an Environmental Impact Assessment (EIA) report for the Expansion of iron & steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA by M/s GM Iron & Steel Co, Ltd. at village Kulei, Parjang in Dhenkanal district, Odisha.

The report has been prepared to ensure environmental soundness of the project and top management commitment towards environmental protection. The purpose of this study report is to take stock of the prevailing quality of environment, and to plan appropriate environmental control measures to minimise adverse impacts and to maximize beneficial impacts.

The following major objectives have been considered:

- Assess the existing status of environment.
- Assess the impacts due to the expansion of project.
- Suggest pollution control and measures.
- Prepare an action plan for implementation of suggested measures.

- ❖ Suggest a monitoring programme to assess the efficacy of the various Assess financial considerations for environmental control plans.

For carrying out the Environmental site at village: Kulei in Dhenkanal district has been considered for generation of base line data with respect to present air quality, water quality, noise level, soil quality, ecology, and meteorology etc. The site studies were carried-out during December 2020 to February 2021 i.e. the winter season.

An in-depth analysis of the baseline environmental data generated by actual field monitoring and collected from various secondary sources has been carried out for identifying and predicting the probable environmental impacts due to the expansion of project.

As per EIA Notification dated 14th Sep. 2006, this project falls under Category "A" or Activity 3 (a) Metallurgical Industries (Ferrous & Non-ferrous) and 3(b)' Cement Plants (EIA Notification dated 14th sept, 2006 as amended time to time). Accordingly, proposal for term of Reference (ToR) for undertaking EIA/ EMP study for Expansion project. Online application for the proposal was filed on 17th Nov, 2020. And the standard ToR was granted by MoEFCC vides file no. J-11011/286/2020-IA.II(I) dated 24/11/2020. And standard ToR letter attached as **Annexure-I.**

1.2 DETAILS OF PROJECT PROPONENT

M/s. GM Iron and Steel Company Limited was incorporated on 23rd February, 2007. The company acquired an Iron & Steel plant from M/s Rana Iron & Power Ltd in 2019 through SARFAESI Act as detailed below. After obtaining CTE from OSPCB , the plant was installed and started operation after obtaining the CTO. The current CTO issued by OSPCB vide Ref. No. 3790/IND-I-CON-4699, dated 21.03.2020 is valid up to 31.03.2021.

M/s GM Iron & Steel Company Ltd. is promoted by Odisha based Misra Group of Companies. One of the prominent business houses in Eastern India, the "Misra Group" is involved in diverse businesses of Mining, Civil Construction, Ceramics,

Cold Storage, Merchant Exports & imports.

The Group was founded by Late Shri Ghanshyam Misra. Shri Ghanshyam Misra had emigrated from Rajasthan, started trading in minerals and agricultural based business in Odisha and West Bengal. By dint of his hard work and sound business acumen he was able to obtain mining leases in the Odisha. The Group is in the following business sectors: Mining, Cold Storage, Civil Construction, Export & Import, Education & Health, Manufacturing, Port Infrastructure.

M/s GM Iron & Steel Company Ltd. has one existing DRI Kiln of 1 x 100 TPD and 1 x 350 TPD configuration, Induction Furnace with LF of 2 x 10 T configuration, Rolling Mill- TMT of 1x 100 TPD configuration, Structure of 1x 100 TPD configuration, CCM of 1 x 2 Strand, CPP (WHRB) of 8 MW configuration and CPP (FBC) of 4 MW configuration.

KEY MANAGEMENT PERSON

Sl. No.	Director Name	Designation	Date of Appointment
1.	Sidharth Misra	Director	18.11.2013
2.	Raj Kumar Misra	Director	14.03.2007
3.	Binod Kumar Misra	Director	14.03.2007

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Location of the Project:

The Project is located at village Kulei, Tehsil: Parjang in Dhenkanal district, Odisha. The nearest town is Talcher at a distance of 7.20 Km from the project site having all basic amenities for living. Site is well connected by Kulei-Pitiri Road (SH) at a distance of 0.50 Km. NH-53 at a distance of 4.1 Km from the Project site. Nearest Railway station, Talcher Railway Station – 10 Km & nearest Airport is Biju Patnaik International Airport-130 Km. Nearest water body is Bramhani River – 0.90 Km. The area fall in Survey of India Toposheet No. F45N4, F45N8, F45T1 & F45T5. The elevation of the project site varies between 68m- 71 m above Mean Sea Level (MSL).

Table– 1.1 Environmental Settings of the Project

A.	**Name of the project**	Modernization & Expansion of existing iron & steel plant of M/s GM Iron & Steel Co, Ltd. Located at village Kulei, Tehsil: Parjang in Dhenkanal district.
B.	**Sl. No. in the schedule**	As per EIA Notification 2006 and amendments thereof the project falls under Sl. No. 3 (Material Production), Project Activity '3 (a)' Metallurgical Industries; Category - A
E.	**Location Details**	
	Village	Kulei
	Tehsil	Parjang
	District	Dhenkanal
	State	Odisha
	Topo Sheet No.	F45N4, F45N8, F45T1, F45T5
	Latitude **Longitude**	20°59'1.34"N to 20°59'10.95"N 85°16'10.49"E to 85°16'49.30"E
F.	**Environmental Setting Details (with approximate aerial distance and direction from the project site)**	
	Nearest City	Talcher (7.20 km, SW)
	Nearest National Highway / State Highway	NH - 53 (4.1 km, S) Kulei-Pitiri Road (SH)- (0.50 km, N)
	Nearest Railway station	Talcher Rly. Station (10 km, SW)

	Nearest Airport	BijuPattnaik International Airport, approx 130 km	
	National Parks, Wildlife Sanctuaries, Biosphere Reserves, Reserve forest and Protected forest within 10 km radius	Name of the RF, PRF, PF, etc.	Distance in km.
		Anantapur Reserved Forest	7.30 (North).
		Talcher Border RF	7.04 (NNW)
		Paturia Reserved Forest	7.70 (West)
		There are no National Parks, Wildlife Sanctuaries and Biosphere Reserves within 10 km radius.	
	Water Body (within 10 km radius)	Name of the Water Body	Distance
		Brahmani River	0.90 km, (SW)
		Dadaraghaty Reservoir	8.00 km, (N)
	Seismic Zone	Zone - III [as per IS 1893 (Part-I): 2002]	
	Make-up Water Requirement (m^3/hr)	Existing (For EC awarded project)	28 m3/hr
		Additional	92.45 m3/hr
		Total	120.45 m3/hr
	Source	Brahmani River	

Source: GMISL, Site visit, Toposheet & Google



Source: Maps of India.

Figure 1.1 Location Map



Source: Survey of India

Figure 1.2 Toposheet Map (10 Km Radius) of Project Site



Source: Google Earth ©2020

Figure 1.3 Google Map (10 Km Radius)

1.3.2 Nature, Size & Category of the Project

The project is for the Expansion of the existing Integrated steel plant to a final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA by M/s GM Iron & Steel Co, Ltd. at village Kulei, Parjang in Dhenkanal district, Odisha.

The total project area is 106.50 acres (43.1 Ha.) which has been acquired for industrial use by M/s GM Iron and Steel Company Limited. About 35.20 acres (33.05%) of the total project area will be covered under green belt & plantation.

The total investment for the proposed expansion project works out to approximately **Rs. 607.52 Crores.**

1.3.3 Importance of the Project to the Country and Region

The development of industrial projects plays a key role in the economic growth of any country. Iron is the most important metal to the mankind and its principal alloy, steel, is widely used for domestic, agricultural, industrial and defense purposes. Per capita steel consumption is a major indicator of economic status of any country.

- In CY 2019, the world crude steel production reached 1870 million tonnes (mt) and showed a growth of 3.4% over CY 2018.
- China remained world's largest crude steel producer in same period (996 mt) followed by India (111mt), Japan (99mt) and the USA (88mt).
- The Indian steel industry has entered into a new development stage, post de-regulation, riding high on the resurgent economy and rising demand for steel. Rapid rise in production has resulted in India becoming the 2ndlargest producer of crude steel during 2018 and 2019, from its 3rd largest status in 2017.

The country was also the largest producer of Sponge Iron or DRI in the world and the 3rd largest finished steel consumer in the world after China & USA in 2019 (prov.) (Source: Ministry of Steel, GOI)

Catering to Local Market & Employment Generation

GM Iron & Steel Company Limited mainly cater to the domestic demand. Production will be done to meet the growing demand of Steel in the country. Priority will be given to domestic markets. Pellets 5,59,000 TPA will be utilized in DRI and rest 2,41,000 TPA will be sold out. Sponge Iron2,66,760 TPA will be used in-house and 1,06,140 TPA will be sold out, Rolled products (Wire Rod/ TMT/ Structure)2,70,000 TPA and Cement 4,16,000 TPA will be sold to domestic markets in Talcher area and other different parts of the state/country.

Operation and maintenance of integrated iron and steel plant required human resources in different categories like managers, engineers of different discipline like metallurgical, mechanical, electrical, electronics, computer, civil, structural, chemical etc., highly skilled, skilled and semi-skilled work force in different discipline, commercial, accountants and financial managers, unskilled labour force, clerical, security personal etc. The estimated manpower requirement is 842.

1.3.4 Brief history of the project

Sl. No.	Clearances	Details
1	**Environmental Clearance**	
2	**Consent to Establish**	CTE granted by OSPCB vide letter no. **14933/Ind-II-NOC-3435** dated **09.05.2005**
3	**Consent to Operate**	CTO granted by SPCB, Odisha vide letter No. **3790/ IND-I-CON-4699** on dated **21.03.2020** & valid till 31.03.2021.
4	**ToR**	EAC granted ToR for the Expansion project vides file no. **J-11011/286/2020-IA.II(I)** dated **24.11.2020.**

1.4 SCOPE OF THE STUDY

EIA/EMP study is a planning tool to confirm environmental acceptability in addition to the statutory requirements. This report presents the results of the EIA process, which is intended to:

- Establish and review existing environment and social conditions pertaining to the plant site and its surrounding area;
- Identify and assess the environmental impacts during construction phase of proposed activity and subsequently during operation phase of the plant; and
- Advise and assist in identifying appropriate measures to mitigate adverse impacts to be adopted under Environment Management Plan (EMP) for all specified environmental impacts likely to emerge.

Objectives of the Project

The objectives of the project are summarized as per given hereunder:

Production

The existing facilities will be enhanced by modernization and high-grade Raw material feeding. DRI Kiln of 1 x 100 TPD & 1 x 350 TPD will be enhanced to 1 x 130 TPD & 1 x 450 TPD respectively. Induction furnace of 2 x 10 T will be enhanced to 2 x 12 T, TMT 1 X 100 TPD to 1 x 400 TPD, Structure 1 x 100 TPD to 1 x 250 TPD.

Apart from the modernization, expansion has also been proposed. Pellet plant of 1 x 0.8 MTPA, DRI Kiln of 1 x 500 TPD, Induction Furnace 3 X 20 T, AOD 1 x 20 T, CCM 1 X 3 strand, CPP (WHRB) 10 MW, CPP (AFBC) 36 MW, Wire Rod mill of 1 x 500 TPD, slag cement Grinding unit 2 x 500 TPD & 1 X 300 TPD has been proposed. The allied objectives will be:-

Environment & Safety

- Comply with current applicable legal requirements and other requirements to which organization subscribes.
- Sustain Quality leadership through deployment of state of the art manufacturing technologies and improved thereof.

- Prevention of Pollution, injury and ill health and continual improvement in QEOHS performance.
- Optimize the use of natural resources.
- Protect the surrounding environment in general during operation of plant with appropriate environmental safeguards to meet community expectations in terms of environmental outcomes and cost;
- Ensure that ecological balance of the area will not be adversely affected by air and noise emissions or any wastes;
- Protect native flora and fauna, quality of surface and groundwater and minimize public health risks.
- Review the policy periodically to ensure relevance & appropriateness for sustainability and communicate to all parties.

Socio-economic

- Improvement in the living standard of local habitants;
- Establish monitoring program and provide procedures for addressing community concerns, if any;
- Improvement of indirect means of livelihood; and
- Generation of various infrastructures in the form of social capital for the community.

Screening & Scope of Work

As per EIA Notification dated 14th Sept. 2006 and as amended time to time, this project falls under Category "A" or Activity 3 (a). Accordingly the proposed Terms of Reference along with Form I of the project was submitted to Expert Appraisal Committee (EAC) - Industry-1. The approved Terms of Reference was issued by Ministry of Environment, Forest and Climate Change (Impact Assessment Division) to M/s GM Iron and Steel Company Limited.

Organization of the Report

This report is based on the approved Terms of Reference issued by the Ministry and Generic structure of EIA report as given in EIA Notification S.O. 1533 (E), dated 14.09.2006 of MoEF & CC. A brief of each Chapter is presented below:

Table No. 1.2 Layout of the Report

Chapter 1	Introduction	Presents an introduction along with scope and objective of this EIA/EMP study
Chapter 2	Project Description	Presents project details of location and technical details related with production process, raw materials, emissions and control.
Chapter 3	Description of Environment	Presents the baseline status for various environmental parameters in the study area for one season (3 months).
Chapter 4	Anticipated Environmental Impacts and Mitigation Measures	Presents the identification, prediction and evaluation of environmental impacts due to the project activities. Also presents proposed mitigation measures.
Chapter 5	Analysis of Alternatives	Presents analysis of alternatives with respect to site and technology.
Chapter 6	Environment Monitoring Programme	Presents details of monitoring, audit and reporting
Chapter 7	Additional Studies	Public Consultation, Risk Assessment and Disaster Management Plan
Chapter 8	Project Benefits	Presents project benefits as: Improvements in the physical infrastructure, social infrastructure Employment potential –skilled; semi-skilled and unskilled etc.
Chapter 9	Environmental Cost Benefit Analysis	Environmental Cost Benefit Analysis not recommended at scoping stage – thus no analysis carried out separately in this EIA/EMP report.

Chapter 10	Environment Management Plan	Description of the administrative aspects to ensure the mitigation measures are implemented and their effectiveness monitored, after approval of the project
Chapter 11	Summary & Conclusion	Summary of the Report
Chapter 12	Disclosure of Consultants Engaged	Disclosure of the Consultant with brief experience of team members.
Generic structure Chapter 9 - not recommended at scoping stage – thus not included in detail.		

Applicable Environment Laws

The Indian steel industries are required to comply with the various environmental acts and regulations. The MoEFCC is the nodal agency to set up policy and standards for the protection of environment, along with Central Pollution Control Board (CPCB). This includes air, noise, water and hazardous waste standards.

Table 1.3: Key environment Laws

Name	Scope and Objectives	Key Areas
Water (Prevention and Control of Pollution) Act 1974 & Rules 1975 Reg: CPCB & SPCB	To provide for prevention & control of water pollution & maintaining wholesomeness of water quality	Control & treatment of sewage and industrial effluent discharges
Air (Prevention and Control of Pollution) Act 1981 & Rules 1982 Reg: CPCB & SPCB	To provide for prevention and control of air pollution. Maintaining air quality in the area	Control of emissions and air pollutants from the process and allied activities
Environment (Protection) Act 1986; Environment Protection Rules 1989. & EIA Notification, 2006 Reg: MoEF&CC, CPCB & SPCB	To provide for protection and improvement of environment Prior Environment Clearance for project activity	Supplements pollution laws. Maintain emissions and discharge within prescribed standards. Obtain prior EC as per norms

Noise Pollution (Prevention & Control) 2000 & its Amendments. Reg: CPCB & SPCB	To control and take measures for abatement of Noise Pollution	Monitoring and provision for maintaining the noise levels within standards as per Area & Industry
Waste Management Rules as Notified in 2016 Reg: CPCB, SPCB & Local bodies	Proper collection, handling, management and disposal of various wastes generated in the industry	Quantification of waste, proper planning for management and obtaining authorization for the same

CHAPTER – II

PROJECT DESCRPTION

2.1 TYPE OF THE PROJECT

2.1.1 Nature of the Project

Proposed unit is an Expansion project for existing Integrated steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA by M/s GM Iron & Steel Co, Ltd. at village Kulei, Parjang in Dhenkanal district, Odisha.

As per EIA Notification dated 14th Sep. 2006, this project falls under Category "A"or Activity 3 (a) Metallurgical Industries (Ferrous & Non-ferrous) (EIA Notification dated 14th sept, 2006 as amended time to time). Accordingly, proposal for term of Reference (ToR) for undertaking EIA/ EMP study for Expansion project. The proposal was presented before the Expert appraisal Committee (EAC) meeting held on 17.11.2020. EAC granted ToR for the Expansion project vides file no. J-11011/286/2020-IA.II(I) dated 24/11/2020. And ToR letter attached as **Annexure-I.**

2.1.2 Size & Magnitude of Operation

The project involves modernization and expansion of units which are described below:

The existing facilities will be enhanced by modernization and high-grade Raw material feeding. DRI Kiln of 1 x 100 TPD & 1 x 350 TPD will be enhanced to 1 x 130 TPD & 1 x 450 TPD respectively. Induction furnace of 2 x 10 T will be enhanced to 2 x 12 T, TMT 1 X 100 TPD to 1 x 400 TPD, Structure 1 x 100 TPD to 1 x 250 TPD.

Apart from the modernization, expansion has also been proposed. Pellet plant of 1 x 0.8 MTPA, DRI Kiln of 1 x 500 TPD, Induction Furnace 3 X 20 T, AOD 1 x 20 T, CCM 1 X 3 strand, CPP (WHRB) 10 MW, CPP (AFBC) 36 MW, Wire Rod mill of 1 x 500 TPD, slag cement Grinding unit 2 x 500 TPD & 1 X 300 TPD has been proposed. The brief has been tabulated below:

Table– 2.1 Size & Magnitude of the Project

A.	**Name of the project**	Modernization & Expansion of existing iron & steel plant of M/s GM Iron & Steel Co, Ltd. Located at village Kulei, Parjang in Dhenkanal district.				
B.	**Sl. No. in the schedule**	As per EIA Notification 2006 and amendments thereof the project falls under Sl. No. 3 (Material Production), Project Activity '3 (a)' Metallurgical Industries; Category - A				
C.	**Project Proponent Detail**					
	Registered Office	7, Waterloo Street, 2nd Floor, Kolkata-700069.				
	Corporate Office	P.O. Rairangpur, Dist- Mayurbhanj, Odisha-757043				
D.	**Area of Plant**	Total Plant Area – 106.50 Ac.				
		Existing Plant Area – 58.20 Ac.	Additional Requirement –48.30 Ac.			
	Classification of Land	Total Land – 106.50 Ac.				
		Forest Land- 29.29 Ac.		Non-Forest Land- 77.21 Ac		
		Existing- 9.10 Ac	Proposed- 20.19 Ac	Proposed- 28.11 Ac. (Tenants Land)	Existing-49.10 Ac	
					Govt. Land- 1.44 Ac.	Pvt. Land- 47.66 Ac.
E.	**Location Details**					
	Village	Kulei				
	Tehsil	Parjang				
	District	Dhenkanal				
	State	Odisha				
	Topo Sheet No.	73H5				
	Latitude Longitude	20°59'1.34"N to 20°59'10.95"N 85°16'10.49"E to 85°16'49.30"E				
F.	**Environmental Setting Details (with approximate aerial distance and direction from the project site)**					
	Nearest City	Talcher (7.20 km, SW)				
	Nearest National Highway / State Highway	NH - 53 (4.1 km, S) Kulei-Pitiri Road (SH)- (0.50 km, N)				
	Nearest Railway	Talcher Rly. Station (10 km, SW)				

	station		
	Nearest Airport	BijuPattnaik International Airport, approx 130 km	
	National Parks, Wildlife Sanctuaries, Biosphere Reserves, Reserve forest and Protected forest within 10 km radius	Name of the RF, PRF, PF, etc.	Distance in km.
		Anantapur Reserved Forest	7.30 (North).
		Talcher Border RF	7.04 (NNW)
		Paturia Reserved Forest	7.70 (West)
		There are no National Parks, Wildlife Sanctuaries and Biosphere Reserves within 10 km radius.	
	Water Body (within 10 km radius)	Name of the Water Body	Distance
		Brahmani River	0.90 km, (SW)
		Dadaraghaty Reservoir	8.00 km, (N)
	Seismic Zone	Zone - III [as per IS 1893 (Part-I): 2002]	
G.	**Cost Detail**		
	Total Cost of Expansion Project	Rs. 607.52 Crores	
	Cost for Environment Management Plan	Rs. 30.3 Crores	
H.	**Basic requirement for the project**		

	Manpower Requirement	Particulars	Existing	Additional	Total
		Regular	25	100	125
		Contractual	225	492	717
		Total	250	592	842
	Source	Local people will be given preference in employment as per eligibility.			
	Power Requirement (MW)	Existing			17.7 MW
		Additional			45.3 MW
		Total			63 MW
	Source	From Captive Power Plant and the short fall of 5 MW will be sourced from GRIDCO			
	Make-upWater Requirement (m3/hr)	Existing (For EC awarded project)			28 m3/hr
		Additional			92.45 m3/hr
		Total			120.45 m3/hr
	Source	Brahmani River			

Source: GMIS & PFR

2.1.3 Need for the Project

The development of industrial projects plays a key role in the economic growth of any country. Iron is the most important metal to the mankind and its principal alloy,

steel, is widely used for domestic, agricultural, industrial and defense purposes. Per capita steel consumption is a major indicator of economic status of any country.

- In CY 2019, the world crude steel production reached 1870 million tonnes (mt) and showed a growth of 3.4% over CY 2018.
- China remained world's largest crude steel producer in same period (996 mt) followed by India (111mt), Japan (99mt) and the USA (88mt).
- The Indian steel industry has entered into a new development stage, post de-regulation, riding high on the resurgent economy and rising demand for steel. Rapid rise in production has resulted in India becoming the 2ndlargest producer of crude steel during 2018 and 2019, from its 3rd largest status in 2017.

The country was also the largest producer of Sponge Iron or DRI in the world and the 3rd largest finished steel consumer in the world after China & USA in 2019 (prov.) (Source: Ministry of Steel, GOI)

Marketing of Final or By Products:

The company will use the pellets in DRI Sponge Iron , Rolled products (Wire Rod/ TMT/ Structure) and Other long products will be sold to domestic markets in Denkanal area and other different parts of the state/country.

It is envisaged to transport the products in HDPE/LPP bags in covered trucks.

2.2 SITE CHARACTERISTIC & LAND REQUIREMENT

2.2.1 Vicinity of the site

The project site is located at Village– Kulei, Parjang in Dhenkanal district of Odisha State under Survey of India, the 10 km radius study area falls in toposheet nos. F45N4, F45N8, F45T1 and F45T5 (Scale 1:50,000). The Latitude and Longitude of the project site are 20°59'1.34"N to 20°59'10.95"N and 85°16'10.49"E to 85°16'49.30"E respectively. The topography of the project site is mostly levelled with very little undulations. The site has an average altitude of 145 - 150 m above MSL.

2.2.2 Industries in the vicinity

Table 2.2: List of Industries within 10 km Radius

Sl.	Name Of Industries	Product	Distance	Direction	Operational / Non Operational
1	Lingaraj Opencast Mine Project	Coal Mine	8.17 Km	WSW	Operational

Source: Site Visit and Interaction

2.2.3 Land Details

The total land required for the project is 106.50 Ac. At present, the Existing Unit (production facilities) has been set up over 58.50 Ac. and Additional Requirement –48.30 Ac. About 35.20 acres (33.05%) of the total project area will be covered under the green belt & plantation.

10 Km radius topographical map is depicted in Figure 2.2. Immediate surroundings of the project site are shown in Figure 2.3 (Google Map) Photographs of the site are shown in Figure 2.4. The land document of the site is attached as **Annexure-II.**

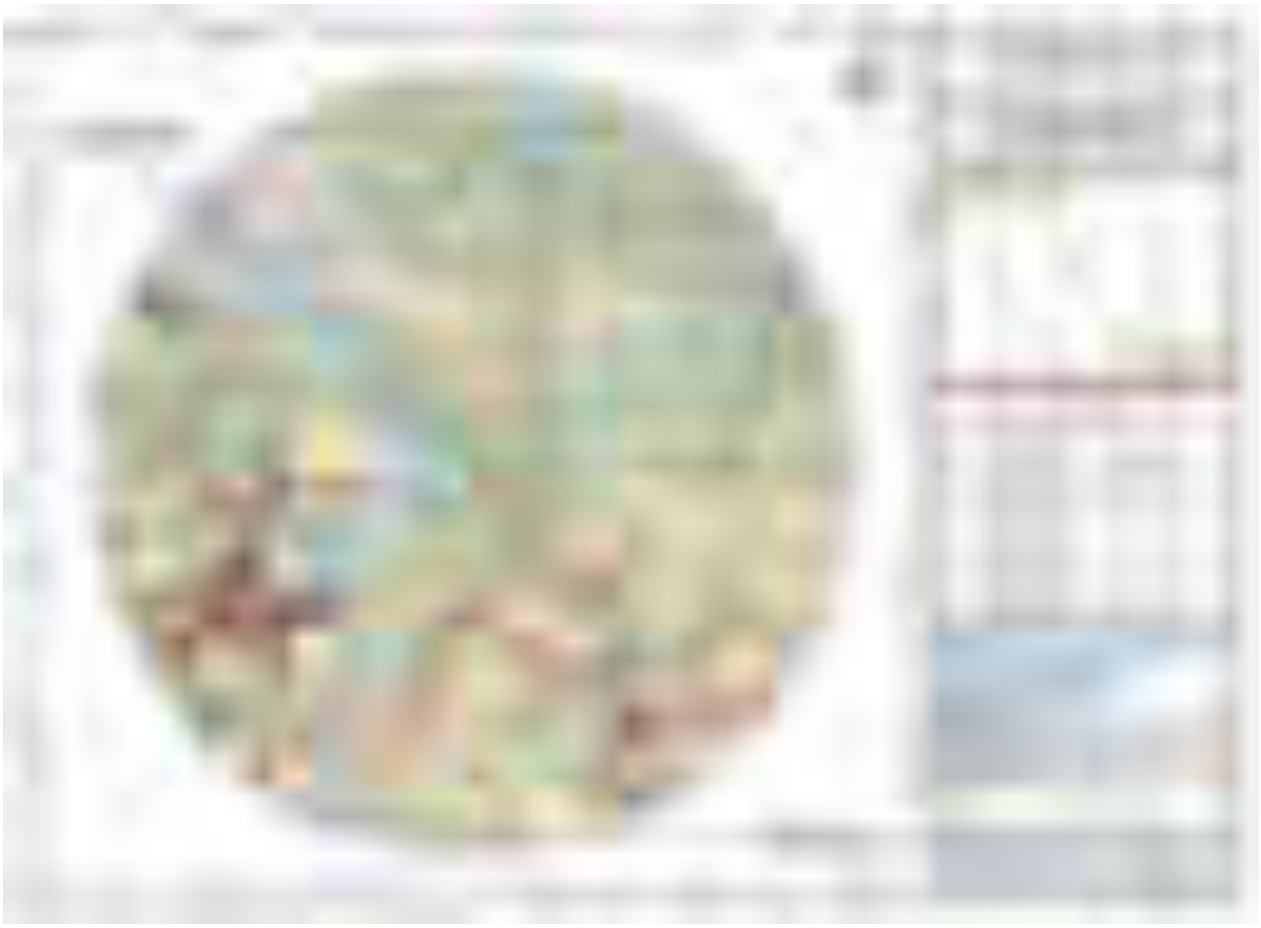


Fig 2.2: 10 Km radius topographical map



Fig 2.3: Immediate surroundings of the project site



Existing Administrative Building



Rolling Mill Section



Existing Kiln



Rolling Shed



Induction Furnace



WHRB Section (350 TPD Kiln)

Source: Site Visit Photographs

Figure 2.4 - Photograph of Project Site

Land Utilization Pattern

Before Construction:

The total land requirement for the project is 106.50 Acres (43.01 Ha.). It is an existing land already in possession of the proponent for industrial use. The land documents are attached as **Annexure II.**

After Construction:

The land-use breakup of the project site after construction and installation of the project is envisaged as below:

Table 2.3 Land Use Pattern

Sl. No.	Particulars	Total Area (Acres)
1	ExistingUnits(Production Facilities)	6.50
2	Proposed Units (Production Facilities)	32.60
3	Road	4.40
4	Reservoir	2.20
5	Raw Material/ Finished Product Stock Yard	10.30
6	Green Belt	35.20
7	Open Space	12.80
8	Utilities / Weigh Bridge/ Truck Parking	2.50
TOTAL AREA		**106.50**

Table 2.4 Co-ordinates of plant boundary pillars

	Latitude	Longitude
1	20°59'10.95"N	85°16'10.49"E
2	20°59'13.13"N	85°16'21.11"E
3	20°59'7.59"N	85°16'37.83"E
4	20°59'8.53"N	85°16'45.11"E
5	20°58'55.21"N	85°16'49.30"E
6	20°58'52.39"N	85°16'47.83"E
7	20°59'1.34"N	85°16'19.77"E
8	20°58'51.70"N	85°16'33.09"E
9	20°59'3.37"N	85°16'16.72"E

Source: GMIS & Site Visit

The plant layout showing above facilities are depicted in following Figure. And attached as Annexure**-III.**



Figure No- 2.5 Plant Layout

2.3 TECHNOLOGY & PROCESS DESCRIPTION

2.3.1 Selection of Technology

Latest energy efficient and eco-friendly technology available for Industrial Unit will be adopted for this project. The evaluation will be based on past achievements, present status and future prospects of each technology under consideration keeping in view the following criteria:

- Adoption of indigenous technology
- Capacity of the plant
- Selected product mix
- Conservation of scarce and costly energy input
- Suitability of available raw materials
- Cost considerations

Project Configuration

M/s GM Iron and Steel Co. Limited proposes for Expansion of existing Integrated steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA.

Table 2.5 Project Configurations

Name of the Units	Existing Production Detail	Final Production		Total (Final Production)
		By Modernization, Argumentation & increasing annual working days	New Installation	
DRI Kiln	1,35,500 TPA (1 x 100 TPD & 1 x 350 TPD)	1,91,400 TPA (1x130 TPD 1x450 TPD)	1,81,500 TPA (1 x 550 TPD)	**Sponge Iron - 3,72,900 TPA**
Induction Furnace with LF	75,000 TPA (2x10 T)	88,500 TPA (2x12 T)	1,81,500TPA (3 x 20 T)	**Billets (Mild & Alloy Steel) 2,70,000 TPA**
Rolling Mill				

TMT Structure	30,000 TPA (1 x 100 TPD & 1 x 100 TPD)	105000 TPA (2 x 400 TPD & 2 x 250 TPD – replacement & addition)		**Rolled Products 2,70,000 TPA**
Wire Rod	-	-	1,65,000 TPA (1 x 500 TPD)	
Pellet	-	-	8,00,000 TPA (1 x 0.8 MTPA)	**Pellets 8,00,000 TPA**
CPP (WHRB)	8 MW	-	10 MW	**Power 18 MW**
CPP (AFBC)	4 MW	-	36 MW	**Power 40 MW**
Cement Grinding Unit	-	-	4,16,000 TPA (2 x 500 TPD 1 x 300 TPD)	**Slag Cement 4,16,000 TPA**

Source: GMIS

Project Infrastructure

The project involves modernization and expansion of units which are described below:

The existing facilities will be enhanced by modernization and high-grade Raw material feeding. DRI Kiln of 1 x 100 TPD & 1 x 350 TPD will be enhanced to 1 x 130 TPD & 1 x 450 TPD respectively. Induction furnace of 2 x 10 T will be enhanced to 2 x 12 T, TMT 1 X 100 TPD to 1 x 400 TPD, Structure 1 x 100 TPD to 1 x 250 TPD.

Apart from the modernization, expansion has also been proposed. Pellet plant of 1 x 0.8 MTPA, DRI Kiln of 1 x 500 TPD, Induction Furnace 3 X 20 T, AOD 1 x 20 T, CCM 1 X 3 strand, CPP (WHRB) 10 MW, CPP (AFBC) 36 MW, Wire Rod mill of 1 x 500 TPD, slag cement Grinding unit 2 x 500 TPD & 1 X 300 TPD has been proposed.

Product Composition

The raw material for this plant is Iron Ore Fines, Coal, Coke, Bentonite, Lime Stone, Ferro Alloys, HM Scrap, Slag, Clinker, Gypsum. The quality of raw materials is key factors for effective plant operation. The quantity of raw material at the installed capacity of the plant is given in the Table below:

Table 2.6 Product Composition

Raw	Quantity in Tons	Source	Distance from site	Mode of

Material Required	per Annum		(Kms)	Transportation
Iron Ore Fines	8,40,000	Captive iron ore mines located at Badampahar mines	180 km	Road
Coal	5,27,500	Mahanadi Coalfields at Talcher	25 km	Road
Coke	7,240	Mahanadi Coalfields at Talcher	25 km	Road
Char	1,24,000	Rourkela	190 km	Road
Bentonite	8,000	Rourkela	190 km	Road
Lime Stone	13,600	Rourkela	190 km	Road
Ferro Alloys	6,750	Rourkela	190 km	Road
HM Scrap	46,860	Rourkela	190 km	Road
Slag	2,45,440	Rourkela	190 km	Road
Clinker	1,49,760	Rourkela	190 km	Road
Gypsum	20,800	Rourkela	190 km	Road

Source: GMIS

2.3.2 Manufacturing Process

M/s GM Iron and Steel Co. Limited proposes for Expansion of existing Integrated steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA.

The Process description is brief below:

PROCESS DESCRIPTION: IRON ORE PELLETIZATION PLANT

Travelling Grate& Grate- Kiln-Cooler are the universal processes for Induration of green pellets using hematite iron ores. Based on the operating experience of existing pellet plants in India, Grate-Kiln-Cooler Technology has been selected by GM Iron and Steel Co, ltd. The following equipment / process route have been adopted:

- Wet grinding of iron ore fines, in the ball mill.
- Pelletizing disc for production of Green Pellets.

- Grate-Rotary Kiln-Annular Cooler for heat hardening or Induration of green pellets.

The pelletizing plant will mainly consist of the following sections:

- Raw material storage and handling.
- Grinding section. Proportioning and mixing section.
- Formation of green pellets.
- Induration of green pellets.
- Finished Product Storage.

Raw Material Handling:

Incoming raw materials Iron ore fines, Bentonite, Limestone, Coke, Dolomite fines, Coal & Oil fuel will be stored under a covered yard inside the plant premises. Iron ore fines &Limestone will be transported to Ground hopper by dumper. Bentonite will be received in powder form & stored in proportionate building. Coke will be stored in a covered shed & transported to proportionate building by front end loader. Coal will be stored in covered shed & transported to coal ground hopper by dumper for further processing. FO/LDO/HSD will be stored in covered tank nearby Rotary Kiln.

Grinding section:

At the storage yard the Iron Ore fines are charged into a hopper which transfers the material to the ball mill through a belt conveyor. In the ball mill the incoming iron ore fines which is of -6mm is grinded with water up to -45 microns. Required quantity of water is added to the Ball mill. The output slurry material from Ball mill goes to a Vibrating Screen for size separation, where -45 micron goes to the Thickener & +45 micron material goes back for regrinding in secondary Ball mill. The slurry material from the Thickener goes to the Filter Press through pumps & pipelines.

Proportioning system:

There are ten bins in the Proportionating building. Four bins for Iron Ore concentrate, two bins for Bentonite, two bins for coke and two bins for limestone. Belt conveyors and belt weighers are placed under the bins. From these bins required quantity of materials are transferred to the Mixture machine & in Mixture machine iron ore cake, bentonite, limestone & coke are properly mixed.

Formation of green pellets

The ground iron ore fines/concentrate along with additives and binder are converted to green pellets after through mixing. The degree of fineness of input materials, critical amount of water, amount of binder in the mix etc, are most important for production of green pellets with adequate compressive strength and size. The strength of green pellets results predominantly from capillary forces caused by wetting with water and mechanical consolidation effected by rolling action. The critical amount of water varies from 8 to 13 percent depending upon the nature of feed material.

The type of equipment used in commercial plants for production of green pellets are drum, disc and cone pelletizers.

Today, even though adopted at a much later date than drum pelletizers, disc pelletizer covers a considerable portion of world pellet production. The disc pelletizer consists of a concentrically rotating inclined disc composed by a circular plain bottom area with peripheral skirt. To ensure sufficient frictional resistance and good lifting effect for the pellet feed, a moist ore bed of about 3-10 cm thickness is layered on the bottom and is controlled by scrapers. Different scraper designs have been developed such as stationary and oscillating or rotating spirals. Attempts have been made to utilize a maximum part of the disc area for green ball formation and 90% of bottom area utilization for green ball formation have been achieved after extensive research and development. Since during ball formation a classification occurs up to the discharge of pellets of desired size, the quantity of necessary pellet feed corresponds to the amount of pellets discharged. If nevertheless, small amount of undersize develop, which mostly occurs during transportation, these are separated by roller screen and re-cycled. The size of the ball in a disc pelletizer is easily controlled by adjusting the moisture content of raw feed, angle of inclination of disc, rotational speed of disc etc. Green balls are produced by disc pelletizer are collected by a belt conveyor and transferred to the green ball screening and distribution system.

Induration of green balls

The green pellets of desired size are subjected to thermal treatment viz. drying,

preheating, induration and cooling: during which the pellets attain the adequate strength to withstand handling, transportation and charging into the furnace besides increased porosity, reducibility and reduction strength etc. The major indurating processes developed for thermal treatment of green pellets are as follows:

- Shaft furnace
- Grate- rotary hearth- shaft furnace
- Annular furnace
- Circular indurating furnace
- Travelling Grate
- Grate- Rotary Kiln- Annular Cooler

However, majority of the pellet plants worldwide use either Travelling Grate or Grate-Rotary Kiln-Annular Cooler process. These two processes have been described below:



Fig 2.6 :Process Flow Chart Pelletization Plant

Travelling Grate Process:

- The Travelling Grate machine used for induration of green pellets resembles the well-known sintering machine of Dwight Lloyd design. The machine consists of three main parts.
- The central part is movable and consists of pallets, composed of a frame and supporting structure into which grate bars are inserted. The pallets are connected by means of sliding seal bars with the wind boxes in a gas tight manner.
- The bottom part is composed of the stationary wind boxes connected with gas mains duct line and the moving grate.
- The upper part comprises the heat energy and air supply system in stationary hood above the grate.
- The system serves to circulate the necessary drying, heating, indurating and cooling of pellets through the moving pellet bed. Important process equipment is the fan with which the process gases are moved through the charge. The entire thermal treatment is achieved during one passage of pellets on the indurating machine. To protect the grate bars from thermal shocks, hearth and side layers of indurated pellets are used. A number of process developers have designed the Travelling Grate process. However, most of the Travelling Grate type commercial plants are either designed by M/S Lurgi, M/S Arthur, G Mckee and Co and the share of Lurgi designed plants are more.

The advantages of Travelling Grate indurations process are production of pellet from different types of iron ore fines, uniform quality of pellets, possibility of use of different types of fuels of relative low specific heat consumption, production of large pellet quantity in one machine, etc. As a result, this process is one of the most popular processes for production of pellets. As the machine features a sophisticated system of gas circulation within the individual zones, a high precision control and high degree of automation have been developed for most economic operation of the Travelling Grate machines. In India all existing operating higher production pellet plants are equipped with Travelling Grate process.

Grate-Kiln-Cooler Process

The Grate-Kiln-Cooler process is also the most common process for pellet hardening. Devised by Mesto Minerals (formerly Allis-Chalmers/ Bolider Allis/Svedala, USA). It is basically a modification ofLepol cement making technology. It differs from the rest of the pellet hardening units in which drying, induratinging and cooling are carried out in a single device. The Grate- Kiln-Cooler unit comprises three equipments viz. Grate, Rotary Kiln and Circular Cooler. The green balls are first dried and preheated on the Grate by gases discharged from the Rotary Kiln & Circular cooler. They are then hardened in a counter flow manner in Rotary Kiln and are air cooled in an annular cooling system in Circular Cooler.

The first Grate Kiln Cooler unit was commissioned by M/S Cleveland Cliffs in the Humboldt Mine plant in 1960. The bed on the drying and preheat grate is 150 -200 mm where as the bed on the Travelling Grate machine is deeper. The firing on the Rotary Kiln lasts longer and the material is cooled in a separate cooler, in which air passes through a relatively deep (0.8 -1.0m) bed of pellets. The biggest Rotary Kiln installed in USA has a capacity of 4.0 MTPA. The major drawback of Grate Rotary Kiln Cooler system is likely build-up of materials inside the Rotary Kiln and it is necessary to test the raw materials to establish proper thermal regime of the Rotary Kiln. However, the Grate Kiln Cooler process has been adopted for product ion of pellets from different type of iron ore fines and the specific energy consumption is low compared to Travelling Grate process. The quality of pellets with respect to tumbler and shatter index are superior and uniform, as pellets are rotated and tumbled continuously during firing inside the Rotary Kiln.

On the basis of above technological considerations, final selection of process for the proposed 1.2 MTPA capacity pellet plants has been arrived at as indicated below:

- Wet grinding process for grinding of iron ore fines along with limestone in ball mills.
- Bentonite will be received in powder form or Bentonite is grounded in separate mill.
- Disc pelletizer for production of green balls.
- Grate-Kiln-Cooler process for heat hardening of pellets.

Ball Mill: The ore from the crushing section is delivered to the fine ore bin placed at the head of the grinding section, from which it is fed, together with water, to one or more grinding units consisting of a ball mill or rod mill in circuit with a classifier. A ball mill consists essentially of a conical or cylindrical shell supported on hollow trunnion bearings on which it revolves ; the construction of the various types is described later. The ore enters through one trunnion and leaves by the other. The mill is kept about half-full of balls and is driven at the speed at which their cascading and rolling action has the maximum crushing and grinding effect on the ore as it passes through under pressure of incoming feed ; the cascading action crushes the ore by impact and the rolling action grinds it by attrition. In a rod mill steel rods replace the balls; the cascading action is less, and the rolling action is responsible for most of the work done.

In this material is fed from over flow Grinding circuit cyclone i.e. concentrate. The material fed to concentrate thickener having 70% water and 30% solid. After thickening process the under flow will have 70% solid and 30% water, which goes to the concentrate holding tank from where it will be pumped to Pressure Filter.

The plate filter press is solid - liquid separating equipment working on the principle of pressure feeding. The filter press is designed to give maximum filtration efficiency among the all dewatering equipments and least maintenance with longest life. The compact filter presses are designed to de-hydrate sludges to ease transport, storage or valorization.

Grinding section: At the storage yard, the Iron Ore fines are charged into a hopper which transfers the material to the ball mill through a belt conveyor. In the ball mill, the incoming iron ore fines which are of -6mm are ground with water up to -45 microns. The required quantity of water is added to the Ball mill. The output slurry material from the Ball mill goes to a Vibrating Screen for size separation, where -45 micron goes to the Thickener & +45 micron material goes back for regrinding in the secondary Ball mill. The slurry material from the Thickener goes to the Filter Press through pumps & pipelines.

Formation of green pellets

The ground iron ore fines/concentrate along with additives and binder are converted to

green pellets after thorough mixing. The degree of fineness of input materials, a critical amount of water, the amount of binder in the mix, etc, are most important for the production of green pellets with adequate compressive strength and size. The strength of green pellets results predominantly from capillary forces caused by wetting with water and mechanical consolidation effected by rolling action. The critical amount of water varies from 8 to 13 percent depending upon the nature of the feed material.

The type of equipment used in commercial plants for the production of green pellets is a drum, disc, and cone pelletizers.

Travelling grate machine-Rotary Kiln-Annular Cooler System:

The roasting system is made up of the three major equipment viz. traveling grate machine, rotary kiln and annular cooler. Green balls are dried and preheated at traveling grate, roasted & indurate in rotary kiln and then cooled in annular cooler.

Returning Pellet System: The returning pellets collected from the head of traveling grate machine and the tail of rotary kiln are sent back through a chute with the help of bucket elevator to rotary kiln, while the returning pellet collected under dust box and bellows dust hopper will be carried through a scrape conveyer and a bucket elevator back to the returning pellet bin to be reused in proportioning after being treated by the grinding mill.

Rotary Kiln: Adopt phosphate mud wear resistance bricks and high strength thermal isolating casting compound liner. This kind of material has the properties of heat-shock resistant, anti-impact; wear resistant, thermal isolating and can prolong the liner‘s life and reduce the shell temperature. After pre-heating in rotary kiln, pellet ore are discharged to the tail of the rotary kiln through shovelling plate and chute. The head kiln is equipped with specially designed expansion refectory gun. Burning intensity and flame shape is adjusted by controlling the expansion and each sprayed volume of the refectory gun. Pellets receive heat radiation in rotary kiln and rotate restless while being roasted, so that the pellets are roasted evenly. Roasting temperature in rotary kiln is 1250~1300o c. Rotation speed can be adjusted in accordance with different materials so as to determine its retaining time in rotary kiln and to determine the quality of pellets. The head housing and tail housing of the rotary kiln adopt new type of sealing device and are

equipped with structural cooling fan.

Annular Cooler: Rotary cooler consists of rotating part, bellows, driving unit, frame and upper hood; equipped with 3 sets of blower with cooling air and 2 sets of structural cooling fan. Annular cooler receives hot pellets with temp. up to 1300℃ coming from rotary kiln. Pellet size is 8~16mm. Oversize block are discharged as the result of high temp. Operation in rotary kiln. The blocks are separated by fixed screen equipped in the head kiln housing and be discharged and treated through chute for oversized block. Pellet ore enters into annular cooler through distributing device.

ESP: Indurating process off gasses from updraft drying hood exhaust and wind box exhaust are being cleaned using Electro Static Precipitators (ESP). The outlet dust concentration is limited to 50 mg/Nm3 . The emission from Producer gas plant are being treated in Cyclone separator to remove dust particles and Electrostatic Tar Precipitatorto separate the tar. The clean gas is sent to Pellet Plant. Fugitive dust from machine discharge area and extraction area is being collected using suction ducts and cleaned in Bag Filters. Fugitive dust generated from Raw Material Handling, Bentonite Grinding, Lime and Coal Grinding and Bentonite Transfer points is being collected using suction ducts and cleaned in Bag Houses. Dust collected from the bentonite and lime stone systems and other systems is returned to their respective storage bins. The emissions from the Pellet plant is being treated in a high efficiency ESP and discharged into the atmosphere through a stack.



Figure 2.7



Figure 2.8

PROCESS DESCRIPTION: DRI PLANT

Direct reduction technology is the most widely accepted alternative to the blast furnace route for steel making. The Product DRI is an ideal feed material in electric arc furnaces, BOF 's and cupolas. DRI is more than a substitute for scrap. Direct reduced iron is a high purity material without tramp elements, permits easy handling and storage as well as continuous charging to the melting vessel with corresponding increase in productivity of the melting shop, predictable cost structure and consistent productivity.

The processing DRI occurs in the following steps:

- Raising the temperature of raw materials to the optimum reaction temperature.
- Production of reductant gases.
- Adsorption of gases on the surface of ore to the reaction interface.
- Reaction of gases with the oxide and release of products of reaction
- De sorption of gaseous products from the reacted interface.
- All the above steps result in travel of the reaction interface towards the core.

The ores are fed in to an inclined rotary kiln, together with the reductant and desulfurizing agent, heated counter current by the hot kiln gases and metallized to DRI.

The kiln is heated from the discharge end in a deficiency of air. Over its entire length, the kiln shell accommodates tuyeres permitting air to be blown into the kiln. It is introduced axially in the direction of the gas flow and serves mainly to burn the carbon monoxide evolving during reduction and also part of the volatile matter in the coal. Thus a temperature profile of 750– 1020 ^{0}C can be maintained in the bed over the length of the kiln.

The Kiln is provided with a centralized burner mounted through the discharge end housing. The burner is fired with fuel oil and is used to heat up the refractories in the Kiln prior to commencing the processing of iron ore. The burner is withdrawn when the coal is introduced and solid fuel processing takes over.

Following heat up, iron ore and coal is introduced into the Kiln at controlled rates through a feed pipe mounted through the feed end housing. Because the Kiln is inclined from the feed end to the discharge end, its rotation causes the iron and coal to mix and

traverse through the system.

The rotational speed of the Kiln is adjusted to permit the desired loading of the feed material and provide the required time to complete the reduction of the iron ore. Carbon monoxide, from coal, chemically reacts with iron ore to remove oxygen thereby converting iron ore (Iron oxide) to metallic iron.

The quantity of coal fed is adjusted to get the acceptable degree of reduction and to sustain the process. Adjustment of coal is done from both the sides of the Kiln; feed end as well a s discharge end. A fraction of the discharge end coal is again adjusted to ensure distribution of coal along the length of the kiln as per requirement and optimize coal consumption without in any way affecting the quality of the product. Rather this adjustment helps to get consistently good quality material.

Once the coal goes into the Kiln, it releases combustibles. These gases are combusted with addition of controlled amount of air. This combustion provides the heat to maintain the iron ore at processing temperature.

The air is supplied through the air tubers from the fans mounted on the Kiln. The iron ore is converted to metallic iron as it travels along the length of the Kiln.

Hot product discharges from the Kiln through a transition chute to the rotary drum cooler. Water is sprayed along its outside surface to cool the product as it moves from the feed end to the point of discharge of the cooler.

The product and char that come out of the cooler, then goes to screen where the fines and lumps are separated into three fractions. All these fractions then pass through individual magnetic separators to separate magnetic sponge iron from non -magnetic char. The sponge iron lumps and fines together are led to the designated product bin / silos.

Magnetic Separator: A full range of magnetic separators is available, from low intensity drum separators to high gradient/high intensity separators, and for either wet or dry feeds. Separation is achieved by exploiting differences in the magnetic susceptibilities of the component minerals. There are four basic types of separator designed to exploit differences in the magnetic properties from the simplest low intensity unit for separating

magnetite to high intensity/gradient units for removing minor impurities.

Bag filters are designed based on the local conditions for continuous operation. It can be installed for collecting dust from hot waste gases and also for dedusting of product and raw material handling circuits.

a) Waste gas stream : Bag filters made of filter glass fabric are designed to withstand temperature of 250-300°C. While installing bag filters care should be taken to operate the preceding waste gas cooler reliably to avoid damages to filters due to high temperature. During interruption to the process, kiln is taken on hold whereby temperatures are lowered to safeguard the kiln.
b) Dust collection during material transportation : In coal based sponge iron plants there is considerable dust generation during conveying of raw materials and product, as well as in certain region of kiln inlet and cooler outlet areas has to be included in the pollution control system plan.

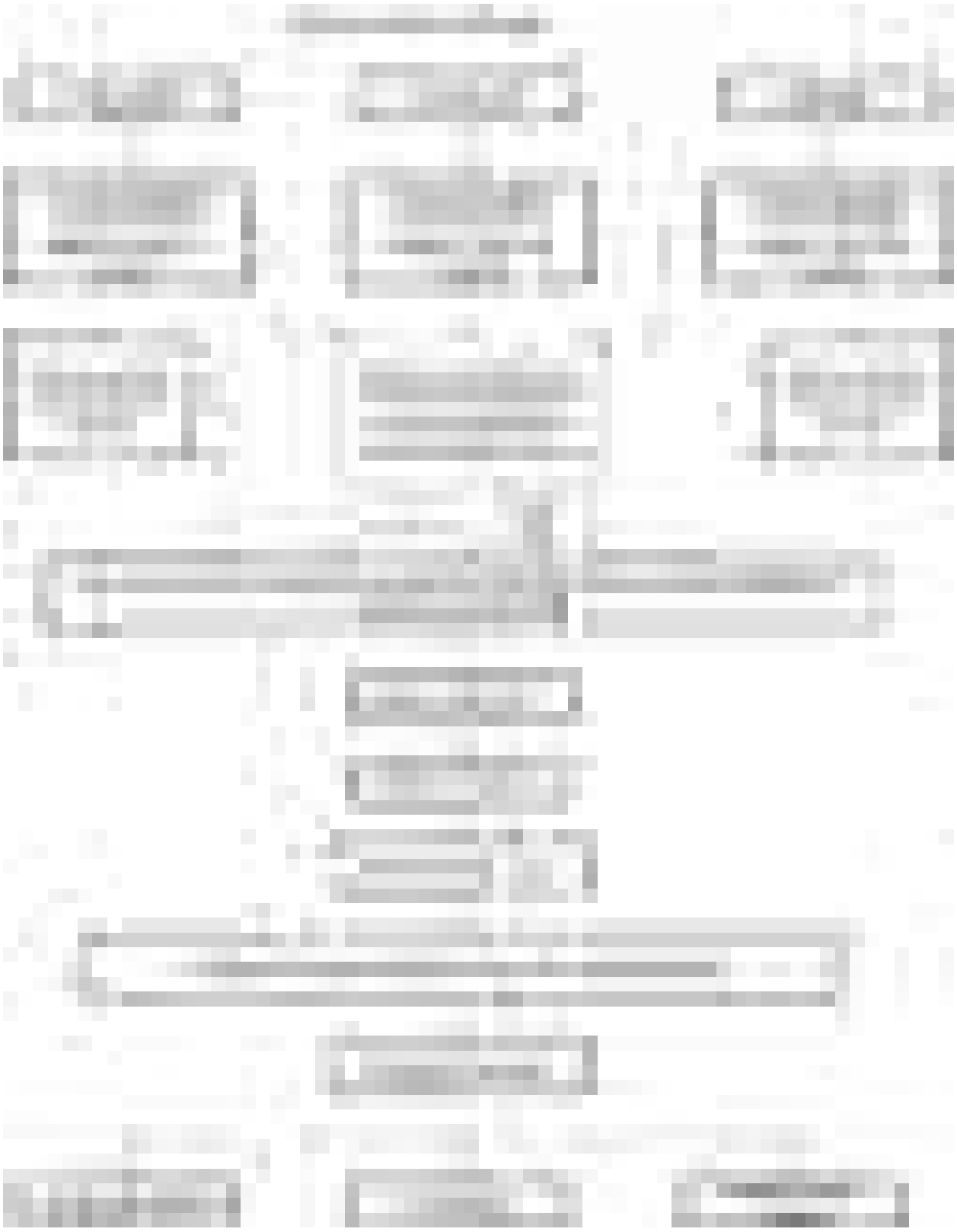


Figure 2.9: Flow Chart for DRI

PROCESS DESCRIPTION: STEEL MELTING SHOP (SMS)

Steel Melting Shop (SMS) receives Hot Metal (HM) from Iron-making units and converts it into various grades of Steel and casts them into Slabs, Blooms, Billets, Beam blanks, Rounds and thin slab- HR coils. Those are delivered as products to down-stream units (Long, Section & Flat Products).

SMS is the first stage in the Steel manufacturing value chain where product differentiation and customization starts. This entire process of steel making is associated with various safety hazards like exposure to excessive heat, dust, noise, fire and explosion, fall from height, confined space, electrical shock, gas & radioactive leakages related hazards etc. The objective of this document is to identify the hazards associated with steel melting shop process & to ensure accident free working.

Induction Furnace -

Induction furnace is a heating method. The heating by the induction method occurs when an electrically conductive material is placed in a varying magnetic field. Induction heating is a rapid form of heating in which a current is induced directly into the part being heated.

The heating system in an induction furnace includes:

- Induction heating power supply,
- Induction heating coil,
- Water-cooling source, which cools the coil and several internal components inside the power supply.

The induction heating power supply sends alternating current through the induction coil, which generates a magnetic field. Induction furnaces work on the principle of a transformer. An alternative electromagnetic field induces eddy currents in the metal which converts the electric energy to heat without any physical contact between the induction coil and the work piece. The furnace contains a crucible surrounded by a water cooled copper coil. The coil is called primary coil to which a high frequency current is supplied. By induction secondary currents, called eddy currents are produced in the crucible. High temperature can be obtained by this method.

The heart of the coreless induction furnace is the coil, which consists of a hollow section of heavy duty, high conductivity copper tubing which is wound into a helical coil. Coil shape is contained within a steel shell and magnetic shielding is used to prevent heating of the supporting shell. To protect it from overheating, the coil is water-cooled, the waterbeing recirculated and cooled in a cooling tower. The crucible is formed by ramming a granular refractory between the coil and a hollow internal former which is melted away with the first heat leaving a sintered lining.

Frequencies used in induction melting vary from 50 cycles per second (mains frequency) to 10,000 cycles per second (high frequency). The higher the operating frequency, the greater the maximum amount of power that can be applied to a furnace of given capacity and the lower the amount of turbulence induced.

When the charged material is molten, the interaction of the magnetic field and the electrical currents flowing in the induction coil produce a stirring action within the molten metal. This stirring action forces the molten metal to rise upwards in the centre causing the characteristic meniscus on the surface of the metal. The degree of stirring action is influenced by the power and frequency applied as well as the size and shape of the coil and the density and viscosity of the molten metal. The stirring action within the bath is important as it helps with mixing of alloys and melting of turnings as well as homogenizing of temperature throughout the furnace. Excessive stirring can increase gas pick up, lining wear and oxidation of alloys. One Billet Caster is used of capacity of 2,00,000 TPA.

Slag Recovery Plant: Iron and steel slags are valuable raw materials that are obtained during the pig iron and crude steel production processes. Two main production methods are involved . In the iron ore-based process, pig iron is produced from oxidic iron ores in a kiln. The molten pig iron is then processed together with steel scrap into crude steel. In the purely scrap-based production variant, the raw steel is produced by recycling steel scrap in an Induction furnace.



Figure 2.10: Process flow chart for Steel Melting Shop

PROCESS DESCRIPTION: CONTINUOUS CASTING MACHINE

Continuous casting is a casting process in which the operation of pouring, solidification and withdrawal of casting from an open mould are carried out continuously. The molten metal from Induction Furnace is continuously supplied from the ladle to the intermediate ladle called 'tundish' from where it is continuously poured into the mould at a controllable rate, keeping the level at a constant position. The mould usually made of copper or graphite is open at the bottom and is water cooled so as to extract the heat of the metal causing its solidification. The shape of the mould corresponds to the shape of the desired casting. The process is started placing a dummy bar at the bottom of the mould upon which the first liquid metal falls. The molten metal from the tundish enters the mould and takes the shape of the mould. The water cooled mould controls the cooling rate of the metal, so that it solidifies before it leaves the mould. The metal after coming out of the mould is further cooled by direct water spray (or water with air) to complete solidification. The solidified metal is continuously extracted by 'pinch rolls', bent and fed horizontally and finally cut to the desired length.



Fig 2.11: Continuous Casting Machine

PROCESS DESCRIPTION: ROLLING MILL

Stock Preparation: The billets charging will pass through mechanical pusher type and pushed into the rolling mill.

Rolling: The hot billets after discharge from the CCM will be passed to the 1st rolling strand having 7 passes with the help of a conveyor. There will be a Y table and a Turning wall on either side of the 1st strand and there will be a operator facilitated with a control desk to control the movement of material through various passes on the conveyor. The material will further move to another 1 set of Roughing mill strand having 2 passes.The material will move from the Roughing Mill to the Intermediate Mill – 4 nos with the help of Bay Way. In the process it will pass through 1 pinch roll and a set Rotary Shears which will crop the bad front and the back ends of the incoming bar from the Roughing Strand. The material will then move continuously to first Intermediate cum Finishing Mill Strand.

Cooling: The finished product is moved into Twin Channel with automatic cooling bed.The finished product is evacuated from the cooling bed with the help of Run Out Conveyors and then cut into required length with the help of cold shearing machine.

Wire Rod mill: The objective of a wire rod mill (WRM) is to reheat and roll steel billets into wire rods. The production of wire rods in wire rod mills is subject to constant change. Modern wire rod mills are high speed mills capable of rolling of smaller dimensions at high production rates, while at the same time keeping investments and operating costs at the reasonable levels.

TMT: TMT steel bars are steel bars that are manufactured with unique metallurgical process known as “Thermo Mechanical Treatment”. These TMT bars are approved by the Bureau of Indian Standards for building and construction projects.

Wire Rod: The objective of a wire rod mill (WRM) is to reheat and roll steel billets into wire rods. The production of wire rods in wire rod mills is subject to constant change. The growing demands on the quality of the wire rods as well as on the flexibility and cost effectiveness of the wire rod mills has necessitated the development of new and innovative technologies and processes. Modern wire rod mills are high speed mills capable of rolling of smaller dimensions at high production rates, while at the same time

keeping investments and operating costs at the reasonable levels.

Structural: Structural shape rolling, also known as shape rolling and profile rolling is the rolling and roll forming of structural shapes by passing them through a rolling mill to bend or deform the workpiece to a desired shape while maintaining a constant cross-section. Structural shapes that can be made with this metal forming process include I-beams, H-beams, T-beams, U-beams, angle iron, channels, bar stock, and railroad rails. The most commonly rolled material is structural steel, including carbon steel and stainless steel.

Inspection & Dispatch

The product is finally moved to the Finished Product Storage area with the help of overhead crane. During rolling, inspection will be carried out for dimensional accuracy of the finished product. Gauges will be made for different section and size. There will be go-no-go gauge for on line checking. After final inspection material will be ready for dispatch.

PROCESS DESCRIPTION: SLAG CEMENT GRINDING PLANT

Cement (PSC); Clinker, slag & Gypsum received through the railway wagons are unloaded by wagon-tippler and transported through belt conveyor system for storage in Clinker silo, Slag & Gypsum covered shed respectively. Slag received in wagons will be dried and ground and mixed with Clinker and gypsum for PSC. Clinker, Slag and Gypsum are subsequently extracted and transported in definite quantity as per the quality requirements to mill feed hoppers which are then fed to Ball Mill for Grinding through weigh feeder in definite proportion are ground for the production of Portland Slag Cement. Based on market demand, slag alone will be ground to produce GGBS. The Ball Mill consists of Rollers which rotate on a Grinding table thereby grinding the raw material In the Cement Silo the cement is homogenized by fluidization method (for blending) and then extracted through specific equipment installed and fed to Electronic Roto-Packing Machine for packing in bags. After packing in bags in the packer machines the cement bags are transported by means of belt conveyor and loaded in Railway

Wagons/Trucks by automatic Wagon/Truck Loading machines for onward dispatch to the customer.

PROCESS DESCRIPTION: CAPTIVE POWER PLANT

Captive power plant (CPP) is proposed to be installed to operate the integrated steel plant. The Plant will be based on the utilization of waste heat of flue gases generated in Sponge Iron. Before discharging to the atmosphere, the heat can be recovered through waste heat recovery boilers. Where steam will be generated and feed to turbo generator set. It is presumed that from the specific volume of flue gas being generated from 72,49,800 TPA Rotary Kiln Maximum 308 MW / Hour power can be generated.

A lot of coal fines will be generated while processing ROM coal along with char from the Rotary Kiln. Hence to utilize the coal fines and char generated in the plant, power through CFBC & AFBC Boilers are conceived. Looking at the total power requirement additional power of 150 MW / Hour is proposed from CFBC and WHRB. To feed to the boilers additional coal fines shall also be purchased from the open market.

WHR Boiler: Waste Heat Recovery Boiler is a system which recovers various kinds of waste heat generated from the production process of steel, non-ferrous metal, chemical, cement etc and those equipment of industrial furnaces, refuse incinerators, industrial waste incinerators, and convert such recovered heat into useful and effective thermal energy.

Conditions of the origin of waste heat depend upon each kind of facility which discharges waste heat. Conditions like gas temperature, pressure, corrosiveness, dust content etc vary depending on the conditions of each case. Therefore, deign and fabrication of waste heat recovery boiler require rich experience and technical capability.

AFBC Boiler: Afbc is air fluidized bed combustion boiler . this type of boiler the bed is having pa (primary air nozzles) through which air passes and burn the fuel which is present on the bed . basically light density fuel is used for this type of boiler. Efficiency of this type of boiler is about 80 per. Bed material (made up of silica sand) is also used in this type boiler . primary and secondary super heaters are there but for high temperature

bed super heater is also there .AFBC boiler is a very developing technology now these days this technology is widely used in the industrial boiler for the purpose of efficient and clean burning of coal and other fuel for steam generation. afbc boiler is suitable for combustion of low quality fuel.

Coal Handling: Coal unloading activity involves unloading of coal from dumpers and truck in coal yard. Coal is fed to coal bunker with the help of conveyor belt, screen and crusher.

Turbine House: High temperature, high pressure steam enters in turbine where heat energy is converted into kinetic energy. Turbine is directly coupled to alternator where electricity is generated by electro motive force produced. Steam is extracted for process and for heating water before feeding in boiler from various extraction points in turbine.

DM Plant: Make up water for the power cycle ise Demineralised (DM) water. Make-up water is also added to the Deaerator. Feed water to the Boilers is fed to one Boiler's MCR requirement) which shall take the suction from the Deaerator. The boilers are connected to the chimney.

Utility: Instrument air compressors are installed for requirement of air at various control valves. Cooling tower with well-designed water distribution system for removing heat from condenser, alternator, oil coolers and at various fan bearing locations are provided. There will be a raw water reservoir for catering raw water requirement.

Ash Silo: In a typical fly ash handling system, the material that is generated as a result of combustion is captured by an electrostatic precipitator (ESP) or a baghouse before the flue gases reach the stack. These ESPs and baghouses generally have multiple pyramidal hoppers at the bottom, in which the ash is collected by gravity and then is transferred to a storage silo. These storage silos generally have provisions for a truck load-out to carry the fly ash for disposal or reuse.

Ash Handling: The ash is trapped in ESP and stored in an ash silo. The ash shall be used in cement industries. The ash handling system envisages dry extraction and disposal of bottom ash and dry extraction for fly ash. The fly ash shall be extracted from the

electrostatic precipitator hoppers and transported to storage silo as a measure for promoting fly ash utilization. Closed ash silos will be provided with sufficient storage capacity so that handling is not an issue. Ash in silos will be unloaded to Browsers for further utilized by brick/cement industries.

Technical detail of captive power plant

Boiler Pressure Parts

The complete system of boiler pressure parts covers:

- Steam & water drums
- Furnace water wall & other circulating system components
- Boiler bank system
- Super heater system
- Economizer system

Detailed process flow charts of various sections are attached as **Annexure IV.** A combine compact flow chart is presented below:



Figure-2.13 Process Flow Diagram

Process Requirements

Iron Ore Fines: The total Iron Ore fines requirement of the plant will be 8,40,000 TPA. The required Iron ore shall be procured from Captive iron ore mines located at Badampahar mines in Odisha. The iron ore transported by Road. Iron ore fines transported to Ground hopper by dumper.

Coal: 5,27,500 TPA Coal required from Mahanadi Coalfields at Talcher mine. Coal generally used for Sponge Iron**.** Coal will be stored in covered shed & transported to coal ground hopper by dumper for further processing and transported by Road in covered vehicles.

Coke: The total Coke requirement of the plant will be 7,240 TPA from Mahanadi Coalfields at Talcher mine. Coke will be stored in a covered shed & transported to proportionate building by front end loader and transported by Road in covered vehicles.

Char: Char will be received by road in covered vehicles from Rourkela. Total 1,24,000 TPA of char is required.

Bentonite: The annual requirement of Bentonite will be 8000 TPA. Bentonite will be received in powder form & stored in proportionate building. The required quantity of bentonite will be obtained from Rourkela. Bentonite transported by Road in covered vehicles.

Ferro Alloys: The total ferro alloys requirement of the plant will be 6,750 TPA. The required alloy shall be procured from Rourkela. Ferro alloys will be transported by Road in covered vehicles.

Lime Stone: The annual requirement of Lime stone will be 13,600 TPA. The required quantity of limestone will be obtained from Rourkela. Limestone will be transported by Road in covered vehicles. Lime stone transported to Ground hopper by dumper.

HM Scrap: Total HM Scrap required 46,860 TPA. Scrap obtained from Rourkela and transported by road.

Slag: Slag will be received by road in covered vehicles from Rourkela. Total 2,45,440

TPA of slag is required.

Clinker: Alloys: The total Clinker requirement of the plant will be 1,49,760 TPA. The required clinker shall be procured from Rourkela and transported by Road.

Gypsum: Gypsem will be received by road in covered vehicles from Rourkela. Total 20,800 TPA of gypsum is required.

Equipment Details

In selecting a particular type of equipment or storage for the project, among others, the following points have been considered:

- Equipment costs & Sizes in which the equipment is available
- Energy consumption & ease of using Raw material with varied characteristics
- Lead times for particular types of equipment
- Operating experience with various types of equipment
- Ease of operation of equipment & Product to be manufactured
- Site conditions & Local skills available
- Environmental issues

Equipment have been envisaged based on the experience and latest availability of energy efficient technology.

2.3.3 Quantity of Raw Material & Fuel Required

The raw material for this plant is Iron Ore Fines, Coal, Coke, Bentonite, Lime Stone, Ferro Alloys, HM Scrap, Slag, Clinker, Gypsum. The quality of raw materials is key factors for effective plant operation. The quantity of raw material at the installed capacity of the plant is given in the Table below:

Table No. 2.7: Requirement of Raw Material in different Product Mix

Raw Material Required	Quantity in Tons per Annum	Source	Distance from site (Kms)	Mode of Transportation
Iron Ore Fines	8,40,000	Captive iron ore mines located at Badampahar mines	180 km	Road

Coal	5,27,500	Mahanadi Coalfields at Talcher	25 km	Road
Coke	7,240	Mahanadi Coalfields at Talcher	25 km	Road
Char	1,24,000	Rourkela	190 km	Road
Bentonite	8,000	Rourkela	190 km	Road
Lime Stone	13,600	Rourkela	190 km	Road
Ferro Alloys	6,750	Rourkela	190 km	Road
HM Scrap	46,860	Rourkela	190 km	Road
Slag	2,45,440	Rourkela	190 km	Road
Clinker	1,49,760	Rourkela	190 km	Road
Gypsum	20,800	Rourkela	190 km	Road

Marketing Area and Mode of transportation of Final Product

The company will use the pellets in DRI Sponge Iron , Rolled products (Wire Rod/ TMT/ Structure) and Other long products will be sold to domestic markets in Denkanal area and other different parts of the state/country.

It is envisaged to transport the products in HDPE/LPP bags in covered trucks.

2.3.4 Water Requirement

Total Circulating water requirement is 41,688 m3/day total make up water requirement is 2,890.8 m3/day. Recirculation water requirement is 38,797.2 m3/day. The breakup of water requirement is given in below tabular form:

Table No. 2.8: Break up of water requirement (Total)

Plant Facilities	Circulating Water M3/hr	Make Up Water M3/ hr	Recirculation Water M3/hr	Evaporation M3/hr	Discharge as waste M3/hr
Pellet	375.0	14.0	360.0	12.0	3.0
DRI	510.0	48.0	460.0	50.0	-
SMS	272.0	14.0	257.0	13.5	1.5
AOD	100.0	4.0	95.0	4.5	0.5
Rolling	278.0	11.45	263.0	14.5	0.5
Cement	50.0	2.0	48.0	1.5	0.5
CPP	150.0	25.0	125.0	22.0	3.0
Drinking & Sanitation	2.0	2.0	-	1.2	0.8
TOTAL	**1737.0**	**120.45**	**1608.0 + 8.55 (Recycled water after ETP)= 1616.55**	**119.2**	**9.8**

- No generation of Industrial wastewater as no requirement of process water in operation for the unit. Make-up water will be added in cooling water circuit for evaporation, blow down and line losses.
- The domestic waste water generated will be treated in STP (Primary). Treated water will be used for water sprinkling and greenbelt development/plantation.
- No waste water will be discharged outside the plant premises. RWH plan will be prepared and implemented.



Figure 2.14: Water Balance Diagram

2.3.5 Power Requirement

Total power requirement for existing and proposed plants is 63 MW per hour. From existing plant power availability is 12 MW per hour (8 MW WHRB + 4 MW AFBC). The power from proposed expansion is 46 MW per hour (10 MW WHRB + 36 MW CFBC). The balance 5 MW shall be sourced from nearest power grid of State Government.

2.3.6 Manpower Requirement

Operation and maintenance of integrated iron and steel plant required human resources in different categories like managers, engineers of different discipline like metallurgical, mechanical, electrical, electronics, computer, civil, structural, chemical etc., highly skilled, skilled and semi-skilled work force in different discipline, commercial, accountants and financial managers, unskilled labor force, clerical, security personal etc. The estimated manpower requirement is **842.**

The detail Breakup of the employees is given in the Table below:

Table 2.9: Manpower Requirement

Particulars	Existing	Additional	Total
Regular	25	100	125
Contractual	225	492	717
Total	**250**	**592**	**842**

2.3.7 Utilities & Services

Utilities for the water requirement & fuel requirements are detailed above.

2.3.8 Material Balance

The product wise material balance for the unit is envisaged as below:

Table No. 2.10: Material Balance for Products

Materials Balance for Pellet Plant (2424 Ton production per day i.e. 800000 TPA)			
Input		Output	
Qty. in Kg/Mt of pellet	Qty. per day in tons for 2424	Qty/ Mt of iron ore pellets	Qty. per day in tons for 2424 ton of
Iron ore fines :1050	2545	Iron ore pellet 100%	2424

Coal: 30kg	73	Ash & Dust	40
Limestone:17kg	41	Inside pellet	41
Bentonite:10kg	24	Inside pellet	24
Coke:5 kg	12	Inside pellet	05
FO/LDO : 15 Liters	36	Steam, Gas & Dust	401
Water in tons	204	Inside pellet	0
Air 15 Kg/ Lit of Oil	540	Combustion of Oil	540
Total Input	**3475**	**Total Output**	**3475**

Material Balance for existing 1,35,000 TPA Sponge Iron

Input		**Output**	
Materials	**QuantityTPA**	**Material Out**	**Quantity**
Iron ore Pellet	2,02,500	DRI	1,35,000
Coal	1,21,500	Char	40,500
Dolomite	6,750	ESP & Bag	8,100
		Off gas	1,47,150
Total Input	**3,30,750**	**Total Output**	**3,30,750**

Material Balance for Total Production (Existing + Modernization + Expansion, 3,72,900 TPA)

Input		**Output**	
Materials	**Quantity TPA**	**Material Out**	**Quantity**
Iron ore Pellet	5,59,350	DRI	3,72,900
Coal	3,35,610	Char	1,11,870
Dolomite	18,645	ESP & Bag	22,374
-	-	Off gas	4,01,461
Total Input	**9,13,605**	**Total Output**	**9,13,605**

Material Balance for per Ton of Liquid Steel for existing 1 x 10 T plant

Input		**Output**	
Materials	**Quantity TPA**	**Material Out**	**Quantity**
DRI	74,100	Billet	75,000

Scrap	6,525	Slag & Gas Loss	14,925
Pig Iron	6,525	-	-
Ferro Manganese	1,125	-	-
Ferro Silicon	750	-	-
Pet Coke	900	-	-
Total	**89,925**	**Total Output**	**89,925**

Material Balance for per Ton of Liquid Steel for Total Configuration (Existing + Modernization + Expansion) (2,70,000 TPA)

Input		**Output**	
Materials	**Quantity TPA**	**Material Out**	**Quantity**
DRI	2,66,760	Billet	2,70,000
Scrap	23,490	Slag & Gas Loss	53,730
Pig Iron	23,490	-	-
Ferro Manganese	4,050	-	-
Ferro Silicon	2,700	-	-
Pet Coke	3,240	-	-
	3,23,730	**Total Output**	**3,23,730**

Material Balance for wire rod mill

Input	**Ton**	**Output**	**Ton**
Billet	1.0	Wire Rod	0.975
	-	Scrap	0.025
Total	1.0	Total	1.0

Material Balance for Slag Cement Grinding Plant

Material In (TPA)		**Material Out (TPA)**	
Slag	2,45,440	Cement	4,16,000
Clinker	1,49,760	Process Loss	7,400
Gypsum	20,800	-	-

Coal	10,400	-	-
TOTAL	**4,26,400**	**TOTAL**	**4,26,400**

2.3.9 Energy Balance

Total power requirement for existing and proposed plants is 63 MW per hour. From existing plant power availability is 12 MW per hour (8 MW WHRB + 4 MW AFBC). The power from proposed expansion is 46 MW per hour (10 MW WHRB + 36 MW CFBC). The balance 5 MW shall be sourced from nearest power grid of State Government.

Table 2.11: Energy Balance

Sl. No.	Units	No of days	No of hours	Phase- I Power required in MW	Phase – II Power required in MW	Total Power required in MW
1	DRI - 1 x 100 TPD	330	24	0.7	-	0.7
2	DRI - 1 x 350 TPD	330	24	1.0		1.0
3	DRI - 1 x 500 TPD	333	24		1.3	1.3
4	0.8 MTPA Pellet Plant	330	24	-	6.0	6.0
5	SMS (IF) - 12 T x 2	330	24	10	-	10.0
6	SMS (IF) - 25 T x 2	330	24	-	24.0	24.0
7	SMSAuxiliaries	330	24	1.0	1.0	2.0
8	AOD	330	24		2.0	2.0
9	TMT &Structural	330	24	4.0	-	4.0
10	Wire Rod	330	24		3.0	3.0
11	Cement	320	24		3.0	3.0
12	CPP (WHRB)1 x 8 MW	330	24	1.0		1.0
13	CPP (WHRB)1 x 10 MW	330	24		1.0	1.0
14	CPP (AFBC)1 x 4 MW	330	24	0.8	-	0.8
15	CPP (AFBC)1 x 36 MW	330	24	-	2.2	2.2
16	Auxiliaries	330	24			1.0

	Total					**63**
17	In House Power Production			12	40	58
	Short fall					**5**

2.3.10 Resources optimization:

Conservation of Natural Resources

- The Raw Material Handling Section would be provided with dust suppression (DS) by water sprinkling at the stockyard and multiple dust extraction (DE) systems for the dust generation points at the screen, conveyor transfer point and gas sealing devices to arrest the dust emissions to the atmosphere.
- Recycle and reuse of domestic waste water to conserve the fresh water
- Rain water harvesting system will be installed to conserve and replenish ground water resources of the area.

Recycle/Reuse

- Construction waste like soil, brick bits, etc. will be utilized in leveling of land and road making
- The exhausted gases sucked through Pellet plant will be cleaned in a ESP. The dust collected will be discharged into a water sealed scraper and sent to primary mixing unit for recirculation. Waste gases will be discharged into atmosphere through a chimney.

Use of alternative Inputs

- Switching off unnecessary lights by micro based timer.
- Use of Optimum size and energy efficient Motors.

Energy conservation by stopping idle running hours of equipment

2.4 PROJECT COST BREAKUP

The overall cost of project is estimated at Rs. 607.52 Crores, the breakup of which is as under:

Table 2.12: Project Cost

Sl. No.	Particulars	Rs. Crore
1	Land and Site development	10
2	Civil Construction	110.32
3	Plant and Machinery	337.36
4	Electrical Insatallation	61.92
Core cost of the project		**519.60**
5	Interest During Construction/Moratorium	61.42
6	Provision For Contingencies	22.38
7	Preliminary & Pre-Operative Expenses	4.12
	Total capital cost	**607.52**

2.5 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

Work carried out and tentative schedule for approval of project:

Table– 2.13 Tentative Schedule for Approval of the Project

S. No.	Project Activity	Date / Duration
1.	Issue of TOR by MoEFCC, New Delhi: vide F.No. J-11011/286/2020-IA.II(I)	24.11.2020
2.	Baseline data collection for EIA/EMP – winter season	December 2020 to February 2021
3.	Submission of Draft EIA/EMP for Public Hearing	1st May 2021
4.	Publication of Notice of Public Hearing in daily Newspapers – Hindustan, Hindustan Times, Rastriya Sahara and Times of India.	
5.	Conduct of Public Hearing	
6.	Submission of Final EIA/EMP for EC along with Form-2 & Presentation	
7.	Water withdrawal permission	
8.	Presentation to EAC for consideration of project for Environmental Clearance	
9.	Approval/Grant of Environmental Clearance from MoEF&CC & Grant of CTE by BSPCB	

Tentative schedule for Start of work at site after obtaining CTE and CTO and Installation/Commissioning of the Project.

Table– 2.14 Tentative Schedule for Implementation of the Project

Project Module	Start Date	End Date
After Receipt of EC; Obtaining Consent to Establish	Zero date	1st month
Land Development	2nd month	3rd month
Building and Plant Shed	2nd month	10th month
Finalization of technology partner	2nd month	4th month
Procurement of Equipment	5th month	13th month
Installation of Plant & Equipment	10th month	30th month
Commissioning of Equipment	30th month	32nd month
Obtaining Consent to Operate	33rd month	34th month
Trial Run of Production	35th month	
Commercial Production	36th month	

2.6 DESCRIPTION OF MITIGATION MEASURES INCORPORATED

2.6.1Mitigative measure for control of Air Pollution

Pellet Plant:

The pellet plant raw material and product handling section would be provided with DE system comprising ESP/bag filters for extracting dust at material transfer point, mills and screening house etc. The exhaust gases from ore drying/grinding and pellet indurations at elevated temperature contaminated with dust particles, sulphur dioxide and oxides of nitrogen would be cleaned by dry gas cleaning systems. Ore drying section would be provided with bag filter and pellet indurations with ESP to remove the

particulates. The clean gases would be vented through stack of adequate height.

Steel melt shops (SMS):

Secondary fumes will be generated at several points during ladle transfer, desulphurisation section, raw material charging in the BOF converter/EAF, liquid steel tapping and secondary refining points. All the fumes from each of the shops would be collected separately by FE systems and taken through an ESP/bag house before venting out clean air into the atmosphere through a stack of adequate height.

Rolling mills:

The rolling mills will not have major air pollution as clean plant fuel gas would be used in all of them. Although, there will be generation of NOx, which would be controlled by optimising the excess air supply and proper burner design.

2.6.2 Mitigative measure for control of Water Pollution

- The existing and proposed units will generate the wastewater and some amount of sewage is also to be generated.
- The industrial effluent and domestic sewage will be suitably treated and reused/recycled in the different units, ash quenching, dust suppression and green belt area.
- Organization will follow the zero liquid discharge (ZLD) norm and will not discharge and wastewater outside the plant premises. The over-all water and wastewater management data is presented below.

2.6.3 Mitigative measure for control of Noise Pollution

- Isolation of high noise generating equipment to the extent possible.
- In order to reduce the effect of noise pollution, earmuffs will be provided to all operators and employees working near the machinery.
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Adequate silencers will be provided in all the diesel engines.
- Green Belt of appropriate width will be maintained inside the pant premises and at

the plant boundary. 33% area of the project land will be developed for green belt.

2.6.4 Solid Waste Management:

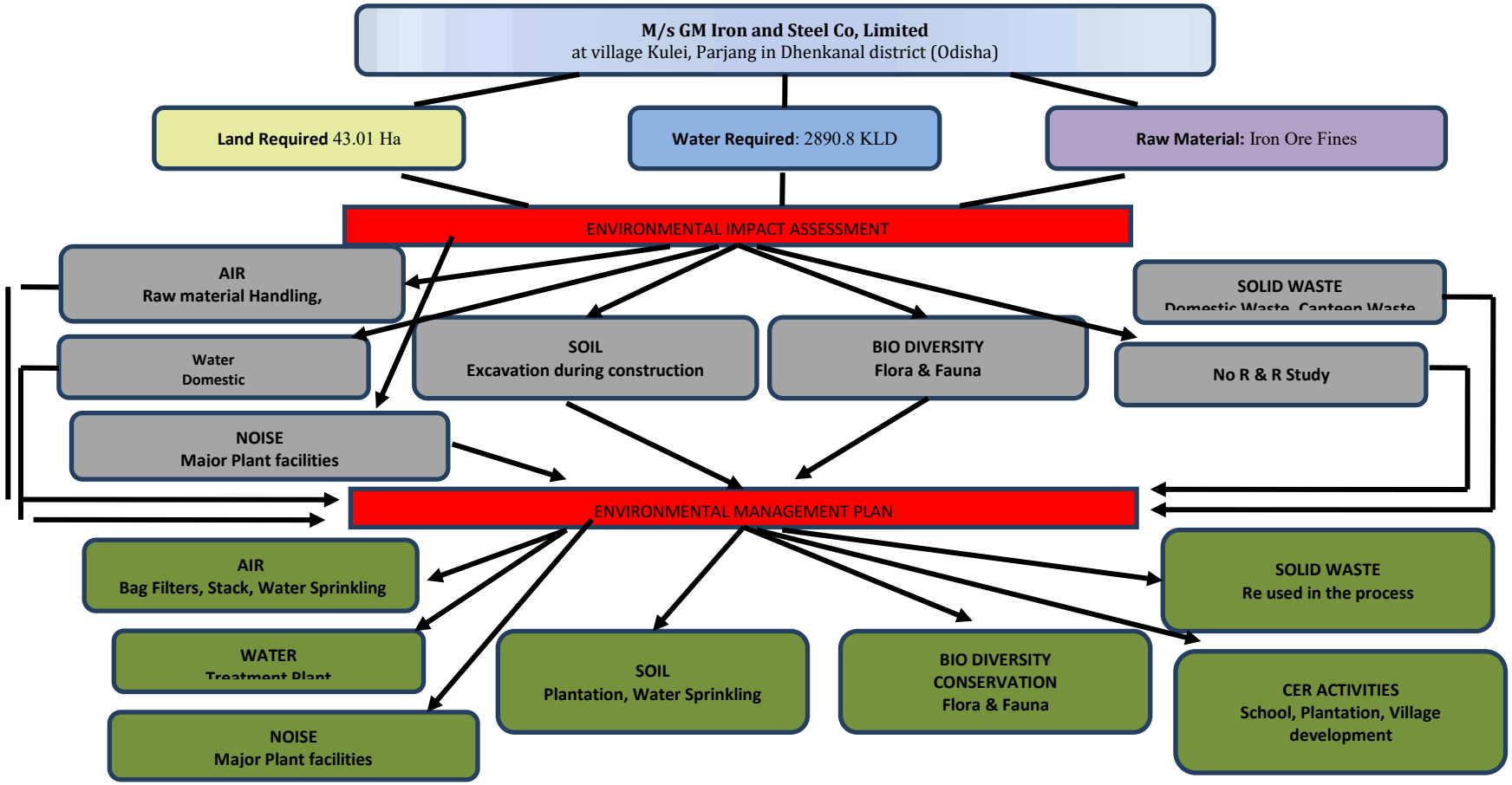
Item	Quantity TPA	Remarks
Slag from Captive IF	27,000	To be used for cement plant.
Char from DRI	1,24,000	To be used in Power Plant.
Dust from DRI	1,64,300	To be supplied to Fly Ash Brick manufactures
ESP Dust from Pellet Plant	23,700	To be recycled to the bin above balling disc section.
Mill scale from Rolling millworkers	13,500	To be used in SMS
Dust from Cement plant	14,700	To be supplied to Fly Ash Brick manufacturers
Fly Ash From CPP	1,58,400	To Fly Ash Brick plant in local Area.

The unit will store the hazardous waste such as used oil in a designated area. Used/Spent Oil from the gear boxes and other wastes will be disposed to the authorized vendors as per the Hazardous & Other Wastes (Management and Transboundary Movement) Rules 2016.

2.7 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY:

Latest energy efficient and eco-friendly technology available for Steel Plant will be adopted for this project.

2.8 FEASIBILITY DRAWING WITH SCHEMATIC REPRESENTATION FOR EIA



Chapter – 3

Description of Environment

3.0 Introduction

This chapter presents the baseline environmental status, depicting the existing conditions of climate, atmosphere, ambient air quality, noise levels, water quality, soil quality, hydrology, hydro-geology, ecology, land use/ land cover and socio-economic environment in the study area. The report incorporates the primary baseline environmental data for various attributes and the secondary data collected from various Government and Semi-Government organizations.

3.1 Study Area

For the requirement of the environmental impact assessment, the study area has been divided into two zones, namely Core Zone, comprising the project site which is the area of maximum impact and the buffer zone i.e. area surrounding the project site, up to10 Km radius as per the approved TOR.

3.1.1 Study Period

The Draft Environmental Impact Assessment (EIA) report was prepared based on one season data i.e. from December 2020 to February 2021 for submission to Odisha State Pollution Control Board (OSPCB) for conducting the Public Consultation.

3.1.2 Study Components

The description of the study area in relation to its environmental setting was studied under the following components as per the Terms of Reference (TOR) accorded by MoEF&CC:

a. **Physico-chemical Component -** comprising of meteorological & air environment; noise environment; land & soil environment and water environment.
b. **Ecological Component -** comprising of terrestrial & aquatic flora-fauna.
c. **Socio-Economic Component -** comprising demographic, socio-economic status and environment in and around the study site.

3.1.3 Study Methodology

An assessment of the baseline environment status and identification of impacts is a prerequisite for prediction of likely impacts due to the project. With this specific view, an environmental quality study was undertaken, which included the collection and analysis of samples of ambient air, water, soil, noise etc. covering three month data (Dec., 2020 to Feb., 2021). The likely impacts on the present environment were assessed due to activity and type of changes expected. To evaluate the pollution load before and after the activity, assessment was carried out based on the collected data from the various environmental components in and around the site. Trained Staffs with adequate qualification and experience are involved in sampling and collection of data from the study area.

3.2 LAND ENVIRONMENT- LANDUSE & LAND COVER (LULC) PATTERN USING SATELLITE IMAGERY DATA

3.2.1 Introduction

Land use of a region reflects the manipulation of land cover for sustenance and economic development, which may directly or indirectly influence the local environment. FAO defines land use as arrangements, activities, and inputs people undertake in a certain land cover type to produce, change or maintain it. The economic prosperity of a region is dictated by the available natural resources in that area such as agriculture, water resources, and forest including mining activities. But these resources are mainly controlled by the terrain parameters such as geology, landforms, slope, drainage pattern, and above all climate. All these parameters influence the land use condition of a terrain individually as well as in various levels of combination. In short, land use of a region is the macroscopic expression of microscopic elements that may have a local or regional impact on the environment over some time and sometimes even after these activities have ceased.

Any sort of imbalance in such microscopic elements may have a direct impact on the environment, which could be perceived by undertaking a periodical study of land-use.

Thus, the land-use study has gained rapid attention due to its impact legacies on major ecological and environmental parameters and attained prominence in environmental impact studies. It is also known that land use is dynamic controlled b intrinsic terrain factors and climate. Hence, it requires systematic knowledge on changes in the land-use pattern of a region of interest (ROI) requiring updated land use information.

Landuse information provides the nature of activities undertaken in an area, geographical location and extent of such activities, period or duration of these activities, and eventually the method of implementation of landuse activities. The information could significantly attribute the nature of the human interface, mechanization involved over a period which in turn, would imply the degree of impact on the adjacent area. Such information is vital in any economical or developmental activities since it could assist in assessing the impact due to such landuse activities. This requires a periodical monitoring of land-use and land cover pattern and such an arduous task could be carried out using multitemporal remote sensing satellite data.

Landuse information using satellite data is more powerful since it could provide a synoptic view of the landuse pattern from a regional to local perspective that could be periodically updated to observe landuse changes over some time.

3.2.2 Remote Sensing Satellite Data Used for the Study

Land use/Land Cover studies were carried out in a 10 km buffer area of the project site. European Space Agency (ESA) Sentinel Constellation satellite, Sentinel-2A data was acquired for processing. The metadata has been tabulated below:

Table 3.1: Metadata of Sentinel 2A Satellite Data

Sl. No.	Details	Value
1.	Processing Level of Product	Level-1C
2.	Type of Product	S2MSI1C
3.	Sensing Start	2020-05-22 T 04:47:11.024

4.	Sensing Orbit	76
5.	Orbit Direction	Descending
6.	Number of Bands	12
7.	Tile Number	T45QUE
8.	Maximum Resolution	10 meters
9.	Cloud Coverage	2.5441%
10.	Image Format	GeoTIFF
11.	Area under Coverage	100 x 100 km^2

The L1C image was processed for atmospheric correction and converted into L2A image using Sentinal-2 processor. The image was orthorectified and Georeferenced using Cartosat 1 DEM. The project site was overlain on the image and a 10 km buffer covering an area of 31,415 ha was clipped. The satellite data was selected with least amount of cloud cover for better clarity and minimum pre-processing.

3.2.3 Methodology for the LULC Study in the 10 Km Buffer Area

ESA SNAP and ArcGIS are the 2-software used for the processing purposes. Visual interpretation of the AOI (Area of Interest) was carried out and important structures, objects, locations were marked. Radiometric enhancement of the image was done by stretching the spectral values. For classification of the image, After training sample collection, k-mean supervised classifier was used for classification of the image. The result was checked for accuracy using 300 random control points. Accuracy assessment report showed an accuracy percentage of 99.371%.



Fig. No. 3.1: Flow Chart of Methodology

3.2.4 Land Use/Land Cover Pattern around 10 km Buffer Area

As explained in the methodology, land use cover map of the study area has been prepared after digitally analyzing the satellite data and using the information derived from them as input for visual interpretation. The delineated landuse categories are verified in the field for accuracy using hand held GPS and compiled as final land use

cover map using GIS (**Figure No. 3.1**). Such an approach using GIS has provided the advantage of using digital information to update and locate specific features exactly on ground as they are Georeferenced - computation of their respective area and acts as base reference for future monitoring and analysis. Some of the major LULC categories such as built-up, agriculture, wasteland, mining area, waterbodies and infrastructure facilities along with their spatial estimation are discussed below.

3.2.4.1 Built-up Land

Settlements in the buffer area are scattered and very small in spatial extent and mainly seen as They are located mostly towards the South. A few built-up lands are scattered in the Northern sides. Use of larger resolution satellite data for this (Sentinel-2A data) has helped immensely to interpret and identify them to a major extent along with the support derived from the use of base line references and ground truth verification.

The spatial estimation of settlements as computed from the land use cover map derived from remote sensing satellite data has shown a total area of 515.64 Ha representing 1.57% of the buffer area.

3.2.4.2 Crop Land

Crop Land, though an important landuse category, is mostly around the area and surrounded to Fallow land. Moreover, it is mostly monsoon dependent and rabi crops are cultivated such as millets, ragi and maize along with some vegetables in the buffer area. The landuse map has shown a total area of 4163.46 Ha representing 12.71% of the buffer area.

3.2.4.3 Forest land

"Forest Land" close association of adhering to high relief hilly region makes them easily recognizable and interpreted. There is some sensitive regions including reserve and protected forest also include in Forest land. The spatial estimation of settlements as computed from the land use cover map derived from remote sensing satellite data has shown a total area of 4979.25 Ha representing 15.20% of the buffer area.

3.2.4.4 Barren Land

Barren area is the major landuse and land cover (LULC) category in the buffer area and easily visible from the satellite data. Barren land, contrary land with scrub area, includes land parcels that have no vegetation and not used for any type of landuse activities both agricultural and industrial. The spatial estimation of settlements as computed from the land use cover map derived from remote sensing satellite data has shown a total area of 15819.80 Ha representing 48.30% of the buffer area.

3.2.4.5 Scrub Land

Land with scrub, includes land parcels that have no vegetation and not used for any type of landuse activities both agricultural and industrial. In the buffer area, it is mostly confined around mining area and industrial area and along the roads. It is restricted to plains and left undisturbed for any practical utility and scattered in Southern side. The spatial estimation of settlements as computed from the land use cover map derived from remote sensing satellite data has shown a total area of 5683.68 Ha representing 17.35% of the buffer area.

3.2.4.6 Water bodies

Water bodies include features such as Brahmani river, Nalas, canals and reservoirs is an important LULC that influences the socio-economic and industrial progress of an area. Within the buffer area, there are Brahamni river and small pond / tanks that acts as storage unit for rain water during monsoon and provide minimal support to the agricultural and domestic requirements of the villages. Total area of waterbodies 644.06 Ha (1.96 %) of the buffer area.



Fig No. 3.2: Land Use map of the Study Area

3.3 Meteorology & Climate

The meteorological data recorded during the study period is very useful for proper interpretation of the baseline information regarding the project area as well as for input in modeling. Historical data on meteorological parameters will also play an important role in identifying the general meteorological pattern of the region.

On site monitoring was taken for various meteorological variables in order to record the site-specific data. Data was recorded from December 2020 to February 2021 covering winter season. The site specific data is compared with meteorological data of nearest IMD station located in Denkanal.

3.3.1 Meteorological Data Recorded At IMD, Angul

The data collected from IMD includes wind speed, wind direction (recorded in sixteen directions), temperature, relative humidity, atmospheric pressure; rainfall and cloud cover over a period of 15 years (1971-1985). The monthly maximum, minimum and average values are collected for all the parameters except wind speed and direction All these parameters are recorded twice a day viz. at 08:30 and 17:30 hours. The collected data is tabulated in **Table No. 3.2**.

Table No 3.2: Climatologically Data, Station: IMD-Angul (1971-1985)

Month	Daily mean Temp. (^{0}C)	Relative Humidity (%)		Rainfall (mm)		Cloud cover (in Okta)	Mean Wind Speed (KMPH)	Mean Wind Speed (KMPH)
	Max	8:30	17:30	Monthly Total	No. of Rainy days			
January	31	11.3	76	47	9	0.7	1.2	1.1
February	35.3	12.7	72	41	20.9	1.6	2	1.6
March	39.2	15.9	67	35	25	1.7	1.5	1.8
April	42.5	20	70	38	36.9	2.3	1.7	2.6
May	44.3	21.6	68	42	75.6	3.6	1.9	3.2
June	42.5	21.7	74	62	210.1	8.5	4.3	5.1
July	36.2	22.4	81	76	260.3	12.1	5.4	5.9
August	34.5	21.3	83	78	325.3	13.4	5.5	5.9
September	34.8	20.5	83	76	206.5	10.2	4.5	5.1
October	34.4	18.6	80	66	100.8	5.1	2.6	1.9
November	32.5	13.6	75	54	26.7	1.3	1.2	1.1
December	30.3	11.5	75	49	3.1	0.3	1.1	0.9
Annual or Mean	**36.5**	**17.6**	**75.3**	**55.3**	**1300.2**	**60.8**	**2.7**	**3.0**

3.3.2 Meteorological Data Recorded at Site

Table No 3.3: Summary of Site Specific Meteorological Data

Parameters	20-Dec	21-Jan	21-Feb

Temperature (^{0}C)	Maximum		34.6	39.8	39.8
	Minimum		16.2	16.2	27.7
	Average		**25.6**	**25.8**	**15.2**
Relative Humidity (%)	Maximum		88	97	96
	Minimum		23	24	17
	Average		**55.6**	**58.4**	**56.1**
Wind Speed (Km/Hr)	Max		**13**	**18**	**23**
Wind Direction (%)		**E**	**4.0**	**4.4**	**1.8**
		ENE	**3.6**	**6.9**	**1.3**
		ESE	**2.0**	**3.6**	**4.0**
		N	**1.6**	**0.8**	**1.3**
		NE	**4.3**	**13.0**	**13.4**
		NNE	**4.4**	**3.6**	**0.9**
		NNW	**14.5**	**0.8**	**4.0**
		NW	**5.0**	**10.6**	**20.5**
		S	**7.3**	**7.3**	**5.8**
		SE	**2.8**	**9.8**	**2.7**
		SSE	**0.8**	**9.3**	**5.4**
		SSW	**11.7**	**2.8**	**2.2**
		SW	**8.9**	**6.9**	**1.8**
		W	**7.3**	**6.5**	**9.8**
		WNW	**11.7**	**6.5**	**11.6**
		WSW	**10.1**	**7.3**	**8.9**
		CALM	**1.3**	**0.7**	**0.3**
Cloud Cover (%)	Maximum		**2**	**6**	**2**
	Minimum		**0**	**0**	**0**
Rainfall (mm)	Monthly Total		**3.8**	**8.2**	**14.8**

Comparison of Regional Meteorological Data with Site Specific Meteorological Data

❖ **Temperature: -** Site specific Temperature ranges from 16.2^{0}C to 34.6^{0}C For the Month of Dec 2020, whereas IMD data daily mean temperature 30.3 ^{0}C. Site specific Temperature ranges from 16.2^{0}C to 39.8^{0}C For the Month of January 2021, whereas IMD data daily mean temperature 31 ^{0}C. Site specific Temperature ranges from 27.7^{0}C to

39.8^{0}C For the Month of February 2021, whereas IMD data daily mean temperature 35.3 ^{0}C.

❖ **Relative Humidity:** - Site specific maximum Relative Humidity is 17% to 97%, whereas as per IMD data maximum Relative Humidity is 17.6 % to 75.3 %.

❖ **Rainfall**: - As per site specific data rainfall during study period is 3.8 mm to 14.8mm, whereas annual or mean rainfall 55.3 mm as per IMD data.





Fig no 3.3: Windrose Diagram- Post Monsoon Season (Dec 20-Feb 21)

3.4 Air Environment

The prime objective of the ambient air quality study is to assess the existing air quality of study area and to establish the existing ambient air quality within the study area and its conformity to NAAQs. The observed sources of air pollution in the study area are industrial, traffic and domestic activities.

The monitoring was carried out for the period from December 2020 to February 2021 to represent winter season for the parameters such as PM_{10}, $PM_{2.5}$, SO_2, NO_X and CO.

The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network considering the followings:

- Meteorological condition on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status;
- Location of residential areas representing different activities;
- Accessibility and power availability; etc

Sampling Locations

Ambient Air Quality Monitoring (AAQM) stations were set up at Eight (11) locations within the study area as depicted in **Figure 3.4** for assessment of the baseline concentrations. The location of the selected stations with reference to the plant area boundary is given in the **Table No. 3.4**.

Table No. 3.4: Details of Ambient Air Quality (AAQ) Monitoring Stations

Station	Name	Distance from project site (km)	Direction	Coordinates	Site Conditions
AAQ1	Project Site	-	-	20°58'56.05"N 85°16'26.48"E	On-site location/ Material Gate
AAQ2	At village Kulei	0.58 km	NW	20°59'27.25"N 85°16'2.30"E	Upwind direction (1st predominant wind direction: NW) Major settlement area near to the project site
AAQ3	Near to Kulei-Pitiri Road	0.40 km	NE	20°59'15.17"N 85°16'57.19"E	Upwind direction (2nd Predominant wind direction: NE), Connected Village Road (Kulei-Pitiri road & Banarpal-Pallahara road) near Talcher left main Canal.
AAQ4	Paramahansapur Village	1.75 km	SE	20°57'58.92"N 85°17'18.22"E	Downwind Direction:

					Sensitive Region (Khalpal RF), near to the Hotel New Surya, Banarpal - Pallahara Rd connect to NH-53, village Paramahansapur [Residential Area.]
AAQ5	Near to the Post Office at Village Pitiri	3.87 km	S	20°56'48.83"N 85°16'23.32"E	Sensitive region (Reserve Forest), junction of the Banarpal-Pallahara road, NH 200 & NH-53 , near Residential area (Pitiri Village)
AAQ6	At Village Kakurhi	2.47 km	WSW	20°58'31.59"N 85°14'55.86"E	Habitation near Brahmani river
AAQ7	AT Khalpal Primary School, Village Khalapal	3.24 km	SW	20°57'33.45"N 85°15'17.14"E	Down wind direction of 2nd Predominant wind direction: NE / Institutional area/ village near to the Khalpal RF
AAQ8	Talcher	5.73 km	SW	20°57'0.76"N 85°13'49.20"E	Major Town (Talcher) within buffer zone
AAQ9	Parjang Hospital	7.90 km	SE	20°55'3.55"N 85°18'51.92"E	Hospital Area near Major Town area (Parjang)
AAQ10	Rangathali Weekly Market at village Rangathali	4.52	NNE	21° 1'32.00"N 85°17'4.57"E	Weekly market area near to the Banarpal-Pallahara road/near to the village Basulei and Rangathali
AAQ11	Bharat Petroleum Petrol Pump , Tunga	6.26 km	WWS	20°57'43.71"N 85°13'2.15"E	**Near to the** Lingaraj Opencast mining Project,

	Filling Stattion, Near to the Bankadhara square ,				(**Mines area) /Near to the NH-200**

Sampling and Analytical Techniques

Ambient air quality monitoring has been carried out with a frequency of two days per week during study period. The duration of sampling for PM_{10}, $PM_{2.5}$, SO_2, and NO_x, were taken for twenty four hourly continuous sampling per day and CO was sampled for 8 hours continuous thrice in 24 hour duration monitoring.

AAQ Samples (Filter Paper) were to collected in air-tight locked polythenes and cassettes. Gaseous samples were collected in sample bottles preserved in ice box and transported to central laboratory as per the guidelines of BIS (Bureau of Indian Standard).

The sampling and analysis of ambient air are carried out as per the procedures detailed in IS-5182 (Indian Standards for Ambient Air Quality Parameters) for specific parameters. Brief of the sampling and testing procedures used are given in **Table 3.5.**

Table 3.5 : Testing and Monitoring Procedures

Sr. No	Parameter	Technical Protocol	Sampler	Instrument for Analysis	Methodology Adopted
1	Particulate Matter (as $PM_{2.5}$)	--	Fine Particulate Sampler (APM 550)	Balance, Oven, Desiccators	Gravimetric Method
2	Particulate Matter (as	IS: 5182 (Part 23)	RDS with cyclone separator	Balance, Oven, Desiccators	Gravimetric Method

Sr. No	Parameter	Technical Protocol	Sampler	Instrument for Analysis	Methodology Adopted
	PM_{10})		(APM 460)		
3	Sulphur dioxide (as SO_2)	IS: 5182 (Part 2)	Gaseous Sampler of RDS	Spectro-photometer	Improved West & Geake Method
4	Oxides of Nitrogen (as $NO_{2)}$	IS: 5182 (Part 6)	Gaseous Sampler of RDS	Spectro-photometer	Na- Arsenite Method
5	Carbon Monoxide (as CO)	IS: 5182 (Part 10)	Tedlar Bag	NDIR CO Analyzer	Non Dispersive Infrared Spectroscopy

Source-VCSPL

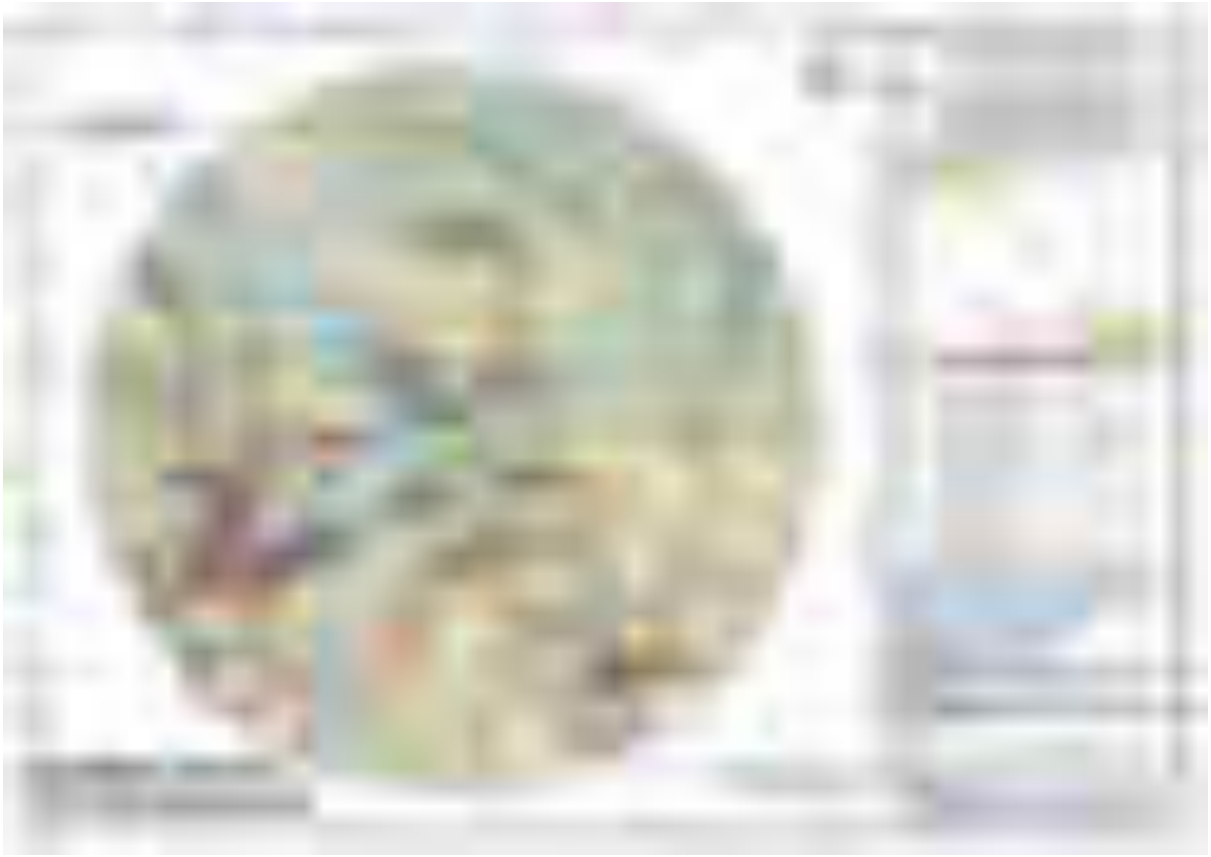


Fig. No 3.4: Ambient Air Quality Monitoring Locations

Discussion on Results

The detailed ambient air quality monitored within the study area is given in **Table 3.5**.

Table 3.6: Summary of Ambient Air Quality Results – (Dec 20 to Feb 21) (µg/m^3)

Sampling Stations	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO*
AAQ1: Project Site (20^0 58'56.05"N $85^0$16'26.48"E)					
Max	88.2	52.9	9.8	23.8	0.44
Min	82.6	49.6	8.1	20.4	0.26
Average	85.1	51.1	9.1	21.8	0.36
98 Percentile	87.7	52.6	9.6	23.5	0.42
AAQ2: At Village Kulei (20^0 59'27.25"N $85^0$16'2.30"E) 0.58 Km, NW)					
Max	81.4	48.8	9.3	21.4	0.23
Min	76.8	46.1	7.6	16.2	0.12
Average	79.0	47.4	8.4	19.3	0.18
98 Percentile	81.1	48.7	9.2	21.1	0.22
AAQ3: Near to Kulei –Pitiri Road (20^0 59'15.17"N $85^0$16'57.19"E) (0.40 KM, NE)					
Max	90.2	54.1	11.8	26.2	0.36
Min	82.6	49.6	9.6	20.6	0.24
Average	86.2	51.7	10.7	23.2	0.32
98 Percentile	89.5	53.7	11.8	25.8	0.36
AAQ4: Paramahansapur Village (20^0 57'58.92"N $85^0$17'18.22"E)(1.75 KM, SE)					
Max	74.8	44.9	8.6	19.4	0.24
Min	64.8	38.9	7.1	17.1	0.15

Sampling Stations	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO*
Average	70.9	42.5	7.8	18.4	0.19
98 Percentile	74.5	44.7	8.4	19.3	0.24
AAQ5: Near to the Post Office at Village Pitiri (85°16'23.32''E 20°56'48.83''N)(3.87 KM, S)					
Max	77.6	46.6	8.8	18.4	0.36
Min	72.6	43.6	6.8	16.2	0.21
Average	75.2	45.1	7.8	17.3	0.29
98 Percentile	77.3	46.4	8.8	18.4	0.36
AAQ6: At Village Kakurhi (20^0 58$'$31.59$''$N 83^{0}14$'$55.86$''$E) (2.47 KM, WSW)					
Max	80.8	48.5	7.4	15.8	0.26
Min	62.6	37.6	6.0	13.6	0.12
Average	70.4	42.3	6.7	14.7	0.20
98 Percentile	80.1	48.1	7.4	15.8	0.25
AAQ7: At Khalpal Primary School, Village Khalapal (20^0 57$'$33.45$''$N 85^{0}15$'$17.14$''$E)(3.24 KM, SW)					
Max	56.6	34.0	5.6	11.6	0.16
Min	46.8	28.1	4.0	10.1	0.11
Average	52.8	31.7	4.6	10.7	0.13
98 Percentile	56.4	33.8	5.2	11.4	0.15
AAQ8: Talcher (20^0 57$'$0.76$''$N 85^{0}13$'$49.20$''$E)(5.73 KM,SW)					
Max	95.6	57.4	9.8	26.6	0.69
Min	84.6	50.8	8.4	23.2	0.46

Sampling Stations	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO*
Average	91.4	54.8	9.2	24.8	0.57
98 Percentile	95.1	57.0	9.6	26.4	0.68
AAQ9: Parjang Hospital (20^0 55'3.55"N $85^0$18'51.92"E)(7.90 KM,SE)					
Max	45.6	27.4	5.8	18.6	0.24
Min	40.6	24.4	4.1	16.2	0.11
Average	43.6	26.1	4.7	17.7	0.17
98 Percentile	45.6	27.3	5.6	18.4	0.23
AAQ10: Rangathali Weekly Market at Village Rangathali (21^0 1'32.00"N $85^0$17'4.57"E)(4.52 KM,NNE)					
Max	63.4	38.0	8.1	21.8	0.31
Min	53.8	32.3	6.2	18.8	0.16
Average	59.7	35.8	7.1	20.3	0.23
98 Percentile	63.1	37.9	7.8	21.6	0.29
AAQ11: Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square (20^0 57'43.71"E $85^0$13'2.15"N)(6.26 KM,WWS)					
Max	98.1	58.9	14.2	27.8	0.77
Min	86.8	52.1	10.6	23.2	0.61
Average	92.1	55.2	12.8	25.8	0.71
98 Percentile	97.4	58.4	14.1	27.4	0.77
Study Area Range	**30.6- 93.6**	**18.4- 56.2**	**4.1-11.6**	**9.1-29.1**	**0.11-2.2**
NAAQS	**100**	**60**	**80**	**80**	**4**

Observation and Interpretation:

The maximum value of PM_{10} is observed to be 98.1 μg/m^3 at Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square and the minimum value is observed to be 40.6 μg/m^3 at Parjang Hospital. The average value ranges from 43.6 to 92.1 μg/m^3.

The maximum value of $PM_{2.5}$ is observed to be 58.9 μg/m^3 at Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square and the minimum value is observed to be 24.4 μg/m^3 at Parjang Hospital. The average value ranges from 26.1 to 55.2 μg/m^3.

The maximum value of NO_X is observed to be 27.8 μg/m^3 at Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square and the minimum value is observed to be 10.1 μg/m^3 at Khalpal Primary School, Village Khalapal. The average value ranges from 10.7 to 25.8 μg/m^3.

The maximum value of SO_2 is observed to be 14.4 μg/m^3 at Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square and the minimum value is observed to be 4.0 μg/m^3 at Khalpal Primary School, Village Khalapal. The average value ranges from 4.6 to 12.8 μg/m^3.

The maximum value of CO is observed to be 0.77 μg/m^3 at Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square and the minimum value is observed to be 0.16 μg/m^3 at Khalpal Primary School, Village Khalapal. The average value ranges from 0.13 to 0.71 μg/m^3.

3.5 Noise Environment

The environmental assessment of noise from the plant activity and vehicular traffic has been undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses.

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness;
- The time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance; and
- The location of the noise source, with respect to noise sensitive land use, which determines the loudness and period of exposure.

The main objective of noise monitoring in the study area is to establish the baseline noise levels, and assess the impact of the total noise expected to be generated by the construction and operation of the plant facilities around it. Measured noise levels, displayed as a function of time, is useful for describing the acoustical climate of the community.

Ambient Noise Level

Digital Sound Level Meter was used and all readings were taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level and on the 'Fast' Range Time Weighting. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring period. To mitigate this shortcoming, the Continuous Equivalent Sound level, indicated by Leq is used. Equivalent sound level, 'Leq', can be obtained from variable sound pressure level, 'L', over a time period by using following equation.

Measured noise levels, displayed as a function of time, is useful for describing the acoustical climate of the community. Noise levels recorded at each station with a time interval of about 60 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels. The equivalent noise level is defined mathematically as

$L_{eq} = 10 \text{ Log } L / T \sum (10^{Ln/10})$

Where L = Sound pressure level at function of time dB (A)

T = Time interval of observation

Noise levels during the night time generally drop, therefore to compute Equivalent noise levels for the night time, noise levels are increased by 10 dB (A) as the night time high noise levels are more annoying compared to the day time.

Noise levels at a particular station are represented as Day Night equivalents (Ldn). Day Night equivalent is the single number index designed to rate environmental noise on daily/ 24 hourly basis.

Mathematically Ldn is given by

Ldn = 10 Log { 1/24 (16x $10^{(Ld/10)}$ + 8 x $10^{[(Ln+10/10)]}$)}

Where Ld = A weighed equivalent for day time period (6am-10 pm)

Ln = A weighed equivalent for night time period (10 pm to 6 am)

In order to assess the noise levels within the study area, noise monitoring was carried out at Eight (10) locations once during pre-monsoon (December 2020 to February 2021) as per details given in **Table 3.6** and depicted in **Figure 3.5**

Table No 3.7: Ambient Noise Level Monitoring Locations

Station	Name	Distance from project site (km)	Direction	Coordinates	Site Conditions
N1	Project Site	-	-	20°58'53.60"N 85°16'48.35"E	On-site location (Main Gate), near to Village Road
N2	Near to the NH 23	0.41 km	SSE	85°16'44.36"E 20°58'38.51"N	Vehicle turning path towards project site from NH
N3	Near to Kulei-Pitiri Road	0.40 km	NE	20°59'15.17"N 85°16'57.19"E	Upwind direction (2nd Predominant wind direction: NE), Connected Village Road (Kulei-Pitiri road & Banarpal-Pallahara road) near Talcher left main Canal.
N4	At village Kulei	0.58 km	NW	20°59'27.90"N 85°16'14.51"E	Upwind direction (1st predominant wind direction: NW) Major settlement area near to the project site
N5	Near to the Hanuman Temple At village Kankili	0.53 km	WWN	20°59'16.85"N 85°15'52.71"E	Habitation area near to the project site/ near to the River Brahamani
N6	Paramahansapur	2.43 km	SSE	20°57'36.51"N 85°17'11.16"E	Temple, Market Area near flour mill
N7	kualo	3.84 km	SSE	85°17'55.14"E 20°57'5.18"N	Close to Public place (Market Complex)

N8	Rangathali	7.88 km	NNE	21° 3'23.69"N 85°17'15.55"E	Sensitive Region (Anantapur RF, Talcher Border RF and Dadaraghati Reservoir)
N9	Lingaraj Opencast Project	6.08 km	WSW	20°57'47.64"N 85°12'59.09"E	Coalfields area near NH
N10	Village Kankanasorha	6.66 km	EES	20°57'48.69"N 85°20'30.06"E	Near to the railway crossing

Source – Noise Level Monitoring Locations

Noise levels were measured using integrated sound level meter manufactured by Quest Technologies, USA which is an integrating/ logging type with Octave filter attachment (model OB-100) and has frequency range from 31.5 to 16000 Hz.

At each noise monitoring station, noise level as Leq was recorded on an hourly basis for 24 hours continuously. The summarized results of noise levels as Leq day (Ld) and Leq night (Ln) are given in **Table 3.7**.

Table No 3.8: Noise Monitoring Results (Dec 20 to Feb 21)

Location		Distance from Plant Site (Km) & Direction	Co-ordinate	December-20		January-21		February-21		Type of Area
				Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	
				dB (A)	dB (A)	dB (A)	dB (A)	dB (A)	dB (A)	
N1	Project Site	--	20°58’53.60”N 85°16’48.35”E	72.4	67.4	71.9	68.0	72.4	68.0	Industrial
N2	Near to the NH 23	0.41 KM, SSE	20°58'38.51"N 85°16'44.36"E	60.3	53.4	61.6	53.7	61.7	53.6	Commercial
N3	Near to Kulei – Pitiri Road	0.40 KM, NE	20°59'15.17"N 85°16'57.19"E	60.5	53.5	61.6	53.4	62.1	53.8	Commercial
N4	At Village Kulei	0.58 KM, NW	20°59'27.90"N 85°16'14.51"E	49.7	43.3	50.9	42.7	50.4	45.3	Residential
N5	Near to the Hanuman Temple at village Kankili	0.53 KM,WNW	20°59'16.85"N 85°15'52.71"E	50.8	43.7	52.6	43.5	51.9	43.5	Residential
N6	Paramhanspur	2.43 KM, SSE	20°57'36.51"N 85°17'11.16"E	61.5	54.4	60.7	52.7	61.8	52.1	Commercial
N7	Kualo	3.84 KM, SSE	20°57'5.18"N 85°17'55.14"E	60.4	51.7	61.4	52.9	62.2	53.4	Commercial
N8	Rangathali	7.88 KM, NNE	21°3' 23.69"N 85°17'15.55"E	42.5	37.3	41.6	37.9	43.3	38.3	Silence
N9	Lingaraj Opencast Project	6.08 KM, WSW	20°57' 47.64"N 85°12'59.09"E	70.5	66.0	71.5	67.0	72.4	67.1	Industrial
N10	Village Kankanasorha	6.66 KM, EES	20°57' 48.69"N 85°20'30.06"E	60.6	53.4	61.6	54.8	62.5	57.8	Commercial

Source - VCSPL

Table No.3.9: Ambient Noise Standard

Area Code	Category of Area	Noise Levels dB(A) eq	
		Day time*	Night time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence**	50	40

Source-VCSPL

Note: -

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.

2. Night time shall mean from 10.00 p.m. to 6.00 a.m.

3. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the Competent authority.

4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

** dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.*

A "decibel" is a unit in which noise is measured.

"A"in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is energy mean of the noise level over a specified period.

It is evident from the above discussion that the recorded Leq during day time and night time is well within the standards prescribed vide MoEF&CC notification.

Noise Level within Plant Premises

The noise level within the plant premises has been continuously monitored and the levels are well within the standards for industrial zone as prescribed vide MoEF&CC notification.

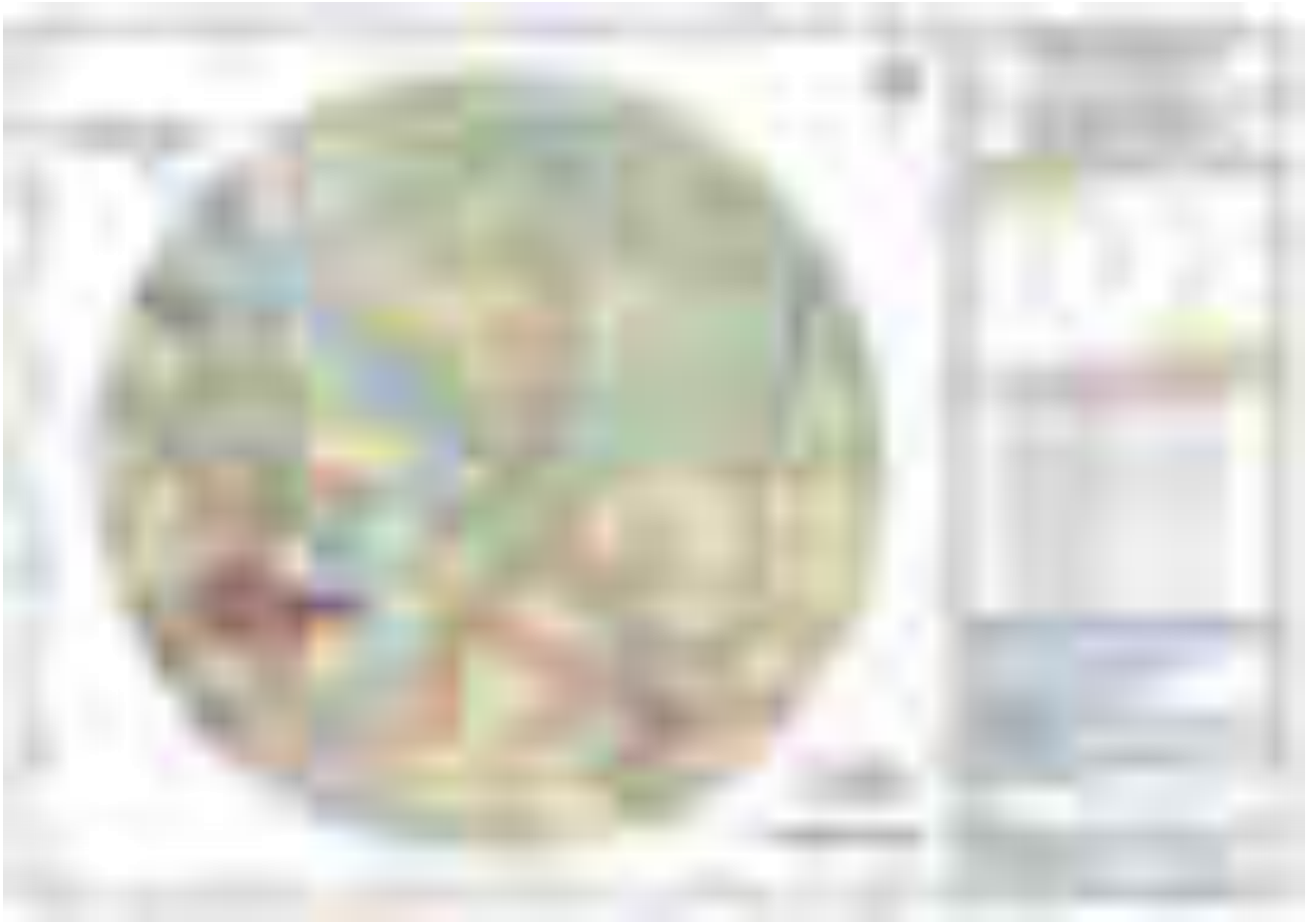


Fig No 3.5 Noise Monitoring Locations

3.6 Geology and Hydrogeology

3.6.1 Physiography

Dhenkanal is one of the centrally located districts of Orissa with a total geographical area of 4452 sq.km. The area of the district is 4452 sq. km, which is about 2.78% of the total area of the state. It is bounded by the Keonjhar district in the north, Cuttack district in the east and south and Angul district in the west. The district is divided into three Sub-divisions namely Hindol, Dhenkanal and Kamakhyanagar and eight Community Development Blocks with the district headquarters located at Dhenkanal town. It very often reels under severe water scarcity condition, especially during the lean season of the year.

The river Brahmani controls the drainage of the district and it's tributaries. Brahmani is the second longest river in Orissa and flows through the district in a general eastwest direction. It divides the district into two halves. Initially, the river flows in a northsouth direction, then follows a northwest-southeast course and subsequently changes to northeast-southwest direction. Finally, it changes to a northwestsoutheast course near the eastern border of the district. Most part of the district falls within It's basin. The Brahmani is perennial in nature with a nominal flow during the summer season. It's important tributaries are Ramiala River, Nigre River, Purajhor River etc. The smaller streams show dendritic pattern while the major river and it's tributaries show sub-parallel drainage, indicating structural control.

Geomorphology

The geological disposition of the area is very complex. The well-developed sequences of the rock from pre Cambrian to recent age is seen in the district. The basement rocks are over lined by Permian and by recent alluvium.

It reveals that the recent alluvium does not have average distribution in either way (i.e. in horizontally and vertically). However, Fine to medium grained sandstone, Carbonaceous shale, coal bands, with greenish sandstones are distributed up to 250 m + which is called as famous Talcher series of upper Permian period. These sediments rest unconformable on the Precambrian basement rocks comprising granite with pegmatite veins, hornblende gneisses, and porphyritic gneisses.

3.6.3 Soil

The major part of the district is covered by red sandy soil, red loamy soil, red gravelly and old alluvial soils. In the study area the soil pH is reported to be majorly acidic to neutral. As per available report of earlier studies, the tested soil samples collected from different location pertaining to the study area have nutrients ranging from low to high concentration. Organic carbon has been reported to be of medium to high concentration. Available Phosphorus and Nitrogen are reported to be in low to medium concentration, whereas availability of Potassium varies from medium to high.

The sub-order associations of soil are Aqualfs-Aquepts, Ustalfs-Ochrepts and Ustalfs Rockouts. These soil associations are generally classified as follows in this district.

i. **Red Forest Soil** - It is rich in organic matter, is porous and is suitable for forest growth as well as for citrus and mango orchards.
ii. **Brown Forest soil** – Pulses, millets and scrub jungle grow well in it.
iii. **Sandy Soil** – This soil is coarse and contains low organic matter. The soil is best for ground nuts and pulses. On the bank of the river, the silt deposited on mal lands is suitable for growing paddy and the lower mal land i.e. pitamal gets excellent drainage growing good varieties of rice.
iv. **Black Cotton Soil** - It contains liberal amount of organic matter.
v. **Kharipani** –It is the most valuable type of land in the district. The water flowing through the village carries all manure which is deposited in the village by the people and cattle. Due to undulating plain of the areas, people built their houses on the highlands, cultivated land slopes away from the house site allowing drainage directly to their paddy fields.
vi. **Clay loam and Clay Soil** -This soil contains various percentages of organic matters from different types of parent rock. This soil is a mixture of sand, gravel and clay. Being less fertile, the soil helps to grow light rice and few weeds.

3.6.4 Hydro-Geology

In-order to understand the hydro geology of the area, hydrology of the area is to be studied which is having direct bearing on the under groundwater. Hence a detailed study has been carried out and the results are enumerated in the subsequent paragraphs.

The major part of the study area forms a part of Brahmani basin. The study area is mainly drained by a seasonal nallah named as Indrajit nalah which originates from the site and flows towards south and joins Brahmani at about 5 km from the site. The Brahmani is formed by the confluence of the rivers South Koel and Sankh near the major industrial town of Raurkela at 22 15'N and 84 47' E. The Sankh has its origins near the Jharkhand-Chhattisgarh border, not far from the Netarhat Plateau. The South Koel too arises in Jharkhand, near Lohardaga; Brahmani takes a sudden eastward turn indicating lineaments at north and east of the site. Other than Inderjit nallah few small streams are identified in the southern part of study area. In the northern part of study area, Ramlala River which is a tributary of river Brahmani, flows towards east at a distance of 10 Km from site and joins river Brahmani in the east. Other than these two rivers and one nallah no noteworthy streams are identified in the study area. Another interesting pattern of drainage is noted in the south of the study area is that the southern part of the study area is drained directly to river. The plant area drains in to Inderjit nallah.

The average rainfall is 1110 mm from the year (1961 to 1990). The number of rainy days is about 71 day and 95% of total rainfall occurs in July & August. The maximum rain fall was 257 mm in a day and the humidity ranges from 52 to 73%. The climate is sub- tropical dry humid. The study region is characterized by hot and dry summer with temperature rising above 45 ^{o}C during April and May.

Ground Water Resources:

As rare phenomena in this area both type of wells are in use and the available dug wells were measured to draw the groundwater table. The villagers are also using the hand bore well provided by the government. It was reported by the villagers that the hand bore wells are drilled up to 80-100 m and the water level is static at 2 to 3m from bgl. This statement should

be correct, because the measured water levels in dug well are also in the same range. Otherwise the hand pumps would be defunct or mal functioning if groundwater is occurring at very deep. From the summer season data measured in 2013, it is evident that the water levels are almost in 3.1 to 13.0 m BGL and maintains static flow. However, in postmonsoon season measured now, the water levels range from 1.2 m to 8 m. On comparing data from both the study periods, it is evident that due to ground water recharging by monsoon season, the water level rises in all wells ranging from 1.2 m to 5 m depending upon the location. Several villagers in the study area reported that no fluctuation in water table even during peak summer. The aquifers are mostly composed of fragmented highly weathered rocks. The phreatic aquifer provides sufficient yield which meets the villagers' day to day consumption. This may be a result of (i) Continuous recharge of groundwater either by rain or by the streams (ii) Extraction/draft of groundwater is lesser than the recharge quantity (iii) Thin population, non-utilization of groundwater for agro and horticulture.

The terrain is favorable for groundwater recharge; hence the authorities are planning for groundwater recharge from the plant structures. It is expected that the groundwater depletion due to increase in population will be taken care by rainwater recharge.

3.7 Soil Environment:

Soil may be defined as a thin layer of earth's crust which serves as a natural medium for the growth of plants. It is unconsolidated mineral matter that has been subjected to and influenced genetic and environmental factors like plant material, climate, organism and topography all acting over a period of time. Soil differs from the parent material in the morphological, physical, chemical and biological properties. Also soils differ among themselves in some or all the properties depending on the difference in the genetic and environmental factors. Therefore some soils are light yellow and others are black. Some are coarse textured and the others are fine textured. They serve as a reservoir of nutrients and water for crops and provide mechanical anchorite and favorable. Soil Sampling is based on agriculture field available in the study area. Composite sampling is done following BIS method. Coning and Quartering method is done & the samples were collected in air locked polythenes using adequate PPE (Personal Protective equipments), following SOP and transported to central laboratory.

The present study of the soil profile establishes the baseline characteristics and this will help in future identification of the incremental concentrations if any, due to the operation of the plant. The sampling locations have been identified with the following objectives:

* *To determine the baseline soil characteristics of the study area;*
* *To determine the impact of industrialization on soil characteristics; and*
* *To determine the impact on soils more importantly from agricultural productivity point of view.*

Six locations in and around the plant were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface and homogenized. This is in line with IS: 2720 and Methods of Soil Analysis, Part-1, 2nd edition, 1986 of (American Society for Agronomy and Soil Science Society of America). The homogenized samples were analyzed for physical and chemical characteristics. The soil samples were collected during january-2021.

The samples have been analyzed as per the established scientific methods for physico-chemical parameters. The heavy metals have been analyzed by using Atomic Absorption Spectrophotometer. The methodology adopted for each parameter is described below.

Table No. 3.10: Analytical Techniques for Soil Analysis

Parameters	Testing Method
pH	IS:2720(Pt-26):2007
Conductivity	IS:14767:2000
Cation Exchange Capacity	IS : 2720(Part XXIV) 1976
Total Phosphorus as P	USDA:1954-Reaffirmed 2010, Page 134& Method in Environmental Analysis Water, Soil and Air Edition 2000
Total Nitrogen as N	IS 14684(Part-26) 1999,RA 2008
Total Potassium as K	Jackson M L Soil Chemical Analysis Page-183-205 1973
Mercury as Hg	EPA 3050B, 7000B
Sand	Methods of Soil Analyses- Black-1965 American Society of Agronomy USA
Silt	Methods of Soil Analyses- Black-1965 American Society of Agronomy USA
Clay	Methods of Soil Analyses- Black-1965 American Society of Agronomy USA

Source: Different Methods of IS standard and USDA

The details of the sampling locations are given in **Table 3.12** and are depicted in **Figure 3.6**. The results and standard classification are given in **Table 3.13.**

Table No. 3.11 Soil Sampling Locations

Station	Name	Distance from project site (km)	Direction	Coordinates	Land Use
S1	Project Site	--	--	85°16'26.33"E 20°59'3.87"N	Built –up land
S2	Jharanabahali	3.3	NE	85°17'40.45"E 21° 0'25.03"N	Crop Land
S3	Gunthbahal	4.09	W	85°14'3.48"E 20°59'10.92"N	Barren land

S4	Bherubania	1.65	N	85°16'24.414"E 20°59'57.308"N	Scrubland
S5	Gaurhasahi	3.50	WSW	85°14'28.101"E 20°58'31.244"N	Crop Land
S6	Kalada	5.94	ESE	85°19'53.66"E 20°58'24.55"N	Fallow land



Fig No 3.6: Soil Monitoring Locations

Table No. 3.12: Soil Analysis Result

Sr.No.	Parameters	Unit	S-1	S-2	S-3	S-4	S-5	S-6
1.	Colour		Light Gray	Light Gray	Light Gray	Light Brown	Light Brown	Light Brown
2.	Type of soil	--	Acidic	Acidic	Acidic	Acidic	Acidic	Acidic
3.	pH	--	6.89	7.21	7.24	7.26	6.88	7.14
4.	Soil Texture	--	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
5.	Bulk Density	gm/cc	1.26	1.34	1.24	1.31	1.26	1.28
6.	Porosity	--	20.0	24.0	18.0	21.0	22	26
7.	Moisture Content	%	6.8	6.4	6.2	6.8	6.8	6.4
8.	Silica as SiO2	%	24.6	38.8	35.2	37.2	41.6	38.2
9.	Chloride as Cl^-	%	0.26	0.22	0.26	0.22	0.29	0.24
10.	Sulphate as So^{4-}	%	0.28	0.24	0.28	0.25	0.26	0.28
11.	Potassium as K	%	0.026	0.028	0.026	0.036	0.031	0.026
12.	Magnesium as Mg	%	0.34	0.37	0.40	0.42	0.32	0.34
13.	Calcium as Ca	%	0.36	0.44	0.41	0.44	0.44	0.46

14.	Iron as Fe	%	0.29	0.36	0.28	0.31	0.32	0.31
15.	Nickel as Ni	%	BDL	BDL	BDL	BDL	BDL	BDL
16.	Lead as Pb	%	BDL	BDL	BDL	BDL	BDL	BDL
17.	Cadmium as Cd	%	BDL	BDL	BDL	BDL	BDL	BDL
18.	Chromium as Cr	%	BDL	BDL	BDL	BDL	BDL	BDL
19.	Mercury as Hg	%	BDL	BDL	BDL	BDL	BDL	BDL
20.	Zinc as Zn	%	0.016	0.021	0.014	0.016	0.015	0.018
21.	Available Organic Carbon	%	1.16	1.28	1.38	1.32	1.29	1.34
22.	Available Nitrogen as N	%	0.28	0.29	0.22	0.26	0.26	0.28
23.	Phosphorus as P	%	0.021	0.024	0.028	0.025	0.026	0.028

Sr. No.	Soil Test	Classification
1	pH	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (µmhos/cm) (1ppm = 640 µmho/cm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon (%)	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5	Phosphorus (Kg/ha)	Up to 15 very less 16-30 less 31-50 medium 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6	Potash (Kg/ha)	0 -120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: Hand Book of Agriculture, Indian Council of Agricultural Research

3.8 Observations of the Results of soil

It has been observed that the pH of the soil ranged from 6.88 to 7.26 indicating that the soil is Neutral in nature. The soil in the study area is sandy loam ranging from 18 to 26 %. The

nitrogen concentrations are in the range of 0.22 to 0.29% indicating that soils have very less quantities of nitrogen. The phosphorous concentrations are in the range of 0.021 to 0.028%. indicating that soils have very less quantities of phosphorus.

The potassium concentrations range between 0.026 to 0.036%, which indicate that the soils have very less of potassium.

3.9 Water Quality

3.9.1 Ground & Surface Water Quality Analysis

Selected water quality parameters of surface and ground water resources in the study area have been studied for assessing the water environment and evaluate anticipated impact of the power plant. Understanding the water quality is essential in preparation of Environmental Impact Assessment and to identify critical issues with a view to suggest appropriate mitigation measures for implementation.

The purpose of this study is to:

- Assess the water quality characteristics for critical parameters;
- Evaluate the impacts on agricultural productivity, habitat conditions, recreational resources and aesthetics in the vicinity; and
- Predict impact on water quality by this project and related activities.

The information required has been collected through primary surveys and secondary sources. Groundwater is being used as source of water in almost all the villages via open wells and tube wells.

Grab water samples from eight (08) groundwater and eight (08) surface water sources were collected once during the monitoring period as per details given in **Table 3.14** and depicted in **Figure 3.7**

The sampling locations were selected based on reconnaissance survey with the following consideration:

- Drainage Pattern;
- Location of water sources; and

- Location of residential areas representing different activities/ likely impact areas.

Eight (08) surface and ground water samples each were analyzed for physico-chemical, heavy metals and bacteriological parameters as per the procedures mentioned in Standards as per IS-2296 Class –'C' and IS: 10500 respectively.

The methodology for sample collection and preservation techniques was followed as per the Standard Operating Procedures (SOP) mentioned below.

Table 3.14 : Analytical Techniques For Water and Wastewater Sampling and Analysis

Parameters	**Standards**
pH Value	APHA 4500H^+B
Temperature	---
Conductivity	APHA 2510 B
Suspended solids	APHA 2540 D
Dissolved Oxygen as DO	APHA 4500 O^-C
Chloride (max)	APHA 4500Cl^-B
Total Dissolved Solids as TDS	APHA 2540 C
Alkalinity as $CaCO_3$	APHA 2320 B
Total Hardness or TH	APHA 2340 C
Calcium as Ca	APHA 3500Ca B
Magnesium as Mg	APHA 3500Mg B
BOD (3) days at 27^0C (max)	APHA 5210 B
Chemical Oxygen Demand as COD	APHA 5220 C
Sodium as Na	APHA 3500Na B
Potassium as K	APHA 3500K B
Silica	APHA SiO_2 C
Oil & Grease	APHA 5520 B
Fluoride as F (max)	APHA 4500F C
Sulphates (SO_4) (max)	APHA 4500SO_4^{2-} E
Phenolic Compounds as C_6H_5OH (max)	APHA 5530 B,D
Nitrate as NO_3, (max)	APHA 4500 N_{org} B
Phosphate as PO_4	APHA 4500 P, D
Total Coliform as TC	APHA 9221 B
Arsenic as As	APHA 3500 As B
Mercury as Hg	APHA 3112B
Lead as Pb	APHA 3111 B
Cadmium as Cd	APHA 3111 B
Hexavalent Chromium as Cr^{6+}	APHA 3500 Cr B
Total Chromium as Cr	APHA 3111 B

Parameters	Standards
Copper as Cu	APHA 3111Cu B
Zinc as Zn	APHA 3111 B
Selenium as Se	APHA 2340 C
Iron as Fe	APHA 3500 Fe B

Source-VCSPL Lab

The details of surface and ground water sampling locations are given in **Table 3.15** and **Table 3.16** and shown in **Figures 3.7 & 3.8** respectively.



Figure No. 3.7: Surface Water Sampling Locations

Table No. 3.15: Surface Water Sampling Location Details

Station	Name	Distance (km)	Direction	Coordinates	Justification
SW1	Brahmani River U/S near village	2.64 km	NW	20°59'50.59"N 85°14'50.50"E	Temple Area near Residential Area

	Kankili				
SW2	Brahmani River D/S near village Biraharpali	3.98 km	SW	20°57'56.87"N 85°14'18.17"E	Residential Area
SW3	Gambharia Nala	0.15 km	E	85°16'49.70"E 20°58'55.20"N	Gambharia Nala near Project Boundary
SW4	Ghorhadian Nala	6.68 km	SE	85°18'41.21"E 20°55'43.51"N	Near Vivekananda ITI and Indian Oil Petrolpump and National Highway
SW5	Dadaraghati Main Canal	4.59 km	N	21° 1'43.95"N 85°16'25.95"E	Dadaraghati main Canal near Basulei Residential Area
SW6	Dadaraghati Reservoir	7.92 km	N	21° 3'25.61"N 85°17'17.19"E	Sensitive Area (Anantapur RF and Talcher Border RF)
SW7	Bagchera Nala	4.09 km	NE	21° 0'15.75"N 85°18'47.12"E	Bagchera Nala near Domuhani Residential Area
SW8	Mundamala Jor	7.42 km	SE	20°56'56.07"N 85°20'29.31"E	Mundamala Jor near Kantor Residential Area

Table No. 3.16: Surface Water Analysis Results

Sl. No.	Parameter	Testing Methods	Unit	Standards as per IS-2296:1992 Class –'C'	Analysis Results			
					SW-1	SW-2	SW-3	SW-4
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	**300**	<5	<5	5	5
2	pH at 25^0C	**pH Meter** APHA 23RD Ed,2017 4500H^+ B	--	**6.0-9.0**	7.3	7.33	7.2	7.2
3	Dissolved Oxygen (min)	**Modified Winkler Method** APHA 23RD Ed,2017 : 4500 O^- C	mg/l	**4.0**	7.9	7.2	6.0	6.2
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017: 2130 B	NTU	**--**	0.5	0.8	1.5	1.1
5	Chloride (max)	**Titrimetric Method** APHA 23RD Ed,2017: 4500Cl^- B	mg/l	**600**	13.0	12.0	12.0	11.5
6	Total Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017: 2540 C	mg/l	**1500**	62	62	76	67
7	Oil & Grease (max)	**Gravimetric Method (Solvent Extraction)** APHA 23RD Ed,2017:5520-B	mg/l	**--**	ND	ND	ND	ND
8	BOD (3) days at 27^0C (max)	**Oxygen Depletion Method** IS 3025(P-44) : 1993	mg/l	**3.0**	BDL (<1.8)	BDL (<1.8)	1.9	2.1

		RA 2003						
9	Chemical Oxygen Demand (COD)	**Open Reflux Method** APHA 23RD Ed,2017: 5220 C	mg/l	**--**	23	23	47	47
10	Arsenic as As	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.2**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
11	Lead as Pb	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.1**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
12	Cadmium as Cd (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.01**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
13	Hexa Chromium as Cr^{+6}	**Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B	mg/l	**0.05**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
14	Copper as Cu (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
15	Zinc as Zn(max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**15**	3.8	4.1	3.6	3.2
16	Selenium as Se (max)	By AAS Method APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.05**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
17	Cyanide as CN (max)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN- C,D	mg/l	**0.05**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
18	Fluoride as F (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F- C	mg/l	**1.5**	0.31	0.42	0.34	0.51

19	Sulphates (SO_4) (max)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 SO_4^{2-} E	mg/l	**400**	4.8	4.8	7.4	5.8
20	Phenolic Compounds as C_6H_5OH (max)	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.005**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
21	Iron as Fe (max)	**By AAS Method** APHA 23RD Ed,2017: 3500Fe, B	mg/l	**0.5**	0.48	0.5	0.46	0.32
22	Nitrate as NO_3 (max)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**50**	BDL (<1.0)	BDL (<1.0)	BDL (<1.0)	1.2
23	Anionic Detergents (max)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**1.0**	ND	ND	ND	ND
24	Total Coli form	**By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	MPN/ 100 ml	**5000**	687	833	2213	1631

Sl. No.	**Parameter**	**Testing Methods**	**Unit**	**Standards as per IS-2296:1992 Class –'C'**	**Analysis Results**			
					SW-5	**SW-6**	**SW-7**	**SW-8**
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B,	Hazen	**300**	5	5	20	5

		C						
2	pH at 25^0C	**pH Meter** APHA 23RD Ed,2017 4500H^+ B	--	**6.0-9.0**	7.1	7.15	7.0	6.75
3	Dissolved Oxygen (min)	**Modified Winkler Method** APHA 23RD Ed,2017 : 4500 O^- C	mg/l	**4.0**	4.6	4.2	6.1	5.1
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017: 2130 B	NTU	**--**	2.5	6.0	19.0	14.0
5	Chloride (max)	**Titrimetric Method** APHA 23RD Ed,2017: 4500Cl^- B	mg/l	**600**	11	12	20	9
6	Total Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017: 2540 C	mg/l	**1500**	67	65	191	68
7	Oil & Grease (max)	**Gravimetric Method (Solvent Extraction)** APHA 23RD Ed,2017:5520-B	mg/l	**--**	ND	ND	ND	ND
8	BOD (3) days at 27^0C (max)	**Oxygen Depletion Method** IS 3025(P-44) : 1993 RA 2003	mg/l	**3.0**	8.4	22.4	2.1	6.9
9	Chemical Oxygen Demand (COD)	**Open Reflux Method** APHA 23RD Ed,2017: 5220 C	mg/l	**--**	71	141	BDL (<4.0)	47
10	Arsenic as As	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.2**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
11	Lead as Pb	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.1**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
12	Cadmium as Cd	**By AAS Method**	mg/l	**0.01**	BDL	BDL	BDL	BDL

	(max)	APHA 23RD Ed,2017: 3111 B			(<0.001)	(<0.001)	(<0.001)	(<0.001)
13	Hexa Chromium as Cr^{+6}	**Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B	mg/l	**0.05**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
14	Copper as Cu (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
15	Zinc as Zn(max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**15**	4.2	4.8	5.1	4.8
16	Selenium as Se (max)	By AAS Method APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.05**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
17	Cyanide as CN (max)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	mg/l	**0.05**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
18	Fluoride as F (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F- C	mg/l	**1.5**	0.42	0.61	0.52	0.42
19	Sulphates (SO_4) (max)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 SO_4^{2-} E	mg/l	**400**	4.8	5.5	14.5	6.1
20	Phenolic Compounds as C_6H_5OH (max)	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.005**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
21	Iron as Fe (max)	**By AAS Method** APHA 23RD Ed,2017: 3500Fe,	mg/l	**0.5**	0.48	0.17	0.45	0.16

		B						
22	Nitrate as NO_3 (max)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**50**	1.2	1.3	1.4	1.6
23	Total Coli form	**By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	MPN/ 100 ml	**5000**	1284	1364	1100	680

Note : CL: Colorless, ND: Not Detected

BDL (Below Detection Limits) Values: Turbidity<1NTU, Cu<0.025 mg/l, Mn<0.05 mg/l, F<0.01 mg/l, C_6H_5OH<0.01 mg/l, Hg<0.01 mg/l, Cd<0.01 mg/l, Se<0.01 mg/l, As<0.01 mg/l, Pb<0.01 mg/l, Zn<0.05 mg/l, Cr^{+6}<0.05 mg/l, Al<0.01 mg/l, B<1.0 mg/l, PAH<0.0001 µg/l.

Table No. 3.17: Ground Water Sampling Location Details

Station	Name	Distance from project site (km)	Direction	Coordinates	water source
GW1	Project Site	--	--	85°16'26.33"E 20°59'3.87"N	Industrial Area (Borewell)
GW2	Kulei	0.85	NE	85°16'48.06"E 20°59'23.36"N	Nearest Habitat to Project site (Dug well)
GW3	Gengutia	1.85	NW	85°15'56.88"E 20°59'59.24"N	Dugwell
GW4	Raghunathpur	3.28	N	85°16'48.21"E 21° 0'48.59"N	Dugwell
GW5	Talaburisahi	3.45	ESE	85°18'22.91"E 20°58'40.11"N	Habitation near RF Dugwell
GW6	purunapani	3.84	N	85°16'33.41"E 21° 1'10.64"N	Near Reservoir (Tube well)
GW7	Pitiri	4.62	S	85°16'49.66"E 20°56'35.81"N	village close to NH (Dugwell)
GW8	Ramachandrapur	4.9	W	85°13'37.76"E 20°59'18.78"N	Tube well

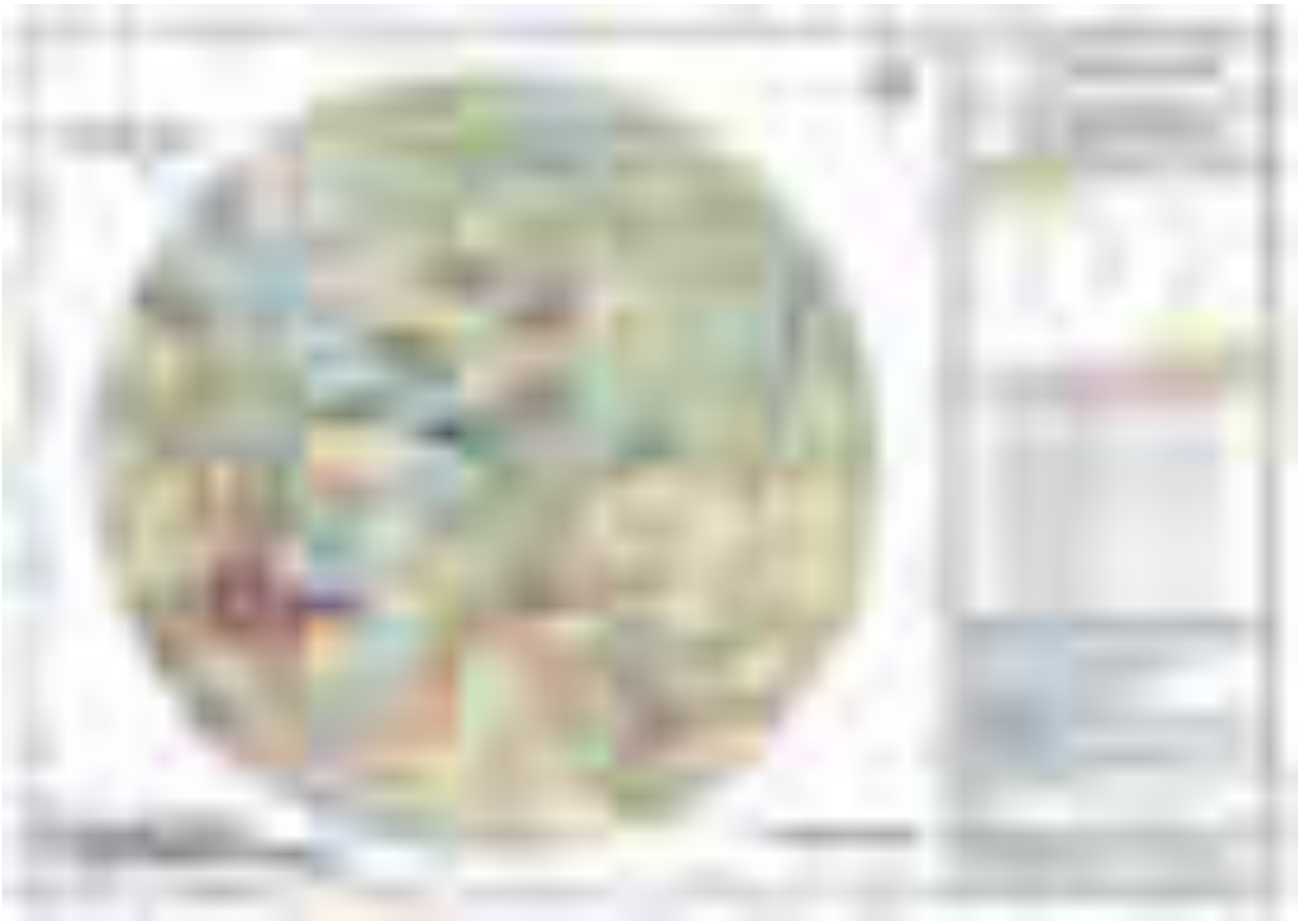


Figure No. 3.8: Ground Water Sampling Location

Table No. 3.18: Ground Water Analysis Result

Sl. No.	Parameter	Unit	Testing Methods	Standard as per IS:10500:2012 Amended on 2015 & 2018		Analysis Results			
				Acceptable Limit	Permissible Limit	GW-1	GW-2	GW-3	GW-4
Essential Characteristics									
1.	Colour	Hazen	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	**5**	**15**	CL	CL	CL	CL
2.	Odour	--	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	--	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	**1**	**5**	<1	<1	1.1	40.0
5.	pH	--	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	**6.5-8.5**	**No Relaxation**	7.3	7.5	6.0	6.9
6.	Total Hardness (as $CaCO_3$)	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	**200**	**600**	349.0	507.0	216.0	106.0
7.	Iron (as Fe)	mg/l	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	**1.0**	**No Relaxation**	<0.1	0.32	0.18	2.2
8.	Chloride (as Cl)	mg/l	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl^-	**250**	**1000**	94.0	112.0	98.0	23.0

			B						
9.	Residual Free Chlorine	mg/l	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	**0.2**	**1**	ND	ND	ND	ND
Desirable Characteristics									
10	Total Dissolved Solids as TDS	mg/l	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	**500**	**2000**	542.0	786.0	376.0	207.0
11	Calcium as Ca	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	**75**	**200**	65.0	98.0	65.0	39.0
12	Magnesium as Mg	mg/l	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	**30**	**100**	45.0	64.0	13.0	2.0
13	Copper as Cu	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**0.05**	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
14	Manganese as Mn	mg/l	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	**0.1**	**0.3**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
15	Sulphate as SO_4	mg/l	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	**200**	**400**	1.8	22.4	26.9	9.4
16	Nitrate as NO_3	mg/l	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	**45**	**No Relaxation**	7.0	2.6	39.0	7.1
17	Fluoride as F	mg/l	**Distillation followed by Spectrophotometric**	**1.0**	**1.5**	1.1	1.0	0.51	0.82

			Method APHA 23RD Ed,2017: 4500F- C						
18	Phenolic Compounds as C_6H_5OH	mg/l	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	**0.001**	**0.002**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
19	Mercury as Hg	mg/l	**AAS Method** APHA 23RD Ed,2017: 3112 B	**0.001**	**No Relaxation**	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)
20	Cadmium as Cd	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 B	**0.003**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
21	Selenium as Se	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	**0.01**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
22	Arsenic as As	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3114 B	**0.01**	**No Relaxation**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
23	Cyanide as CN	mg/l	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN- C,D	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
24	Lead as Pb	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.01**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
25	Zinc as Zn	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**5**	**15**	0.58	0.62	0.66	0.61
26	Total Chromium as Cr	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
27	Alkalinity	mg/l	**Titration Method**	**200**	**600**	31.0	587.0	122.0	122.0

			APHA 23RD Ed,2017:2320 B						
28	Aluminium as Al	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 D	**0.03**	**0.2**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
29	Boron	mg/l	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	**2.4**	**No Relaxation**	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
30	Total Coliform as TC	MPN/ 100ML	**By Multiple tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	**Shall not be detectable in any 100 ml sample**	**---**	<1.1	<1.1	<1.1	<1.1

Sl. No.	**Parameter**	**Unit**	**Testing Methods**	**Standard as per IS:10500:2012 Amended on 2015 & 2018**		**Analysis Results**			
				Acceptable Limit	**Permissible Limit**	**GW-5**	**GW-6**	**GW-7**	**GW-8**
Essential Characteristics									
1.	Colour	Hazen	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	**5**	**15**	5	45	<5	25
2.	Odour	--	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	--	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	**Nephelometric Method**	**1**	**5**	4.5	46.5	0.4	26.0

			APHA 23RD Ed,2017 :2130 B						
5.	pH	--	**pH Meter** APHA 23RD Ed,2017 : 4500H+ B	**6.5-8.5**	**No Relaxation**	6.6	7.2	5.51	7.31
6.	Total Hardness (as $CaCO_3$)	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	**200**	**600**	189.0	293.0	85.0	293.0
7.	Iron (as Fe)	mg/l	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	**1.0**	**No Relaxation**	0.5	1.5	<0.1	6.1
8.	Chloride (as Cl)	mg/l	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl- B	**250**	**1000**	105	20	50	21
9.	Residual Free Chlorine	mg/l	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	**0.2**	**1**	ND	ND	ND	ND
Desirable Characteristics									
11.	Total Dissolved Solids as TDS	mg/l	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	**500**	**2000**	388.0	452.0	186.0	448.0
12.	Calcium as Ca	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	**75**	**200**	67.0	55.0	30.0	62.0
13.	Magnesium as Mg	mg/l	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	**30**	**100**	5.6	38.0	2.5	34.0
14.	Copper as Cu	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**0.05**	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)

15.	Manganese as Mn	mg/l	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	**0.1**	**0.3**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
16.	Sulphate as SO_4	mg/l	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	**200**	**400**	7.2	7.2	<1.0	6.3
17.	Nitrate as NO_3	mg/l	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	**45**	**No Relaxation**	4.8	<1.0	39.8	<1.0
18.	Fluoride as F	mg/l	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	**1.0**	**1.5**	0.52	0.61	0.44	0.62
19.	Phenolic Compounds as C_6H_5OH	mg/l	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	**0.001**	**0.002**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
20.	Mercury as Hg	mg/l	**AAS Method** APHA 23RD Ed,2017: 3112 B	**0.001**	**No Relaxation**	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)
21.	Cadmium as Cd	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 B	**0.003**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
22.	Selenium as Se	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	**0.01**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
23.	Arsenic as As	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3114 B	**0.01**	**No Relaxation**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)

24.	Cyanide as CN	mg/l	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
25.	Lead as Pb	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.01**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
26.	Zinc as Zn	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**5**	**15**	0.68	0.64	0.62	0.58
27.	Total Chromium as Cr	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
29.	Alkalinity	mg/l	**Titration Method** APHA 23RD Ed,2017:2320 B	**200**	**600**	145	381	10	388
30.	Aluminium as Al	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 D	**0.03**	**0.2**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
31.	Boron	mg/l	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	**2.4**	**No Relaxation**	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
32.	Total Coliform as TC	MPN/ 100ML	**By Multiple tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	**Shall not be detectable in any 100 ml sample**	**--**	<1.1	<1.1	<1.1	<1.1

Note: CL:Colorless, ND: Not DetectedBDL (Below Detection Limits) Values: Turbidity<1NTU, Cu<0.025 mg/l, Mn<0.05 mg/l, F<0.01 mg/l, C_6H_5OH<0.01 mg/l, Hg<0.01 mg/l, Cd<0.01 mg/l, Se<0.01 mg/l, As<0.01 mg/l, Pb<0.01 mg/l, Zn<0.05 mg/l, Cr^{+6}<0.05 mg/l, Al<0.01 mg/l, B<1.0 mg/l, PAH<0.0001 µg/l

3.9 Result and Discussion

The surface water quality parameters were analyzed at eight locations for three months i.e. from December 2020 to February 2021.

Ground Water Quality

The pH values observed were in the range of 6.00 to 7.50, with total dissolved solid ranging from 186 mg/l to 786 mg/l. Total Hardness was in the range of 85 mg/l to 507 mg/l,. The fluoride ranged from 0.44 mg/l to 1.1 mg/l. The concentration of alkalinity, sulphates and nitrates in all the samples were less than prescribed limits. The total coliforms were found to be <1.1 mg/l.

Surface Water Quality

The pH values observed were in the range of 6.75 to 7.33 with total dissolved solids in the range of 62 mg/l to 191 mg/l. BOD were in the range of less than 1.8 mg/l to 22.4 mg/l. Chloride varied between 9 mg/l & 20 mg/l. Sulphates varied from 4.8 to 14.5 mg/l, Nitrate varied from less than 1 mg/l to 1.6 mg/l. Overall, the surface water samples were found within the prescribed limits.

Heavy Metals in Surface Water Quality

Heavy metal concentrations: Iron (Fe) ranging from 0.16 to 0.50 mg/l and Zinc (Zn) ranging from 3.2 to 5.1 mg/l.

Heavy Metals in Ground Water Quality

Heavy metal concentrations i.e. Iron (Fe) ranging from less than 0.1 mg/l to 6.1 mg/l and Zinc (Zn) ranging from 0.58 to 0.68mg/l.

3.10 Flora and Fauna Studies

3.10.1 Introduction

Ecological studies are one of the important aspects of Environmental Impact Assessment with a view to conserve environmental quality and biodiversity. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between themselves but also with the abiotic components viz. physical and chemical components of the environment. Relevant details on terrestrial and aquatic life within the study area were collected from related government offices. Detailed flora and fauna studies have been carried out in and around plant

area during study period to assess the present floristic and faunal composition in the study area.

The main aim of Conservation of Biodiversity is to ensure "No Net Loss" of any biological species whether big or small. The biodiversity-related Conventions are based on the premise that further loss of biodiversity is unacceptable. Biodiversity must be conserved to ensure it survives, continuing to provide services, values and benefits for current and future generations. The following approach has been chosen by the IAIA (International Association of Impact Assessment), to help achieve 'no net loss' of biodiversity.

- Avoidance of irreversible loss of biodiversity;
- Seeking alternative solutions to minimize biodiversity losses;
- Use of mitigation to restore biodiversity resources;
- Compensation for unavoidable loss by providing substitutes of at least similar biodiversity value; and
- Looking for opportunities for enhancement.

This approach can be called "positive planning for biodiversity." It helps to achieve no net loss by ensuring the safety and survival of Rare or Endangered or Endemic or Threatened (REET) species.

3.10.2 Objectives of Ecological Studies

The present study was undertaken with the following objectives:

- To assess the nature and distribution of vegetation in and around project site area;
- To assess the distribution of animal life spectra;
- To ascertain migratory routes of fauna if any;
- Possibility of presence of breeding grounds, if any; and
- Identification of protected areas as per Wildlife Protection Act, 1972 if any.

3.10.3 Methodology Adopted for the Survey

To achieve the above objectives, a detailed study of the area was undertaken with the project site area as its centre. The present report gives the review of published secondary data and the results of field sampling conducted during pre-monsoon season, 2013. The different methods adopted were as follows:

- Compilation of secondary data with respect to the study area from published literature and Government agencies;
- Generation of primary data by undertaking systematic ecological studies in the area;
- Discussion with local people so as to elicit information about local plants, animals and their uses;
- Preparing a general checklist of all plants encountered in village area, along the village roads, waste lands and forest blocks. This would indicate the bio-diversity for wild and cultivated plants. The plants so encountered were classified into life form spectrum according to the Raunkiaer's classification of life form spectrum;
- Determining the bird population of migratory and local birds by taking 10 random readings at every location;
- Observing mammals, amphibians and reptiles, noting their calls, droppings, burrows, pugmarks and other signs;
- Carrying out physical observations from the village area and in and around project site area for terrestrial fauna;
- Interviewing local inhabitants for knowing the uses of plants and animals and to get ethno biological data.

3.11 Ecological Environment

An ecosystem is composed of plant and animal populations, and it differs from natural community designation in that it involves the total nutrient and energy economics of the system as well as the organisms involved. Ecosystems are self-maintained and self- contained. Natural ecosystems are invariably richer in species and more stable than those of artificially developed, due to their many inter-dependencies and inter-relationships.

The plant and animal populations in an area from recognizable associations called Natural Communities. These are characterized by a few species called dominants. Natural communities have structure based on the life forms (e.g. Grass) of the species that make them up. A hardwood forest has a given structure by virtue of the trees and shrubs that compose it. The species composition refers to the kinds of species making up to the community. The variety of species and their relative numbers are referred to as species diversity. A community composed of few species is called simple or one of Low diversity. A community composed of many species is called complex or one of high diversity. The greater the biotic diversity, the greater the number and kind of habitats for the

inhabitants of the community Based on the physical setting and the kind of distribution of flora and fauna, the study area can be classified into crop, terrestrial and aquatic ecosystems.

Ecosystem shows complex inter-relationships between biotic and abiotic components Leading to dependence, competition and mutualism. Biotic components comprise both plant and animal communities, interacting not only within and between themselves but also with the abiotic components of the environment. The map showing the bio- geographic provinces of India is shown in **Figure 3.9**.

Generally, biological communities are good indicators of climatic and edaphic factors because of their strong relationships with them. The studies on the biological aspects of the ecosystem are important in Environment Impact Assessment studies for the suitability of natural flora & fauna. Information on the impact of environment stress on the community structure serves as an inexpensive and efficient early warning system to check the damage on a particular ecosystem. The biological environment includes mainly terrestrial and aquatic ecosystem.

A change in the composition of biotic communities under stress is reflected through a change in the distribution pattern, density, diversity, frequency, dominance and abundance of natural species of fauna and flora existing in the ecosystem. These changes over a span of times can be quantified and related to the existing environment.

3.11.1 Objectives of Ecological Studies

The objectives of ecological study during the period of EIA study may be outlined as follows:

- To characterize the environmental components like land, water, flora and fauna;
- To understand their present status;
- To understand carrying capacity of the ecosystem;
- To assess present bio-diversity; and
- To identify susceptible and sensitive areas.

3.11.2 Biogeographic zone, province and Forest type

An independent and comprehensive baseline assessment of the flora, terrestrial vertebrate, aquatic fauna and associated habitat values of the site and within 10 Km radius a subsequent assessment of potential ecological impacts. The study area falls under the category of 6C- Deccan Peninsula – Eastern Highlands as far as the Indian Biogeographical Zones (*Rodger, Panwar, and Mathur 2000*) are concerned.



Figure 3.9: Map showing the Bio-geographic Provinces of India

The forest in the study area can be classified under sub group:

(1) North Indian Moist Deciduous Forest and

(2) North Indian Dry Mixed Deciduous Forest.

According to Champion and Seth's 'Classification of Revised forest types of India' the forests of the study area has been broadly classified as moist peninsular Sal forest (3C/C2), Northern dry deciduous forest (5B/C2) and Dry deciduous scrub forest (5D/S1). The flora over most of the areas in the eastern region of project site has a predominance of Sal, the crop in areas is mostly paddy along with miscellaneous agriculture practices. Majority of the forest blocks had good percentage of Sal in the past, but due

to continuous biotic interference and degradation of forests, the present status of Sal in the forests has suffered and it has now become associated with mixed and bamboo and palash forests in the form of patches and the quality of Sal has become degraded due to edaphic factors.

There are 6 reserve forests in the study area and there are no wildlife sanctuaries,



Figure 3.10: Map showing the Forest area of Odisha

The detailed ecological assessment of the study area has been carried out with the following objectives:

- To establish the present status of ecological conditions surrounding the project location;
- To study the existing anthropogenic stresses on the prevailing ecosystem.
- To identify and predict the likely impacts on the local ecosystem from the proposed activities;

- To list out floral species, terrestrial vertebrate and aquatic flora and fauna present within the study area, and significance status under The Wildlife (Protection) Act 1972;
- To define ecological/conservation status of each species as per IUCN categories (Red Data List)
- To formulate mitigatory measures and a sustainable Environmental Management Plan (EMP) based on the likely impacts.

During survey, following aspects were considered for ecological studies:

- Assessment of present status of flora and fauna;
- Identification of rare and endangered species of plants and animals (if any);
- Identification of ecologically sensitive areas within the study area;
- Assessment of migratory route of wildlife (if any); and
- Assessment of Aquatic Ecology with specific reference to aquatic birds and fishery resources.

3.11.3 Methodology Adopted for the Study

Terrestrial investigations for flora and fauna records were collected by random field survey and a checklist was prepared. During field survey, discussions with the local people were carried-out to collect information related to local biodiversity in and around the villages. The ecological status of the study area has been assessed based on the following methodology:

- Primary field surveys to establish primary baseline of the study area;
- Compilation of secondary information available in published literatures/ working plan was referred from State Forest Department.
- Site Verification and finalization in consultation with Project proponent, local inhabitants.
- Vegetation analysis through quadrate method using sampling plots of 20m x 20m.
    - 20m X 20m for tree species (record trees >20 cm in GBHOB /species);
    - 5m X 5m [four plots] was laid along diagonals wherein all the shrubs recorded.
    - 1m X 1m [five plots], one at the centre and four at one per quadrate] was laid and herbs, grasses in five plots to be noted.

3.11.4 Protocol for Sampling through Quadrate Method

The standard method chosen for the assessment of plant diversity involves the use of square vegetation quadrates ('plots'). These quadrates were used to measure most vegetation attributes in most vegetation types. Quadrate locations marked by pegs or sometimes by grid system.

The study area is demarcated as 10 km from the periphery of project area based on the MoEF&CC guidelines. After demarcation, the study area is divided into sampling units, i.e. the areas which are approximately true representative of the whole area, and were sampled for the identification of plant and animal species.

A. Floral Study

The assessment of the flora of the study area is done by an extensive field survey of the area.

- Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature and herbarium Botanical Survey of India (BSI).
- Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.
- Qualitative analysis of vegetation is made by two different methods such as floristic (by simple studying various genera and species of various plant groups i.e. herbs, shrubs, trees etc).

B. Phyto-sociology

A nested quadrates technique was used for sampling the vegetation. All the plots sampled were representative of most common types, sampling 20m x 20m for trees and 5m x 5m for shrubs, 1m x 1m for herbs square meter quadrates were laid. Selection of sites for sampling of vegetation is done by random sampling procedure. However, in general to study the phytosociological attributes, quadrates of 20m × 20m size for tree species are randomly laid out at each site at different elevations. Then the observation on the following parameters is recorded:

1. Name of the species.
2. Number of the occurrence of each species in each quadrate.

The field data for phytosociological studies was collected in the study area. Vegetation data was quantitatively analyzed for frequency, density and dominance using standard methodologies. The relative values of frequency, density, and dominance of all the recorded species was summed up to represent Importance Value Index (IVI). Not only IVI facilitates comparison between species of a community, but also the data collected on dispersion, number and cover can be profitably used in comparing the vegetation structure of two or more stands or of the same stand over a period

of time. Vegetation structure with respect of varying environmental factors can also be studied through such studies in sets of varying environmental conditions. The IVI was determined as the sum of the relative frequency, relative density and relative dominance. It thus Incorporate three important parameters that measures of productivity and diversity of every species therefore.

IVI = Relative frequency + Relative density + Relative dominance

C. Faunal Study

Ground surveys are carried out by trekking the study area for identification of important animal groups such as birds, mammals and reptiles for sampling of animals through the following methods.

- For sampling birds/ avifauna 'point sampling' along the fixed transects (foot trails) were done to record all the species of birds with the help of binoculars; field guides and photography for more than 1 hour on each transect (n=4).
- For sampling mammals, 'direct count on open width (20 m) transect' were used on the same transects. Besides, information on recent sightings/records of mammals by the locals was also collected from the study areas.
- 'Reptiles' mainly lizards were sampled by 'direct count on open width transects'.
- Secondary information collected from local villagers, published government data etc.

3.11.5 List of the endangered and endemic species as per the schedule of the Wildlife

Protection Act, 1972

Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN. Various methods used for study animals are as follows:

1. Point Survey Method: Observations were made at each site for 15-20 min duration.
2. Road Side Counts: The observer travelled by motor vehicles from site to site and all sightings were recorded.

Sampling Locations

The ecology and diversity survey was conducted in the 10 km radius in the study area and the surrounding area. It is observed that human settlements and large industrial units present within the study area of 10 km radius and many of villages have moderate ranges of plantations. Most of the vegetation area is in agricultural fields. During site assessment several floral species encountered within the 10 km radius area.

Floristic composition within the study area

The ecology and diversity survey was conducted in the 10 km radius in the study area and the surrounding area. During site assessment several floral species encountered within the 10 km radius area.

Besides Paddy, vegetables like tomato, potato, cabbage etc., maize, pulses and oil seeds are grown in the buffer zone. Banana, Guava, Mango are the most common and widely grown fruit trees in the buffer zone. The shrubby vegetation is between 1 to 2 m in height, with few scattered trees growing in between. In fact the shrubs seen are mostly tree species but due to high biotic pressure are reduced to shrubs. The plants encountered as shrubby vegetation are *Shorea robusta* (Sal), *Diospyros melanoxylon* (Kendu), *Pterocarpusmarsupium* (Piyasal), Gamhar *(Gmelina arborea),* Mahua *(Madhuca indica),* Charoli *(Buchananialanzan) etc. The understory consists of* Kendu *(Diospyros melanoxylon),* Dhawai *(Woodfordia fruticosa),* Ber *(Ziziphusnummularia), Lantana sp., Calotropis spp,* etc. The scattered trees standing in the scrublandare, *Madhuca indica, Pterocarpus marsupium* (Piyasal), *Ficus bengalensis* (Bot), *Azadirachta indica* (Neem), *Phoenix sylvestris* (Khajoor), *Borassus flabellifer* (Tal), *Cocosnucifera* (Narial). The herbs and grasses growing are *Achyranthes aspera, Tridaxprocumbens, Elephantopus scaber, Cynodon dactylon, Cyperus rotundus.* The list of flora observed in the buffer zone is given below:

Table 3.19: List of Flora observed in the study area

Sl.No	Scientific Name	Local name	Family	IUCN Conservation
Tree				
1	*Mangifera indica*	Amba	Anacardiaceae	Data Deficient
2	*Phyllanthus emblica*	Amla	Phyllanthaceae	Not assessed
3	*Ficus religiosa*	Aswastha	Moraceae	Not assessed
4	*Acacia nilotica*	Babool	Mimosaceae	Not assessed
5	*Azadirachta indica*	Neem	Meliaceae	Not assessed
6	*Pongamia pinnata*	Karanj	Fabaceae	Least Concern
7	*Terminalia arjuna*	Arjuna	Combretaceae	Not assessed

8	*Madhuca indica*	Mahul	Sapotaceae	Not assessed
9	*Aegle marmelos*	Bela	Rutaceae	Not assessed
10	*Cassia siamea*	Chakunda	Fabaceae	Least Concern
11	*Shorea robusta*	Sal	Dipterocarpaceae	Least Concern
12	*Diospyros melanoxylon*	Kendu	Ebenaceae	Not assessed
13	*Syzygium cumini*	Jamu	Myrtaceae	Not assessed
14	*Diospyros montana*	Halda	Ebenaceae	Not assessed
15	*Lannea coromandelica*	Moi	Anacardiaceae	Not assessed
16	*Ficus bengalensis*	Bara	Moraceae	Not assessed
17	*Naringi crenulata*	Benta	Rutaceae	Not assessed
18	*Anacardimum occidentale*	Cashew	Anacardiaceae	Not assessed
19	*Albizia lebbek*	Kalasiris	Mimosaceae	Not assessed
20	*Albizzia procera*	Tentra	Mimosaceae	Not assessed
21	*Bauhinia purpurea*	Kanchan	Fabaceae	Least Concern
22	*Bridelia retusa*	Kasi	Euphorbiaceae	Not assessed
23	*Ougeinia oojeinensis*	Bandhan	Fabaceae	Not assessed
24	*Ficus glomerata*	Dimiri	Moraceae	Not assessed
25	*Gmelina arborea*	Gambhari	Verbenaceae	Not assessed
26	*Dalbergia sissoo*	Sissoo	Fabaceae	Not assessed
27	*Tectona grandis*	Saguan	Lamiaceae	Not assessed
28	*Morinda tinctoria*	Acchu	Rubiaceae	Not assessed
29	*Pterocarpus marsupium*	Piasal	Fabaceae	Vulnerable
30	*Bombax ceiba*	Simili	Bombacaceae	Not assessed
31	*Schleichera oleosa*	Kusum	Sapindaceae	Not assessed
32	*Tamarindus indica*	Tentuli	Fabaceae	Not assessed
33	*Anogeissus latifolia*	Dhaura	Combretaceae	Not assessed
34	*Terminalia chebula*	Harida	Combretaceae	Not assessed
35	*Buchanania lanzan*	Char	Anacardiacea	Not assessed
36	*Terminalia alata*	Asan	Combretaceae	Not assessed
37	*Terminalia bellerica*	Bahada	Combretaceae	Not assessed
38	*Borassus flabelliformis*	Tala	Palmaceae	Vulnerable
39	*Adina cordifolia*	Kurum	Rubiaceae	Not assessed
Shrub				
1	*Dendrocalamus strictus*	Salia	Poaceae	Not assessed
2	*Bambusa arundinaceae*	Kanta bans	Poaceae	Not assessed
3	*Lantana camara*	Naga airi	Verbenaceae	Not assessed
4	*Calotropis gigantea*	Arakha	Asclepidaceae	Not assessed
5	*Cassia fistula*	Sunari	Fabaceae	Not assessed
6	*Chromolaena odorata*	Poksunga	Asteraceae	Not assessed
7	*Helicteres isora*	Antia	Sterculiaceae	Not assessed
8	*Pavetta indica*	Kukur chhalia	Rubiaceae	Not assessed
9	*Vitex negundo*	Begunia	Lamiaceae	Not assessed
10	*Flemingia chappar*	Ranidantkathi	Fabaceae	Not assessed
11	*Justicia adhatoda*	Basanga	Acanthaceae	Not assessed
Herb & Grasses				
8	*Cynodon dactylon*	Duba	Poaceae	Not assessed

5	*Cyperus rotundus*	Mutha	Cyperaceae	Least Concern
1	*Achyranthes aspera*	Apamaranga	Amaranthaceae	Not assessed
2	*Commelina benghalensis*	Kanasiri	Commelinaceae	Least Concern
3	*Acalypha indica*	Nakachana	Euphorbiaceae	Not assessed
4	*Amaranthus spinosus*	Kanta leutia	Amaranthaceae	Not assessed
6	*Andrographis paniculata*	Bhuin neem	Acanthaceae	Not assessed
7	*Elephantopus scaber*	Mayurchulia	Asteraceae	Not assessed
9	*Barleria prionitis*	Daskerenda	Acanthaceae	Not assessed
10	*Scoparia dulcis*	Badi justimadhu	Plantaginaceae	Not assessed
11	*Tridax procumbens*	Bisalyakarani	Asteraceae	Not assessed
12	*Sida cordifolia*	Bajramuli	Malvaceae	Not assessed
13	*Phyllanthus amarus*	Bhuin amla	Phyllanthaceae	Not assessed
14	*Evolvulus alsinoides*	Jyotismati	Convolvulaceae	Not assessed

3.11.6 Economically Important Flora of the study area

Agricultural Crops:

Kharif is the main crop season of this area. The main crop – paddy is widely cultivated in this area. The rabi crops represented by green gram, black gram etc. and vegetables are also cultivated in a small scale. The major crop paddy is grown over 75% of the Gross Culturable Area and the rest by other crops. Total land holdings are not utilized for cultivation because the fertility gradient of the uncultivable land is low from commercial point of view and they are mostly rain fed. As such agriculture is not intensive, it is mostly for getting rice for own consumption from personal land. Potato, Onion, Turmeric, Brinjal are the most common and widely grown vegetables.

Minor Forest Produces:

Almost all families belong to SC and ST involved in collection of NTFP. The main product is mouha (Madhuca indica) flower, apart from mouha they also collect Amla (Emblica officinalis), Bahada (Terminalia bellirica), Harida (Terminalia chebula) and Mango (Mangifera indica) fruits. Honey and Jhuna (resin from Sal tree) collection is infrequent in the study area. Kendu leaf collection is not practiced here. However, during our survey we did not found any family entirely dependent on NTFP collection. The left over family members of the main work force (old age people, women and children) are mostly engaged in NTFP collection. All family members' joins when daily wages not available to collect NTFP. Apart from NTFP, fire wood (locally called Jhati) collection from forest is a traditional and common practice in the study area. Villagers cut the tree for small timber and firewood for their own

consumption. They collect their fencing materials and agricultural tools preparing from timber the surrounding forests. On an average per family use two pole size trees per year as reported in the Working Plan of the Forest Division. Also Sal leaves and seeds, Kendu (*Diospyros melanoxylon)* leaves, Char seeds, fire wood collected by the locals.

Rare and Endangered Floral Species:

Floristic survey of both core and buffer zones of the leasehold area did not encounter any such species, which can be considered to be critically endangered, endangered or threatened under the IUCN guidelines.

3.11.7 Phytosociological Analysis

Phytosociological parameters, such as, density, frequency, basal area and importance value index of individual species were determined in randomly placed quadrats of different sizes in the study area. Relative frequency, relative basal area and relative density were calculated and the sum of these three represented Importance Value Index (IVI) for various species. For shrubs, herbs and seedlings, the IVI was calculated by summing up relative frequency, relative density and relative abundance.

Sample plots were selected in such a way to get maximum representation of different types of vegetation and plots were laid out in different part of the study area of 10 km radius. Analysis of the vegetation will help in determining the relative importance of each species in the study area and to reveal if any economically valuable species is threatened in the process.

Biodiversity Indices

Biodiversity index is a quantitative measure that reflects how many different types' species, there are in a dataset, and simultaneously takes into account how evenly the basic entities (such as individuals) are distributed among those types of species. The value of biodiversity index increases both when the number of types increases and when evenness increases. For a given number of type of species, the value of a biodiversity index is maximized when all type of species are equally abundant. Interpretation of Vegetation results in the study area is given in **Table 3.20**.

Fauna in the study area

The status of faunal diversity within study area of 10 km radius around the studies were conducted. Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area. Additionally reference of relevant literatures (published/unpublished) and dialogues with local villagers were also carried out to consolidate the presence of faunal distribution in the area (*Smith 1933-43, Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar 1988*).

Mammals:

No wild mammalian species was directly sighted during the field survey. Dialogue with local villagers located around the study area confirm presence of some wild animal in that area. Livestock like cattle, buffalo, goat, poultry, duck, and pig are reared for dairy products, meat, egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area.

The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table.

Avifauna:

Since birds are considered to be the indicators for monitoring and understanding human impacts on ecological systems (*Lawton, 1996*) attempt was made to gather quantitative data on the avifauna by walk through survey within the entire study area and surrounding areas. From the primary survey, a total of 55 species of avifauna were identified and recorded in the study area. The diversity of avifauna from this region was found to be quite high and encouraging.

List of animals present in the study area are given below:

Table 3.20: List of Fauna observed in the study area

Sl.No	Scientific name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
Mammals					
1	*Elephas maximus*	Indian elephant	I	Endangered	NS
2	*Sus scrofa*	Wild boar	III	Least Concern	DS
3	*Canis aureus*	Jackal	II	Least Concern	NS
4	*Muntiacus muntjak*	Barking deer	III	Least Concern	NS
5	*Axis axis*	Spotted Dear	III	Least Concern	DS
6	*Hystrix Indica*	Porcupine	IV	Least Concern	DS
7	*Hyaena hyaena*	Hyaena	III	Near Threatened	NS
8	*Macaca mulatta*	Rhesus Macaque	II	Least Concern	DS
9	*Presbytis entellus*	Common langur	II	Least Concern	DS
10	*Lepus nigricollis*	Indian Hare	IV	Least Concern	DS
11	*Herpestes edwardsii*	Indian Grey Mongoose	II	Least Concern	DS
12	*Rattus norvegicus*	Brown Rat	V	Least Concern	DS
13	*Felis chaus*	Jungle Cat	II	Least Concern	NS
14	*Hystrix indica*	Indian Crested porcupine	IV	Least Concern	DS
15	*Funambulus palmarum*	Common Palm Squirrel	IV	Least Concern	DS
Birds					
1	*Egretta garzetta*	Little Egret	IV	Least Concern	DS
2	*Gallus gallus*	Jungle fowl	IV	Least Concern	DS
3	*Bubulcus ibis*	Cattle Egret	IV	Least Concern	DS

4	*Ardeola grayii*	Pond Heron	IV	Least Concern	DS
5	*Acridotheres tristis*	Common myna	IV	Least Concern	DS
6	*Coracias benghalensis*	Roller	IV	Least Concern	DS
7	*Pycnonotus cafer*	Bulbul (red vented)	IV	Least Concern	DS
8	*Corvus macrorhynchos*	Jungle Crow	V	Least Concern	
9	*Milvus migrans*	Common Kite	IV	Least Concern	DS
10	*Columba livia*	Rock pigeon	IV	Least Concern	DS
11	*Alcedo atthis*	Common Kingfisher	IV	Least Concern	DS
12	*Apus nipalensis*	House swift	IV	Least Concern	DS
13	*Cypsiurus parvus*	Palm Swift	IV	Least Concern	DS
14	*Dicrurus adsimilis*	Black Drongo	IV	Least Concern	DS
15	*Accipiter virgatus*	Besra sparrow- hawk	IV	Least Concern	
16	*Coturnix coturnix*	Grey qauil	IV	Least Concern	DS
17	*Corvus splendens*	House crow	V	Least Concern	DS
18	*Turdoides striatus*	Jungle Babbler	IV	Not assessed	DS
19	*Eudynamys scolopacea*	Koel	IV	Least Concern	
20	*Orthotomus sutorius*	Tailor Bird	IV	Least Concern	DS
21	*Ardeola grayili*	Paddy bird	IV	Least Concern	DS
22	*Psittacula eupatria*	Parakeet large indian	IV	Least Concern	
23	*Francolinus*	Patridge grey	IV	Least Concern	
24	*Pericrocotus flammeus*	Scarlet-Minivet	IV	Least Concern	
25	*Pycnonotus cafer*	Red vented Bulbul	IV	Least Concern	DS
Reptiles & Amphibians					
1	*Python molurus*	Indian Python	I	Least Concern	NS
2	*Ptyas mucosus*	Rat snake	II	Not assessed	DS
3	*Naja naja*	Indian cobra	II	Least Concern	NS
4	*Mabuya bibro*	Skink	-	Not assessed	DS
5	*Bungarus fasciatus*	Banded krait	II	Least Concern	NS
6	*Nerodia sipedon*	Fresh water snake	IV	Least Concern	DS
7	*Bufo melanostictus*	Common Indian Toad	IV	Least Concern	DS
8	*Varnus bengalensis*	Land monitor	II	Least Concern	DS
9	*Hemidactylus flaviviridis*	House lizard	-	Not assessed	DS
10	*Rana limnocharis*	Paddy-field Frog	IV	Not assessed	DS
11	*Rana tigrina*	Indian bull frog	IV	Least Concern	DS
Butterflies					
1	*Pachliopta hector*	Crimson rose	-	Not assessed	DS
2	*Papilio demoleus*	Lime Butterfly	-	Not assessed	DS

3	*Junonia almana*	Peacock pansey	-	Least Concern	DS
4	*Neptis hylas*	Common sailor	-	Not assessed	DS

N.B: NS= Not sighted but included as per the information provided by villagers, DS = Direct

3.11.8 Aquatic Ecology

The study area intersected by few natural drainage, rivers and ponds. A number of samples were investigated for enumeration of aquatic fauna. In order to study aquatic flora and fauna life one time survey was conducted during the pre-monsoon season. Major component of the aquatic life under the study area are listed below.

- *Aquatic macrophytes*
- *Phytoplankton and zooplankton*
- *Aquatic vertebrates like fish, amphibians etc.*

To assess the planktonic profile of Phytoplankton and Zooplankton, 2 water samples from a nearby pond in Village Pasasingha, Rasasingha & Tetuliguda were collected at sub surface level. The aquatic ecological study was conducted in different water bodies of the study area and the flora and fauna was recorded.

❑ **Aquatic Flora**

The study area is not very rich in floral diversity for both land and aquatic ecology as there is no river or perennial natural nalla is flowing close by of the POL Terminal area through which water is passing. The aquatic vegetation consists of the following groups of plants in this area.

❑ **Significance of Plankton:**

Planktons can be broadly grouped into two categories those with plant origin are called 'Phytoplankton' and those with animal origin are called 'Zooplankton'.

- **Significance of Phytoplankton:**

Phytoplanktons are the major primary producers of organic matter in the aquatic ecosystem and especially oceans whose 90% productivity is from the planktons. Collectively, they directly or indirectly support the entire animal population. When the water column becomes shallow in spring, phytoplanktons are exposed to higher light intensity in the upper sunlight. Light is one of the major abiotic factors that favour the growth of phytoplankton. The massive build up of phytoplankton in spring directly contributes new organic carbon to support the zooplankton, which, in turn, benefits larger aquatic animals including fish, crustaceans, molluscs, birds.

Name of species	Name of Family
Phormidium sp.	Cyanophyceae
Actinastrum sp., Ankistrodesmus sp., Cosmarium sp., Closterium sp., Pediastrum simplex, Straurastrum sp., Scenedesmus sp., Sirocladium vandalurensis, Zygnema sp., Chlorella sp., Chlorococcum sp.,	Chlorophyceae
Asterionella sp., Diatoma sp., Melosira sp., Naviclula sp., Pinnularia sp., Cymbella sp.	Bacillariophyceae
Spirulina Sp., Oscillatoria Sp., Closteropsis Sp., Phormidium Sp.	Myxophyceae

- **Significance of Zooplankton:**

The significance of zooplanktons is found in their role in transferring biological production from phytoplankton to larger organisms in the food web. A large number of phytoplankton species are grazed upon by the microscopic protozoans, tunicates, copepods and other crustaceans. These in turn become food for other animals further linking the food web. Therefore, variability in the production of planktons would affect the survival of young fish that depend on them.

Name of species	Name of Family
Diaptomus sp., Mesocyclops hyalinus, Diaphanosoma excisum Nauplius sp., Cyclopus	Copepoda
Filinia sp., Asplanchana sp.	Rotifera
Penilia avirostris, Evadna tergestina, Daphnia sp., Ceriodephnia, Alonella	Cladocera

- **Aquatic Fish Fauna**

Among all the aquatic life in the study area the fish fauna occupies an important place. The fish fauna of the area includes: Major carps includes Catla, Rahu, Mirgai, Balia, Baligarda, Bansa pati, Chenga, Dandakiri, Gadisa, Jalanga.

Sl No.	Local Name	Scientific Name
1	Balia	Wallagonia attu
2	Baligarda	Glossogobius giuris
3	Bansa pati	Allia coha
4	Chenga	Ohiocaphalus gachua
5	Dandakiri	Esomus dandrica
6	Gadisa	Ohiocaphalus punctatus
7	Jalanga	Pangasius pangasius
8	Jallah	Chela argentea
9	Kantia	Myotus cavasius
10	Kerandi	Barbus ambassis
11	Kou	Anabas tistudineus
12	Magura	Clarias batrachus
13	Mahurali	Amblypharyngodon mola
14	Mirakali	Cirrhina mrigala
15	Phali	Notopterus notopterus
16	Pohale	Cirrbina reba
17	Seula	Ophiocephalus striatus
18	Singi	Heterophneustes fossilis
19	Todi	Mastacembelus armatus

Environmental Sensitivity

As per MoEF&CC guideline, 10 km radius from the project site is considered as a study area for evaluating environmental sensitivity. The description of the environmental sensitivity of the site is given below;

- **National Parks and Wild Life Sanctuaries**

There is no National Park & Wildlife Sanctuary present within 10 Km radius of the Project site.

3.12 Socio-Economic Environment

The assessment of socio-economic environment forms an integral part of an EIA study. Socio-Economic status of the population is an indicator of the development of the region. Any developmental project of any magnitude will have a bearing on the living conditions and on the economic base of the population in particular and the region as a whole. Similarly, the activities will have its share of socio-economic influence in the study area. The section delineates the overall appraisal of society relevant attributes. The data collection for evaluation of the impact of the project on socioeconomic aspects in the study area has been done through primary household survey and through the analysis of secondary data available for the study area.

3.12.1 Methodology

The methodology adopted in assessment of socio-economic condition is as given below;

- To assess Socio-Economic conditions of the Population
- Analysis of the identified social attributes like population distribution, availability of public utilities etc., through Census of India 2011
- Primary household survey to assess the present status of population of the study area.

3.12.2 Sources of Information

As per the scope of this study, the information on socio-economic aspects has been gathered and compiled from several secondary sources. These include Block Office, Collectorate, Agriculture Department, Irrigation Department, Central Ground Water Board, Directorate of Census Operation, Odisha etc. The demographic data have mainly been compiled from the Census of India 2011. The socio-economic details are briefly described in the following sections. This section includes the present status of the Socio-Economic Environment in the study area. To determine the baseline socio-economic pattern, at and around the project site, the required data have been obtained from the published data. Socio-economic baseline data were collected for the following indicators:

- Demographic Structure

- Economic Structure
- Availability of Basic Amenities

The major demographic and economic structure of the study area are classified into the population, literacy rate and workers details.

DHENKANAL DISTRICT

Centrally located on the Geo-Political map of Odisha, Dhenkanal District is surrounded by beautiful wild lives and forests. The District is situated on the Cuttack-Sambalpur road (NH 55) and on the Cuttack-Sambalpur or Baranga-Sambalpur railway line. The Dhenkanal District touches the boundary of Kendujhar district on its north, Cuttack district on south and bounded by Jajpur District on the east and Angul District on its west. It is commonly believed that the Dhenkanal District owes its name to a Savara chief named 'DHENKA' who formerly ruled over in this tract. Dhenkanal District covers an area of 4950 Sq Km. It has a vast area covered with dense forests and a long range of hills.This is the reason of calling the District as 'Home of Elephants and tigers of the country'. The District lies between 85 degree 58' E to 86 degree to 2' E longitude and between 20 degree 29' N to 21 degree 11' N latitude. Dhenkanal District has a moderate climate.The District experiences hot with high humidity during April and May and cold during the winter months, i.e. December and January. The monsoon generally breaks during the month of June with the average annual rainfall being 1421.1 mm. As per the agriculture is concerned, the District produces a substantial agricultural yield and paddy, ground nut, cashew nut, potato, mango, jackfruit, sugarcane and some vegetables as its primary agricultural products.

Dhenkanal is very rich in case of eminent personalities. Baji Rout (freedom fighter), Bira Baishnaba Pattanaik (Freedom Fighter), Brajanath Badajena (Eminent Poet), Sarangadhar Dash, Nandini Satpathy (First and only woman Chief Minister of Odisha), Kalpana Das (First woman from Odisha to scale Mt Everest) are some of the prominent personalities born in this District.

Dhenkanal District is very much famous for its fairs and festivals. Gajalaxmi Puja is very much popularly known festival to be celebrated in the District. Every year this festival begins from Kumar Purnima and continues for eleven days. Kapilash is the abode of Lord Chandra Sekhar which is one of the famous tourist spot of Odisha. Every year during Mahashiv Ratri "Jagar Yatra" is being observed. Dussehera festival of Kamakhyanagar bears a special significance in the culture of Dhenkanal District. Maghamela at Joronda is yet another most famous festival of 'Mahima Dharma'. Every year it begins on 'Magha Purnima' and continues for four days at Jorondo. Bullock festival of Bhuban has a special identity. Racing competition is held among the bullocks and prizes are awarded to the owners.

The Dhenkanal district has its administrative headquarters in Dhenkanal town. In the present scenario of the administrative set up, there are 3 sub divisions, 8 tahsils and 8 CD blocks. There are total number of 198 gram Panchayat, 4 Urban Bodies (1.Dhenkanal Municipality 2.Bhuban NAC, 3.Kamakhyanagar NAC and 4.Hindol NAC) and 15 police stations running in the District of Dhenkanal.As per 2011 Provisional Census the Dhenkanal District has 1237 villages having 11,92,948 population out of which 6,12,597 Male population and 5,80,351 Female Population. The Dhenkanal District is having 79.41% literacy rate with total numbers of 4,71,681 male literates and 3,70,307 female literates.

Settlement Pattern

The project site is located at village Kulei, Parjang in Dhenkanal district, Odisha. The area within 10 km radius from the project site has been considered as a study area.

3.12.4 Demography

Almost all villages in the study area are experiencing a rapid growth of population, which may be due to the process of urbanization and industrialization. The demographic structure of the study area was derived primarily from data of Census record of Odisha state covering districts Dhenkanal. The Demographic structures of each village in the study area as per Census 2011 are presented in **Table 3.22 .**

3.12.5 Distribution of Population

POPULATION

According to the 2011 census, the entire study area has a population of 46676 and 10817 Households. Male population is about 23990 & female population is 22686 with sex ratio of 946 females for every 1000 males and a literacy of 70%; Scheduled Castes and Scheduled Tribes accounted for 10079 and 5137 of the total population respectively. There were a total of 10287 main workers, 8025 marginal workers, 28364 non-workers. About 39% employment rate found within the entire study area.

The distribution of the population in the study area is given in **Table 3.21**. Source: Census 2011 Dhenkanal-District, State- Odisha; (* Total area is according to 2011 V.D)

Table 3.21: Distribution of population in the study area

Sl.No	Name of Village	Total Household	Demography								
			Total Population	Total Male	Total Female	Total SC	SC Male	SC Female	Total ST	ST Male	ST Female
1	Jaka	330	1,242	641	601	248	125	123	-	-	-
2	Patuapali	51	216	119	97	66	39	27	18	10	8
3	Sarakishorpal	280	1,195	596	599	351	183	168	65	28	37
4	Manikamara	416	1,858	937	921	459	219	240	217	106	111
5	Kadapada	275	1,234	640	594	277	145	132	165	82	83
6	Basulei	1,121	4,682	2,439	2,243	714	352	362	1,239	637	602
7	Akhupal	20	95	47	48	2	1	1	28	17	11
8	Rangathali	484	2,157	1,141	1,016	364	199	165	759	400	359
9	Mahanpasi	136	626	331	295	203	112	91	423	219	204
10	Domuhani	327	1,432	717	715	249	129	120	469	230	239
11	Kankadasoda	659	2,970	1,537	1,433	1,002	531	471	940	466	474
12	Gangadharpur	25	110	54	56	44	21	23	-	-	-
13	Ambapalas	680	3,187	1,639	1,548	230	123	107	1,108	554	554
14	Bansiballavpur	-	-	-	-	-	-	-	-	-	-
15	Kalada	343	1,549	773	776	223	117	106	32	15	17
16	Kandheikhol	223	1,010	499	511	177	88	89	-	-	-
17	Kulei	601	2,440	1,253	1,187	435	224	211	42	19	23
18	Jharana Bahali	106	424	214	210	50	23	27	49	23	26
19	Raghunathapur	116	485	250	235	97	49	48	170	83	87
20	Gengutia	145	626	301	325	152	68	84	-	-	-

21	Khalapal	673	2,336	1,233	1,103	628	344	284	44	26	18
22	Kualo	980	4,127	2,048	2,079	598	284	314	161	89	72
23	Pitiri	294	1,162	619	543	82	43	39	-	-	-
Sl.No	**Name of Village**	**Total Household**	**Demography**								
			Total Population	**Total Male**	**Total Female**	**Total SC**	**SC Male**	**SC Female**	**Total ST**	**ST Male**	**ST Female**
24	Odasinga	97	386	196	190	73	37	36	97	52	45
25	Jatia	428	1,948	1,008	940	369	194	175	47	21	26
26	Damol	459	1,953	996	957	333	165	168	7	5	2
27	Golagadia	2	4	2	2	-	-	-	-	-	-
28	Gaudakateni	63	350	177	173	-	-	-	-	-	-
29	Gauda Munda	-	-	-	-	-	-	-	-	-	-
30	Gehleikateni	322	1,333	679	654	136	61	75	-	-	-
31	Naupal	262	1,085	568	517	429	221	208	84	47	37
32	Mundeilo Balabhadrapur	229	1,016	523	493	133	69	64	177	92	85
33	Hatiluchani	64	230	127	103	-	-	-	61	33	28
34	Brahmanbedia	127	577	298	279	48	25	23	-	-	-
35	Salapada	58	197	107	90	144	78	66	-	-	-

Table 3.22: Distribution of Literacy and Worker population in the study area

Sl.No	Name of Village	Literacy						Worker							
		Total Literate	Male Lit	Femal e Lit	Total Illeterate	Male Illet	Femal e Illet	Total Worker	Total Main Worker	Main Cultivator	Main Agr. Lab	Main HH worker	Main Other Worker	Total Marginal Worker	Total Non Worker
1	Jaka	928	547	381	2579	1088	1491	3622	1365	629	363	44	329	2257	2082
2	Patuapali	155	88	67	196	92	104	220	48	22	0	7	19	172	172
3	Sarakishorpal	824	461	363	260	101	159	203	91	13	47	0	31	112	232
4	Manikamara	1,215	671	544	0	0	0	2	2	0	2	0	0	0	0
5	Kadapada	729	411	318	660	243	417	1127	117	14	19	2	82	1010	1153
6	Basulei	3,070	1,764	1,306	1158	444	714	1377	1028	265	295	38	430	349	2974
7	Akhupal	63	34	29	0	0	0	0	0	0	0	0	0	0	0
8	Rangathali	1,333	792	541	333	149	184	353	188	33	1	5	149	165	691
9	Mahanpasi	260	174	86	0	0	0	0	0	0	0	0	0	0	0
10	Domuhani	867	503	364	3	2	1	7	4	0	0	1	3	3	7
11	Kankadasoda	1,905	1,101	804	48	25	23	156	88	18	26	26	18	68	260
12	Gangadharpur	74	40	34	142	56	86	367	267	12	5	41	209	100	777
13	Ambapalas	1,912	1,105	807	368	150	218	528	435	75	77	33	250	93	1045
14	Bansiballavpur														
15	Kalada	1,045	589	456	19	10	9	78	74	2	1	19	52	4	125
16	Kandheikhol	750	416	334	0	0	0	0	0	0	0	0	0	0	0
17	Kulei	1,778	992	786	221	96	125	294	231	65	17	3	146	63	477
18	Jharana Bahali	320	181	139	18	6	12	34	33	2	0	17	14	1	75

19	Raghunathapur	305	188	117	375	154	221	509	404	73	31	74	226	105	981
20	Gengutia	449	247	202	364	158	206	408	223	49	2	13	159	185	938
21	Khalapal	1,741	985	756	197	89	108	329	280	32	45	29	174	49	619
22	Kualo	3,036	1,649	1,387	974	424	550	1618	723	204	81	35	403	895	2054
23	Pitiri	885	503	382	923	342	581	847	425	50	160	22	193	422	1608
24	Odasinga	279	160	119	186	89	97	91	41	37	0	0	4	50	228
25	Jatia	1,527	837	690	507	213	294	547	485	135	19	5	326	62	1106
26	Damol	1,371	757	614	1068	439	629	1110	745	40	200	53	452	365	2431
27	Golagadia	4	2	2	922	328	594	1196	693	101	76	25	491	503	1948
28	Gaudakateni	258	144	114	276	119	157	340	295	15	0	1	279	45	653
29	Gauda Munda														
30	Gehleikateni	932	493	439	79	35	44	143	68	40	10	7	11	75	143
31	Naupal	691	398	293	603	279	324	790	727	122	40	9	556	63	1692
32	Mundeilo	766	419	347	105	34	71	152	81	54	19	0	8	71	124
33	Hatiluchani	188	109	79	76	32	44	76	60	9	41	1	9	16	112
34	Brahmanbedia	429	255	174	120	55	65	117	47	1	43	0	3	70	140
35	Salapada	124	78	46	298	138	160	236	173	38	111	1	23	63	640

Table 3.23: Summary of demographic Structure in the Study Area

Sl. No.	Demographic Parameters	Village Details 10 Km Radius
1.	Name of States	Odisha
2.	Name of District	Dhenkanal
3.	No of Total Villages in Parjang Tehsil	35
4.	Total No. of Households	10,817
5.	Total Population	46,676
6.	Sex ratio (No. of Female/1000 Males)	946
7.	Scheduled Castes	10,079
8.	Scheduled Tribe	5,137
9.	Literate	30,782
10.	Main Worker	10,287
11.	Marginal Worker	28,364
12.	employment	39%

***Source:** Primary Census Abstract– 2011, Dhenkanal-District, State- Odisha*

CHAPTER – IV

Anticipated Environmental Impact & Mitigation Measures

4.1 Objective & Methodology of Impact Prediction

4.1.1 Objective of Impact Prediction

Through this EIA/EMP Report, an attempt has been made to identify and list all possible aspects, which could generate significant impact on different environmental attributes during various phases of implementation of the Project. Some of these impacts are less threat or insignificant and don't need further analysis. The objective is to identify and list only the significant impacts, which shall require detailed analysis to the extent of decision-making purposes. The major construction activities will be of short duration and will have very few lasting impacts. The operation will have the potential of major impacts, which has been analyzed in detail. Based on the impacts identified, most affected environmental attributes have been considered for detailed evaluation.

4.1.2 Methodology of Impact Prediction for various Components

The impacts are identified based on the possible worst-case emission, effluent discharge, and solid waste generation from the project and also taking into consideration the baseline environmental status of the project site. All the potentially significant environmental impacts from the project are:

- Impacts on-air environment.
- Impacts on the water environment.
- Impact on Soil/Land.
- Impacts of disposal of solid wastes.
- Impacts on socio-economic condition.
- Impacts on flora & fauna.

The environmental impacts can be categorized as either primary or secondary. Primary impacts are those, which are attributed directly due to the project and secondary impacts are those, which are indirectly induced. The project is likely to create impact on the environment in two distinct phases:

- During the construction phases, it may be regarded as temporary or short term effects.
- During the operation phase that would have long term effects.

4.2 Impacts of the project

After screening and scoping the identification of potentially significant environmental impacts constitute one of the preliminary steps of Environmental Impact Assessment (EIA). There are three principal methods for identifying environmental effects and impacts; these are checklists, matrices and flow diagram, overlays and geographic information systems, expert systems, etc.

This project pertains to capacity enhancement of Expansion of existing Integrated steel plant to final capacity of Sponge Iron– 3,72,900 TPA, Billets (Mild & Alloy Steel)- 2,70,000 TPA, Rolled Products – 2,70,000 TPA, Captive Power– 58 MW, Pellets– 8,00,000 TPA, Cement griding Unit – 4,16,000 TPA of M/s GM Iron & Steel Co, Limited Located at village Kulei, Parjang in Dhenkanal district.

M/s GM Iron & Steel Co, Limited endeavour is to create enduring value for customers and stakeholders in core manufacturing and service businesses, through world-class operating standards, state-of- the-art technology and the 'positive attitude' of their staff.
As such, detailed impact assessment studies and planning of appropriate control measures have been undertaken for this project.

Table 4.1 Impact assessment studies of various Environmental attributes

Activity	Environmental attributes	Cause	Impact characteristics			
			Nature	Duration	Reversibility	Significance, Mitigative measures
Site clearing	Air Pollution (Dust)	Excavation of the area	Direct Negative	Short Term	Reversible	Insignificant. Personnel Protective Equipment (PPE) shall be used.
	Noise Pollution	Noise generation from earth moving equipment	Direct Negative	Short Term	Reversible	Insignificant. Personnel Protective Equipment (PPE) shall be used.

Activity	Environmental attributes	Cause	Impact characteristics			
			Nature	**Duration**	**Reversibility**	**Significance, Mitigative measures**
	Land use	Change of Land use	Direct Negative	Long Term	Irreversible	Insignificant, As the proposed expansion shall be within the existing plant boundary.
	Ecology	Removal of vegetation and loss of flora & fauna	Direct Negative	Long Term	Reversible	Insignificant, No cutting of trees involve
Transportation of construction on materials to site	Air Pollution (Dust)	Transportation of construction material in trucks	Direct Negative	Short Term	Reversible	Medium, Water sprinkling shall be practiced.
	Air Pollution (Gases)	Transportation of construction material in trucks	Direct Negative	Short Term	Reversible	Medium, Regular emission checks shall be performed.
	Noise Pollution	Noise generated from vehicles	Direct Negative	Short Term	Reversible	Insignificant, Regular vehicle maintenance shall be done.
Construction activities / laying of roads	Air Pollution (Dust & Gases)	Operation of construction machinery, welding & others	Direct Negative	Short Term	Reversible	Medium. PPE shall be provided to workers
	Noise Pollution	Generation from construction activities and use of earth moving machineries	Direct Negative	Short Term	Reversible	Insignificant. PPE shall be provided to workers
	Water Pollution	Use of water in various construction activities and surface run-off	Direct Negative	Short Term	Reversible	Medium. Water to be routed through collection drains to settling tank/treatment unit and reused for various purposes.
	Land use	Setting up of project	Direct Negative	Short Term	Reversible	Insignificant, no major change in land use.

Activity	Environmental attributes	Cause	Impact characteristics			
			Nature	Duration	Reversibility	Significance, Mitigative measures
	Ecology	Loss of vegetation	Direct Negative	Short Term	Reversible	Insignificant, No cutting of trees. Green belt development is envisaged.

Table 4.2: Impact assessment studies of various Environmental attributes for Constructional Phase

Activity	Environmental attributes	Cause	Impact characteristics			
			Nature	Duration	Reversibility	Significance, Mitigate measures
Transportation of the Coal, Iron ore & Other raw materials from source						
Transportation Iron ore - Raw material Unloading, Handling & storage	Air Pollution (Dust Emission)	Transportation of RM to the Site.	Direct Negative	Short Term	Reversible	Insignificant, As there is good connectivity with SH in vicinity and captive railway siding
	Air Pollution (Dust Emission)	Unloading of RM, handling and storage in yard or covered shed.	Direct Negative	Short Term	Reversible	• Low. Unloading will be done in covered area or bunkers/hoppers fitted with mist sprinklers/ dry fog system. • Water sprinkling and proper usage of the PPE by the workers in dust emission areas.
Operation: Raw material preparation & charging in various units of the Plant						
Handling of raw material & Charging of Raw material	Air Pollution (Dust Emission)	Handling of RM for charging to beneficiation circuit.	Direct Negative	Short Term	Reversible	Moderate. Process will be done in covered area and stored in hoppers - fitted with mist sprinklers / dry fog system and proper usage of the PPE by the workers in dust emission areas.
Operation: Processing for manufacture of products in various units of the Plant						

Activity	Environmental attributes	Cause	Impact characteristics			
			Nature	Duration	Reversibility	Significance, Mitigate measures
Beneficiation of the iron ore in the plant	Water Pollution	Use of water – 1118 m^3/hr for beneficiation plant	Direct Negative	long term	Irreversible	Significant. Water to be kept in closed circuit through ETP.
Operation: Handling of solid & other waste in various units of the Plant						
Solid waste from **beneficiation plant**	Land / Soil Pollution	Handling, pumping and disposal of solid wastes	Direct Negative	Long term	Irreversible	Significant. Disposal of tailings in tailing pond.
DG Set						
Operation of the DG Set	Air Pollution,	Flue gas emission	Direct Negative	Short Term	Reversible	Low. The DG will be operated in case of power failure only. Green DG sets shall be installed.
	Noise Pollution	Generation of noise during DG Set operation				Low. The DG Sets will have acoustic enclosure to minimize the noise.
Domestic Waste						
Operation and of Domestic utilities	Water Pollution	Operation of Washroom, toilets – Wastewater generation	Direct Negative	Long Term	Reversible	Sewage to be treated in STP. Part of sewage disposed into septic tank and soak pits. No discharge from Soaking Pits
Green Belt Development						
Development and maintenance of Green Belt	Reduction in Air Pollution and Noise Pollution	Plantation of trees within premises. to cover 34% of the area	Direct Positive	Long Term	Reversible	Positive Impact due to development of a proper green belt along the periphery of the premises. This will act as barrier for air emission and noise
Socio-economic Development						

Activity	Environmental attributes	Cause	Impact characteristics			
			Nature	Duration	Reversibility	Significance, Mitigate measures
Employment Generation			Direct Positive	Long Term	Irreversible	Positive Impact due to direct employment of persons from the nearby areas.
						Substantial benefits in the form of contracts to local agencies for different services.
						Employment generation in transport sector for transportation of raw material and products

4.2.1 Impacts due to Project Location

The primary function of an environment impact assessment study is to predict and quantify the magnitude of these impacts, evaluate and assess the importance of the identified changes, present information and monitor actual changes. Environmental impacts could be positive or negative, direct or indirect, local or regional and also reversible or irreversible.

The activities of the project are studied. The impacts of various activities of the proposed expansion project are identified and presented as matrix in **Table- 4.1**. Further the characteristics of these impacts have been evaluated and they are presented as matrix in **Table- 4.3**

Table 4.3: Impact Identification Matrix

Sl. No	Activities	Environmental Attribute						
		Air	Noise	Water	Land & Soil	Ecology	Socio Eco	Aesthetics
Construction phase								
1.	Site clearing	x	x		x	x		
2.	Storage of Raw materials	x		x	x			x
3.	RMC/concrete preparation	x	x		x			
4.	Transportation of raw materials	x	x				√	
5.	Construction activities	x	x	x	x	x	√	x

Sl. No	Activities	Environmental Attribute						
		Air	Noise	Water	Land & Soil	Ecology	Socio Eco	Aesthetics
6.	Laying of roads	x	x		x	x	√	
Operational phase								
1.	Operation of iron ore beneficiation plant	x	x	x	x			x
2.	Operation of raw material Handling & charging sections	x	x	x	x			x
3.	Handling of products			x	x			
4.	Operation of Domestic utilities			x				
5.	Operation of the DG	x	x		x			
6.	Storage facilities of raw materials	x		x	x			
7.	Development of greenbelt					√	√	√
8.	Employment generation						√	

4.2.2 Impacts due to Project Design

It is an Expansion project which presently is working & wants of environment clearance. As such, detailed impact assessment studies and planning of appropriate control measures have been undertaken for this project.

4.3 Impacts on Air Environment

4.3.1 Ambient Air Quality Modeling

Selection of Pollutants for Air Dispersion Modeling

Emission of NOx & CO generation has been considered Air pollutants for dispersion modeling. Hence based on the above discussion and considering ambient air quality of the study area, NOx & CO emission has been considered as critical pollutant for dispersion modeling.

Modeling is carried out for plant emission. Incremental pollution because of the plant operation is added to the back ground pollutant concentration to calculate the resultant pollution level in the operation phase. Details of the modeling are described below.

Prediction of impacts on Air Environment has been carried out using Mathematical model based on a steady state Gaussian Plume Dispersion Model designed for Point Sources.

4.3.2 Dispersion Air Modeling

The mathematical model used for prediction of impacts on air environment in the present studies is the ISCST3 model, which is based on the straight line steady state Gaussian Plume Dispersion Model developed and approved by USEPA and MoEF, Govt. of India. The parameters for which the Ground Level Concentrations predicted are NOx & CO.

A study area within a radius of 10 km around the project area is taken into consideration to compute the incremental ground level concentrations (GLC) of NOx & CO from the Modeling study. These incremental values are added to the back ground GLC to know the resultant conc. after implementation of the project.

In the present case Gaussian Dispersion model, applicable to industrial sources located on flat as well as undulated terrain has been applied for prediction on impacts on air environment. This model has been developed to simulate the effect of emissions from the plant on the neighborhood air quality.

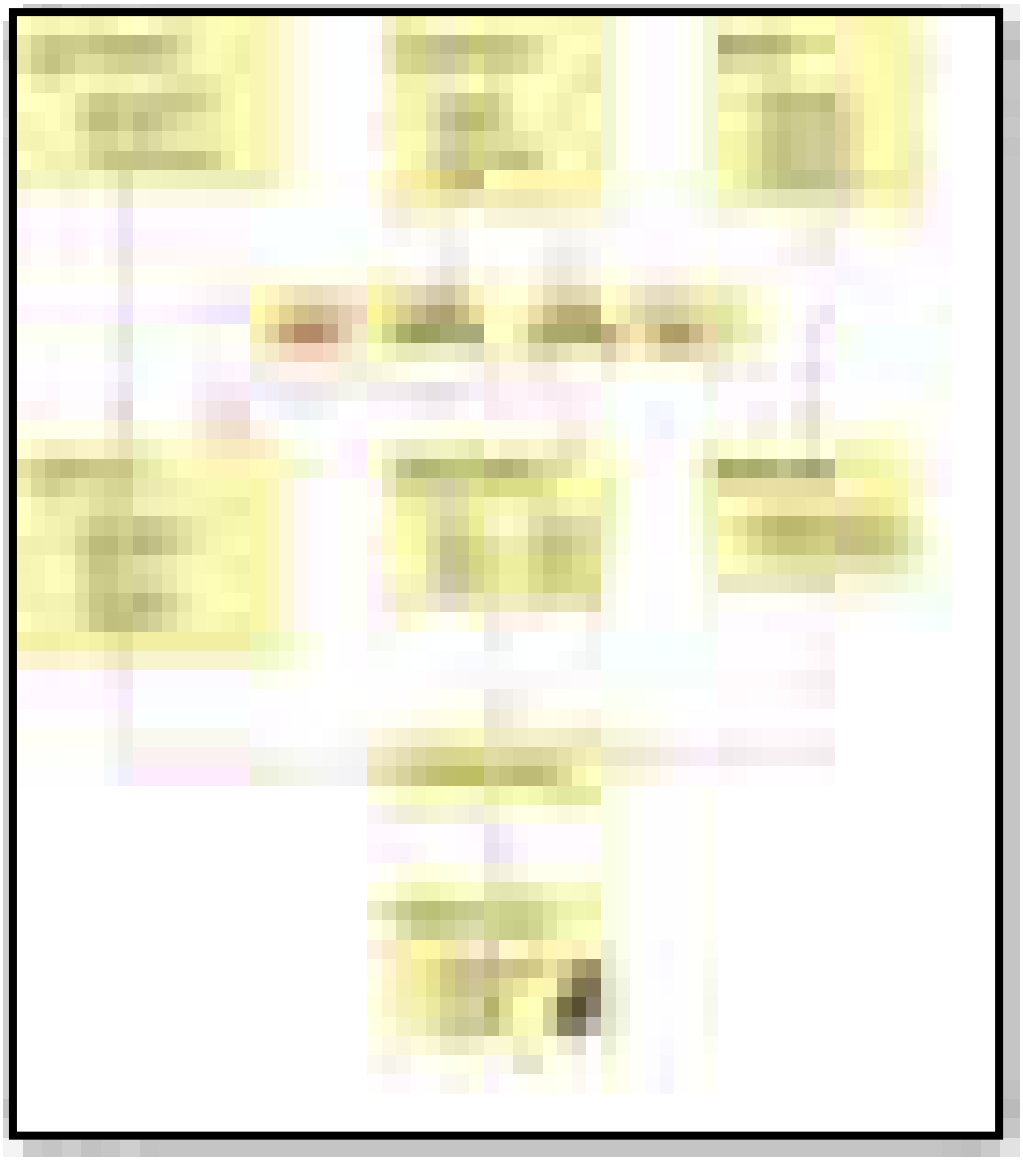


Figure 4.1: Air Modelling Flow Chart

Emission Source Coordinates

The center is considered (0, 0) in the Mathematical Modeling.

Mathematical Model for Pollutants Dispersion Model Set-up

The model simulations are done for the air pollutant arising from the operations, namely PM_{10}, $PM_{2.5}$, SO_2, &. NO_X **Ground Level Concentration (GLC)** have been computed using hourly meteorological data. The model set-up details are presented in below:

- **Parameter Details**

Model Name: AERMOD (Version 9.6.1)

Model Type: Steady state Gaussian Plume Air Dispersion model

Averaging Time 24 hours

Source Type: Point Source

Boundary Limits: 10 km X 10 km

Co-ordinate System: Uniform Cartesian Grid

Anemometer: 10 m

❖ **Model Input Data**

The major emission generating sources from Stack generated dust and wind erosion. Emission rates have been used as input for the modeling study, which are given in following **Table 4.1**

Table 4.4: Mixing Height in Winter Season, Odisha

Hours	Morning Mixing Height (m)	Afternoon Mixing Height (m)
7	24	47
8	73	106
9	224	274
10	418	518
11	739	839
12	937	1058
13	1008	1155
14	1114	1226
15	1105	1221
16	1039	1145
17	838	967
18	588	873
19	361	453

Source- *Envitrans*

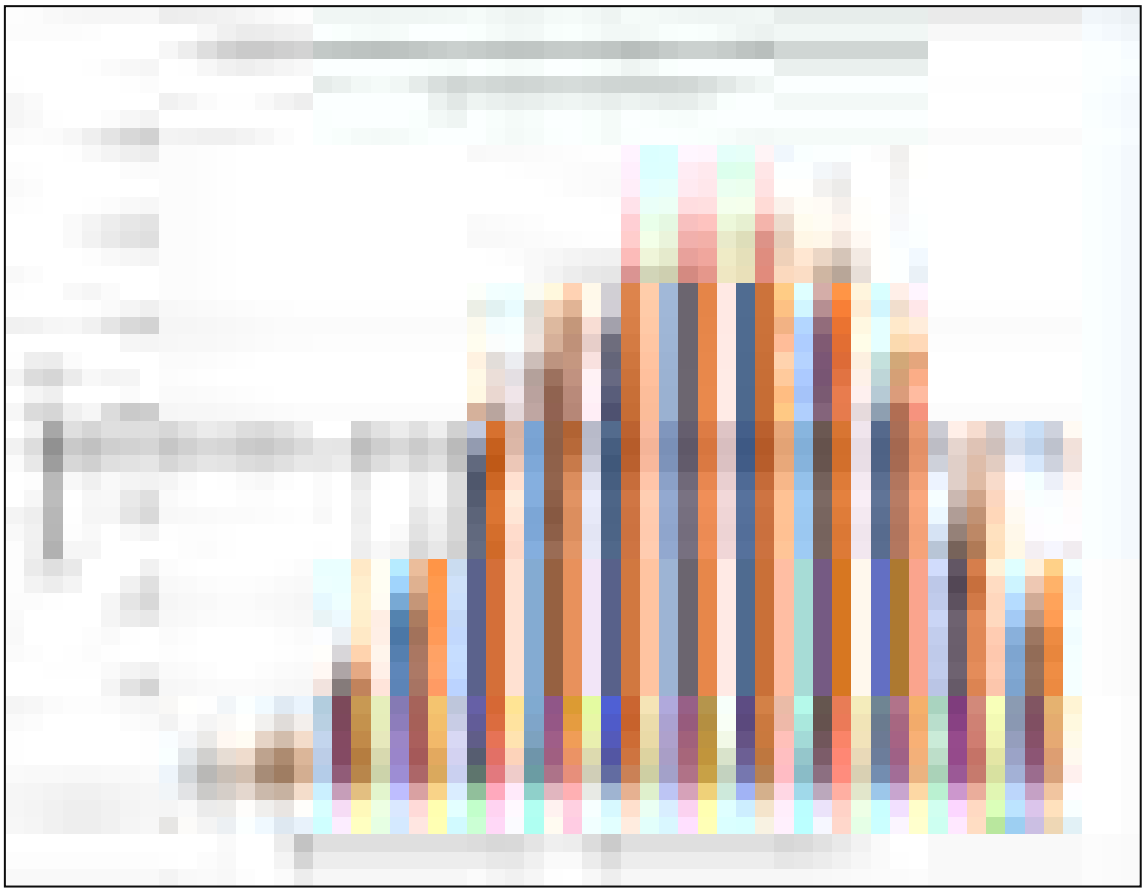


Figure 4.2: Graph Showing Mixing Height in Winter Season

4.3.2.1 Selection of Pollutants for Air Dispersion Modeling

Considering ambient air quality of the study area, PM_{10}, $PM_{2.5}$, SO_2 & NOx emission has been considered as critical pollutants for dispersion modeling. Modeling is carried out for plant emission. Incremental pollution because of the plant operation is added to the back ground pollutant concentration to calculate the resultant pollution level in the operation phase.

4.3.3.2 Dispersion Modeling

The mathematical model used for prediction of impacts on air environment in the present studies is the AERMOD (ISCST3 run) model, which is based on the straight line steady state Gaussian Plume Dispersion Model developed and approved by USEPA and MoEF&CC, Govt. of India. The parameters for which the Ground Level Concentrations predicted are PM_{10}, $PM_{2.5}$, SO_2 & NOx. A study area within a radius of 10 km around the project area is taken into consideration to compute the incremental ground level concentrations (GLC) of PM_{10}, $PM_{2.5}$, and SO_2 & NOx from the Modeling study. These incremental values are added to the

back ground GLC to know the resultant conc. after implementation of the project.

In the present case Gaussian Dispersion model, applicable to industrial sources located on flat as well as undulated terrain has been applied for prediction on impacts on air environment.

Predictive GLCs are calculated by using meteorological data collected at site during the monitoring period. GLC have been assessed at every 2000 m grid points. Predominant wind directions are mainly from NW (1st Pre-dominant Wind Direction) followed by NE (2nd predominant wind direction).

Emissions for each source are apportioned and the impact on air quality from the activities is assessed by computing concentrations of air pollutant concentrations at several environmental receptors within the study area.

Figure 4.4: Incremental Ground level Concentration of $PM_{2.5}$

Figure 4.5: Incremental Ground level Concentration of PM10

Figure 4.6: Incremental Ground level Concentration of NOx

Figure 4.7: Incremental Ground level Concentration of SO_2

4.3.3 Findings of Model Study

All major project components as potential source of emission were considered in determining the impacts in the plant. The predicted impacts are discussed in the following sections: The computed ground level concentrations (GLCs) for PM_{10} at various receptor locations after implementation of the project are presented in the following **Table No .4.5** and Isopleths of the pollutant concentration are shown in Figures (**Figure No.- 4.3 to 4.6**)

The post-project Resultant Concentrations of PM10, PM2.5, SO2 & NOX (GLC) after adopting necessary control measures is given in Table below:

Table 4.5: Incremental & Resultant GLC with Control (Post Project)

4.4 Impact on Noise Environment

4.4.1 Construction Phase

Impacts

The major activities which are likely to increase ambient noise levels during construction phase are foundation work, fabrication of structures, operations of construction equipment and movement of vehicles.

The study area is likely to experience increment in ambient noise level due to the above-mentioned activities. The areas affected will be those which are closer to the site. However, as there are no settlements in the immediate vicinity of the plant, the impact of noise will be negligible.

Mitigation measures

- Noise generating equipments will be used during day time.
- All the vehicles entering into the project site will be informed to maintain speed limits and not to blow horns unless it is required.
- The workers involved in operating major noise generating equipments will be provided with personal protective equipment like ear plugs/ear muffs etc.

4.4.2 Operation Phase

During the normal operation of various plants the ambient noise levels are expected to increase significantly with the attributes of the respective equipment, but this noise will be restricted close to the concerned equipment. Normally the equipments are designed based on the OSHA standards and noise close to this equipment seldom exceeds the OSHA standards. Therefore all the equipment in the plant will be designed/operated in such a way that the noise level shall not exceed 75 dB (A) as per the requirement of OSHA (Occupational Safety and Health Administration).

Table 4.6: Permissible Exposure Noise Limit

Total time of exposure per Day in hour	Sound Pressure level in dB(A)
8	90
6	92

4	95
3	97
2	100
1	105
½	110
1/4	115

**** Source: OSHA Standard***

Mitigation Measures

- The noise level within the plant boundary will be occupational noise and will be confined within the shops.
- Proper noise barriers/ shields etc shall be provided in the equipment wherever required;
- Thick green belt will be developed to attenuate the noise level outside the plant area.
- All workers exposed to high noise levels will be provided with personal protective equipment like ear muffs, ear plugs, etc;
- Noise from equipment shall be adequately attenuated by providing insulation to minimize the noise emission and acoustic enclosures;
- After implementing mitigation measures, noise level will be controlled with the permissible norms.

4.4.3 NOISE MODELING FOR PLANT MACHINERY

The impact of noise level from a continuous stationary noise source at observer's place can be predicted considering the hemispherical propagation of sound waves, which is represented by the following equation as follows:

$$\mathbf{A_{div} = 20 \times Log_{10}(d/d_0) - 10 \times Log_{10}(Q)\ dB}$$

Where,

A_{div} is the sound pressure level attenuation due to geometric divergence.

d is the distance from the source to receiver in metres.

d_0 is the reference distance (= 1m).

Q is the directivity

- Absorption in Air
- Effect of rain, snow and fog

- Reflections and refractions at barriers and buildings
    - Effect of the terrain, grass, shrubs, trees etc.
    - Effect of wind and temperature gradient

The absorption of the sound is generally a complex phenomenon. In general, for homogeneous loss in free atmosphere Ae = 0.

Also the cumulative impact of multiple stationary noise sources can be predicted (through hemispherical wave propagation) at a particular place by:

The main noise generating sources from plant will be vertical roller mill, crushers, pumps etc.. The noise levels at the source for these units will be in the range of 80-90 dB(A).

4.4.4 Construction Phase

The major activities which are likely to increase ambient noise levels during construction phase are foundation work, fabrication of structures, operations of construction equipment and movement of vehicles. The study area may likely to experience increment in ambient noise level due to the above- mentioned activities. The areas closer to the site will have slight increase in noise level. However, as there are no settlements in the immediate vicinity of the plant, the impact of noise will be negligible. Nearest habitation from plant, which will not be affected by noise level due to the plant.

4.4.5 Operation Phase

During the normal operation of various plants the ambient noise levels are expected to increase significantly with the attributes of the respective equipment, but this noise will be restricted close to the concerned equipment. Normally the equipment are designed based on the OSHA standards and noise close to this equipment seldom exceeds the OSHA standards. Therefore, all the equipment in the plant will be designed/operated in such a way that the noise level shall not exceed 75 dB (A) as per the requirement of OSHA **(Occupational Safety and Health Administration).**

4.5 Mitigation Measures for Noise Environment

4.5.1 Construction Phase-Noise Control

- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.

- All the vehicles entering into the project site will be informed to maintain speed limits and not to blow horns unless it is required.
- The workers involved in operating major noise generating equipment will be provided with personal protective equipment like ear plugs/ear muffs etc.
- Construction equipment will be properly lubricated to minimize the noise level.

4.5.2 Operation Phase- Noise Control

- Isolation/Insulated enclosures for equipment generating high noise.
- Improved silencers within the equipment generating high noise, wherever possible.
- proper and secured mountings of continuously vibrating structures/ machines by
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Personal Protective Equipment (PPEs) like earplugs and earmuffs will be provided to the workers exposed to high noise level.
- Greenbelt of appropriate width will be developed inside the project premises and at the project boundary.
- Regular monitoring of noise level will be carried out and corrective measures will be adapted accordingly.

4.6 Impact on Land Environment

With land development and leveling, the site may have better landscape. However, this is restricted only to the factory boundary and within factory shed. It will be replacement of existing machinery. Hence there will be no change in land use pattern or soil quality.

4.6.1 Construction Phase

Construction activities for the proposed development can have minor impact on hydrology and ground water quality of the area if the construction waste leaches into the ground water source. Potential sources of impacts on the hydrology and ground water quality during the construction phase are as follows:

- Soils runoff from the site leading to off-site contamination (particularly during rainy season).

- Improper disposal of construction debris leading to off-site contamination of water resources.
- Spillage of Oil and grease from the vehicles and waste water generated on site activities such as vehicles washing, workshop etc.

4.6.2 Operation Phase

Brahmani river 0.90 km (SW) passing through the project site. The total project area is 106.50 acres (43.099 Ha.) Existing Plant area – 58.20 acres and additional land requirement – 48.30 acres. Total Forest land 29.29 acres from which existing 9.10 acres and Proposed 20.19 acres land. About 35.20 acres (33.05%) of the total project area will be covered under green belt & plantation.

4.7 Mitigation Measures for Land Environment

Following precautions and preventive measure will be taken at the site during construction to avoid any ground and surface water contamination.

- Not allowing water to leave the construction site.
- Disposal of construction debris in designated areas and reusing it.
- Construction of storm water diversion channels to divert storm runoff from flowing over the construction areas.
- Installing oil and grease traps in construction workshop and vehicle parking areas.
- Due to civil construction activities, during rainy season the surface run off may contain more of eroded soil and other loose matter. Construction activities will be avoided during rainy days to mitigate the small impacts on soil quality caused due to construction activity.
- With segregation of construction area and proper drainages provided prevents the contamination of water due to soil erosion.
- Discharge of untreated or inadequately treated wastewater effluent to canals and drains with resulting effects on water quality and potential adverse effects on crops and human health.

- Disposal of solid waste, particularly that containing toxic or otherwise harmful compounds with resulting detrimental effects on amenity, water quality and land quality, and potential adverse effects on crops and human health.

The land at site is fairly level as it is running plant, as such no leveling is required. No additional land required for expansion. In view of this no deterioration of the existing conditions will occur. Natural drainage will not be disturbed. Solid waste from construction activities will be used within the premises under roads & refilling. The area being very small there will not be any significant impact on land.

4.8 Impact on Water Environment

4.8.1 Construction Phase

Total quantity of water 2,890.8 m^3/day will be required during construction period. Stagnant pools of water would promote breeding of mosquitoes and generally create unsanitary conditions. However, adequate arrangements would be made to ensure proper drainage of wastewater from the construction sites, so that such waters do not form stagnant pools nor aggravate soil erosion.

The waste water during construction will contain only suspended impurities. This water would be passed through settlement ponds and recycled for use in gardening and other non-consumption activities. During monsoons, the water will be discharged to the nearest drain after passing the waste-water through settlements.

4.8.2 Operation Phase

Impacts

- In the construction phase, there will be generation of waste water for which suitable management has to be adopted.
- The treated water will be generated from Clariflocculator, which will be used in greenbelt development and dust suppression.
- The run-off rain water from the raw material stock pile area should be guided to a water harvesting pond through de-silting pits. Area has been allocated for Rain water storage pond and pump house. Rain Water Harvesting system with construction of

ancillary structures and ground water recharge wells should be done to conserve water resource.

- Development of 106.50 acres (33% total land of 35.20 Acres) of land has been planned to keep the environment clean.
- Even though the company shall not draw Ground Water, suitable water conservation measures will be implemented in the plant to improve the Ground Water resources of the area.
- Outlet of STP shall meet the norms of CPCB/ MoEF &CC.

4.9 Mitigation Measures for Water Environment

- Installation of water conservation.
- Urinals to reduce flushing demand.
- STP treated water to be used in plantation/ & make up for C.T.
- Reheating furnace will be used occasionally to reduce C.W demand.
- Push type drinking water taps to be used in place of convention taps.

4.9.1 Construction Phase- Control of Water pollution

Source	Impact	Mitigation
Leaching of industrial Waste Water.	Groundwater contamination	• After expansion Industrial waste generation 2955 m3/day which will be treated through STP. • The Storage tank and pipelines will be properly maintained to avoid any leakages.
Industrial Waste Water	Surface water contamination	All the pipelines carrying domestic and industrial water will be checked regularly for leakages.

Increase in water drawl use for Industrial purpose.	Effect on Ground water level	Groundwater will be recharged through rainwater harvesting. Waste water will be used for plantation after treatment through STP.

4.9.2 Operation Phase- Control of Water Pollution

- Installation of water conservation.
- Urinals to reduce flushing demand.
- STP treated water to be used in plantation/& make up for C.T.
- Reheating furnace will be used occasionally to reduce C.W demand.
- Push type drinking water taps to be used in place of convention taps.

4.10 Impact on Soil Environment

4.10.1 Construction Phase

During construction phase, excavated soil, construction debris, metal waste, oil & grease from construction machinery and equipment will be generated. If not managed properly may lead to degradation of soil in the project premises. Also, during transportation of construction material the re-entrained dust may settle on the land area besides the road and may lead to change in soil quality.

4.10.2 Operational Phase

The soil of the area will get affected due to operational activities, if proper care will not be taken.

i. Changes in soil texture due to settling of air borne dust or due to wash off of solid particulates by surface water. This will lead to change in porosity, permeability and other physical characteristics of soil of the area.
ii. Changes in soil chemistry due to addition of foreign material from polluted air and water due to plant activities in the area.

4.11 Mitigation Measures

But proper mitigative measures like use of efficient pollution control systems, proper stack height, and use of top soil in plantation results in no significant impact on soil of the core zone. There will be no impact on soil of the study area located beyond the working area of the project. Soil samples will be collected and tested at regular intervals from the nearby areas. This will help in mitigation of any harmful impact on soil due to the project activity, if any.

4.12 Solid Waste Management

4.12.1 Construction Phase

Impacts

During construction phase, solid waste i.e. Excavated soil, construction debris, metal waste, oil & grease from construction machinery and equipment will be generated. Certain hazardous wastes such as used oil, lubricants and used containers will be generated.

Mitigation Measures

- Generated top soil will be partly used for levelling and remaining will be stored for utilisation in plantation.
- The waste generated will be dumped intermittently in side plant premises for other use.
- On completion of civil work, all debris etc. will be completely removed from site to avoid any incompatibility with future use.
    - Litter, fuel /oil drums, used grease containers would be collected and removed properly, and dust bins shall be placed at requisite Locations.
    - Other waste material like waste oil, paints, diesel etc. will be properly stored and handled to prevent any spillage on land & ground water contamination.
    - All oily waste collected will be stored on impervious floor under covered sheds and subsequently disposed as per the provisions of the Hazardous & Other waste (Management, & Tran boundary movement) Rules 2016 and amendments thereafter.
    - Sewage Sludge generated from Soak Pit/STP will be used as manure.

4.12.2 Operation Phase

Impacts

The solid waste management & disposal is really a hard task. Comprehensive EMP is required for maximum reuse and recycling of the wastes so that considerably less amount solid waste, non-polluting in nature will be disposed in land fill.

The wastes generated from the plant are segregated into Non Hazardous and hazardous wastes.

Non Hazardous Waste

The main solid waste generated from the plant is fugitive dust collected from various pollution control devices. The solid waste from STP which will be used as manure for green belt. Hence no solid waste for disposal is available in the plant.

Domestic Waste

- The generated solid wastes are segregated in biodegradable parts.
- The biodegradable waste will be composted and used as manure.
- Other non-biodegradable waste will be sent to landfill.
- Sludge generated from the STP shall be used as manure for plantation.

Hazardous Waste

- Used lubricating oil will be used for scraper/screw conveyors internally and the balance quantity will be sold to authorized recyclers.
- Waste grease will be sold to the approved recyclers.
- Lead acid batteries will be disposed to authorized reprocesses.

Mitigation Measures

The quantities of solid wastes generated from different sections during operation of plant and their disposal/recycling/ utilization has been/ shall be as per given hereunder:

- No solid waste will be generated in manufacturing process.
- Dust collected from Air Pollution Control equipment shall be recycled in the process as per guidelines of CPCB and best practices adopted in the industries.

- Solid waste in the form of sludge generated from Water Treatment Plant, shall be used as manure for green belt development.

4.13 Impacts due Traffic & Its Management

Impact

- Generation of exhaust gases is likely during the pre-construction stage during movement of heavy machinery, tankers etc. This impact is envisaged to be insignificant during the pre-construction stage.
- High levels of SO_2, NO_2 and HC are likely from hot mix plant operations. Volatile toxic gases are released through the heating process during production. Although the impact is much localized, it can spread downwind depending on the wind speeds. Construction vehicles shall also be releasing exhaust gases.
- The major impact on air quality will be due to plying of vehicles. The impacts on air quality will at any given time depend upon traffic volume/ rate of vehicular emission within a given stretch and prevailing meteorological conditions. Air pollution impacts arise from two sources:

1. Inadequate vehicle maintenance and
2. Use of adulterated fuel in vehicles.

Mitigation

1. Regular maintenance and pollution check is proposed for construction vehicles and machineries
2. No bad quality fuel shall be used in construction vehicles and machinery
3. Broad leaved pollution resistant species, which can grow in high pollutant concentrations or even absorb pollutants, shall be planted as they help settle particulates with their higher surface areas along with thick foliage, which can reduce the distance for which particulates are carried from the road itself.
4. Other measures such as the reduction of vehicular emissions, ensuring vehicular maintenance and upkeep, educating drivers about driving behavior. However, these methods are beyond the scope of the project but will be far more effective in reducing

the pollutant levels. Project developer together with the Motor vehicles Department and SPCB can arrange for provision for inspection for PUC certificates at all the major junctions.

4.14 Impacts on Biological Environment

4.14.1 Construction Phase

Impacts

There is 29.29 acres forest land within the project site. The project site have 3 reserve forest inside 10 km buffer zone, Anantapur RF (7.30 km, North), Talcher Border RF (7.04 km, NNW) & Paturia RF (7.70 km, West). Brahmani River (0.90 km, SW) is crossing the project site. The plant site does not have any major vegetation as nearby soils are industrial built-up land. As construction activity will be confined within the project site for the plant, impact on the ecology will be minimal due to the project.

Mitigation Measures

Site development will not have any major impact on ecological environment. Also, the magnitude of construction work for project is small; hence impact on ecology will be insignificant. 33% of the total plant area will be developed as green belt for improvement of biological environment.

4.14.2 Operation Phase

Impacts- Core Area

- No major plant species are available within the site.
- Diversity value is almost nil within the core area.
- Forest land is involved in the project area (29.29 acres).

Impacts – Buffer Area

- Species Bio-Diversity is moderate.
- A greater number of successful species and a more stable ecosystem.
- More Ecological niches are available and the environment is less likely to be hostile.

- Complex Food Webs.

Environmental change is less likely to be damaging to the ecosystem as a whole.

Mitigation Measures -Core Area

- The maintenance such as suitable fencing, watering, replacement of dead plants etc. shall be done for better survival rate.

- Dust suppression shall be done by regular water sprinkling to minimize the impact on plants.

Mitigation Measures –Buffer Area

- As the bio-diversity index value is quite good in buffer area hence the project will have less impact on buffer area. However avenue plantation shall be done to increase the diversity in future.

- Entire wastewater from the process will be reused in the dust suppression & green belt development. Further, the storm water collected during rainy season will also be collected and used. In case of excess rain water, surface runoff after treatment will be discharged to outside after complying with the prescribed standards. Therefore, impact on flora and fauna due to waste water discharge is expected to be negligible.
- A thick green belt shall be developed along the plant periphery. This will act as noise barriers to reduce noise propagation from the plant site to the surrounding. This will be apart from the mitigation measures to be provided with the noise generating equipments and machineries.
- Illumination is necessary inside the plant from safety point of view. However, positioning of the lights shall be done in such a way that lighting will be focused within the factory area and impact to outside will be minimum.

4.15 Occupational Health & Safety Management

4.15.1 Construction Phase

Impacts

During construction, major risks to safety and health of workers are due to Dust, gas cutting, welding, bruises, cuts, and abrasions because of manual handling, accidents due to common

reasons like fall from height and entrapment of limbs in machinery.

GM Iron & Steel is committed to use best practices during construction and include occupational and safety aspects of workers in the tender itself. System for work permit system shall be implemented strictly and PPE for workers shall be made compulsory. Only trained workers shall be allowed for critical job works.

Presently, **GM Iron & Steel** is providing medical facility as per details given below:

Mitigation Measures

- Due care shall be taken to maintain continuous water supply in the water spraying system and all efforts will be made to suppress the dust generated by material/solid waste handling system by water spraying at appropriate points;
- Any worker found to develop symptoms of dust related diseases will be changed over to other jobs in cleaner areas;

General Safety Measures

- Shield guards or guard railings will be installed at all belts, pulleys, gears and other moving parts;
- Electrical equipments will be grounded, well insulated and conform with applicable codes;
- Employees will be provided with helmets, safety boots, eye and ear protection, and snug fitting gloves as appropriate;
- Masks and dust-proof clothing will be provided to personnel working in areas with high dust levels;
- Work permit system shall be strictly implemented; and
- Procedures will be strictly enforced for the storage, handling, and transport of explosives, flammable and hazardous materials.

General Health Measures

- Sanitary facilities will be well equipped with supplies and employees will be encouraged to wash frequently, particularly those exposed to dust, chemicals or pathogens;

- Pre-employment medical examinations of all personnel will be made mandatory for contractor.

4.15.2 Operation Phase

Exposure problems to noise, dust are the major occupational hazards. Noise induced hearing loss and dust related problems are the notified occupational hazard. The employees working in dusty environment will be subjected to regular health check-up. The workers will be diagnosed for respiratory functions at periodic intervals and during specific complaints for lung function test, sputum test, X-ray test, etc.

It will be ensured that workers are not exposed above the threshold noise limits prescribed by OSHA and Factories Act through suitable administrative controls. Personal Protective Equipment like earplugs and muffs will be provided and administrative pressure applied for using them. Auditory examination by qualified doctors upon the first employment and thereafter periodic examination will be conducted.

4.16 Socio-Economic Environment & Management

4.16.1 Construction Phase

Impacts

There will be no displacement of local population and consequently no need for any rehabilitation scheme. Rather, generation of employment potential direct or indirect will have beneficial effect on the local populace. Thus, general impact on local economy and quality of life is likely to be appreciably beneficial. But potential of local workers getting affected by dust laden atmosphere within the plant will be relatively high and may cause impact on the health status of the local populace, which will be taken care of in peripheral development and community welfare.

Employment

The labour strength (Approx. 842 nos) engaged in the construction will depend upon construction activities, since many items of construction are labour intensive. Most of the unskilled and semi-skilled labour (Approx 717 nos) will be by and large available from the nearby villages and towns. Thus, impact on the physical and aesthetic resources will be minimal. Further local skilled, semi skilled and unskilled labourers will get indirect

employment during the construction phase.

In addition to direct employment, several opportunities for locals will be available in terms of supply of construction materials & machinery, vehicles and other essential commodities.

Project will have positive impact on socio-economic status of the area because of following:

Preference will be given to locals for temporary direct and indirect employment;

- Local suppliers for machineries and construction materials will be given preference; and
- Local transporters will be preferred for transportation of machinery/ materials.

Mitigation Measures

- **GM Iron & Steel** shall also develop greenbelt in the adjoining roads & peripheral villages.
- Proper planning and communication with traffic police;
  - Advance notice to local administration about the activities;
  - Proper cordon off the site with sign boards;
  - Diversion of traffic, if required;
  - Placing the warning sign board on the vehicles during transportation of machinery and materials; and
  - Proper training to the drivers about public safety.

4.16.2 Operation Phase

Potential Impacts

- **Employment**

The operation of the unit will require skilled and semi-skilled workforce which may have to be imported from outside the study area. The migration of people will marginally increase the total population in the study area particularly in the peripheral zone.

Moreover, a sizeable number of service class people who are directly connected with the operating personnel of the plant, e.g. house servants, washer man, barbers, shopkeepers etc. will flow in from the neighboring areas. As the plant and its ancillary facilities will act as an

active nucleus of activity, a shift of population towards this centre will also occur within the study area.

- **Community Skills Development**

The employees will benefit from the training programmes that will be instituted by **GM Iron & Steel** to enable the community labour force to work in different areas. This training will increase the number of technicians, plant operators, electricians, and mechanics, among others, that will not only benefit the above mentioned plant but also the community at large during and after the service life.

- **Improved Standard of Living**

Employment opportunities created by this project will not only increase income but also improve the overall standard of living in the area.

- **Community Organizational Capacity Development**

Through engagement of community members in development structures such as Community Development Committees, the community organizational capacity will be developed.

Adverse Social Impacts

- **Population Influx**

Project will attract job seekers and other people who will come to the area to provide support services including traders, hoteliers, etc. The potential future population influx will add to the existing one in the area.

- **Health Impacts**

The project has the potential for triggering health impacts through water contamination, increased dust, creation of breeding grounds for disease viruses. Added to that, population influx may create inadequate sanitation facilities.

- **Livelihood Change**

Due to the labour intensity of the industry, it will attract more able-bodied persons from the community which in turn will lead to less of labour availability for other sectors of

the economy including agriculture, education, and health etc. However, employment opportunities created by the project would improve the living standards of the local people.

Quantitative Impacts

On the basis of field survey and discussion with the officials of the plant a quantitative analysis was made on employment.

Apart from contract laborers long-term employment of persons in operation of plant would be generated directly, which includes executives, Non-Executives, plant Workers and Administrative and supervisory staff.

Further is it assumed that this plant would prompt some ancillary industries in nearby areas like concrete building materials or blocks.

Besides this a general market comprising of restaurants, tea stalls, fast food shops would also come up. In this process indirect employment would be 4 times more than direct employment by the plant. All these economic activities would considerably uplift the socio-economic status of the local population in the plant area.

4.16.3 Mitigation Measures

- **Managing Price Inflation**

This impact can be mitigated by the project inducing development and production of goods and services to cater to the increased demand that will be created by the presence of the project and increased incomes. Some of the opportunities that could be explored include poultry farming, vegetable farming, carpentry, brick making, transport, bakery, recreational business, food vending, tailoring among others. **GM Iron & Steel** can support training and skills development, help women SHGs, business and infrastructure development, agricultural development and social and community development.

- **Mitigating Health Impacts**

An awareness programme on health hazards would be implemented to safeguard the employees as well as the local population‘s health. **GM Iron & Steel** can provide medical service to the villages in a better manner in association with government and local NGOs. This way health issues can be monitored and addressed.

4.17 End of Life

Impacts and Mitigation Measures

1. During closure of plant, surplus raw materials & products will be sold to outside parties which shall not cause any impact on environment.
2. 100% solid wastes will be reused/recycle during normal operation. Hence no solid waste will be left out during closure, which shall not cause any environmental impact.
3. 33% greenbelt area will remain as it is, even during plant closure. No watering and care is required due to grown up plants.
4. Plant & machineries will be supplied to prospective parties. They shall maintain & operate the plant again. No environmental impact is envisaged on this aspect.
5. Since use of water will be stopped during closure, waste water generation will be nil during post-plant closure period (i.e. post-end of life period of plant).
6. Noise generation will be completely nil during post-plant closure period.
7. No other hazardous impacts are envisaged during post-plant closure period.
8. Due to stoppage of plant operation, transportation etc, air pollution will be nil.

It is evident that industrial plant when comes to closure due to any reason, shall operate further by the same proponent or buyer of the plant. On worst case, if the plant & machineries are completely ruined/ worn out, these will be sold to different recycling parties/scrap dealers with marginal recovery of cost. Construction & Demolition (C&D) waste generated from the plant can be reused as per the guideline of C&D Waste Management Rules, 2016.

- Demolished concrete can be recycled as aggregate and used in concrete.
- Ferrous metals are most profitable and recyclable material. Scrap steel is almost totally recycled and allowed for repeat recycling. Structural steel can be reused can be recycled to avoid wastage. These ferrous metals will be sold to scrap metal dealer at a specified price. Metals like scrap iron can be mixed with metal in the foundry.
- Non-ferrous metals like aluminum and copper are recyclable and are valuable resources.
- Other plastic & debris can be disposed to authorized parties or municipality for further disposal.

4.18 Summary & Conclusion

Above table shows that impact on air quality and water quality needs to be properly tackled. Major reduction of impact will be obviously through properly designed pollution control system and avoidance of exposure of the workmen to pollutants. Further, medical care needs to be provided to prevent and diagnose the effect on the workers health.

CHAPTER - V

ANALYSIS OF ALTERNATIVES

5.1 ALTERNATIVE ANALYSIS

The project alternative is the course of action in place of another, that would meet the same purpose and need, but which would avoid or minimize negative impacts and enhance project benefits. Alternative approaches may therefore be more effective in integrating environmental and social concerns into the project planning process.

No alternate site has been considered as it is an expansion of existing Integrated steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets - 2,70,000 TPA, Rolling Mill – 2,70.000 TPA, Captive Power Plant – 58 MW, Pellets – 8,00,000 TPA, Slag Cement – 4,16,000 TPA. The selection of project site/location has been based on the following considerations:

a) Availability of adequate land for the proposed expansion plant. Total 106.50 acres land is required out of which Existing Plant Area – 58.20 Ac. & Additional land – 48.30 Ac.
b) Sources of supply of raw materials & their delivered cost.
c) Existence of rail & road connections in the vicinity for transportation of incoming & outgoing saleable materials.

5.2 SITE SELECTION ALTERNATIVES

Alternative analysis is the process of analyzing the proposed location for suitability for basic necessities to operate the plant safely and for any alternate technology. This analysis also covers the environmental aspect of pollution prevention and improvement in quality of life in the project vicinity. The project alternative is the course of action in place of another, that would meet the same purpose and need, but which would avoid or minimize negative impacts and enhance project benefits. Such projects may result in specific impacts which can be avoided or mitigated by adherence to certain predetermined performance standards, guidelines or design criteria. Alternative approaches may therefore be more effective in integrating environmental and social

concerns into the project planning process.

Since, the expansion project will be done in existing plant premises; hence no alternative site is considered for the expansion activity.

5.3 SELECTION OF TECHNOLOGY

5.3.1 Process Technology Alternatives

The existing technology used in the integrated steel Plant for manufacturing of sponge iron, steel Billets and Captive Power is one of the best and proven technologies. For Steel making Sponge iron from DRI undergoes Induction Furnace, Ladle Furnace and Continuous casting machine resulting in the production of M.S. Billets. Pelletization plant will be established based on the basic principle of Raw material preparation, Pelletizing disc and Induration and cooling. It is based on the proven technology. Hence, no alternative technology has been explored.

5.3.2 Selection of Process Technology

The technical concept of the plant has been developed keeping in view the state-of-art technology for effective pollution control for the integrated steel plant.

The selection of the most optimum process route for installation of steel plant needs critical analysis and evaluation. The evaluation process is more relevant due to the emergence of a large number of new competitive technologies in various fields of steel making. This section evaluates the technologies and suggests the optimum one for expansion of existing steel plant.

Such an evaluation involves an analysis of past achievements, present status and future prospects of each technology under consideration keeping in view the following criteria.

- Adoption of indigenous technology
- Capacity of the plant
- Selected product mix
- Conservation of scarce and costly energy input
- Suitability of available raw materials
- Cost considerations

For this Project,

Travelling Grate or Grate-Rotary Kiln-Annular Cooler process.

Direct reduction technology is considered.

5.3.3 Pollution Control Technology Alternatives

Air Pollution Control Devices

There are many Air Pollution Control Devices APCDs used in the steel industry to control emission of dust and other pollutants into the atmosphere. The particle size, the dust loading, flow rate, moisture content and the temperature of the gases determine the type dust collectors to be used.

For this project, Bag filters, ESP will be used as pollution control equipment are tested and proven technology for steel industry.

Water Pollution Control Technology

The Sewage Treatment Plant (STP) for treating the effluent by both chemical and biological methods. The influent will be treated by adopting the following steps-

Raw sewage being discharged will be collected and brought to the sewage treatment plant (STP).

- The sewage will be first collected in the equalization tank after passing the same through the screen chamber.
- The equalized sewage will then be passed through oil removal tank which will be followed by an elaborate treatment comprising of secondary and tertiary treatment.
- Secondary treatment will consist of biological treatment comprising of Single Stage Aerobic Treatment System consisting of aerobic reactor based on MBBR system followed by tertiary treatment system.
- Tertiary treatment will consist of pressure sand filtration and activated carbon filtration followed by UV Treatment of underflow of activated carbon filter.

Effluent Treatment Plant of capacity 250 KLD will be installed to treat the 216 KLD effluent. About 205.2 KLD will be recycled and reused in the process.

The estimated requirement of make-up water is 2,890.8 KLD (approx.).The waste water discharged will be utilized for vegetation & dust suppression inside the plant after treatment.

- The process waste water/ Effluentis pumped into Collection cum Equalization tank after sterilization process.
- Neutralization of pH of process waste water / Effluent by commercial grade HCl or H2SO4 is done.
- Further, the neutralized waste water is pumped to primary clarifier for clarification / settlement of suspended solids.
- From the Primary clarifier, the waste water passes to Aeration Tank by gravity force.
- The waste water passes from Aeration Tank to Secondary Clarifier for clarification/ settlement.
- In Aeration tank the HRT is calculated as 48 hours for maximum reduction of BOD.
- The waste water passes from Secondary Clarifier to Secondary Aeration tank for aeration
- From there it passes to Tertiary Clarifier for clarification.
- The clarified water from Tertiary Clarifier passes to Treated Water Holding Tank.
- The water from Treated Water Holding Tank pumped to Treated Water Tank through ACF MGF (Activated Carbon Filter & Multi Grade Filter); ACF & MGF are installed for better treatment.
- The outlet water from ACF & MGF is collected for analysis in ETP Lab.
- If the treated water characteristics are below the Odisha State Pollution Control Board Standards/ Central Pollution Control Board, then the water is used for Green belt.
- The sludge from the Primary, Secondary & Tertiary Clarifiers is pumped to Sludge Drying Beds; In order to maintain the sufficient cell concentration in aeration tank, a part of sludge from Sludge Beds tank is recycled. The remaining sludge is transferred to a Pollution Control Board Authorized Treatment & Storage Disposal facility

5.3.4 Selection of Pollution Control Technology

In this Proposed expansion steel industry, bagfilters &ESP will be used as APCD.

Bag filter

It is one of the earliest and effective methods of particulate matter control. The device is made of fabric bags via which the air stream is directed. The particles are trapped in the fiber of the fabric bags. The flow of air through the bag filters is either way, which enables the particles separated accumulate in the bag.

Electrostatic Precipitator

Indurating process off gasses from updraft drying hood exhaust and wind box exhaust are being cleaned using Electro Static Precipitators (ESP). The outlet dust concentration is limited to 30 mg/Nm^3. The emission from Producer gas plant are being treated in Cyclone separator to remove dust particles and Electrostatic Tar Precipitatorto separate the tar. The clean gas is sent to Pellet Plant. Fugitive dust from machine discharge area and extraction area is being collected using suction ducts and cleaned in Bag Filters. Fugitive dust generated from Raw Material Handling, Bentonite Grinding, Lime and Coal Grinding and Bentonite Transfer points is being collected using suction ducts and cleaned in Bag Houses. Dust collected from the bentonite and lime stone systems and other systems is returned to their respective storage bins. The emissions from the Pellet plant is being treated in a high efficiency ESP and discharged into the atmosphere through a stack.

5.4 CONCLUSION

Based on the above discussion, it is evident that the site and technology is best suited for expansion and shall contribute to fulfill the demand of market for steel. As the project proposal is prepared keeping in view of socio-economic, health and environmental aspects, the project shall result in overall socio-economic development of the area and the country in general with minimum adverse effects on environment.

CHAPTER - VI

ENVIRONMENTAL MONITORING PROGRAMME

6.1 OBJECTIVES OF ENVIRONMENTAL MONITORING

Environmental monitoring and audits will be carried out during construction phase & operation phase to check whether environmental management measures are satisfactorily implemented and are delivering the appropriate level of environmental performance or not.

The audit program will include pre-commissioning audits of the facilities focusing on the compliance of equipments and procedures to deliver the specified level of performance to ensure that all environmental requirements are being met. Regular operational audits will check the following:

- Integrity and function of physical systems;
- Compliance with operating procedures and standards;
- Compliance with prescribed relevant environment standards;
- Testing and review of emergency procedures;
- Compliance with regards to maintenance of procedures and records;
- Competence and training of operatives and field management staff.

Audit results will be reported to management and field staff responsible for the process or equipment. Where audits reveal non-compliance with requirements, corrective actions will be implemented. These will be prioritized according to the significance of the environmental risks.

6.1.1 Technical aspects of monitoring for the effectiveness of mitigation measures

The monitoring and evaluation of the management measures envisaged are critical activities in the implementation of the Project. Monitoring involves periodic checking to ascertain whether activities are in accordance with the plans. It provides the necessary feedback for project management to keep the program on schedule. The purpose of the environmental monitoring plan is to ensure that the envisaged purpose of the project is achieved and results in desired benefits.

To ensure the effective implementation of the proposed mitigation measures, the broad objectives of the monitoring plan are:

- To evaluate the performance of mitigation measures proposed in the EIA.
- To suggest improvements in the management plan, if required.
- To enhance environmental quality.
- To implement and manage the mitigative measures defined in EMP.
- To undertake compliance monitoring of existing project operation and evaluation of mitigative measure.
- Control of activities inside the plant, until the environmental problem has been corrected.
- Suitably respond to emergencies. Provide details of the emergency and the actions taken to the top management.
- Suitably make modifications or alterations in the mining operations to meet regulatory standards as amended from time to time.

6.1.2 Structure of Environment Management Cell (EMC)

In order to maintain the environmental quality within the standards, regular monitoring of various environmental components is necessary. M/s. GM Iron and Steel Co, Limited will maintain a full-fledged Environment Management Cell (EMC) for environmental monitoring and control. The EMC team will take care of pollution monitoring aspects and implementation of control measures.

A qualified and efficient engineer (GM Works) with technicians will be deputed for maintenance, up keeping and monitoring of the pollution control equipment to keep them in working at the best of their efficiencies. Essentially, this department will undertake monitoring of the environmental pollution levels by measuring fugitive emissions, ambient air quality, water and effluent quality, noise level, greenbelt, statutory environmental compliances etc., either departmentally or by appointing external agencies wherever necessary. In case, the monitored results of environmental pollution will be found to exceed the allowable values, the EMC will suggest remedial action and ensure that the same are implemented through the concerned plant authorities. M/s. GM Iron and Steel Co, Limited shall take the overall responsibility of

environmental management and duly supervise the third party environmental monitoring agency for carrying out the monitoring work as per the standard procedure laid by CPCB/MoEF&CC/SPCB. EMC will also coordinate all the related activities such as collection of statistics with respect to the health of workers, afforestation and green belt development / plantation.

Responsibilities of EMC

The responsibilities of the EMC include the following:

- Environmental monitoring of the surrounding area.
- Timely Commissioning of pollution control equipments and facilities.
- Specification and regulation of maintenance schedules for pollution control equipments.
- Ensuring that standards are maintained.
- Developing the green belt.
- Ensuring optimum water usage.
- Carrying out the Environmental Management Plan.
- Organizing meetings of the Environmental Management Committee and preparation of report and submission of such reports to management.
- Coordination for all statutory requirements like submission of applications / Reports for obtaining consents, Environmental clearances, authorization etc.

6.2 METHODOLOGIES OF MEASUREMENT

Instruments to be used

The following instruments will be used for data collection work in the monitoring Schedule:

1. Weather Monitoring Station (WMS)
2. Respirable Dust Sampler (RDS)
3. Fine Particulate Sampler (FPS)
4. Stack Monitoring Kit
5. Sound Level Meter
6. Water Level Indictor

6.3 PERFORMANCE MONITORING

Safety features, ambient working environment and Occupational Health and Safety (OHS)-indicators will be subjected to regular monitoring and review. The compiled information and any corrective measure taken will be applied in a continuous process to improve the OHS management system (OHSMS) which will be responsible for management of environment, health and safety aspects related to existing project.

OHSMS shall include specifications for performance monitoring, evaluation, and improvement of the system as well as for recording and reporting occupational diseases and accidents.

- **OHSMS**: The performance and achievements of the OHSMS responsible for management of overall environment, Health & Safety aspects will be re-assessed on annual basis.
- **Safety Inspection, Testing and Calibration**: GM Iron and Steel Co, Limited will arrange for regular (annually) third party inspection and testing of all safety features and hazard control measures for plant operation. The inspection will focus on engineering and personal protective features, work procedures, places of work, installations, equipment, and tools used. The inspection must ensure that issued personal protective equipment continues to provide adequate protection and is being worn as required. All instruments installed or used for monitoring and recording of working environment parameters must be regularly tested and calibrated. Records will be kept of all inspections, tests, and calibrations.
- **Monitoring of the Working Environment**: GM Iron and Steel Co, Limited will document compliance using an appropriate combination of portable and stationary sampling and monitoring instruments for meeting the regulatory requirement as well as for keeping healthy and hygienic environment. The recommended frequency and parameter of environment monitoring for the existing project is as per given in **Table 6.1** & **6.2** during construction and operation phase respectively. However, monitoring programme will be modified as stipulated by MOEF/CPCB/SPCB:

6.3.1 Monitoring Schedule during Constructional Phase:

Table 6.1: Environment Monitoring Plan during Construction

Sl. No.	COMPONENT	Parameter	Locations	Frequency
1	Ambient Air	PM_{10}, $PM_{2.5}$. SO_2, NOx, CO	4 locations (all corner points) at the boundary of plant premises	24 hourly samples, twice a month
2	Waste Water	pH,TDS, SS, BOD3, COD, Oil & grease and Heavy metals	Drain from septic tank	Once in a month
3	Noise Level	Hourly Leq	4 locations (all corner points) at the boundary of plant premises	Continuously during working hour, twice in a month

6.3.2 Monitoring Schedule during Operation Phase:

Table 6.2: Environment Monitoring Plan during Operation

Sl. No.	Description	Frequency of Monitoring
1	Ambient Air Quality	Twice a week monitoring, as per NAAQS for PM_{10}, $PM_{2.5}$. SO_2, NOx, CO at Plant Site at three locations (Plant boundary) & as per EC / CTO conditions. Two locations outside the plant, downwind at max GLC locations.
2	Fugitive emissions	4-5 Locations in the plant for PM2.5 & PM10 levels – near unloading area, transfer points, truck parking area and packaging area.
3	Stack Monitoring	Monitoring for PM, SO_2, NOx & CO level at Cement Mill stack and HAG-Slag Dryer Stack. PM level in other bag filter stacks
4	Noise Level Monitoring	Monthly at three locations (Plant boundary) and work zone noise – cement mill, slag dryer, packaging area and truck parking.
5	Water Level & Quality monitoring	Two locations, quality twice a year and monthly level at Nearby Ground water sources
6	Medical Checkup of Employee	Yearly

Table 6.3: Locations for Post project Monitoring

Sl. No.	Description	Frequency of Monitoring
1	Meteorological data	Plant Site
2	Ambient Air Quality	Plant Site – 3 nos., villages – 2 nos. in downwind direction from the Plant site and as per EC / CTO conditions
3	Stack emissions	Plant Site – Cement Mills, Slag Dryer, Cement Silo, Packaging section
4	Water Level and Quality	Nearby water sources and as per CTO conditions – Ground water at plant site, Surface water – Karamnasa River etc.
5	Noise Level Monitoring	Plant Boundary, High noise generating areas within the Plant - – cement mill, slag dryer, packaging area and truck parking and as per EC/CTO conditions
6	Health Check-up	Dispensary/Recognized hospital near Durgawati or at plant site through registered medical doctor

6.4 OCCUPATIONAL HEALTH & SAFETY MONITORING

To control and minimize the risks at workplace, Health, Safety and Environment Policy will be implemented along with the following objectives:

- To prevent hazards
- To provide safe and healthy environment to all the employees.

Health and Safety Policy

- Health, Safety and Environmental Protection (HSE) is a part of M/s. GM Iron and Steel Co, Limited commitment to conduct the activities in harmony with society and nature. The company expects all its employees to implement the HSE Policy.
- Integration process of H&S must start at the inception of a project since HSE consideration must be addressed at the design stage, which also helps in optimizing the support process.
- M/s. GM Iron and Steel Co, Limited has integrated Health, Safety and Environment Protection into the business strategies to add value to the enterprise, to manage risk and to enhance the reputation.

- The health and safety of the employees, neighbors, customers and consumers, and the protection of the environment are company's priorities consistently pursued throughout.
- Each employee will be made to comply with the HSE guidelines and the laws applicable to her or his area of operational responsibility.

Details of OHS given in Chapter – 7 of this EIA/EMP report.

Safety Committee

A safety committee will be formed and manned by equal participation from management and workers with the following functions:

a) Accident prevention and control including ensuring the use of safety appliances
b) Publicity, propaganda, education and training
c) Assisting and cooperating with the management in achieving the aims and objectives outlined in the "Health and Safety Policy" of the occupier
d) Carrying out health and safety surveys for identifying unsafe working condition/practices, which causes accident.

6.5 ACCIDENT AND DISEASE MONITORING

GM Iron and Steel Co, Limited shall establish procedures and systems for reporting and recording:

- Occupational accidents and diseases; and
- Dangerous occurrences and incidents.

The system will enable workers to report to their immediate supervisor immediately any situation that they believe presents a serious danger to life or health. The system shall further enable and encourage workers to report all:

- Occupational injuries and near misses;
- Suspected cases of occupational disease; and
- Dangerous occurrences and incidents.

GM Iron and Steel Co, Limited will, with the assistance of a competent person investigate all reported occupational accidents, occupational diseases, dangerous occurrences and incidents together with near misses. The investigation shall as far as possible:

- Establish what happened;
- Determine the cause of what happened; and
- Identify measures necessary to prevent recurrence.

Occupational accidents and diseases should be at a minimum and will be classified according to Table 6.3. Distinction will be made between fatal and non-fatal injuries. The two main categories are divided into three sub-categories according to time of death or duration of the capacity to work. The total number of man-days and hours worked during the reporting period must be stated.

Table 6.4: Occupational Accident and Disease Reporting

a. Fatalities (number)	**b. Non-fatal injuries (number)***	**c. Total time lost non-fatal injuries (days)**
a.1 Immediate	**b.1** Less than one day	
a.2 Within a month	**b.2** Up to 3 days	**c.1** Category b.2
a.3 Within a year	**b.3** More than 3 days	**c.2** Category b.3

**The day on which an incident occurs is not included in b.2 and b.3.*

6.6 ENVIRONMENTAL LABORATORY

An environmental laboratory will be set up to carry out all the environmental monitoring jobs. Third party monitoring will also be carried out by the suitable recognized consultancy organizations.

The main analytical instruments/ equipments will be:

1. Micro Meteorological Station
2. Respirable Dust Sampler (RDS)
3. Fine Particulate Matter Sampler (FPS)
4. Stack Monitoring Kit
5. Sound Level Meter
6. Water Level Indicator

Besides adequate glassware & other laboratory equipment and chemicals will be indented.

6.7 POST MONITORING OF ENVIRONMENT MANAGEMENT SYSTEM

Post project monitoring will be carried out as per conditions stipulated in Environmental Clearance Letter issued by SEIAA Odisha/CTO issued by OSPCB; as-well-as according to CPCB guidelines. Plant site is considered as core zone and the area lying within 10 km radius from the plant site is considered to be the buffer zone where slight impacts may be observed on physical and biological environment and that too is occasional. Details of Post Project Monitoring Programme are given in table below:

Table 6.5: Post Project Monitoring Programme

Attributes	Sampling		Measurement Method	Test Procedure
	Network	Frequency		
A. Ambient Air Quality Monitoring				
Meteorological • Wind speed • Wind direction • Dry bulb temperature • Wet bulb temperature • Relative humidity • Rainfall	Minimum 1 site in the project impact area	Regularly in one season by Weather Monitoring Station	Mechanical/ automatic weather station	-
Pollutants • PM_{10} and $PM_{2.5}$	4 locations area (1 location in upwind side, 1 in downwind side / impact zone, other nearby receptors)	National Ambient Air Quality Standards (NAAQS) vide MoEF circular, dated 16.11.2009 Twice a week	Gravimetric method	-
• SO_2			EPA Modified West and Geake method	Absorption in Potassium Tetra Chloromercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde (IS: 5182 Part - II).

Attributes	Sampling		Measurement Method	Test Procedure
	Network	Frequency		
• NO_2			Arsenite modified Jacob and Hochheiser	Absorption in dilNaOH and then estimated calorimetrically with sulphanilamide and N (I-Nepthyle) Ethylene diamine Dihydrochloride and Hydrogen Peroxide (CPCB Method).
B. Stack Monitoring				
Pollutant PM	Ball Mill Stack	Continuous Monitoring System	As Per CPCB Guideline	Gravimetric method
	HAG-Slag Dryer (SO_2 & NO_x also)	Once in a month	As Per CPCB Guideline	Gravimetric method
C. Water Environment				
pH, Turbidity, Colour, Odour, Taste, TDS, TSS, Total Hardness, Calcium hardness, Magnesium hardness, Chloride, Fluoride, Sulphate, Nitrates, Alkalinity, Iron, Manganese, Mercury	Set of grab samples during pre and post-monsoon for ground water for 10 km distance	Diurnal and Season wise	As per IS 10500-	Samples for water quality should be collected and analyzed as per: IS: 2488 (Part 1-5) methods for sampling and testing of Industrial effluents. Standard methods for examination of water and wastewater analysis published by American Public Health Association.
D. Noise				
Noise levels at Day & night time -Leq dB (A)	3 locations	Once in a month	As per CPCB norms	As per CPCB norms

6.7.1 Analysis of monitoring data

Monitoring data analysis will be done by MoEFCC approved laboratory as per CPCB guidelines and timely submitted to concerned authority (specified in Environment Clearance Letter issued by SEIAA, Odisha and Consent to operate issued by SPCB) on regular basis.

6.7.2 Reporting schedules of monitoring data

The monitoring results will to be reported every six-months to the SPCB and MoEFCC. Effective reporting mechanism will be developed as part of Management System. The results will be statistically analyzed with graphical representation for understanding of technical and administrative personnel. Standard reporting formats for all environmental components will be developed.

6.7.3 Emergency Procedures

In case any problems with the pollution control measures or environmental management plan has been found during the routine monitoring, it will be immediately communicated to all concerned and time-targeted action plan will be prepared to rectify the defect. The environmental performance of the project will be published in the form of a document.

6.8 COST OF ENVIRONMENT MONITORING

The details of estimated capital and recurring cost of the environmental management plan during construction and operation phase are as per given in **Table – 6.6.** Implementation of following EMP will be carried out along with installation of plant and completed prior to commissioning except for the Occupational health & Green Belt.

Table – 6.6: Cost of Environment Management

Estimated Cost of EMP			
Sr. No.	**Particulars**	**Estimated cost in Rs. Crore**	**Recurring cost in Rs. Lacs/annum**
1	Air Pollution Control	20	98.00
2	Water Pollution Control	4.5	25.00

3	Noise Pollution Control	1.3	3.5
4	Environment Monitoring & Management	1.0	8.00
5	Occupational Health	1	5.00
6	Green Belt/plantation	2.5	10.50
	TOTAL	**30.30**	**150.00**

CHAPTER-VII

ADDITIONAL STUDIES

INTRODUCTION

In this chapter, Public Consultation, Social Impact Assessment, Rehabilitation & Resettlement, Risk Assessment, Disaster Management, proposed safeguards and mitigation measures, CREP and Action Plan for implementing the issues raised at Public Hearing are discussed.

7.1 PUBLIC CONSULTATION

The basic purpose of Public participation/ Consultation is to promote productive use of inputs and perceptions from private and public interest group in order to improve the quality of environment decision making. Interest group includes those representatives of industry, development, conservation and preservation. Public participation is required in environmental decision making by the regulation in environment clearance process.

All the issues of environmental concerns to be expressed during the proceeding of Public Consultation/Public Hearing will be addressed in final EIA Report.

7.2 REHABILITATION & RESETTLEMENT PLAN

No rehabilitation or resettlement plan is proposed as there are no habitations in the Plant site.

7.3 RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

7.3.1 Risk Assessment and Damage Control

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat. Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

The main objective is to identify the potential hazards, assess the effect/consequence

of all probable accidental releases and risk mitigating measures to reduce hazards of the proposed facilities.

7.3.2 Hazard Identification and Risk Assessment (HIRA)

Hazard is defined as a chemical or physical condition having the potential for causing damage to life, property or the environment. Hazards associated at the steel plant have been identified using HAZAN techniques. For each selected release source, several scenarios may be possible depending upon the failure mode causing loss of containment.

The hazard identification includes a selection of scenarios ranging from the more likely high probability-low consequence event to the low probability-higher consequence event. The criteria used for selection of scenarios for the consequences analysis is the Maximum Credible Accidental (MAC) scenarios.

Risk Analysis:

Risk is defined as the unwanted consequence of a particular activity in relation to the likelihood that this may occur. Risk thus comprises of two variables: magnitude of consequences & the probability of occurrence. It thus finds application as a decision making tool in situations where judgment has to be made about the tolerability of the risk posed by an existing activity. The normal approach adopted is to relate the risk measures obtained to risk acceptance criteria. The risk criteria simply attempt to establish whether Risk is "tolerable". Below is a list of words generally in use in risk analysis.

1. **ACCEPTABLE RISKS**: No risk should be called "acceptable". It might be better to say that the activity may be acceptable generally, but the risks can only ever be tolerable;
2. **TOLERABLE RISKS**: are the risks which are expected to bear without undue concern ; and
3. **NEGLIGIBLE RISKS**: are risks so small that there is no cause for concern. Risk criteria, if they are to be workable, recognize the following:

- Level of risk that is so high that it is considered unacceptable or intolerable regardless of the benefits derived from an activity;
- Level of risk that is low enough as to be considered negligible; and
  Level of risk in between the two as mentioned above is to be considered tolerable subject to being reduced to a level i.e. "As Low As is Reasonably Practicable (ALARP)".

Broadly, there will be mainly three major types of hazards during operation of expanded plant as described below:

- Fire in flammable materials;
- Explosion in flammable and explosive materials; and
- Toxic Release of hazardous gases.

Apart from these, there will also other hazardous conditions during lifting hot metal handling by cranes and hoists, handling of industrial gases throughout the plant.

7.3.2.1 Exposure to High Temperature

The principal exposures to heat in Industrial unit. Recommended prevention and control techniques include the following:

- Shielding surfaces where workers' proximity and close contact with hot equipment is expected,
- Using personal protective equipment (PPE), as needed (e.g. insulated gloves and shoes);
- Minimizing the work time required in high temperature environments by implementing shorter shifts at these locations.

7.3.2.2 Physical Hazards

Injuries during Project operation are typically related to slips, tips, and falls; contact with falling / moving objects; and lifting / over-exertion. Other injuries may occur due to contact with, or capture in, moving machinery (e.g. dump trucks, front loaders, forklifts). Activities related to maintenance of equipment, including crushers, mills, mill separators, fans, coolers, and belt conveyors, represent a significant source of exposure to physical

hazards. Such hazards may include the following:

- Falling / impact with objects
- Contact with allergic substances

Management measures to prevent the physical hazards in the proposed expansion project

- Any person working on equipment with moving parts will personally ensure the equipment is de-energized, isolated and locked/tagged out.
- Any person working from a position with the potential risk for a fall from height will use fall protection
- Any person doing flame welding, cutting or brazing in the proximity of any flammable material will be provided with PPE.
- Safety helmets to be used to protect workers against falling material.
- Barriers like toe boards or mesh guards will be provided to prevent items from slipping or being knocked off the edge of a structure.
- Danger areas will be clearly marked with suitable safety signs indicating that access is restricted to essential personnel wearing hard hats while the work is in progress.
- In case of any accident immediate and proper medical care will be provided at the project site.

7.3.2.3 Events pertaining to the manufacturing process

The following areas are identified as hazard prone in case of Grinding unit where Disaster management plan is required.

(i) Handling of Coal

1. The coal will be received and stored in Stockpile. The possible hazards are envisaged due to the slipping of truck during unloading.
2. During summer season, there is a possibility of coal catching fire due to spontaneous heating.
3. Effective sprinkling systems will be provided all round the coal storage yards.

(ii) Handling of Cement

Cement is the fine dust which requires proper care in handling, storage and packing to avoid any health hazards.

7.3.3.4 Fire

Fire can be observed in the Coal storage yard, Fuel spillage, Electrical rooms, Transformer area etc. due to accidental failure scenario.

Suitable fire extinguishers, fire hydrant system and fire buckets will be provided for fighting the fire during emergency. Employees working in such areas will be imparted training for first aid firefighting to prevent/extinguish the fire at initial stage.

7.3.2.5 Explosion

Explosion may lead to release of heat energy and Pressure waves.

7.3.2.6 Electrocution

Fatal Accident due to carelessness during working hours may lead to electrocution.

7.3.2.7 Natural and Manmade Calamities which can lead to Emergency

Disaster is a catastrophic situation in which the day-to-day patterns of life are, in many instances, suddenly disrupted and people are plunged into helplessness and suffering and as a result need protection, clothing, shelter, medical, social care and other necessities of life, such as; Disasters resulting from natural phenomenon like earthquake, volcanic eruptions, storm, surges, cyclones, tropical storms, floods, landslides, forest fires and massive insect infection. Also in this group, violent draught which will cause a creeping disaster leading to famine, disease and death must be included. Second group includes disastrous events occasioned by man, or by man's impact upon the environment, such as armed conflict, industrial accidents, factory fires, explosion and escape of toxic gases or chemical substances, river pollution, mining and other structural collapses; air, sea, rail and road transport accidents, aircraft crashes, collision of vehicles carrying inflammable liquids, oil, spills at sea, and dam failures.

(a) Earthquake

The District - Dhenkanal falls under the seismic zone-III, which is the low risk quake Zone

but earthquake may trigger into a technological disaster, includes collapse of old structures, buildings leading to fire and explosion. Earthquake cannot usually be forecasted and therefore precautions immediately prior to such event are not usually possible. All the buildings will be constructed as per IS 1893 Part 4: 2005 Criteria for Earthquake Resistant Design of Structures (Industrial Structures Including Stack-Like Structures) and IS 13920: 1993 Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces to minimize the risk of Seismic loads.

Apart from some of the counter-measures to be taken in foreseeable cases, emergency recovery plan has been considered by the emergency management team as per the situation and site conditions as follows:

Step	**Activity**	**Action By**
Preparedness	• Identify and constitute Emergency Response Team • Identify ECC, if the identified ones are damaged • Control centers to be equipped with ❖ Communication facilities ❖ Emergency vehicles/ equipment ❖ List of emergency contacts and suppliers ❖ Medical facilities	Plant key person
Action during effective period	• Do not panic. Raise alarm • Avoid standing near to windows, external walls • Stand near the columns or duck under sturdy furniture. • Assemble at emergency assembly point as there may be aftershocks	Individual(s)

Action after effective Period (Establish Emergency Control Center. Site Main Controller to direct all activities)	• Take head count • Activate emergency plan as situation demands • Assess situation and initiate shut down of plants (if required) • Initiate search and rescue (if required) • Provide first aid to victims. Remove casualties • Key persons to report to site • Assess damage • Undertake	Site Incident Controller Site Main Controller Coordinators – Fire & Security, Safety, Material, Medical, and Plant Key Person

(b) **Storm and Lightning**

The contingency action during storm will be based on the weather forecasts obtained from meteorological stations and the local meteorological department. However all the buildings are constructed as per IS 875 Part 3 : 1987 Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures for resistant against wind and IS 2309 : 1989 Protection of Buildings and allied structures against lightning, BS 6659 : 1992 Protection of Structures against Lightning, NFPA 780 Standard for the Installation of Lightning Protection Systems 2004 Edition and IEC 1024-1-1 International Standard for Protection of Structures against Lightning for protection against storm and lighting. Some of the important actions to be carried out are as follows:

Prior to Storm

- Establish regular contact with the local meteorological department
- Establish distances from storm in order to execute preparatory actions in a shorter time

- Appraise the factory operations installations and consider the consequences that the emergency might have on operations and personnel
- Check the availability of tools, batteries, non-perishable foods and other materials that might be required
- Review all operations carefully to ensure that systems in jeopardy are taken care of or shut down
- Ensure the readiness of first aiders, emergency vehicles, medical Centre, medicines etc.
- Metallic sheets, loose materials, empty drums and other light objects will be properly secured
- Flush the drainage systems

During Storm

- Remain calm
- Do not go outdoors
- Do not seal the office completely as the suction created by the difference in atmospheric pressure inside and outside can rip open a window or door by breaking window glass panes

After the Storm

- Do not touch electric lines
- Stay away from the disaster area
- Take special precautions in driving vehicles since the under-pavement could cave in due to the weight of automobile

(c) Cyclone

Cyclones are considered as one of the most damaging natural disasters. They make impact by killing people, damaging property, crops and infrastructure. According to NDMA guidelines the region considered in Low damage risk zone. Thus climatologically, this area is having low risk of cyclone strikes.

(d) **Landslide**

The Landslides is not observed in the dhenkanal region. Hence on the basis of past scenarios and NDMA guidelines the landslides considered as a very low hazards.

7.3.2.8 High Risk Categories and Preventive Measures

High Risk Categories and Preventive Measures are given in table below:

Table - 7.1: High Risk Categories and Preventive Measures

High Risk Categories	Prevention
Contractors	Contractor Safety Management
Young/Temporary Employees	Special Safety Induction Training
Direct Causes	
Traffic and Mobile Plant	Driver Training
Falls from Heights, Objects falling from Heights	Safety Procedures for Work at Heights, Overhead Protection
Caught in Starting/Moving Equipment	Plant isolation procedures

RISK ASSESSMENT OF STEEL PLANT

The areas identified as potential risk areas and the hazard associated with them along with mitigation measures are given below:

Table 7.2: Risk areas and the hazard associated with mitigation measures

Equipment	Process	Potential Hazard	Provision
DRI PLANT			
Sponge Iron Kiln	Reduction of Iron Ore	Falling of Hot Mass & Dust	• Ensuring before opening the kiln bottom door, first clean the inner surface of the stack cap, such that the dust particle and hard clinkers which are deposited in the cap is fallen into the Dust Settling Chamber (DSC). • Ensure DSC bar position and condition before opening and to remove big block of castable or any hard clinkers which is blocking the dust flow passage to wet scrapper chute. • Ensure to clean the dust by opening the main hole provided in the chute and check the spiking rods and the screen. In built safety system is provided in the construction of furnace with suitable refractory walls. • Allow the wet scrapper to run to remove the sludge, then open the drain pipe of the wet scrapper, which is located at bottom on either side, pour sufficient water to clean the sludge and the slurry dust to flow through drain pipe. • Ensure to stop the wet scrapper and open the top plate to check the alignment, weak and tear of the plates and take necessary precaution against the excessive worn out plate.
Sponge Iron Kiln	Reduction of Iron Ore	Air emission	Adequately designed ESP and other Air Pollution control systems will be provided with internal lock to the kiln feeding system in order to prevent by passing of emissions through safety cap and also during non-operation of ESP or any other pollution control devices.
POWER PLANT			
Turbine	Converts steam into power	• Mechanical & Fire Hazards • Noise	• Layout of Equipment / Machinery will be in accordance to factory and electrical inspectorate. • Acoustic enclosure to Turbine
DG sets	Converts mechanical energy into electrical energy	• Mechanical & Fire Hazards a) Lube Oil System b) Cable galleries c) Short circuits • Noise	• Layout of Equipment / Machinery will be in accordance to factory and electrical inspectorate. • Acoustic enclosure • Isolated panel rooms • Special foundation with vibration absorbers
Power Transformers	Electrical energy production	Fire and explosion	• Automatic fire fighting system will be provided. • Isolated with fencing and restricted entry.

Switch Yard	Transformer	Fire	All electrical fittings and cables are provided as per the specified standards.
Switch Yard control room		Fire in cable galleries and switch	
• Coal storage Shed • Coal handling bunkers	• Storage of coal	• Fire and spontaneous combustion • Fire and dust explosions	• Coal storage yard will be continuously sprinkled with water with garden type sprinklers. • Continuous water sprinkling
Coal storage yard	-	• Coal dust is Combustible • Explosion Hazard	• Coal storage shall be minimised • Coal piles shall not be located above heat sources such as steam lines. • All mechanical & electrical equipment inside the coal storage area shall be approved for use in hazardous locations and provided with spark proof
Compressor House	Plant operation	Failure of pins and springs leading to opening of safety valves	The design precautions of safety will be followed in manufacture and erection of compressors.
STG, draft fans, soot Blowing from boiler, Ventilation pipes	Noise generated due to operation of STG, working of fans, ventilation	Noise hazard	• Acoustic enclosures will be provided to STG. • Enclose fans, insulating ventilation pipes • Use of dampeners.

	system		
Failure of APCS	Dust / Smoke	Air emission	• Interlocking system will be provided and whenever APCS is not working, then raw material feed will be stopped. Consequently, there will be no production in the unit till APCS is rectified. • The unit cannot be stopped immediately and it will take some time to stop. During this period release of particulate matter will take place, hence mobile dust suppression system will be provided to suppress the particulate matter immediately to mitigate the impact of PM on surroundings. • Depending upon the wind direction at the time of emergency, Mobile dust suppression equipment will be provided to suppress the dust within the plant and also outside the plant to reduce the impact on habitation, water body, crops etc. Immediately upon failure of any APCS, emergency siren will be blown to inform the employees and nearby villagers about the emergency. • Dust masks will be provided to the employees and nearby villagers. Immediately • upon hearing siren, every employee and villager must wear the dust mask. • Mock drills will be conducted in the nearby villages for the emergency preparedness.
Slag Cement Grinding Plant			
Mechanical moving parts of slag dryer, mills, packing machines etc.	Contact with moving parts, entrapment	Injury, serious injury	Proper guarding, warning sign boards and PPEs
Hot surfaces in	Contact with hot	Burns and heat stress	Proper insulation and separation of the equipment, supervision

HAG-Slag dryer	surfaces, heat stress etc.		

7.4 DISASTER MANAGEMENT PLAN

7.4.1 Introduction

The word 'disaster' is synonymous with 'emergency' as defined by the MoEFCC. A disaster in the plant area may cause serious injuries, loss of lives, extensive damage to the environment or property or serious disruption outside the plant. It requires the best use of internal resources and external resources to address it effectively. It may happen due to malfunction of the normal operating procedures or by an outside force such as a cyclone, flood.

Local community and the employees are the important stakeholders for an organization. Hence, better safeguards for them against industrial disasters become inevitable. The management today has more responsibilities with respect to any kind of disaster in its project. As disaster types, sources and effects are varied, it needs a multi-disciplinary and multi-organizational approach to handle such situation.

The various steps involved in the process of disaster management can be summarized as:

- Minimize risk occurrence (Prevention)
- Rapid control (Emergency Response)
- Effectively Rehabilitate Damaged Areas (Restoration)

7.4.2 Types of Disaster

Disaster is an event which causes severe disruption to life of number of people or to the project activities resulting in suffering and/or loss of life and property. Disasters can be:

- ❖ Plant Oriented: Plant oriented disasters are usually due to design errors, operational defects, uncontrolled chemical reactions, failure of equipment and human errors.
- ❖ Natural: Natural disasters are caused by natural agents e.g. flood, cyclone, fire and earthquakes.

- Manmade: Manmade disasters are caused by the human activities that are aimed at disruption and destruction of the unit.

7.4.3 Degrees of Disaster

Disaster can be categorized into three levels based on their severity:

a. **Low –**Low level disasters can cause minor injuries, illness and equipment damage. These are not very serious and can be controlled with little effort.

b. **Mid –**Mid level disasters are critical situations that can cause serious injuries to a personnel, serious illness and property and equipment damage. Sometimes, if not addressed appropriately, these disasters can trigger higher degree of disasters.

c. **High –**High level disasters are catastrophic emergency that can bring vital damages like loss of life, major widespread of illness, severe injuries, major of loss property and equipment. These cannot be controlled immediately and require strategic initiatives to contain it.

The following would be action initiatives during each kind of disaster:

Low Disaster - Activities in the affected area would be stopped. The team would take necessary steps to prevent any mid-level disaster.

Mid Disaster - All project activities would be stopped. Related employees would be sent to a safe place. The Disaster Management team would be ready for any High level disaster situation. Local administration would be informed about the situation.

High Disaster –This disaster would be marked as a catastrophic situation. All employees would be to be evacuated and the plant operation would be shut down. Local administration would be properly informed and interacted to address the disaster using internal and external disaster management tools and techniques.

7.4.4 Stages of Disaster Management

The stages of a disaster can be divided into following categories:

a) Warning
b) Impact
c) Rescue

d) Relief

e) Rehabilitation

Warning: The natural calamities which may lead to disasters (e.g. flood and cyclone) can often be predicted. There are possibilities of disasters during local trouble, riot and war etc. Since these disasters would be foreknown, employees will be alerted and all facilities to encounter the disaster will be kept ready.

Impact: This is the time when the disaster actually strikes and very little can be done to counter the situation. The impact period may be of few seconds (like explosion or earthquake).

Rescue: This is the most important stage which starts before the predicted disaster or just after the impact. All available resources need to be immediately engaged in rescue operation.

Relief: This is a longer stage of work depending on the degree of disaster. Work during this stage needs external help for medical, food, clothing and shelter.

Rehabilitation: This is an important stage in terms of future planning. It includes rebuilding of damaged properties, restart of project work, compensation etc.

There are many factors that can result in a disaster. Anyone or more of following can lead to a disaster:

1. Reduction or failure of steam
2. Failure of Power
3. Rupture or damage of the line, vessel or tank
4. Excessive leakage of inflammable or corrosive or toxic material
5. Cyclone
6. Earthquake
7. Explosion
8. Sabotage
9. Riot
10. Air Raid

7.4.5 Disaster Management Plan

Definition

A major emergency in a work is one, which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the work. It would normally require the assistance of emergency services to handle it effectively.

Scope

The aim of hazard control and disaster management is concerned with preventing accidents through good design, operation, maintenance and inspection, by which it is possible to reduce the risk of an accident, but it is not possible to eliminate it. Since, absolute safety is not achievable; an essential part of major hazard control must also include mitigating the effects of a major accident. An important element of mitigation is emergency planning, i.e. recognizing accidents as soon as possible, assessing the consequences of such accidents and deciding on the emergency procedures, both on-site and off-site, that would need to be implemented in the event of an emergency.

Objectives

The objective of the On-site Emergency Plan should be to make maximum use of both the internal as well as the external resources to contain a disaster. The main objectives of the Disaster Management Plan are:

- Rescue and treatment of casualties and safeguard personnel in the premises.
- Minimize damage to the property and environment.
- Contain and ultimately bring the incident under control.
- Ensure safe rehabilitation of affected areas. .
- Provide authoritative information to the stakeholders.
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the disaster.

7.4.6 Scope of Disaster Management Plan

The Disaster Management Plan of the company is divided into two parts:

1. Onsite Emergency Plan

In this plan, the company officers are given pre-designated responsibilities for dealing with the emergency. The plant is equipped with appropriate devices, processes and employee trainings to contain a disaster of any kind.

2. Offsite Emergency Plan

In this plan, different Govt. agencies (e.g. fire department and police department) will be informed about the disaster for necessary help from them. The disaster and its severities would be addressed by best utilization of both the internal and external resources.

7.4.6.1 On-Site Emergency Plan

a) The disaster control procedure lays down the efforts to be made to prevent fatal accidents, physical harm or injury to personnel and damage to equipment facilities materials. It requires coordinated efforts of all employees to control and eliminate a disastrous situation.

b) All efforts to control a disaster will be coordinated among the various co-coordinators and all actions taken will be as directed by the chief co-coordinator. The coordinating members will be responsible to keep him posted on the development and course of action.

Onsite Disaster Management Plan

Disaster management plan are prepared with an aim of taking precautionary step to control the hazard propagation, avert disaster, take action after the disaster which limits the damage to the minimum and follow the on-site emergency planning.

The onsite emergency is an unpleasant situation that causes extensive damage to plant personnel and surrounding area and its environment due to in operation, maintenance, design and human error. Following point are taken into consideration:

- To identify, assess, foresee and work out various kinds of possible hazards, their

places, potential and damaging capacity and area in case of above happenings.

- Review, revise, redesign, replace or reconstruct the process, plant, vessels and control measures if so assessed.
- Measures to protect persons and property of processing equipment in case of all kinds of accidents, emergencies and disasters.
- To inform people and surroundings about emergency if it is likely to adversely affect them.

Disaster control Management system

Disaster Management group plays an important role in combating emergency in a systematic manner. Schematic representation of Emergency Control Management system is shown in Fig. 7.1



Figure No- 7.1: Onsite DMP- Emergency Control/Management System

7.4.7 Facilities Available With the Factory

On-Site Emergency Control Plan (ECP)

The fundamental need of an Emergency Control Plan (ECP) is to establish two control centres, one at the affected site as Emergency Control Centre (ECC) and the other one reasonably away from the affected site as Central Control Centre (CCC).

Emergency Control Centre (ECC)

This centre will seek the services of the Emergency Task Force and also contact the personnel IC & SC for any assistance during the emergency. The important telephone numbers for contacting various essential services during the emergency are kept in the centre, listed in the plan. The residential address of important persons to be contacted for communicating the emergency situation, are also kept. This centre is the communication link between the **Emergency services and Central Control Centre.** The Department-In-Charge takes control of this centre and acts as an Incident Controller. ICC shall be equipped with:

- Telephones
- Site-Master Plan
- A list of Internal/External Telephone numbers of site personnel.

Central Control Centre (CCC)

CCC is located in the office of Manager (Personnel) at the main gate of the factory. This centre is utilized for receiving and assessing information regarding the situation, directing the resources to Incident Control Centre, at the demand of Incident Controller located at ICC, calling in assistance from External Fire Services, ambulance etc. The Site Controller will be stationed in the office of Manager (Personnel& Administration) and will communicate with the Incident Controller and the Corporate Office according to need. CCC shall be equipped with:

- Internal/ External emergency communication telephone nos.
- Site-Master Plan
- List of important person's onsite, authorities outside along with their names and telephone numbers.

7.4.8 Roles and Responsibility

A team of following Essential persons shall be taking necessary action during the event of emergency. The roles and responsibilities of these personnel are defined subsequently:

A. Head of the Department / Section In-charge or Incident Controller

- Quickly assess cause/source of the hazards and its effects.
- Discuss with the Site Controller and coordinate the necessary action required to control/contain the emergency situation.
- Continuously monitor the work of firefighting personnel and other persons engaged in the emergency actions so that all actions are carried out safely.

B. Site Controller –GM (Works)

- Responsible for the overall control of the emergency situation.
- Discuss with the Incident Controller about the situation and evaluate the Major Emergency situation. The initial assessment of the situation is done by the concerned HOD immediately after the incident happens.

Ensure communication to the following authorities if necessary: -

a. Fire Brigade

b. Local Hospitals

c. Civil Authorities

d. Electricity Board

- Ensure communication to the neighboring industries of the incident, if required.
- Maintain a speculative continuous review of possible developments and assess these to determine most probable course of events.
- Ensure proper preservation of evidence for subsequent investigation. Inform the Company Officers at the Corporate Office.

C. Safety Officer

- Ensure overall safety of the Emergency Operations.
- Assist in controlling the Emergency.
- Keep Central Control Center (CCC) informed of the developments from time to time.
- Mobilize all available resources for controlling the incident.

- Help in carrying out search and rescue operations, if required.

D. Security Officer

- Ensure that unauthorized persons do not enter the emergency area.
- Ensure cordoning off the prohibited area.
- Ensure availability of the firefighting personnel.
- Act as per the instructions of the Incident Controller.

E. Process & Maintenance Personnel of Affected & Non- Affected Areas

- Persons of the unaffected area shall ensure the smooth operation of their own areas and shall not create a crowd at the emergency site. They are to extend their full co-operation to the staff fighting with the emergency, if the need arises.
- Persons of the affected area shall not create hue and cry and before arrival of the Security Staff, should initiate first aid action against the emergency. They shall extend help to the firefighting staff as per their requirement. The maintenance staff shall ensure availability of crane, gas cutting and welding facilities to meet any emergency requirement. The electrical staff shall ensure electrical isolation of the area, if required, and shall arrange emergency lights to lighten the area.
- Persons are to remove the materials from emergency area prone to fire / explosion etc.
- Conduct emergency control operations as per the instructions of the Incident Controller

F. Role of the Store Personnel

The Store Department shall ensure that in emergency situation it is open to issue Personnel Protective Equipment (PPEs) and other materials required to tackle the emergency.

7.4.9 Evacuation Plan

A. General Building Evacuation Procedure

At recognition of Fire / hearing the shouting "Fire", it is the responsibility of all building occupants to evacuate immediately and proceed to predetermined assembly points, away from the building. Building occupants are also responsible for ensuring that their

visitors/customers follow the evacuation procedure described herein, and leave the building along with all other occupants. Designated essential personnel needed to continue or shut down critical operations, while an evacuation is underway, are responsible for recognizing and/or determining when to abandon the operation and evacuate themselves. Contract workers will be made familiar with the procedures outlined herein, and are expected to leave the building when the alarm sounds.

Whenever Recognize SMOKE OR A FIRE --> REMEMBER - R.A.C.E.

- RELOCATE - If it is safe to do so, Relocate people. Instruct others to report to their designated gathering areas. Be aware of persons who may need assistance.
- ALARM – Sought "FIRE" to alert all occupants. Move to a safe location. Call Security & Fire.
- CONFINE - Close all doors, windows and other openings to confine the fire, if this can be done safely.
- EVACUATE - Evacuate from building & assemble at assembly point.

B. Evacuation Instructions

On ringing of the building alarm or upon information of a general building emergency, following instructions are to be followed:

- Do not panic.
- Do not ignore alarm.
- Leave the building immediately, in an orderly fashion.
- Follow quickest evacuation route from where you are (see posted floor evacuation diagram/map).
- Do not go back to your office area for any reason.
- Proceed to the designated emergency assembly point for your area. If the designated assembly point/area is unsafe or blocked due to the emergency, proceed to the alternate assembly point.
- Report to your Work Area Reporting officer at the assembly point to be checked off as having evacuated safely; also report any knowledge you may have of missing persons.

- Return to the building only after emergency officials or building monitors give the all-clear signal. Silencing the Alarm doesn't mean the emergency is over.

C. Emergency Evacuation Personnel

For the purpose of this Plan, Emergency Evacuation Personnel, and their alternates are regular employees who have been selected to ensure that building evacuation is carried out as planned, evacuated building occupants are directed to assigned assembly points where they will be accounted for, and persons needing assistance to evacuate are attended to. Building emergency evacuation personnel and their alternates shall be selected among building occupants, and on a voluntary basis.

7.4.10 Fire Fighting Facility

In view of vulnerability to fire, effective measures will be taken to minimize fire hazard. The following areas in the power station are mainly susceptible to fire:

- Cable galleries
- Electrical switchgear/ MCC room
- Coal handling areas: Conveyors, transfer points, tunnels and storage yard.
- Transformers and turbine oil tank

For containment of fire and preventing it from spreading in cable galleries, section wise fire barriers with self - closing fire resistant doors will be provided. The ventilation systems, if any, provided in cable galleries will be interlocked with the fire alarm system, so that in event of a fire, the ventilation system will be automatically switched off. In order to avoid spreading of fire all cable entries opening in cable galleries, tunnels, channels, floors, barriers etc. will be sealed with non-inflammable/Fire resistant sealing materials.

Some of the working premises in a steel plant have hazardous and fire prone environment. To protect the working personnel, equipment and machinery's, adequate safety and fire fighting measures have been planned for the activity.

For detection and protection of the plant against fire hazard, any one or a combination of the following systems will protect susceptible areas:

- Hydrant system
- Automatic high velocity spray system
- Medium velocity spray system
- Portable fire extinguishers
- Fire alarm systems

A fire hydrant point will be provided throughout the premises. Automatic high velocity spray system will be provided for protection of transformers and cable galleries. Manual medium velocity spray system will be provided for protection of fuel oil and turbine oil storage tanks and coal conveyor galleries. Water for hydrant, spray and sprinkler system will be supplied from the firewater pumps located in firewater pump house adjacent to Raw Water Reservoir. Adequate number of portable and mobile chemical fire extinguishers will be provided at strategic locations throughout the plant. Fire detection and alarm system will be provided at strategic locations throughout the plant. Fire detection and alarm system will be provided to detect fire/ smoke in vulnerable areas of the plant through smoke /heat detectors.

Fire Hydrants

The security guards on duty should rush at the fire place immediately after collecting the hoses & Nozzles from the fire store at main gate. Connect the male coupling of the hose to the hydrant and spread the hose. Connect the nozzle to the other end of the hose. Hold the nozzle firmly, and ask the other man to inform the pump operator to start the fire hydrant pump and then open the hydrant valve slowly. Direct the nozzle towards the base of the fire. In case of one hose length is found insufficient another hose should be connected to the first hose and at the end of second hose the nozzle should be connected. Fire hydrant points will be provided throughout the premises. Automatic high velocity spray system will be provided for protection of transformers and cable galleries. Manual medium velocity spray system will be provided for protection of fuel oil and turbine oil storage tanks and coal conveyor galleries. Water for hydrant, spray and sprinkler system will be supplied from the firewater pumps located in firewater pump house adjacent to Raw Water Reservoir. Adequate number of portable and mobile chemical fire extinguishers will be provided at strategic locations throughout the plant. Fire detection

and alarm system will be provided at strategic locations throughout the plant. Fire detection and alarm system will be provided to detect fire/ smoke in vulnerable areas of the plant through smoke /heat detectors. Table - 7.3 and Table - 7.4 enlist case and Site specific Fire extinguishers respectively.

Table - 7.3 List of Extinguishers to be used as case specific

S. No.	Chemical Name	Type of Extinguisher
1.	Coal	Use: Water fog, CO2, Foam, Dry Chemical
2.	HSD	Use: Foam, Carbon dioxide, Dry Chemical Powder. Water may be used to cool fire-exposed containers
3.	LDO	Use: water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames
4.	Fly Ash	Non Flammable
5.	Gypsum	Non Flammable

Table - 7.4: List of Extinguisher to be used as Site specific

S. No.	Name of site	Type of Extinguisher
1.	Cable galleries	CO2 & Foam type, Dry chemical powder
2.	High voltage panel	CO2 & Foam type, Dry chemical powder
3.	Control rooms	CO2 & Foam type, Dry chemical powder
4.	MCC rooms	CO2 & Foam type, Dry chemical powder
5.	Pump Houses	CO_2 & Foam type, Dry chemical powder
6.	Stores and offices	Dry chemical powder, foam type
7.	Godowns	Foam type
8.	Bunkers, Silo, enclosed dust Collector	CO_2 type, N_2 type, automatic sprinkler, fixed spray nozzle (unless water reactive)

7.4.11 Material Handling

Heavy duty cranes including mobile cranes, forklifts, trucks, loading trolleys are being used in the plant. The same could be used at time of emergency for handling

the material. The plant consists of efficient pathways and exit channels so that the material handling vehicles and equipment reach any location in minimal time. These have been optimally designed to cater any level of disaster at the plant.

7.4.12 Personnel Protective Equipment

Safety shoes, safety helmets, safety goggles, asbestos hand gloves, rubber hand gloves, acid proof aprons, earplugs, aprons, leg guards etc. are available in the Central store of the plant. At the time of emergency, the same can be made easily available by the safety coordinator. During regular operations too, the employees are provided with these amenities when they enter the plant. Visitors are carefully guided about the plant safety procedures and provided with essential safety gears while their visit.

7.4.13 Medical Facility

The Plant has the required emergency medical facilities for the workers. There is a hospital with competent doctors and staff. In case of any major accident, affected persons will be referred to the nearest hospital at Talcher.

7.4.14 Communication

The plant premise is connected by state-of-the-art communication system. The communication system includes telephones, alarms and wireless devices. Different modes of communication make sure that the communication system remains working if in case there a unit fails e.g. telephone. The Disaster Management Cell would also be accompanied with staff that will execute the communication channels and make sure respective heads are updated about real- time information. The communication system will be centrally controlled with sub-stations at each functional department. It'd also allow the departments to find a cohesive inter-department solution to any disaster.

7.4.15 Assembly point

In case of emergency some locations are considered as assembly points. Depending on the wind direction and location of emergency, Assembly point will be declared. The

employees should run across the wind direction and not against the wind direction. Depending upon the location of the emergency the incident controller will fix the Assembly point and officer will announce the location of the Assembly point. Employee's attendance, visitors and contractors workmen register will be made available at the assembly point for head count.

7.4.16 Emergency Control Center

Factory Manager Office will be declared as an emergency control center. Emergency control center will be facilities like:

· Address and Telephone numbers of the factory inspectorate, Odisha Pollution Control Board, Police, Fire Brigade, Hospitals and DMP Team members.

· Plant layout- indicating storage of hazardous materials, layout of fire Hydrants/extinguishers,

entrances/exits; roads etc.

· Portable P.A. system, manual siren, Flood lights, Torches, Pickaxe, Saw Nylon Ropes.

· Fire Blankets/Fire Proximity suit, Breathing Apparatus, First Aid Box etc.

· List of employees with address, telephone number, blood group etc.

· Material safety data sheets of all chemicals handled.

7.4.17 Alarm System

A siren (with 5 km range) is provided under the control of time office in the plant premises to give warning. The warning signal for emergency follows:

- Emergency Siren: Waxing and waning sound for 1.5 minutes.
- All clear signal: Continuous siren for one minute.

7.4.18 Mock Drill

As per the Industrial Major Accident Hazard Rules,

- The plant is to ensure that a mock drill of the on-site emergency plan is conducted every six months.
- A detail report of the mock drill conducted is to be made immediately available to all the concerned authority
- Onsite disaster mock drills are conducted once in six months.

- Also, Major Fire and Minor Fire mock drills are conducted once in three months and one month respectively.

7.4.19 Training

On job training to the engineers on various stages of risk analysis and preparedness during emergency to reflect in the operation of terminal, especially from the safety stand point. The fire team belonging to the firefighting department are to be intensively trained for the use of all equipment and in various firefighting methods for handling different types of fires.

7.4.20 Key Personnel and Responsibilities

The actions necessary in an emergency will clearly depend upon the surrounding circumstances. Nevertheless, it is imperative that the required actions will be initiated and directed by nominated people, each with specified responsibilities as part of a coordinated plan. Such nominated personnel have been given extensive disaster management training and have several years of plant experience so that they understand the cause and solution for any disaster. In order to deal with an emergency, various disaster and fault scenarios have been worked out so that the key responsible employees remain vigilant and take prompt actions during any emergency.

7.5.1 Off Site Emergency Plan

The Disaster Management Cell will have strong communication mechanism with the local Government facilities. If need comes, the government bodies would be informed accordingly and appropriate help would be sort to address any disaster. Government bodies would be often required during mid and high level disasters. Schematic representation of various organisation involved during emergency is shown below in Fig. 7.2. Either way, the plan must identify an emergency coordinating officer who would take overall command of the off-site activities. Type of facilities required from outside bodies:

a) Fire-fighting facilities: Factory will have its own firefighting facilities but during emergency, fire brigade may be called.

b) Police would be required during emergency for evacuation of the people, traffic control and security.

c) Medical: Seriously injured personnel may be referred to the advanced care hospitals depending upon the gravity and type of injuries.

d) People living within the influence zone should be educated on the emergency in a suitable manner. This will be achieved through the local and district authorities. Necessary information and training materials will be extended to the Authorities.

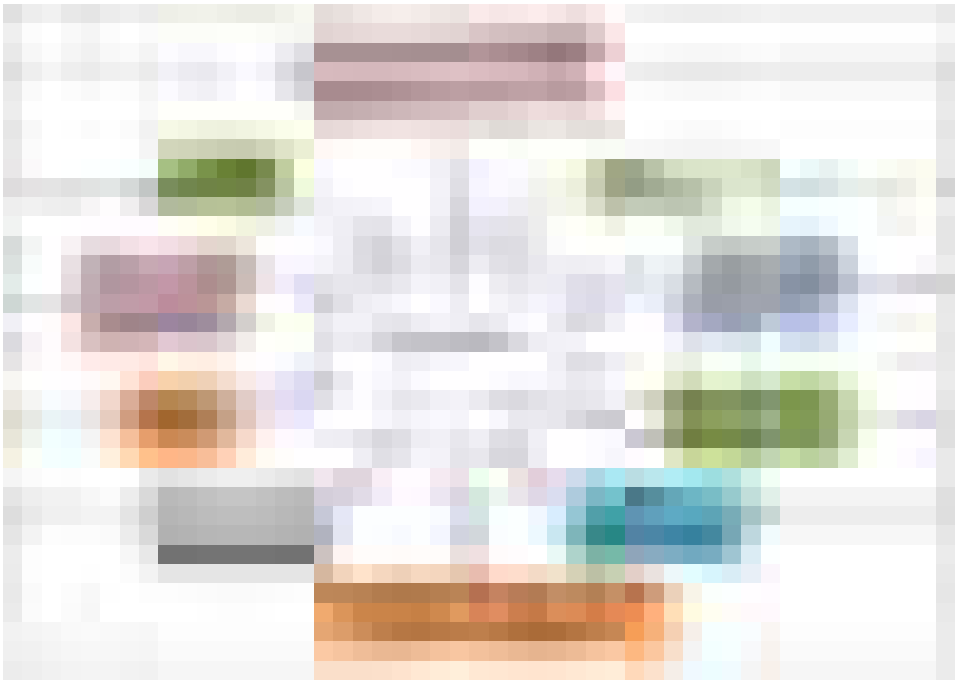


Figure No- 7.2: Various Organizations Involved During Emergency

7.5.2 Organization

Organizational details of command structure, warning systems, implementation procedures, emergency control centres include name and appointments of incident controller, site main controller, their deputies and other key personnel involved during emergency.

7.5.3 Communications

Identification of personnel involved, communication centre, call signs, network, list of telephone numbers.

7.5.4 Special Emergency Equipment

Details of availability and location of heavy lifting gear, specified fire-fighting equipment etc.

7.5.5 Voluntary Organizations

Details of Voluntary organizations, telephone numbers of nearby hospitals, Emergency helpline, resources etc. are to be available with chief authorities.

7.5.6 Public Information

- Dealing with the media-press office
- Informing relatives, etc.

7.5.7 Role of local authority

Local Authorities like Panchayat, municipalities can help in combating emergency situation after assessing the impact scenario in rescue phase.

7.5.8 Role of police

The police may assist in controlling of the accident site, organizing evacuation and removing of any seriously injured people to hospitals:

- Co-ordination with the transport authorities, civil defence and home guards
- Co-ordination with army, navy, air force and state fire services
- Arrange for post mortem of dead bodies
- Establish communication centre with easy contact with ECC.

7.5.9 Role of Fire Brigade

The fire brigade is to be organized to put out fires and provide assistance as required during emergency.

7.5.10 Media

- The media should have ready and continuous access to designated officials with relevant information, as well as to other sources in order to provide essential and accurate information to public throughout the emergency and to avoid commotion and confusion.

- Efforts are made to check the clarity and reliability of information as it becomes available, and before it is communicated to public.
- Public health authorities are consulted when issuing statements to the media concerning health aspects of any material/ chemical.
- Members of the media are to facilitate response efforts by providing means for informing the public with credible information about accidents involving hazardous substances.

7.5.11 Role of health care authorities

- Hospitals and doctors must be ready to treat all type of injuries to causalities during emergency.
- Co-ordinate the activities of Primary Health Centres and Municipal Dispensaries to ensure required quantities of drugs and equipments.
- Securing assistance of medical and paramedical personnel from nearby hospitals/institutions.

7.6 OCCUPATIONAL HEALTH STUDY

7.6.1 Expected Occupational Hazards

Manufacturing activities in an integrated steel plant, process, treat, store and handle hazardous substances, have a high hazard potential, endangering the safety of man and environment at work place and surrounding habitation. For effective implementation of the Rules, Ministry of Environment, Forests & Climate Change has provided a set of guidelines. The guidelines, in addition to other aspects, set out the duties required to be performed by the occupier along with the procedure. The Rules also list out the industrial activities and chemicals, which are required to be considered as hazardous.

7.6.2 Hazards for Workmen from the Raw Material

Dust: Coal dust is the principal occupational hazard for the employees involved in the coal handling area during the process of receiving or unloading of coal in the plant from the suppliers.

Dust can act as an allergen and cause Asthma and other Respiratory disorders.

Coal dust contains a lot of Silica, which is very well known for “Silicosis”, the notorious

disease, this hazard produces.

The Coal dust, inhaled over a period of time, during working hours, after a few years has a likelihood of producing an irreversible condition in the lungs termed as the "Coal Worker's Pneuomonitis."

Water: This as such does not produce a disease directly, as the workers involved in the procurement and supply of water in to the boilers, don't have a direct contact with it**.**

GM Iron and steel will follow the MSDS guidelines supplied by the manufacturer to safe-guard the health of the workers.

7.7 DISCUSSIONS & RECOMMENDATIONS FOR PREVENTION HEALTH IMPACTS

A. Pre-Placement and Periodical Health Status

Pre / Post-employment checkup will be carried out and following tests will be conducted:

- BMI (Body Mass Index)
- Chest X ray PA view
- Vision testing (Far & Near vision, color vision and any other ocular defect)
- ECG
- Haemogram (examination of the blood)
- Blood Pressure &Blood Sugar Fasting
- Serum Cholesterol
- Renal Function Test (Blood Urea, Serum Creatinine)
- Liver Function Test (S. Bilirubin, Alk. Phosphatase, SGOT and SGPT)
- Urine (Routine and Microscopic)
- Complete physical examination
- Post-employment occupational health check-up such as lung function, audiometry, CBC, Blood Sugar, Lipid Profile etc.
- Medical records of each employee will be maintained separately and will be updated as per finding during monitoring.
- Medical records of the employee at the end of his / her term will be updated.

Spirometry Tests						
Year	Total Manpower	FVC (litres)	FEV 1	FEV 1/ FVC %	PEFR	Conclusion

Physical Examination Tests								
YEAR	Total Manpower	Pulse	ECG	BP	Right Eye	Left Eye	Color Blindness	Squint

Investigations Tests					
YEAR	Total Manpower	Blood (CBC)	Blood Sugar (F& PP)	Lipid profile	URINE (R&M)

Audiometry Tests					
YEAR	Total Manpower	Audiometry done	Normal	Abnormal	Conclusion

B. Frequency of Medical Examination

- Once in a year

C. Anticipated Occupational & Safety Hazardous

- Heat Stress and Stroke
- Physical activity
- Dehydration
- Skin disorders
- Dust Exposure
- Noise
- Burns and shocks due to electricity

D. Personal Protective Devices and Measures

- Industrial Safety helmets, Crash helmets
- Face shield
- Zero power Safety goggles and Gas Cutting Goggles
- Welders equipment for eye and face protection i.e. welding shield Ear muffs and Ear Plugs
- Full body Safety harness

- Leather hand gloves, Electrical hand gloves, Heat Resistive hand gloves, Chemical hand gloves and Cut resistance hand gloves
- Safety net, Barricading net.
- Industrial safety shoes with steel toe
- Electrical safety shoes without steel toe and Gum boots
- Reflective Jackets
- Safety belt / line man's safety belt
- Rope grab fall arrestor

Implementation of OHS standards as per OHSAS/USEPA

The overall objective of the company will be to provide a system that is capable of delivering healthy and safe workplace. Following measures will be adopted implementation of OHS standards.

- Annual contract with Occupational Health Centre with adequate paramedical staff
- Routine and special investigation related to occupational health
- Health surveillance and maintenance of health record
- Rules and procedure for effective implementation of Safety, Health and Environment policy and made to know all employees
- Round the clock Ambulance facility
- Sufficient number of First aid boxes
- Implementation of OHSAS 18001 for OHS Management System
- Implementation of ISO 14001 for Environment Management System
- Formulation of OHS implementation team/ cell
- Risk assessment of each and every activity
- Implementation of OHS management program
- Training, awareness program and work place talk
- Displaying the safety and health policy and instructions at various locations
- Display of safe operating procedure (SOP) at various locations
- Job safety analysis
- Carry out daily plant safety inspection by internal safety department

- reports of occupational diseases
- Monthly safety meeting of all employees and workers to discuss last month accident if any, reason and corrective measures taken
- Organize campaigns, competitions, contests etc. to promote safety
- Organize safety training, seminars for safe working and safe vehicle and traffic movement within the plant premises and regular training for safe driving outside the plant premises
- Prepare annual reports of accidents and occupational diseases. Preparation and updating of Onsite Emergency Plan
- Ensure use of PPEs according to the job like helmet, safety shoes, goggle, dust mask, ear plug and hand gloves etc.
- Display Material Safety Data Sheets (MSDS) for use of every hazardous substance
- There shall be a proper exhaust/ventilation system specifically in the raw material handling, grinding and product handling areas to ensure proper maintenance of Temperature and Ambient air. This facility may also be extended to the other areas of the plant.

7.8 SOCIAL IMPACT ASSESSMENT

Potential impacts of the project on socio-economic environment are summarized below and categorized either as positive / beneficial or negative / adverse impacts.

- **Positive Impacts**
  - **Employment**

Employment opportunities will be created by M/s. GM Iron and Steel Co. Limited during planning and preparation, construction and operational phases of the proposed Grinding Unit and it will provide a sustainable and safe working environment for workers.

- **Community Skills Development**

The employees will be benefited from the training programmes that instituted by

GM Iron and Steel to enable the community labour force to work in the different areas of production.

- **Improved Standard of Living**

Employment opportunities created by the project will improve the standards of living in the area.

- **Community Organizational Capacity Development**

Through engagement of community members in development structures such as Community Development Committees, the community organizational capacity will be developed.

- **Improved Water Supply**

Ensuring safe water for the community that may improve health standards and living conditions in the villages.

- **Economic Exposure and Development**

Implementation of the project will strengthen financial institutions as well as availability of related economic facilities, infrastructure and services for the people.

In order to maximize the project's positive impacts during the construction phase, it is proposed that local people will be preferred based on their skills and qualifications and also, local companies would be encouraged to supply the construction materials, therefore stimulating the job market and the local economic activities.

- **Adverse Social Impact**
    - **Health Impacts**

The project may induce the potential for triggering health impacts through air pollutants from heavy vehicles, increased dust, creation of breeding grounds for disease vectors, inadequate sanitation facilities and population influx which might introduce new diseases in the area.

    - **Livelihood change**

Due to the labor intensity of the manufacturing sector, the project will attract more

work force from the community which in turn will lead to low labor availability in other sectors of the economy including agricultural, education and health workers. This impact will not be significant due to low level of education and skills in the area which will result in sourcing workforce from outside area, but the magnitude of impact will be higher due to high number of dependents in a household.

7.9 CONCLUSION

It is concluded that there will be no major risk involved. Proper precautionary measures will be taken to minimize risks. Personal Protective Equipments (PPEs) will help to minimize the health hazards and accidental casualties. So, it is safe to say that there will be no major risk involved.

CHAPTER-VIII

PROJECT BENEFITS

8.0 INTRODUCTION

Any industrial activity will help in improving the socio-economic status in the area like employment, communication, education etc. it improves the living standard of the people, supports for education and increase the ability of people to understand the changes. The industrial establishments will also help to improve the basic infrastructure of the society, thereby there is an overall improvement in the economic status of the people. The following paras will discuss the benefits that are obtained from proposed establishment of Pellet plant within the existing integrated mini steel plant premises.

8.1IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The project is expected to yield a positive impact on the socio-economic environment. It helps to sustain the development of this area including further development of physical infrastructural facilities. The following physical infrastructure facilities will improve due to establishment of the project.

- Road Transport facilities
- Housing facilities
- Water supply
- Power

The development of industrial projects plays a key role in the economic growth of any country. Peripheral development takes place due to more influx of money through the populace; overall importance of the area increases and the infrastructure improves. Management of GM Iron and Steel is aware of and concerned about the health and safety of not only its own employees and their families but also about the ecology and issues affecting the society around their plant. As a corporate citizen it has always been the endeavor of the group to take effective steps to tackle all these issues. Following improvements in the physical infrastructure are envisaged:

- The transportation of all the raw materials and finished product will be through road. GM Iron and Steel will liaison with the concerned Government departments for maintenance / upgradation of the existing roads in the vicinity.
- The unit will contribute to the construction/maintenance of school buildings in the nearby villages.
- The company will have MOU with nearby hospitals/nursing homes for day to day and annual checkup and treatment of employees, their family and other affected persons.
- Conditions of other infrastructural facilities like transport, drinking water, health and hygiene are also likely to improve due to the project.

8.2 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

Community development activities are very important aspects for any big organization because people of the villages surrounding the plant are the indirect stakeholders. Marginal positive impact on socio-economic environment is foreseen due to direct and indirect employment, opportunity of business and social welfare taken up by the company. The mostly rural population may see development of educational, medical and infrastructural facilities.

8.3EMPLOYMENT POTENTIAL-SKILLED; SEMI-SKILLED & UNSKILLED

Operation and maintenance of integrated iron and steel plant required human resources in different categories like managers, engineers of different discipline like metallurgical, mechanical, electrical, electronics, computer, civil, structural, chemical etc., highly skilled, skilled and semi-skilled work force in different discipline, commercial, accountants and financial managers, unskilled labour force, clerical, security personal etc. The estimated manpower requirement is 842.

Apart from jobs, the company will provide medical and training facilities to the employees which can also be availed by the people around the plant.

A summary of the manpower requirement for the project is as given below:

Table 8.1: Manpower Break-up

Particulars	Existing	Additional	Total
Regular	25	100	125
Contractual	225	492	717
Total	250	592	842

Source: GMIS

8.4 CORPORATE ENVIRONMENT RESPONSIBILITY (CER)

M/s. GM Iron & Steel Co, Limited will implement various rural development programmes near the plant through its CER activities. The following measures are suggested for minimizing the adverse impacts on socio-economic and human interest values due to the proposed development:

- Communication with the local community shall be conducted on regular basis by the project authorities to provide opportunity for mutual discussion.
- For social welfare activities to be undertaken by the project authorities, collaboration may be sought with local administration, Gram Panchayat, Block Development Office etc. for better co-ordination and timely implementation.

In order to maintain good Industrial Relations and to implement the project smoothly, following facilities will be provided:

- Essential facilities like electricity, drinking water, toilets, and bathrooms, proper fencing, and leveled ground with proper drainage, sanitation arrangements, and adequate illumination arrangements shall be provided.
- Provision of ambulance with doctor and first aid shall be kept.
- All contract workers and staff shall be dressed with Personal Protective Equipment and safety gadgets. Safety during project operation will be accorded highest priority. Regular awareness programmes shall be conducted to create and sustain a safe working culture.
- Rest rooms, canteen and drinking water near the workplace shall be provided for contract workers as well as transporters etc. Hygienic working conditions shall be maintained at the work place.

Wherever possible, the Company shall provide infrastructure to help set up local schools, centers for primary learning and education, repair/construction of primary schools in neighboring villages. Training would be provided to the eligible local people for attaining skills with recognized institutions. It is usually envisaged that setting up of an industry helps in developing the infrastructure of the locality. A total budget of Rs 3.1 Crores (2%) has been kept for CER activities .

CHAPTER-IX

ENVIRONMENT COST BENEFIT ANALYSIS

Environmental Cost Benefit Analysis not recommended at scoping stage – thus no detailed analysis carried out separately in this EIA/EMP report. However as discussed earlier, environmental monitoring and audits will be carried out during & after the construction and during operation phase to check that the environmental management measures are being satisfactorily implemented and are delivering the appropriate level of environmental performance and identifies the following:

- Specific measures that will be taken to prevent, reduce or manage the environmental impacts during construction and operation;
- Proper EMP for identified the level of environmental performance that will be expected during the operation.
- Ensure that environmentally critical actions are undertaken in compliance with various regulatory requirements.

Cost of Environment Management

Estimated Cost of EMP			
Sr. No.	**Particulars**	**Estimated cost in Rs. Crore**	**Recurring cost in Rs. Lacs/annum**
1	Air Pollution Control	20	98.00
2	Water Pollution Control	4.5	25.00
3	Noise Pollution Control	1.3	3.5
4	Environment Monitoring & Management	1.0	8.00
5	Occupational Health	1	5.00
6	Green Belt/plantation	2.5	10.50
	TOTAL	**30.30**	**150.00**

CHAPTER-X

ENVIRONMENTAL MANAGEMENT PLAN

10.1 OBJECTIVES OF ENVIRONMENT MANAGEMENT PLAN

The objective of the Environmental Management Plan (EMP) is to identify administrative aspects for ensuring that mitigation measures are implemented and their effectiveness is monitored.

The EMP focuses on direct impacts, which are identified as having the potential to cause significant impacts on the environment and identifies the following objectives:

- Specific measures that will be taken to prevent, reduce or manage the environmental impacts during construction and operation; and
- Objective of EMP is to identify the level of environmental performance that will be expected during the operation.

The major objective and benefit of utilizing Environmental Impact Assessment in project planning stage itself, is to prevent avoidable losses of environmental resources and conservation of the same to the maximum extent and values as a result of Environmental Management. The Environmental Management includes protection/mitigation/enhancement measures to be adopted by the project proponents, as well as suggests revision of project site or operation to avoid adverse impacts or often additional project operations may have to be incorporated in the conventional operation.
The industrial development in the study area needs to be intervened with judicious utilization of non-renewable resources of the study area and within the limits of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged in the environment without affecting the designated use of that area and is governed by dilution, dispersion, and removal of pollutants due to Physicochemical and biological processes. The Environment Management plan (EMP) is required to ensure sustainable development in the study area of the plant site, hence it needs to be an all encompassive plan for which the industry, Government, Regulating agencies like pollution control Board working in the region and

more importantly the affected population of the study area needs to extend their cooperation and contribution. It has been evaluated that the study area has not been affected adversely and is likely to get new economical upliftment. The affected environmental attributes in the region are air quality, soil, land use, ecology, public and public health.

The Management Action plan aims at controlling pollution at the source level to the possible extent with the available and affordable technology followed by treatment measures before they are discharged.

The Environmental Management aims at the preservation of ecosystem by considering proposed establishment of pellet plant within the existing premises of integrated steel plant pollution abatement has become an integral part of planning and design along with Techno economic factors.

M/s GM Iron & Steel Co, Limited management has environment & safety policy and is committed to use best environment management practices during construction and operation phases.

M/s GM Iron & Steel Co, Limited will ensure that environmentally critical actions are undertaken in compliance with various regulatory requirements. There will be an Environment Management Cell overseeing all environment and safety responses to ensure implementation of mitigation measures and monitoring programme (as mentioned in Chapter 4 & 6) during construction and operation phase including findings / recommendation of third party audit and monitoring results.

10.2 Environment Management

10.2.1 Air Environment Management

During excavation and transportation of the raw materials/finished goods, on roads at the plant site, there is a scope for creation of local fugitive dust emissions. There is a likelihood of fugitive dust from the construction activity and material handling from the truck movement in the premises of the project site.

The operational phase of the expansion project comprises of various activities each of which will have an impact on air quality. The impact on air quality can be due to:

- Stack Emissions

- Fugitive Emissions

10.2.1.1 Stack Emissions and Control Technologies

Following are the pollution control measures adopted:

- The existing boilers are equipped with Electrostatic precipitators along with adequate stack height.
- Other units like DRI, SMS etc. are also equipped with ESP and bag filters and stacks of adequate height
- DG Sets are provided with adequate stack height.
- All the roads are asphalted/ concrete to control the fugitive dust emissions.
- Greenbelt is being/will be maintained and strengthened along the periphery of the plant premises to control fugitive dust emissions.
- Online stack monitoring system is already in place and operational.

10.2.1.2 Fugitive Emissions, Sources and Control Technologies

Fugitive Emissions

Fugitive emissions are the air pollutants released in the air other than those from stacks or vents. Fugitive dust may be defined as "any solid particulate matter that becomes airborne by natural or man-made activities, excluding particulate matter emitted from an exhaust stack".

Factors that influence emissions

Factors affecting emissions that are common to most operations include the following:

- Moisture content of the material
- Type of material processed
- Type of equipment

10.2.1.3 Sources of Fugitive Emissions in steel plant and Mitigation Measures

a) Storage of raw materials:

Dust will be generated here due to carryover by wind. However to avoid this, material will be kept under covered shed. Proper water sprinkling will be done for dust suppression in open yards roads.

b) Transportation

- All Internal roads are paved to prevent the fugitive dust emission due to vehicular movement.
- Speed limit in plant premises is in control.
- All transportation vehicles carry/ will carry a valid PUC (Pollution under Control) Certificate.
- Flow of vehicles is being/will be maintained.
- Proper traffic management is being/will be undertaken.
- Proper servicing & maintenance of vehicles is being/will be carried out.
- Proper dust masks are being/will be provided to workers coming in direct contact of fugitive emissions.

c)Material Transfer

- Dust is/will be generated from all the transfer points of belt conveyors. This is/will be controlled by providing bag filters at material transfer points.
- All the internal roads are asphalted, leveled as such no undulations, no sharp curves exists in the existing plant. Therefore, vehicular movement will not generate fugitive dust.
- Adequate greenbelt has already been developed in the plant area. Greenbelt acts as a surface for settling of dust particles and thus reduces the concentration of particulate matter in air.
- Regular sweeping of roads and floors is being/will be done as a measure to prevent fugitive dust emissions.
- Water Sprinkling is being /will be done to reduce fugitive emission in the plant and maintain the ambient air quality within CPCB standard.
- Adequate spares of critical components of dust and gas collection systems will be kept to ensure trouble - free operations and continuous compliance to emission norms.
- Ambient air quality is being/will be regularly monitored, so as to keep a check on the emissions of different pollutants.

- In SMS unit, induction furnaces are/ will be provided with moveable hood and Bag filters. Bag filters will limit the particulate emission from the stack within the permissible limit.
- Fugitive emission sources are being /will identified and monitored at regular basis.
- A comprehensive plan for fugitive emission control based on CPCB guidelines will be followed.

Following measures will be implemented in the plant to control the generation of fugitive emissions:

a) Enclosures will be provided for unloading operations.

b) Water will be sprayed during unloading of materials.

c) Covered conveyer belt will be used for material transportation.

d) All transfer point locations will be fully enclosed.

e) Bag filters will be provided at all the transfer points as per the requirement.

f) Maintenance of Bag filters:

Maintenance of the Bag Filter includes replacement of bags, checking the performance of the Bag Filter, maintenance of ID fans etc.

g) The information on performance of Bag Filter in relation to the process/ production conditions will be collected to optimize the efficiency of Bag Filters.

h) All the roads inside the premises will be concreted.

i) Regular cleaning of roads and Unit area by vacuum cleaning machine will be done.

j) Fines collected from air pollution control equipment will totally be used in the pellet plant

k) Dense green belt within the premises and along the roads to control the fugitive emission from vehicular movement.

10.2.2 Noise Environment Management

Exposure of high noise level to workers for long duration may lead to certain occupational diseases. To mitigate the high noise level, following measures will be adopted.

- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- In order to reduce the effect of noise pollution, earmuffs will be provided to all operators and employees working near the machinery.
- Adequate silencers will be provided in all the diesel engines.
- Green Belt of appropriate width will be maintained inside the pant premises and at the plant boundary. 33% area of the project land will be developed for green belt.
- Regular monitoring of noise level will be carried out and corrective measures will be adapted accordingly.

10.2.3 Water Environment Management

10.2.3.1 Water Requirement

The total water requirement (make-up) for the project will be 2,890.8 m^3/day . Details of Water Requirement breakup and Water Balance Diagram is given Chapter – 2 of EIA / EMP Report.

10.2.3.2 Wastewater Management

- The project is being/will be based on "Zero Effluent Discharge".
- Waste water generated from the process is being/will be treated in neutralization pit and after treatment 100% recycling will be done.
- Domestic waste water generated is being/will be treated in sewage treatment plant. The STP of 25 m^3/day Capacity is installed to cater the wastewater treatment.
- Rain Water Harvesting is being / will be practiced within and outside the plant premises.
- Waste water generated will be treated through neutralisation pit and settling tank i.e. will be sent to collection Pit and 100 % recycling will be ensured after adjusting pH.

10.2.3.3 Water Conservation Measures

The following measure has been / will be adopted to minimize use of water-

- Closed circuit cooling system is being/will be provided in the process & cooling of SMS & CPP plants. Hence there is/will not be any waste water generation from process. However, loss due to evaporation has to be made up as make up water.
- Boiler blow down & DM plant regeneration waste water will be used in Pellet / Sponge Iron plant for cooling purposes.
- The treated water from the Effluent treatment will be used in the Industrial cooling of DRI plant.
- Domestic waste water is being/will be treated in Waste Water treatment plant.

10.2.4 Land Environment

The total project area is 106.50 Acres, existing: 58.20 Acres & proposed expansion: 48.30 Acres which is under process for acquisition. And the proposed expansion will be done within the existing plant premises.

10.2.5 Biodiversity Management

Out of the total project area of 106.50 acres area 33.05% i.e. 35.20 acres will be developed as green belt/plantation all around the plant boundary, roadside, office , building & stretches open are within the premises.

Local plant species will be preferred as per the CPCB guidelines in consultation with Local Forest Department. A planned 5 year Afforestration scheme has developed over an area of 35.20 Acres with 2500 saplings/Ha. The maintenance such as suitable fencing, watering, replacement of dead plants etc. shall be done for better survival rate. Dust suppression shall be done by regular water sprinkling to minimize the impact on plants.

The following characteristics will be taken into consideration while selecting plant species for green belt development and tree plantation.

- They should be fast growing and tall trees.
- They should be perennial and evergreen.
- They should have thick canopy cover.
- The planting should be in appropriate alternate rows around the site to prevent lateral pollution dispersion.

- The trees should maintain regional ecological balance and conform to soil and hydrological conditions. Indigenous species should be preferred.

Species	Common Name
Moringa oleifera	Drumstick
Butea monosperma	Palash
Dalbergia sissoo	Sissoo
Neolamarckia cadamba	Kadam
Terminalia arjuna	Arjun
Mangifera indica	Mango
Albizzia lebbeck	Siris
Polyalthia longifolia	Ashoka
Dendrocalamus strictus	Bamboo

Table 1: Green Belt Development Plan

S. No	Year	Greenbelt area to be developed	No. of saplings proposed to be planted
1.	1st Year	2.965	3,000
2.	2nd Year	4.942	5,000
3.	3rd Year	7.413	7,500
4.	4th Year	9.390	9,500
5.	5th Year	10.489	10,613
Total		**35.20 acres**	**35,613**

Guidelines for Greenbelt Development

Following guidelines have been followed for the Greenbelt Development in the plant

1. Barren areas will be vegetated in consultation with horticulturist
2. Plantation of trees will be undertaken around the area in alternating rows to prevent horizontal pollution dispersion

3. Trees will be planted along road sides, to arrest auto-exhaust and noise pollution, and in such a way that there is no direct line of sight to the installation when viewed from a point outside the foliage perimeter
4. Fast growing trees with thick perennial foliage will be grown. In order to facilitate proper growth of the vegetation, limited measures involving preparation of seed bed with suitable amount of fertilizers and treatment with mulches will be taken. The topsoil will be used for greenbelt development.

Vegetation cover in and around the plant generally helps in:

- Stabilizing erodible slopes to minimize pollution
- Control of dust
- Enhancement of aesthetic value
- Maximizing evapo -transpiration, which helps minimizing run off
- Reducing noise

10.2.6 Socio-Economic development

GM Iron and Steel Co, Limited will be undertaking activities related to social development of the villages near to the plant. Some of the activities proposed to be undertaken by GM Iron and Steel Co, Limited are given below.

- Vocational training for the youth & women will be provided.
- Infrastructure facilities like road making, water supply schemes etc. will be implemented in the nearby villages, which have these facilities in an inadequate proportion.
- Health & Eye camps will be organized for general health checkups, eye checkups, family planning & aids awareness programs will also be organized. Free medicines will be provided for local villagers.
- Skill development programs for local youths for employment in steel plant industry.

The following activities for the up-liftment of the social community through community development activities as given below:

1. **Education**
    - Promotion of education programmers

- Promotion of adult & female literacy programmers
- Repairing of schools

2. **Health**
   - Preventive medical care & educational facilities for rural population will be promoted.
   - Awareness to improve health & hygiene standards
   - Periodic medical check-up of employees as well as residents of adjoining villages.
3. **Water**
   - Digging and repairing of wells and hand pumps
   - Awareness program on safe drinking water
   - Support for rain water harvesting schemes in nearby villages.
4. **Others**
   - Assistance in Social Forestry Program.
   - Supplementing Govt. efforts in health monitoring camps, social welfare and various

Initially socio-economic development program will be implemented in the villages in the immediate vicinity of the project based on the need analysis exercise by the CER team. Budgets for the same will be allocated accordingly to the priority of the need.

10.3 Solid Waste Management

The domestic solid waste generated during construction will be disposed off without causing pollution in the surrounding environment. Excavated soil will be used for backfilling and leveling of roads. Part of Construction wastes will be reused for filling and the rest will be disposed off to authorized recyclers.

Table 2: Solid Waste Management

Item	Quantity TPA	Remarks
Slag from Captive IF	27,000	To be used for cement plant.
Char from DRI	1,24,000	To be used in Power Plant.
Dust from DRI	1,64,300	To be supplied to Fly Ash Brick manufactures

ESP Dust from Pellet Plant	23,700	To be recycled to the bin above balling disc section.
Mill scale from Rolling millworkers	13,500	To be used in SMS
Dust from Cement plant	14,700	To be supplied to Fly Ash Brick manufacturers
Fly Ash From CPP	1,58,400	To Fly Ash Brick plant in local Area.

Concept Of Waste Minimization, Energy And Natural Resource Conservation Measures

Reuse

- Waste generated from construction activity is/will be utilized in leveling of land.
- STP Sludge is being / will be used as manure for greenbelt development / plantation.
- Fly Ash generated from CPP is being / will be sold to cement and brick manufacturing process.
- SMS slag is being/will be used in filing of low-lying area and in Road making.

Recycle

- Treated water from STP is being / will be reused for greenbelt development / plantation. RO reject water is being / will used in dust suppression.
- Cooling water drain and Boiler blow down will be used for cooling in DRI.

Recovery

Waste heat generated from kiln is being / will be utilized for power generation through WHRB.

10.3.1 Energy Conservation

GM Iron and Steel Co, Limited has implemented numerous process control measures as well as energy efficient technologies which ensure proficient management of its energy resources.

- Installation of energy efficient lightings. Use of energy saving light fittings
- Installation of LED/CFL lighting.

- Use of energy efficient electric motors complying IEE3 Standards.
- Use of highly efficient VFD, minimizing idle running of machines.
- Optimizing loads and periodic preventive maintenance & lubrication
- Prevention of leakages of compressed air
- Optimized compressed air pressure.
- Periodic energy audits.
- Training, awareness and motivational programmes.
- Maximum utilization of renewable energy resources

10.4 CORPORATE ENVIRONMENT POLICY

The Company has formulated a Corporate Environment Policy approved by Board of Directors, to ensure that all aspects of plant operation will be least harmful on the Environment by implementing an Environmental Management system to:

- Have full awareness of all Environmental and Factory legislation in India and ensure that regulatory requirements are met including conditions/ stipulations/ norms of Environment Clearance, Consent to Establish & Consent to Operate.
- Monitor the implementation of the policy by carrying out periodic audits of compliance with full reporting to the Board of Directors and when appropriate, introduce remedial measures.
- Ensure all employees, in the course of their duties, act in accordance with the Environmental policy. Encourage suppliers, contractors and vendors to act in accordance with Company's environmental standards.
- Keep attention within the business for selection of nonpolluting technology, waste minimization, reuse/recycling and the reduction of energy consumption.
- Maintain transparency in matters of Environmental compliance.
- The Company will also make a positive environmental contribution in the local community by encouraging open communication, general Environmental awareness and the promotion of CER activities. In case of any deviation/ non compliance/ violation of environmental norms, Head of Plant EMC will report directly to GM (works) and Board of Directors for immediate remedial action.

The copy of approved Environment Policy is attached as **Annexure.**

10.5 REPORTING OF NON-CONFORMANCE & MANAGEMENT REVIEW

Review and audit is essentially a management tool. It is the application of the operational level for verification and feedback on the effectiveness of the organization system and environmental performance. A system of auditing will be undertaken during operation and includes the use of trained internal and external auditors. In addition, auditing shall be undertaken to ensure compliance with all the applicable legislation.

Management Review

A comprehensive review of the objectives and targets associated with the individual project of the company shall be undertaken on an annual basis. These reviews, which include involvement from the site management and other key personnel, assess the performance of the plant & EMP over the previous year and develop goals and targets for the following period.

Table 10.3: Environmental Monitoring Plan for the Performance Indicators

Environmental Component	Parameters & Location	Location	Frequency	Implementation	Supervision
Effluent Quantity & Quality					
Ambient Air Quality	PM10, PM2.5, SO2, NOx	In &around the plant	As per NAAQS, 2009	Through approved monitoring laboratory	EMC
Ambient Noise Levels	As per National Ambient Noise Standard as per Environmental Protection Act, 1986 amended 2002	All along the plant boundary	Quarterly or as prescribed by OSPCB.	Through approved monitoring agency	Owner
Ground Water Quality	As per IS 10500	All ground water sources within and around the project site	Quarterly or as prescribed by OSPCB.	Through approved monitoring agency	Owner

Surface Water	As per IS 2296	All surface water body within and around the plant site	Quarterly or as prescribed by OSPCB.	Through approved monitoring agency	Owner

10.6 RECORD KEEPING

a) Records of significant environmental matters, including monitoring data, accidents and occupational illnesses, and spills, fires and other emergencies will be maintained;

b) Recorded information will be reviewed and evaluated to improve the effectiveness of the environmental, health and safety program; and

c) An annual summary of the above information shall be provided to MOEF/SPCB, if required.

Compliance of CREP guidelines

Compliance to the CREP guidelines prescribed by CPCB for the iron & steel industry is given in Table 10.4.

Table 10.4 CREP guidelines for Iron & Steel Industry

Sr. No.	CREP Guidelines	Compliance to CREP
1	Fugitive emissions from material handling, conveying and screening operations shall be evacuated in closed systems and extracted by Fabric filters or ESPs or equally effective methods	Dust extraction System along with ESP & bag filter have been proposed
2	Pollution control systems shall be operated as an integral part of production to ensure minimum emissions. Timely evacuation of dust (from Dust catchers, ESPs, Bag filter hoppers etc.) shall be routinely organized.	This shall be complied
3	Fugitive emissions shall be controlled by controlled wetting and /or by the use of crust	Water sprinkling as proposed

	formers.	
4	Flue dust, collected within the dust catchers shall be evacuated using closed vessels or employing equally effective methods to minimize fugitive dust.	Shall be complied
5	Cooling water shall be recycled and reused	Shall be complied
6	Domestic discharges which are not reused, shall meet outfall, only after conforming to the specified effluent discharge standards.	Shall be complied
7	The areas where high noise levels persist continuously for a significant period of time like Furnace area, Gas Cleaning Plant area, etc. shall be earmarked as High Noise Zone areas and accordingly it shall be displayed at appropriate places for warning employees. Through Integrated Maintenance Management system, necessary care shall be taken to minimize the noise at these areas.	Shall be complied
8	Employees who are continuously exposed to high noise levels shall be provided with earplugs or earmuffs.	Shall be complied
9	Appropriate measures shall be taken, so that employees are not getting exposed to higher noise levels for a significant period of time.	Shall be complied
10	Noise levels at various areas of the plant shall be regularly monitored and reviewed	Shall be complied
11	Areas where continuous exposure cannot be avoided, necessary care shall be taken to insulate them from the surroundings.	Shall be complied
12	All efforts shall be made to minimize the generation of wastes and maximize its effective utilization	Shall be complied

13	Wherever it becomes unavoidable, except resorting to option of dumping, in such cases, the wastes shall be disposed under controlled conditions.	Shall be complied
14	All the wastes from the pollution control systems or treatment units shall be reused or recycled to the extent possible.	Shall be complied
15	Disposal of wastes shall be done in such a way that the pressure on land and subsequent land contamination shall be minimum.	Shall be complied

CHAPTER-XI

SUMMARY & CONCLUSION

11.1 INTRODUCTION

M/s GM Iron & Steel Co, Ltd. proposes for the Expansion of iron & steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70.000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA at village Kulei, Parjang in Dhenkanal district, Odisha.

Project falls under "Category "A" or Activity 3 (a) Metallurgical Industries (Ferrous & Non-ferrous) and 3(b)' Cement Plants (EIA Notification dated 14th Sept, 2006 as amended time to time). Accordingly, the proposal for the term of Reference (ToR) for undertaking EIA/ EMP Study for the Expansion Project. Online application for the proposal was filed on 17th Nov 2020. And the standard ToR was granted by MoEFCC vides file no. J-11011/286/2020-IA.II(I) dated 24/11/2020.

11.2 PROJECT DESCRIPTION

Project Site

The project site is located at Village– Kulei, Parjang in Dhenkanal district of Odisha State under Survey of India, the 10 km radius study area falls in toposheet nos. F45N4, F45N8, F45T1 and F45T5 (Scale 1:50,000). The Latitude and Longitude of the project site are 20°59'1.34"N to 20°59'10.95"N and 85°16'10.49"E to 85°16'49.30"E respectively. The topography of the project site is mostly levelled with very little undulations. The site has an average altitude of 145 - 150 m above MSL. The nearest railway station is the Talcher Railway Station – 10 km (SW). The nearest airport is at Bhubaneswar, BijuPattnaik International Airport, approx 130 km from the site. The site is well connected through Kulei-Pitiri Road

(SH)- (0.50 km, N) which is just 4.1 km away from NH - 53 in South direction.

Land use Pattern

The total land required for the project is 106.50 Ac. At present, the Existing Unit (production facilities) has been set up over 58.50 Ac. and Additional Requirement –48.30 Ac. About 35.20 acres (33.05%) of the total project area will be covered under the green belt & plantation.

The land-use breakup of the project site is given in the following table.

Land Use Pattern

Sl. No.	Particulars	Total Area (Acres)
1	ExistingUnits(Production Facilities)	6.50
2	Proposed Units (Production Facilities)	32.60
3	Road	4.40
4	Reservoir	2.20
5	Raw Material/ Finished Product Stock Yard	10.30
6	Green Belt	35.20
7	Open Space	12.80
8	Utilities / Weigh Bridge/ Truck Parking	2.50
TOTAL AREA		**106.50**

Source: GMIS

Process Technology

The technical concept of the plant has been developed keeping in view the state-of-art technology for effective pollution control for the integrated steel plant.

The selection of the most optimum process route for installation of steel plant needs critical analysis and evaluation. The evaluation process is more relevant due to the emergence of a large number of new competitive technologies in various fields of steel making. This section evaluates the technologies and suggests the optimum one for expansion of existing steel plant.

Such an evaluation involves an analysis of past achievements, present status and future prospects of each technology under consideration keeping in view the following criteria.

- Adoption of indigenous technology
- Capacity of the plant
- Selected product mix
- Conservation of scarce and costly energy input
- Suitability of available raw materials
- Cost considerations

Plant Configuration

Plant configuration and production capacity is given below

Project Configurations

Name of the Units	Existing Production Detail	Proposed Final Production		Total (Final Production)
		By Modernization, Argumentation & increasing annual working days	New Installation	
DRI Kiln	1,35,500 TPA (1 x 100 TPD & 1 x 350 TPD)	1,91,400 TPA (1x130 TPD 1x450 TPD)	1,81,500 TPA (1 x 550 TPD)	**Sponge Iron -3,72,900 TPA**
Induction Furnace with LF	75,000 TPA (2x10 T)	88,500 TPA (2x12 T)	1,81,500TPA (3 x 20 T)	**Billets (Mild & Alloy Steel) 2,70,000 TPA**
Rolling Mill				

TMT Structure	30,000 TPA (1 x 100 TPD & 1 x 100 TPD)	105000 TPA (2 x 400 TPD & 2 x 250 TPD – replacement & addition)		**Rolled Products 2,70,000 TPA**
Wire Rod	-	-	1,65,000 TPA (1 x 500 TPD)	
Pellet	-	-	8,00,000 TPA (1 x 0.8 MTPA)	**Pellets 8,00,000 TPA**
CPP (WHRB)	8 MW	-	10 MW	**Power 18 MW**
CPP (AFBC)	4 MW	-	36 MW	**Power 40 MW**
Cement Grinding Unit	-	-	4,16,000 TPA (2 x 500 TPD 1 x 300 TPD)	**Slag Cement 4,16,000 TPA**

Raw material Requirement

The raw material for this plant is Iron Ore Fines, Coal, Coke, Bentonite, Lime Stone, Ferro Alloys, HM Scrap, Slag, Clinker, Gypsum. The quality of raw materials is the key factor for effective plant operation. The quantity of raw material at the installed capacity of the plant is given in the table below:

Raw Material Requirement

Raw Material Required	Quantity in Tons per Annum	Source	Distance from site (Kms)	Mode of Transportation
Iron Ore Fines	8,40,000	Captive iron ore mines located at Badampahar mines	180 km	Road
Coal	5,27,500	Mahanadi Coalfields at Talcher	25 km	Road
Coke	7,240	Mahanadi Coalfields at Talcher	25 km	Road
Char	1,24,000	Rourkela	190 km	Road
Bentonite	8,000	Rourkela	190 km	Road
Lime	13,600	Rourkela	190 km	Road

Stone				
Ferro Alloys	6,750	Rourkela	190 km	Road
HM Scrap	46,860	Rourkela	190 km	Road
Slag	2,45,440	Rourkela	190 km	Road
Clinker	1,49,760	Rourkela	190 km	Road
Gypsum	20,800	Rourkela	190 km	Road

Water Requirement

The total Circulating water requirement is 41,688 m3/day total makeup water requirement is 2,890.8 m3/day. Recirculation water requirement is 38,797.2 m3/day. The breakup of water requirement is given in below tabular form:

Plant Facilities	Circulating Water M3/hr	Makeup Water M3/ hr	Recirculation Water M3/hr	Evaporation M3/hr	Discharge as waste M3/hr
Pellet	375.0	14.0	360.0	12.0	3.0
DRI	510.0	48.0	460.0	50.0	-
SMS	272.0	14.0	257.0	13.5	1.5
AOD	100.0	4.0	95.0	4.5	0.5
Rolling	278.0	11.45	263.0	14.5	0.5
Cement	50.0	2.0	48.0	1.5	0.5
CPP	150.0	25.0	125.0	22.0	3.0
Drinking & Sanitation	2.0	2.0	-	1.2	0.8
TOTAL	**1737.0**	**120.45**	**1608.0 + 8.55 (Recycled water after ETP)= 1616.55**	**119.2**	**9.8**

Power Requirement

The total power requirement for existing and proposed plants is 63 MW per hour. From existing plant power availability is 12 MW per hour (8 MW WHRB + 4 MW AFBC). The power from the proposed expansion is 46 MW per hour (10 MW WHRB + 36 MW CFBC). The balance of 5 MW shall be sourced from the nearest power grid of the State Government.

Manpower Requirement

Operation and maintenance of integrated iron and steel plant required human resources in different categories like managers, engineers of different discipline like metallurgical, mechanical, electrical, electronics, computer, civil, structural, chemical etc., highly skilled, skilled and semi-skilled work force in different discipline, commercial, accountants and financial managers, unskilled labor force, clerical, security personal etc. The estimated manpower requirement is **842.**

Project Implementation Schedule

The overall project shall be implemented over 36 months commencing from the zero date. Zero Date shall be the date when the Company acquires and possess the land and have the statutory approvals in hand.

11.3 DESCRIPTION OF ENVIRONMENT

Baseline study of the study area was conducted during Winter Season (Dec 2020 to Feb 2021). Ambient air quality monitoring has been carried out at 11 stations in the study area on 24 hourly basis. The concentration of PM10 ranges between 43.6 to 92.1 μg/m^3, PM2.5 ranges from 26.1 to 55.2 μg/m^3, SO_2 from 4.6 to 12.8 μg/m^3, NOx ranges from 10.7 to 25.8 μg/m^3 CO from 0.13 to 0.71 μg/m^3.

Ambient noise levels were measured at 10 locations around project site. Noise levels varies from 41.6 to 72.4 Leq dB(A) during day time and from 37.3 to 68.0 Leq dB(A) during night time.

The ground water analysis for all the 8 sampling stations shows that pH varies from 6.00 to 7.50, with total dissolved solid ranging from 186 mg/l to 786 mg/l. Total Hardness was in the range of 85 mg/l to 507 mg/l,. The fluoride ranged from 0.44 mg/l to 1.1 mg/l. The concentration of alkalinity, sulphates and nitrates in all

the samples were less than prescribed limits. The total coliforms were found to be <1.1 mg/l.

The surface water, pH values observed were in the range of 6.75 to 7.33 with total dissolved solids in the range of 62 mg/l to 191 mg/l. BOD were in the range of less than 1.8 mg/l to 22.4 mg/l. Chloride varied between 9 mg/l & 20 mg/l. Sulphates varied from 4.8 to 14.5 mg/l, Nitrate varied from less than 1 mg/l to 1.6 mg/l. Overall, the surface water samples were found within the prescribed limits.

Soil monitoring was carried out at 6 locations and the analysis results show that the pH value ranging from 6.88 to 7.26 , which shows that the soil is Neutral in nature. The soil in the study area is sandy loam ranging from 18 to 26 %. Nitrogen concentrations are in the range of 0.22 to 0.29% indicating that soils have very less quantities of nitrogen. The phosphorous concentrations are in the range of 0.021 to 0.028%. indicating that soils have very less quantities of phosphorus. Whereas the potassium concentrations range between 0.026 to 0.036%, which indicate that the soils have very less of potassium.

Land use / land cover

The land use/Land Cover map of the study area is prepared based on Sentinel 2A, European Space Agency Satellite free data has been used for Land use/Land cover analysis. 10 km radius study area constitutes Built-up land shown a total area of 515.64 Ha representing 1.57% of the buffer area, forest area shown a total area of 4979.25 Ha representing 15.20% of the buffer area, water body 644.06 Ha (1.96 %) of the buffer area., crop land shown a total area of 4163.46 Ha representing 12.71% of the buffer area, Scrub land shown a total area of 5683.68 Ha representing 17.35% of the buffer area & Barren land shown a total area of 15819.80 Ha representing 48.30% of the buffer area.

Biological Environment

Flora: Most common species found in the area are *Shorea robusta* (Sal), *Diospyros melanoxylon* (Kendu), *Pterocarpusmarsupium* (Piyasal), Gamhar *(Gmelina arborea),* Mahua *(Madhuca indica),* Charoli *(Buchananialanzan) etc. The understory consists*

of Kendu *(Diospyros melanoxylon),* Dhawai *(Woodfordia fruticosa),* Ber *(Ziziphusnummularia), Lantana sp., Calotropis spp,* etc. The scattered trees standing in the scrublandare, *Madhuca indica, Pterocarpus marsupium* (Piyasal), *Ficus bengalensis* (Bot), *Azadirachta indica* (Neem), *Phoenix sylvestris* (Khajoor), *Borassus flabellifer* (Tal), *Cocosnucifera* (Narial). The herbs and grasses growing are *Achyranthes aspera, Tridaxprocumbens, Elephantopus scaber, Cynodon dactylon, Cyperus rotundus.* etc.

Fauna: Commonly found species in the study area are, Indian elephant (*Elephas maximus*), Wild boar (*Sus scrofa*), Jackal (*Canis aureus*), Barking deer (*Muntiacus muntjak*), Little Egret (*Egretta garzetta*), Jungle fowl (*Gallus gallus*), Indian Python (*Python molurus*), Rat snake (*Ptyas mucosus*), etc.

Socio-Economic Environment

Generation of employment potential direct (35 Nos.) will have beneficial effect on the local populace. Thus, general impact on local economy and quality of life is likely to be appreciably beneficial.

11.4 ANTICIPATED ENVIRONMENTAL IMPACT & MITIGATION MEASURES

Air Environment

The stacks are major sources of air pollution from the plant. The plant is to be provided with necessary air pollution control devices like bag filters, to control dusts and also limit emission within the prescribed standard. There will be total 6 nos. of stacks in the plant.

Prediction of Incremental Ground Level Concentrations (GLCs) of PM_{10}, SO_2 & NOx is made by using AERMOD (ISCST3 run) /Industrial Source Complex Short Term model.

It is observed that resultant concentrations of PM_{10}, SO_2 & NOx are within the standards stipulated by CPCB.

Traffic Management

Impact

- Generation of exhaust gases is likely during the pre-construction stage during movement of heavy machinery, tankers etc. This impact is envisaged to be insignificant during the pre-construction stage.
- High levels of SO_2, NO_2 and HC are likely from hot mix plant operations. Volatile toxic gases are released through the heating process during production. Although the impact is much localized, it can spread downwind depending on the wind speeds. Construction vehicles shall also be releasing exhaust gases.
- The major impact on air quality will be due to plying of vehicles. The impacts on air quality will at any given time depend upon traffic volume/ rate of vehicular emission within a given stretch and prevailing meteorological conditions. Air pollution impacts arise from two sources:
    1. Inadequate vehicle maintenance and
    2. Use of adulterated fuel in vehicles.

Mitigation

- Regular maintenance and pollution check is proposed for construction vehicles and machineries
- No bad quality fuel shall be used in construction vehicles and machinery
- Broad leaved pollution resistant species, which can grow in high pollutant concentrations or even absorb pollutants, shall be planted as they help settle particulates with their higher surface areas along with thick foliage, which can reduce the distance for which particulates are carried from the road itself.
- Other measures such as the reduction of vehicular emissions, ensuring vehicular maintenance and upkeep, educating drivers about driving behavior. However, these methods are beyond the scope of the project but will be far more effective in reducing the pollutant levels. Project developer

together with the Motor vehicles Department and SPCB can arrange for provision for inspection for PUC certificates at all the major junctions.

Noise Environment

All the equipment in the plant will be designed/operated in such a way that the noise level shall not exceed 75 dB (A) as per the requirement of OSHA (Occupational Safety and Health Administration).

Construction Phase-Noise Control

- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- All the vehicles entering into the project site will be informed to maintain speed limits and not to blow horns unless it is required.
- The workers involved in operating major noise generating equipment will be provided with personal protective equipment like ear plugs/ear muffs etc.
- Construction equipment will be properly lubricated to minimize the noise level.

Operation Phase- Noise Control

- Isolation/Insulated enclosures for equipment generating high noise.
- Improved silencers within the equipment generating high noise, wherever possible.
- proper and secured mountings of continuously vibrating structures/ machines by
- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce generation of noise.
- Personal Protective Equipment (PPEs) like earplugs and earmuffs will be provided to the workers exposed to high noise level.
- Greenbelt of appropriate width will be developed inside the project premises and at the project boundary.
- Regular monitoring of noise level will be carried out and corrective measures will be adapted accordingly.

Land Environment

Brahmani river 0.90 km (SW) passing through the project site. The total project area is 106.50 acres (43.099 Ha.) Existing Plant area – 58.20 acres and additional land requirement – 48.30 acres. Total Forest land 29.29 acres from which existing 9.10 acres and Proposed 20.19 acres land. About 35.20 acres (33.05%) of the total project area will be covered under green belt & plantation.

Mitigation Measures for Land Environment

Following precautions and preventive measure will be taken at the site during construction to avoid any ground and surface water contamination.

- Not allowing water to leave the construction site.
- Disposal of construction debris in designated areas and reusing it.
- Construction of storm water diversion channels to divert storm runoff from flowing over the construction areas.
- Installing oil and grease traps in construction workshop and vehicle parking areas.
- Due to civil construction activities, during rainy season the surface run off may contain more of eroded soil and other loose matter. Construction activities will be avoided during rainy days to mitigate the small impacts on soil quality caused due to construction activity.
- With segregation of construction area and proper drainages provided prevents the contamination of water due to soil erosion.
- Discharge of untreated or inadequately treated wastewater effluent to canals and drains with resulting effects on water quality and potential adverse effects on crops and human health.
- Disposal of solid waste, particularly that containing toxic or otherwise harmful compounds with resulting detrimental effects on amenity, water quality and land quality, and potential adverse effects on crops and human health.

Water Environment

Total quantity of water 2,890.8 m^3/day will be required during construction period. Stagnant pools of water would promote breeding of mosquitoes and generally create unsanitary conditions. However, adequate arrangements would be made to ensure proper drainage of wastewater from the construction sites, so that such waters do not form stagnant pools nor aggravate soil erosion.

Impacts

- In the construction phase, there will be generation of waste water for which suitable management has to be adopted.
- The treated water will be generated from Clariflocculator, which will be used in greenbelt development and dust suppression.
- The run-off rain water from the raw material stock pile area should be guided to a water harvesting pond through de-silting pits. Area has been allocated for Rain water storage pond and pump house. Rain Water Harvesting system with construction of ancillary structures and ground water recharge wells should be done to conserve water resource.
- Development of 106.50 acres (33% total land of 35.20 Acres) of land has been planned to keep the environment clean.
- Even though the company shall not draw Ground Water, suitable water conservation measures will be implemented in the plant to improve the Ground Water resources of the area.
- Outlet of STP shall meet the norms of CPCB/ MoEF &CC.

Mitigation Measures for Water Environment

- Installation of water conservation.
- Urinals to reduce flushing demand.
- STP treated water to be used in plantation/ & make up for C.T.
- Reheating furnace will be used occasionally to reduce C.W demand.
- Push type drinking water taps to be used in place of convention taps.

Control of Water pollution

Source	Impact	Mitigation
Leaching of industrial Waste Water.	Groundwater contamination	• After expansion Industrial waste generation 2955 m3/day which will be treated through STP. • The Storage tank and pipelines will be properly maintained to avoid any leakages.
Industrial Waste Water	Surface water contamination	All the pipelines carrying domestic and industrial water will be checked regularly for leakages.
Increase in water drawl use for Industrial purpose.	Effect on Ground water level	Groundwater will be recharged through rainwater harvesting. Waste water will be used for plantation after treatment through STP.

Soil Environment

Construction Phase

During construction phase, excavated soil, construction debris, metal waste, oil & grease from construction machinery and equipment will be generated. If not managed properly may lead to degradation of soil in the project premises. Also, during transportation of construction material the re-entrained dust may settle on the land area besides the road and may lead to change in soil quality.

Operational Phase

The soil of the area will get affected due to operational activities, if proper care will not be taken.

i. Changes in soil texture due to settling of air borne dust or due to wash off of solid particulates by surface water. This will lead to change in porosity, permeability and other physical characteristics of soil of the area.
ii. Changes in soil chemistry due to addition of foreign material from polluted air and water due to plant activities in the area.

Mitigation Measures

But proper mitigative measures like use of efficient pollution control systems, proper stack height, and use of top soil in plantation results in no significant impact on soil of the core zone. There will be no impact on soil of the study area located beyond the working area of the project. Soil samples will be collected and tested at regular intervals from the nearby areas. This will help in mitigation of any harmful impact on soil due to the project activity, if any.

Solid Waste Management

Construction Phase

During construction phase, solid waste i.e. Excavated soil, construction debris, metal waste, oil & grease from construction machinery and equipment will be generated. Certain hazardous wastes such as used oil, lubricants and used containers will be generated.

Mitigation Measures

- Generated top soil will be partly used for levelling and remaining will be stored for utilisation in plantation.
- The waste generated will be dumped intermittently in side plant premises for other use.
- On completion of civil work, all debris etc. will be completely removed from site to avoid any incompatibility with future use.

Operation Phase

The solid waste management & disposal is really a hard task. Comprehensive EMP is required for maximum reuse and recycling of the wastes so that considerably less amount solid waste, non-polluting in nature will be disposed in land fill.

The wastes generated from the plant are segregated into Non Hazardous and hazardous wastes.

Non Hazardous Waste

The main solid waste generated from the plant is fugitive dust collected from various pollution control devices. The solid waste from STP which will be used as manure for green belt. Hence no solid waste for disposal is available in the plant.

Domestic Waste

- The generated solid wastes are segregated in biodegradable parts.
- The biodegradable waste will be composted and used as manure.
- Other non-biodegradable waste will be sent to landfill.
- Sludge generated from the STP shall be used as manure for plantation.

Hazardous Waste

- Used lubricating oil will be used for scraper/screw conveyors internally and the balance quantity will be sold to authorized recyclers.
- Waste grease will be sold to the approved recyclers.
- Lead acid batteries will be disposed to authorized reprocesses.

Mitigation Measures

The quantities of solid wastes generated from different sections during operation of plant and their disposal/recycling/ utilization has been/ shall be as per given hereunder:

- No solid waste will be generated in manufacturing process.

- Dust collected from Air Pollution Control equipment shall be recycled in the process as per guidelines of CPCB and best practices adopted in the industries.
- Solid waste in the form of sludge generated from Water Treatment Plant, shall be used as manure for green belt development.

Biological Environment

Impacts

There is 29.29 acres forest land within the project site. The project site have 3 reserve forest inside 10 km buffer zone, Anantapur RF (7.30 km, North), Talcher Border RF (7.04 km, NNW) & Paturia RF (7.70 km, West). Brahmani River (0.90 km, SW) is crossing the project site. The plant site does not have any major vegetation as nearby soils are industrial built-up land. As construction activity will be confined within the project site for the plant, impact on the ecology will be minimal due to the project.

Mitigation Measures

Site development will not have any major impact on ecological environment. Also, the magnitude of construction work for project is small; hence impact on ecology will be insignificant. 33% of the total plant area will be developed as green belt for improvement of biological environment.

Core Area

- The maintenance such as suitable fencing, watering, replacement of dead plants etc. shall be done for better survival rate.
- Dust suppression shall be done by regular water sprinkling to minimize the impact on plants.

Buffer Area

- As the bio-diversity index value is quite good in buffer area hence the project will have less impact on buffer area. However avenue plantation shall be done to increase the diversity in future.
- Entire wastewater from the process will be reused in the dust suppression &

green belt development. Further, the storm water collected during rainy season will also be collected and used. In case of excess rain water, surface runoff after treatment will be discharged to outside after complying with the prescribed standards. Therefore, impact on flora and fauna due to waste water discharge is expected to be negligible.

- A thick green belt shall be developed along the plant periphery. This will act as noise barriers to reduce noise propagation from the plant site to the surrounding. This will be apart from the mitigation measures to be provided with the noise generating equipments and machineries.
- Illumination is necessary inside the plant from safety point of view. However, positioning of the lights shall be done in such a way that lighting will be focused within the factory area and impact to outside will be minimum.

Occupational Health & Safety Management

GM Iron & Steel is committed to use best practices during construction and include occupational and safety aspects of workers in the tender itself. System for work permit system shall be implemented strictly and PPE for workers shall be made compulsory. Only trained workers shall be allowed for critical job works.

Presently, GM Iron & Steel is providing medical facility as per details given below:

Mitigation Measures

- Due care shall be taken to maintain continuous water supply in the water spraying system and all efforts will be made to suppress the dust generated by material/solid waste handling system by water spraying at appropriate points;
- Any worker found to develop symptoms of dust related diseases will be changed over to other jobs in cleaner areas;

General Safety Measures

- Shield guards or guard railings will be installed at all belts, pulleys, gears and other moving parts;

- Electrical equipments will be grounded, well insulated and conform with applicable codes;
- Employees will be provided with helmets, safety boots, eye and ear protection, and snug fitting gloves as appropriate;
- Masks and dust-proof clothing will be provided to personnel working in areas with high dust levels;
- Work permit system shall be strictly implemented; and
- Procedures will be strictly enforced for the storage, handling, and transport of explosives, flammable and hazardous materials.

General Health Measures

- Sanitary facilities will be well equipped with supplies and employees will be encouraged to wash frequently, particularly those exposed to dust, chemicals or pathogens;
- Pre-employment medical examinations of all personnel will be made mandatory for contractor.

Socio-Economic Environment

There will be no displacement of local population and consequently no need for any rehabilitation scheme. Rather, generation of employment potential direct or indirect will have beneficial effect on the local populace. Thus, general impact on local economy and quality of life is likely to be appreciably beneficial. But potential of local workers getting affected by dust laden atmosphere within the plant will be relatively high and may cause impact on the health status of the local populace, which will be taken care of in peripheral development and community welfare.

The labour strength (Approx. 842 nos) engaged in the construction will depend upon construction activities, since many items of construction are labour intensive. Most of the unskilled and semi-skilled labour (Approx 717 nos) will be by and large available from the nearby villages and towns. Thus, impact on the physical and aesthetic resources will be minimal. Further local skilled, semi skilled

and unskilled labourers will get indirect employment during the construction phase.

Mitigation Measures

- **GM Iron & Steel** shall also develop greenbelt in the adjoining roads & peripheral villages.
- Proper planning and communication with traffic police;
- Advance notice to local administration about the activities;
- Proper cordon off the site with sign boards;
- Diversion of traffic, if required;
- Placing the warning sign board on the vehicles during transportation of machinery and materials; and
- Proper training to the drivers about public safety.

11.5 ANALYSIS OF ALTERNATIVES

The project alternative is the course of action in place of another, that would meet the same purpose and need, but which would avoid or minimize negative impacts and enhance project benefits. Alternative approaches may therefore be more effective in integrating environmental and social concerns into the project planning process.

No alternate site has been considered as it is an expansion of the existing Integrated steel plant to a final capacity of Sponge Iron – 3,72,900 TPA, Billets - 2,70,000 TPA, Rolling Mill – 2,70.000 TPA, Captive Power Plant – 58 MW, Pellets – 8,00,000 TPA, Slag Cement – 4,16,000 TPA. The selection of project site/location has been based on the following considerations:

a) Availability of adequate land for the proposed expansion plant. Total 106.50 acres land is required out of which Existing Plant Area – 58.20 Ac. & Additional land – 48.30 Ac.

b) Sources of supply of raw materials & their delivered cost.
c) Existence of rail & road connections in the vicinity for transportation of incoming & outgoing saleable materials.

Since the expansion project will be done in existing plant premises; hence no alternative site is considered for the expansion activity.

SELECTION OF TECHNOLOGY

Process Technology Alternatives

The existing technology used in the integrated steel plant for manufacturing sponge iron, steel Billets, and Captive Power is one of the best and proven technologies. For Steel making Sponge iron from DRI undergoes Induction Furnace, Ladle Furnace and Continuous casting machine resulting in the production of M.S. Billets. A Pelletization plant will be established based on the basic principle of Raw material preparation, Pelletizing disc and Induration and cooling. It is based on proven technology. Hence, no alternative technology has been explored.

Selection of Process Technology

The technical concept of the plant has been developed keeping in view the state-of-art technology for effective pollution control for the integrated steel plant.

The selection of the most optimum process route for installation of steel plant needs critical analysis and evaluation. The evaluation process is more relevant due to the emergence of a large number of new competitive technologies in various fields of steel making. This section evaluates the technologies and suggests the optimum one for expansion of existing steel plant.

11.6 ENVIRONMENT MONITORING PROGRAMME

OBJECTIVES OF ENVIRONMENTAL MONITORING

Environmental monitoring and audits will be carried out during construction phase & operation phase to check whether environmental management measures

are satisfactorily implemented and are delivering the appropriate level of environmental performance or not.

METHODOLOGIES OF MEASUREMENT

Instruments to be used

The following instruments will be used for data collection work in the monitoring Schedule:

1. Weather Monitoring Station (WMS)
2. Respirable Dust Sampler (RDS)
3. Fine Particulate Sampler (FPS)
4. Stack Monitoring Kit
5. Sound Level Meter
6. Water Level Indicator

PERFORMANCE MONITORING

Safety features, ambient working environment and Occupational Health and Safety (OHS)-indicators will be subjected to regular monitoring and review. The compiled information and any corrective measure taken will be applied in a continuous process to improve the OHS management system (OHSMS) which will be responsible for the management of environmental, health and safety aspects related to the existing project.

OCCUPATIONAL HEALTH & SAFETY MONITORING

To control and minimize the risks at the workplace, Health, Safety and Environment Policy will be implemented along with the following objectives:

- To prevent hazards
- To provide a safe and healthy environment to all the employees.

ACCIDENT AND DISEASE MONITORING

GM Iron and Steel Co, Limited shall establish procedures and systems for reporting and recording:

- Occupational accidents and diseases; and

- Dangerous occurrences and incidents.

The system will enable workers to report to their immediate supervisor immediately any situation that they believe presents a danger to life or health. The system shall further enable and encourage workers to report all:

- Occupational injuries and near misses;
- Suspected cases of occupational disease; and
- Dangerous occurrences and incidents.

ENVIRONMENTAL LABORATORY

An environmental laboratory will be set up to carry out all the environmental monitoring jobs. Third-party monitoring will also be carried out by suitable recognized consultancy organizations.

The main analytical instruments/equipment will be:

1. Micro Meteorological Station
2. Respirable Dust Sampler (RDS)
3. Fine Particulate Matter Sampler (FPS)
4. Stack Monitoring Kit
5. Sound Level Meter
6. Water Level Indicator

POST MONITORING OF ENVIRONMENT MANAGEMENT SYSTEM

Post project monitoring will be carried out as per conditions stipulated in Environmental Clearance Letter issued by SEIAA Odisha/CTO issued by OSPCB; as-well-as according to CPCB guidelines. The plant site is considered as a core zone and the area lying within a 10 km radius from the plant site is considered to be the buffer zone where slight impacts may be observed on the physical and biological environment and that too is occasional.

11.7 ADDITIONAL STUDIES

In this chapter, Public Consultation, Social Impact Assessment, Rehabilitation & Resettlement, Risk Assessment, Disaster Management, proposed safeguards and

mitigation measures, CREP and Action Plan for implementing the issues raised at Public Hearing are discussed.

11.8 PROJECT BENEFITS

IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The project is expected to yield a positive impact on the socio-economic environment. It helps to sustain the development of this area including further development of physical infrastructural facilities. The following physical infrastructure facilities will improve due to the establishment of the project.

- Road Transport facilities
- Housing facilities
- Water supply
- Power

IMPROVEMENT IN SOCIAL INFRASTRUCTURE

Community development activities are very important aspects for any big organization because the people of the villages surrounding the plant are the indirect stakeholders. Marginal positive impact on the socio-economic environment is foreseen due to direct and indirect employment, the opportunity of business and social welfare taken up by the company. The mostly rural population may see the development of educational, medical and infrastructural facilities.

EMPLOYMENT POTENTIAL-SKILLED; SEMI-SKILLED & UNSKILLED

Operation and maintenance of integrated iron and steel plant required human resources in different categories like managers, engineers of different discipline like metallurgical, mechanical, electrical, electronics, computer, civil, structural, chemical etc., highly skilled, skilled and semi-skilled work force in different discipline, commercial, accountants and financial managers, unskilled labour force, clerical, security personal etc. The estimated manpower requirement is 842.

CORPORATE ENVIRONMENT RESPONSIBILITY (CER)

M/s. GM Iron & Steel Co, Limited will implement various rural development programmes near the Plant through its CER activities. The following measures are suggested for minimizing the adverse impacts on socio-economic and human interest values due to the proposed development

11.9 ENVIRONMENT MANAGEMENT PLAN

OBJECTIVES OF ENVIRONMENT MANAGEMENT PLAN

The objective of the Environmental Management Plan (EMP) is to identify administrative aspects for ensuring that mitigation measures are implemented and their effectiveness is monitored.

The EMP focuses on direct impacts, which are identified as having the potential to cause significant impacts on the environment and identifies the following objectives:

- Specific measures that will be taken to prevent, reduce or manage the environmental impacts during construction and operation; and

Objective of EMP is to identify the level of environmental performance that will be expected during the operation.

Particulars	**Details**
Air Management	
Emissions	• CPCB and CREP guidelines will be followed. • Baghouses will be provided with a Cement mill • Enclosures will be provided for unloading operations. • Bag filters will be installed at all transfer points. • All the roads inside the plant premises will be concreted. • Dust collected from air pollution control equipment will be recycled in the process.

	• The packing machine will be equipped with dust extraction arrangement.
storage	Clinker, Cement and Fly ash will be stored in stockyard/stockpiles Gypsum & Coal will be stored in the Covered shed.
Monitoring	Ambient air quality and stack emissions will be regularly monitored to ensure that mbient air quality standards are being met all the time.
Water Management	
	➢ No generation of Industrial wastewater as no requirement of process water in operation for the unit. Make-up water will be added to the cooling water circuit for evaporation and line losses. ➢ The domestic wastewater generated will be treated in STP (Primary). Treated water will be used for water sprinkling and greenbelt development/plantation. ➢ No wastewater will be discharged outside the plant premises. RWH plan will be prepared and implemented.
Noise Management	
Management	• Properly insulated enclosures will be provided to equipment generating excessive noise. • Improved silencers within the equipment generating high noise • Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce the generation of noise. Personal Protective Equipment (PPEs) like earplugs and earmuffs will be provided to the workers exposed to high noise levels. • A Greenbelt of appropriate width will be developed inside the plant premises and at the project boundary.
Monitoring	Regular monitoring of noise level will be carried out and corrective measures in concerned machinery will be adapted accordingly to the possible extent.

Solid & Hazardous Waste Management
• Dust collected from the dust collectors (Bag Filters) will be recycled back into the process. • Used Oil and grease will be disposed of to CPCB authorized recycler.
Green Belt Development / Plantation
Greenbelt development will be done all along the road & plant boundary which will attenuate noise level,

A budget of Rs. 30.30 crores have been kept as Capital Cost and Rs. 150 Lacs per annum as Recurring Cost for Environmental Management.

EMP Budget

Estimated Cost of EMP			
Sr. No.	**Particulars**	**Estimated cost in Rs. Crore**	**Recurring cost in Rs. Lacs/annum**
1	Air Pollution Control	20	98.00
2	Water Pollution Control	4.5	25.00
3	Noise Pollution Control	1.3	3.5
4	Environment Monitoring & Management	1.0	8.00
5	Occupational Health	1	5.00
6	Green Belt/plantation	2.5	10.50
	TOTAL	**30.30**	**150.00**

11.10 CONCLUSION

The Project will prove beneficial to the local people as more infrastructure development, improvement in education and health facilities, roads, availability of drinking water, etc. in near-by villages will be done. There will be an increase in

revenue generation to the government by way of royalty, excise and government taxes etc.

There will be no significant impact on the area, as adequate preventive measures will be adopted to contain the various pollutants within permissible limits. Regular monitoring of all the components of the environment will be done. Increased social welfare measures taken by the company will lead to development in the nearby villages. Greenbelt development will be done around the plant area; this will help to mitigate the pollutants released from the premises of GM Iron & Steel Co, Limited.

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Chapter-12

Disclosure of Consultant

12.1 CONSULTANT'S PROFILE

Organization : Visiontek Consultancy Services Pvt. Ltd.

Address : Plot No-M-22 & 23, Chandaka Industrial Estate, Patia, Bhubaneswar-24 (Odisha)

Contact Person : P.Kumar Ranjan

Contact No : 9338772882

E Mail ID : visiontekin@gmail.com

Principal Field : Consulting Services

Visiontek Consultancy Services Private Limited is a pioneer consulting organisation of India as a Pvt. Limited company, specializing in Environmental Protection, Industrial Pollution Control & Engineering field. This is also rendering consultancy services for Geotechnical Investigations, Topographical Survey, Planning and Designs, Supervision, Quality Monitoring and Preparing detailed Project Reports. VCSPL assists a client in comprehensive environmental and engineering services ranging from conceptual planning and preliminary investigation to detailed engineering design. Local knowledge coupled with national and international experience of proven technical know-how and a strong commitment from our team of experts; enable VCSPL to assist in solving the clients environmental and engineering problems successfully with competence by first analyzing then visualizing and finally utilizing technically strong and dedicated skill.

VCSPL has successfully completed a wide range of multi disciplinary assignments. VCSPL project formulation requires preliminary and detailed project investigation. The objective of the investigation is to assess the technical viability and cost effectiveness of the proposals vis-à-vis the objective and benefit. VCSPL was founded in 2001 and brought together a number of consultancy services with a track record of performance in the environmental Science and Engineering field ranging conceptual planning and preliminary investigation to detailed engineering design Today it has over more than 100 people working in our corporate office at Bhubaneswar, Orissa and branch office at Asansol, Ranchi and Pune also at various industrial sites.

Vision:

- Build stability and success through sustainable growth and profit.
- Put clients and their needs back at the heart of business.
- Deliver more than just compliance with environmental, health & safety requirements.

Mission:

To continue to create value for its clients, shareholders and employees and to be considered as the leading global professional service provider of technical and environmental consulting services by its clients, employees and peers.

Environment Policy:

Good environment management is the central focus of our business activities. We extend this through our own operation and management, in order to reflect positively on our clients, shareholders and staff. Visiontek takes its commitment to quality, health, safety & environmental management very seriously.

The Organization:

Visiontek Consultancy Services Pvt. Ltd. is floated by the master brain of few former Chief Engineers of the State Government, Central Govt. and young Enthusiastic Engineers and Scientists. The Organization has Seven Divisions each headed by an eminent Engineer and allied laboratory and computerized services. The divisions are as follows.

1	Planning project preparation and Monitoring
2	Infrastructure Roads, Highways & Bridges
3	Designs and Detailed Engineering
4	Water Resources Management
5	Industrial Pollution Control and Socioeconomic Study
6	Construction management & Quality Control
7	Survey and Investigation

12.2 EIA COORDINATORS & FUNCTIONAL EXPERTS INVOLVE IN THIS PROJECT

1. **Dr. Chittaranjan Panda-** M.*Sc (Chemistry), BE in Chemical Engg, M.Tech (Environmental Engineering & Management) and Ph.D (Environmental engineering)-* ***EIA Coordinator, FAE- AQ, WP***

He has 13 years of experience in Project Planning, Management, Execution & Implementation; General Technical Management; Responsible for finalization of project and EIA quality. He has worked in Fertilizer Corporation of India, Talcher Unit as an Environmental Engineer from 1980 to 2002. He is presently an Assistant professor in Environmental engg, ITER under SOA University, Bhubaneswar. Currently he is a NABET empanelled consultant with M/s Visiontek Consultancy Services Pvt. Ltd. as an EIA Coordinator and Functional Area Expert.

2. **Mr. Manoj Kumar,** *B.Tech.(Chemical Engineering), MBA–Marketing,****FAE-AP, WP***

He has experience in Preparation of EIA/EMP and presentation before the Concerned authority, Space Marketing and Event Management, Operation of ETP, Scrubber, Cyclone, Bag Filters and other Pollution Control Equipments, Chemical Plant & FBC Boiler, Water Treatment & Softener Plant - operation of Boiler, Review of EIA, EMP, EMS of industries, mines etc. He has worked as Executive - industry & Technical in Eco Care, Ranchi since May 2005 to Sept 2011, P.A. to Chairman & JRF in Jharkhand State PollutionControl Board, Ranchi in Feb 2003 - April 2005, Project Coordinator (Marketing) in CBMD, Jamshedpur since June 1999 - January 2003, Deputy Manager, Production in TRIPL, Khunti since May 1998- April 1999, Shift Engineer (Production) in Sanderson Industries Ltd, Jamshedpur since May 1994 - April 1998, & Competent Person (Testing & Audit) in Institute of Industrial Safety & Risk Management Services since December 2009 – till Date.

3. **Mr.B.K. Mishra,** *Bachelor in Engineering (Chemical),* ***FAE: SHW***

He has experience in preparing EIA/EMP, preparing DPR/ PFR, Scientific Modeling, Environment Audits, Environmental Lab Management, ISO Audit, Human Resource Management. He has worked as Project Manager (Design, Procurement, Installation and Commissioning of HydroFluoric Acid Project) in Kalyan Flourides Limited,

Andhra Pradesh since 1983 to 1992 & Project Manager (Design, Procurement, Installation and Commissioning of Potassium Nitrate) in Pulavarty Chemical Pvt. Ltd., A.P since 1982 to 1983 & now presently working as Director (Design and Implementation of Effluent Treatment plant) in Visiontek Consultancy Services Pvt. Ltd. since 2003 to till date.

4. **Dr. Arati Nanda,** *M.A (A & A Economics), Ph.D (A & A Economics),* ***FAE-SE***

She has experience in Socio-economic survey, Compilation and Analysis of Data and Writing of Report, Monitoring and Supervision, Implementing HH Survey. She has worked as Sr. Research Officer (Socio Economic) in ARDCOS, Bhubaneswar since 2004 to till Now, Project Associate & Supervisor (Socio Economic) in Nabakrushna Choudhury Centre for Development Studies, (NCDS), Bhubaneswar since 1998-2001 and 2002-2003.

5. **Dr. Shrustidhar Rout,** *M.Sc in Botany (Biochemistry & Enzymology Specialization), PG Diploma in Ecology & Environment, Ph.D. in Botany: Medicinal Plants of Similipal Biosphere Reserve.****-FAE-EB***

Former Reader in Wildlife & Biodiversity Conservation, North Orissa University; Wildlife Research Technician in Similipal Tiger Reserve. Experience in preparation of Wildlife Management Plan, Biodiversity study on Coastline flora & fauna, Medicinal Plants, Evaluation of Forest Development Agency (FDA), ecological enumeration of flora and fauna, etc.

6. **Mr. P.K.Panda-** ***M.Sc (Geology), FAE-HG, GE.***

He has experience in Geological survey, mapping, exploration, & engineering geology, hydrogeology. He is involved in preparation of project report related to EIA/EMP related to Geological Exploration of Ground water/Delineation of Aquifers by Geophysical method and preparation of Hydro geological Report.

7. **Dr. B.C. Nagaraja,** *Post Doctoral Research Fellow in Ecology & Biodiversity,* ***FAE: LU, SC.***

He has 20 years of experience in EIA projects, collection of primary data on ecology, biodiversity and soil resources. Preparation of EIA & EMP. Conducting public hearing and documentation. Presentation to EIA committee. Preparation of land use & land cover

maps. Currently he is a NABET empanelled consultant with M/s Visiontek Consultancy Services Pvt. Ltd. as an EIA Coordinator and Functional Area Expert.

8. **Mr. Aprup Anant Adawadkar FAE- RH**

He has 25 years of experience in EIA projects, Erection & Commissioning of New Projects & Modifying existing plants with due attention to SHE issues. Process Safety & Hazard Management consulting to industry, Preparation of Disaster Management Plans.Currently he is NABET empanelled consultant with M/s Visiontek Consultancy Services Pvt. Ltd. as an EIA Coordinator and Functional Area Expert

9. **Mrs. Jyotshna Dash, MSc. Environmental Science, TM-FAE: SHW**

She has got 10 years of experience in EIA projects. Assisting FAE & EIA Coordinator.

10. Ms. Bandana Jaipuria, M.Sc. Biotechnology, FAA:WP

She is working in Visiontek Consultancy services Pvt. Ltd since June 2018 to till date. And assisting FAE-WP in preparing EIA Reports.

12.3 ENVIRONMENT POLICY

Good environment management is the central focus of our business activities. This is extended to through operation and management, in order to reflect positively on our clients, shareholders and staff. Visiontek takes its commitment to quality, health, safety & environmental management very seriously.

12.4 INVOLVEMENT IN THE EIA

VCSPL has carried out a large number of assignments in Environmental Impact Assessment and Environmental Management Plans (EMP) in the following fields:

- River Valley, Hydel, Drainage and Irrigation Projects.
- Thermal Power Plants.
- Beneficiation.
- Metallurgical Industries
- Cement Plants.
- Common Hazardous waste treatment, storage and disposal facilities.
- Building & Large construction projects.

The organization helps the Government bodies and other agencies in identifying and specifying EIA requirements. The task included highlighting environmental constraints, monitoring air & water qualities, determining soil characteristics, background noise levels for the identification of the project's impact on the environment. Impact on Flora, Fauna and Agriculture and impact on land use are then carried out. The organization is also undertaking post project impact studies.

12.5 ACCREDITATION OF VCSPL:

VCSPL's Environmental Laboratory has been recognized under E (P) Act, 1986 by MoEF & CC. The copy of gazette notification is given in VCSPL Credentials.

Reaccreditation approved letter and valididty extension letter have been attached below.



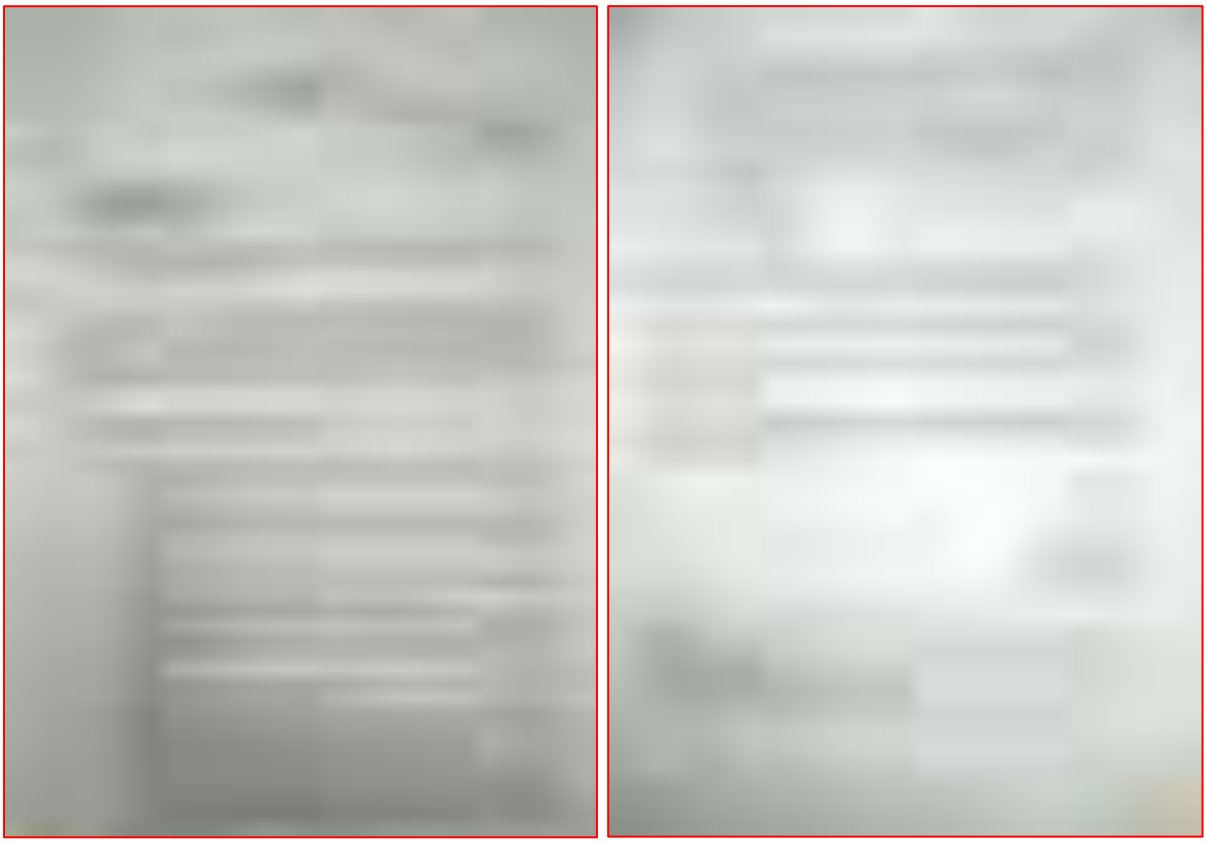
RE-ACCREDITATION APPROVED LETTER



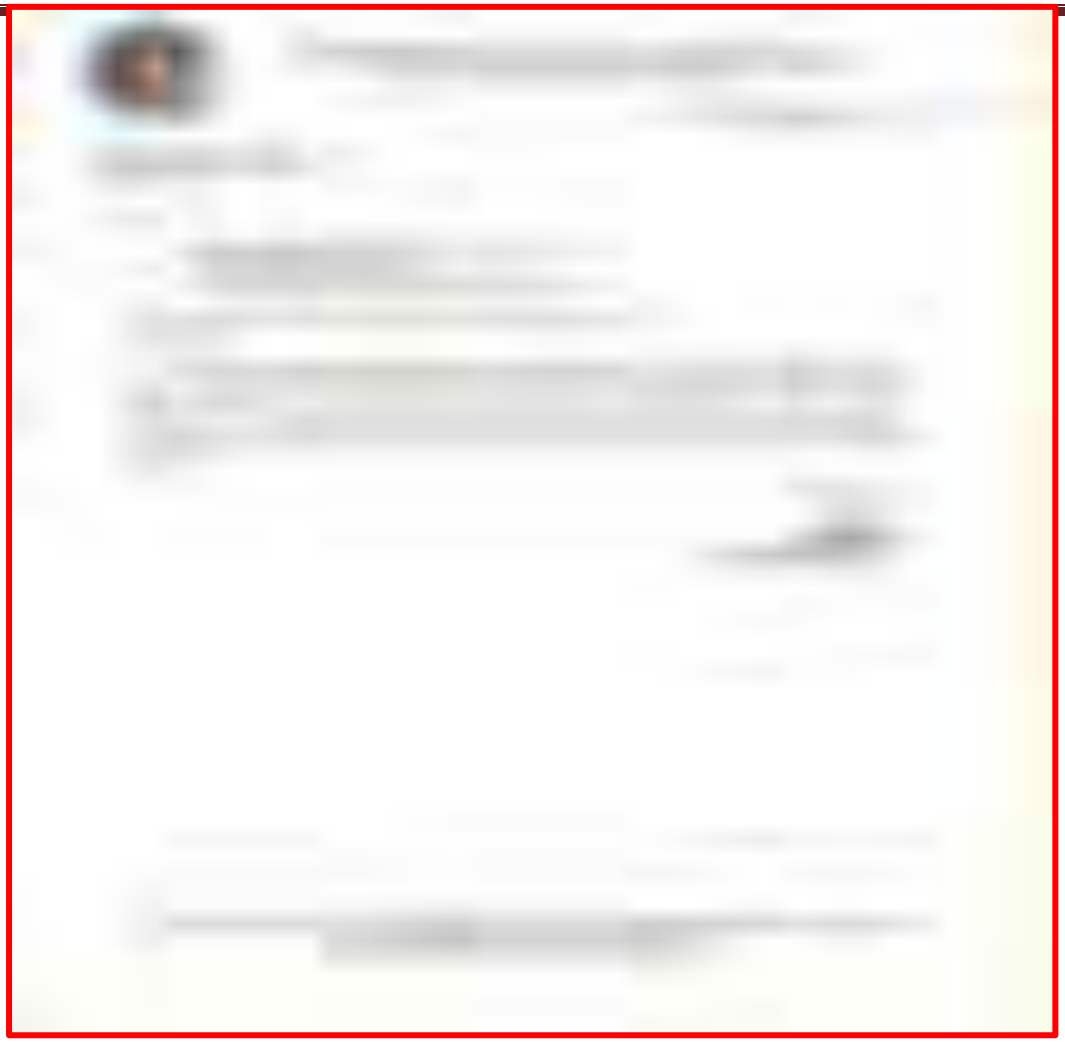
Validity Extension Letter



NABL CERTIFICATE



MoEFCC ACCREDITATION FOR LAB



ORSAC EMPANELMENT

ISO 9001:2015



ISO 45001:2018(OH&S)



ISO: 14001: 2015



ISO/IEC 17025:2005

12.6 QUALITY POLICY OF VCSPL



ANNEXURE I

No.J-11011/286/2020-IA.II(I)

Goverment of India

Minister of Enviroment,Forest and Climate Change

Impact Assessment Division

***

Indira Paryavaran Bhavan,
Vayu Wing,3rd Floor,Aliganj,
Jor Bagh Road,New Delhi-110003
24 Nov 2020

To,

M/s M/S GM IRON & STEEL COMPANY LTD.
PO- Rairamgpur, Dist- Mayurbhanj,
Mayurbhanj-757043
Orissa

Tel.No.033-22480602; Email:gmsteelbbsr@gmail.com

Sir/Madam,

This has reference to the proposal submitted in the Ministry of Environment, Forest and Climate Change to prescribe the Terms of Reference (TOR) for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance in accordance with the provisions of the EIA Notification, 2006. For this purpose, the proponent had submitted online information in the prescribed format (Form-1) along with a Pre-feasibility Report. The details of the proposal are given below:

1. Proposal No.:	IA/OR/IND/183272/2020
2. Name of the Proposal:	Modernization & Expansion of existing iron & steel plant to final capacity of Sponge Iron – 3,72,900 TPA, Billets (Mild & Alloy Steel) - 2,70,000 TPA, Rolled Products – 2,70,000 TPA, Captive Power – 58 MW, Pellets – 8,00,000 TPA and Slag Cement – 4,16,000 TPA by M/s GM Iron & Steel Co, Ltd.
3. Category of the Proposal:	Industrial Projects - 1
4. Project/Activity applied for:	3(a) Metallurgical industries (ferrous & non ferrous)
5. Date of submission for TOR:	17 Nov 2020

In this regard, under the provisions of the EIA Notification 2006 as amended, the Standard TOR for the purpose of preparing environment impact assessment report and environment management plan for obtaining prior environment clearance is prescribed with public consultation as follows:

3(a):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS) PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

A. STANDARD TERMS OF REFERENCE (TOR)

1) Executive Summary

2) Introduction

i. Details of the EIA Consultant including NABET accreditation

ii. Information about the project proponent

iii. Importance and benefits of the project

3) Project Description

i. Cost of project and time of completion.

ii. Products with capacities for the proposed project.

iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.

iv. List of raw materials required and their source along with mode of transportation.

v. Other chemicals and materials required with quantities and storage capacities

vi. Details of Emission, effluents, hazardous waste generation and their management.

vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)

viii. Process description along with major equipments and machineries, process flow sheet (quantative) from raw material to products to be provided

ix. Hazard identification and details of proposed safety systems.

x. Expansion/modernization proposals:

a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing Iexisting operation of the project from SPCB shall be attached with the EIA-EMP report.

b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.

4) Site Details

i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.

ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet. (including all eco-sensitive areas and environmentally sensitive places)

iii. Details w.r.t. option analysis for selection of site

iv. Co-ordinates (lat-long) of all four corners of the site.

v. Google map-Earth downloaded of the project site.

vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.

vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.

viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included. (not required for industrial area)

ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area

x. Geological features and Geo-hydrological status of the study area shall be included.

xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided. (mega green field projects)

xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.

xiii. R&R details in respect of land in line with state Government policy

5) Forest and wildlife related issues (if applicable):

i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department. (if applicable)

ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)

iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.

iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon

v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area

vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife

6) Environmental Status

i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.

ii. AAQ data (except monsoon) at 8 locations for PM10, PM2.5, SO2, NOX, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.

iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.

iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.

v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.

vi. Ground water monitoring at minimum at 8 locations shall be included.

vii. Noise levels monitoring at 8 locations within the study area.

viii. Soil Characteristic as per CPCB guidelines.

ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.

x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.

xi. Socio-economic status of the study area.

7) Impact and Environment Management Plan

i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.

ii. Water Quality modelling - in case of discharge in water body

iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.

iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.

v. Details of stack emission and action plan for control of emissions to meet standards.

vi. Measures for fugitive emission control

vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle/reuse/recover techniques, Energy conservation, and natural resource conservation.

viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.

ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.

x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.

xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.

xii. Action plan for post-project environmental monitoring shall be submitted.

xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

8) Occupational health

i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,

iv. Annual report of heath status of workers with special reference to Occupational Health and Safety.

9) Corporate Environment Policy

i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.

ii. Does the Environment Policy prescribe for standard operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.

iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.

iv. Does the company have system of reporting of non compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report

10) Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.

11) Enterprise Social Commitment (ESC)

i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time

bound action plan shall be included. Socio-economic development activities need to be elaborated upon.

12) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

13) 'A tabular chart with index for point wise compliance of above TOR.

B. SPECIFIC TERMS OF REFERENCE FOR EIASTUDIES FOR METALLURGICAL INDUSTRIES (FERROUS & NON FERROUS)

1) Complete process flow diagram describing each unit, its processes and operations, along with material and energy inputs & outputs (material and energy balance).

2) Details on blast furnace/ open hearth furnace/ basic oxygen furnace/ladle refining, casting and rolling plants etc.

3) Details on installation/activation of opacity meters with recording with proper calibration system

4) Details on toxic metals including mercury, arsenic and fluoride emissions

5) Details on stack height requirement for integrated steel

6) Details on ash disposal and management -Non-ferrous metal

7) Complete process flow diagram describing production of lead/zinc/copper/ aluminium, etc.

8) Raw materials substitution or elimination

9) Details on smelting, thermal refining, melting, slag fuming, and Waelz kiln operation

10) Details on Holding and de-gassing of molten metal from primary and secondary aluminum, materials pre-treatment, and from melting and smelting of secondary aluminium

11) Details on solvent recycling

12) Details on precious metals recovery

13) Details on composition, generation and utilization of waste/fuel gases from coke oven plant and their utilization.

14) Details on toxic metal content in the waste material and its composition and end use (particularly of slag).

15) Trace metals Mercury, arsenic and fluoride emissions in the raw material.

16) Trace metals in waste material especially slag.

17) Plan for trace metal recovery

18) Trace metals in water

C. ADDITIONAL TOR FOR INTEGRATED STEEL PLANT

1). Iron ore/coal linkage documents along with the status of environmental clearance of iron ore and coal mines

2). Quantum of production of coal and iron ore from coal & iron ore mines and the projects they cater to. Mode of transportation to the plant and its impact

3). For Large ISPs, a 3-D view i.e. DEM (Digital Elevation Model) for the area in 10 km radius from the proposal site. MRL details of project site and RL of nearby sources of water shall be indicated.

4). Recent land-use map based on satellite imagery. High-resolution satellite image data having 1m-5m spatial resolution like quickbird, Ikonos, IRS P-6 pan sharpened etc. for the 10 Km radius area from proposed site. The same shall be used for land used/land-cover mapping of the area.

5). Respirable Suspended particulate matter (RSPM) present in the ambient air must be analysed for source analysis - natural dust/RSPM generated from plant operations (trace elements). The RSPM shall also be analysed for presence of poly-aromatic hydrocarbons (PAH), i.e. Benzene soluble fraction, where applicable. Chemical characterization of RSPM and incorporating of RSPM data.

6). All stock piles will have to be on top of a stable liner to avoid leaching of materials to ground water.

7). Plan for the implementation of the recommendations made for the steel plants in the CREP guidelines.

8). Plan for slag utilization

9). Plan for utilization of energy in off gases (coke oven, blast furnace)

10). System of coke quenching adopted with justification.

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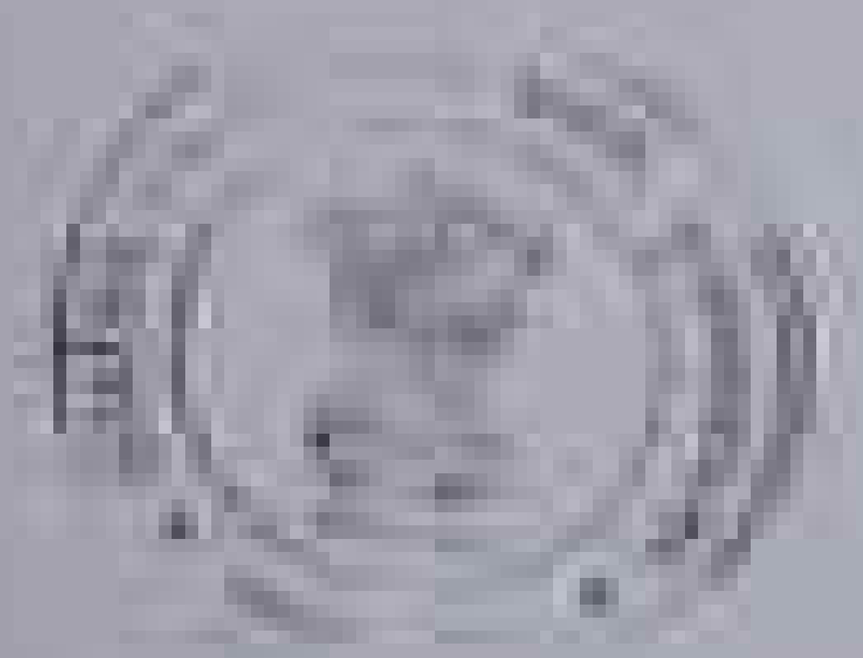


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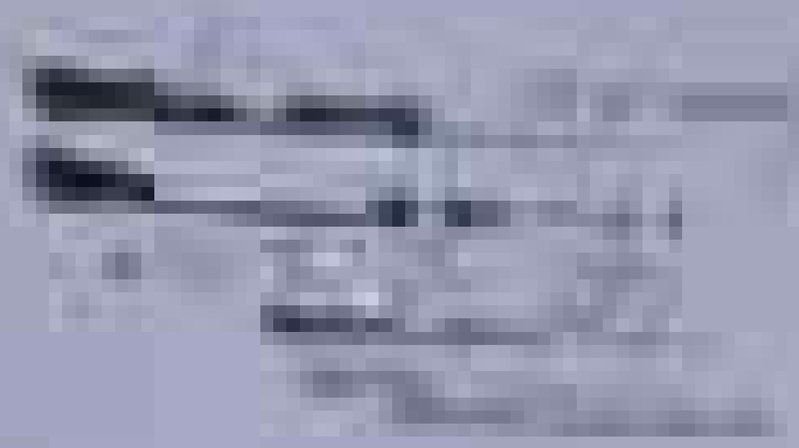


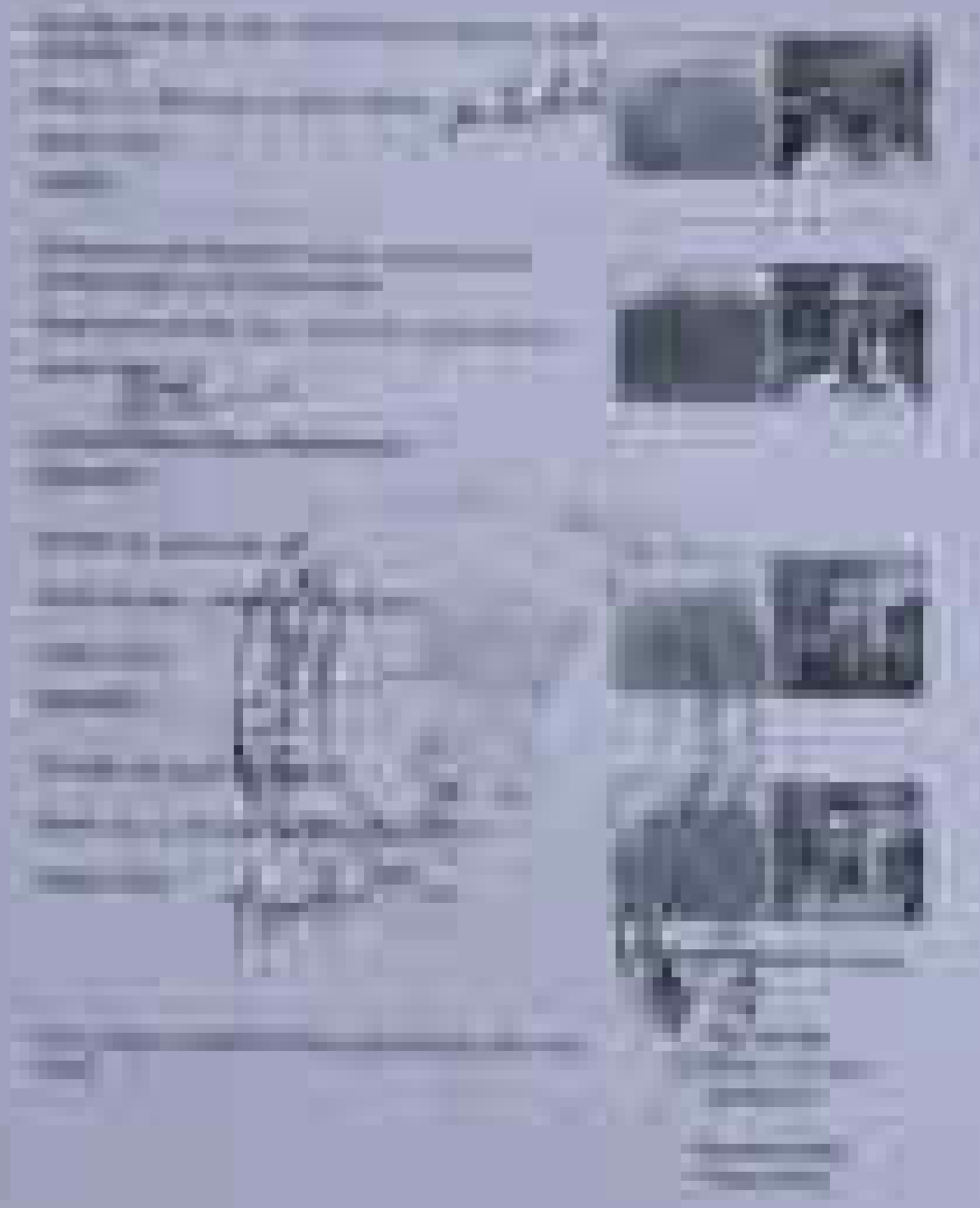
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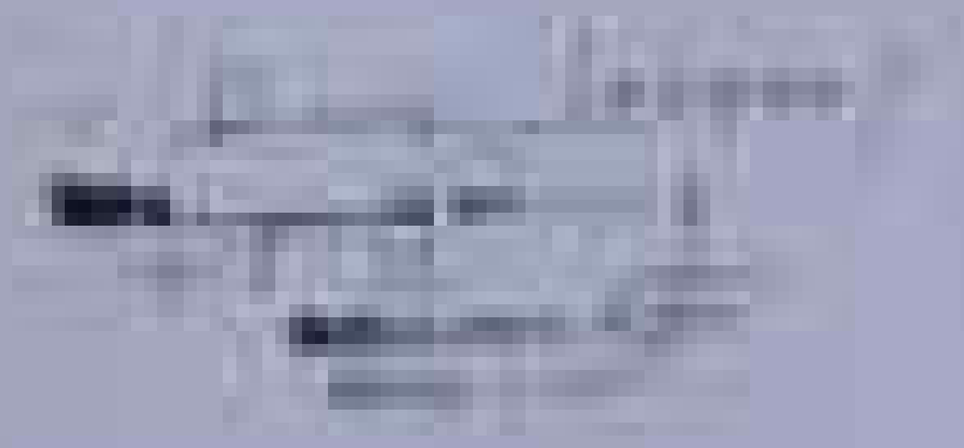


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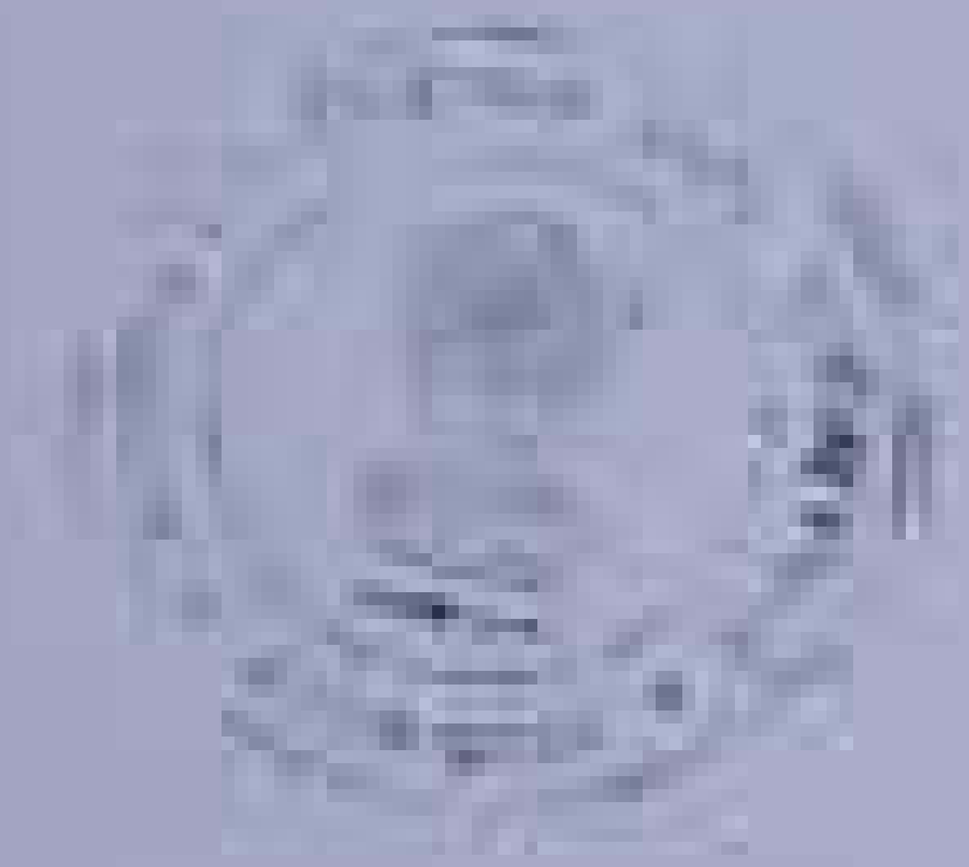
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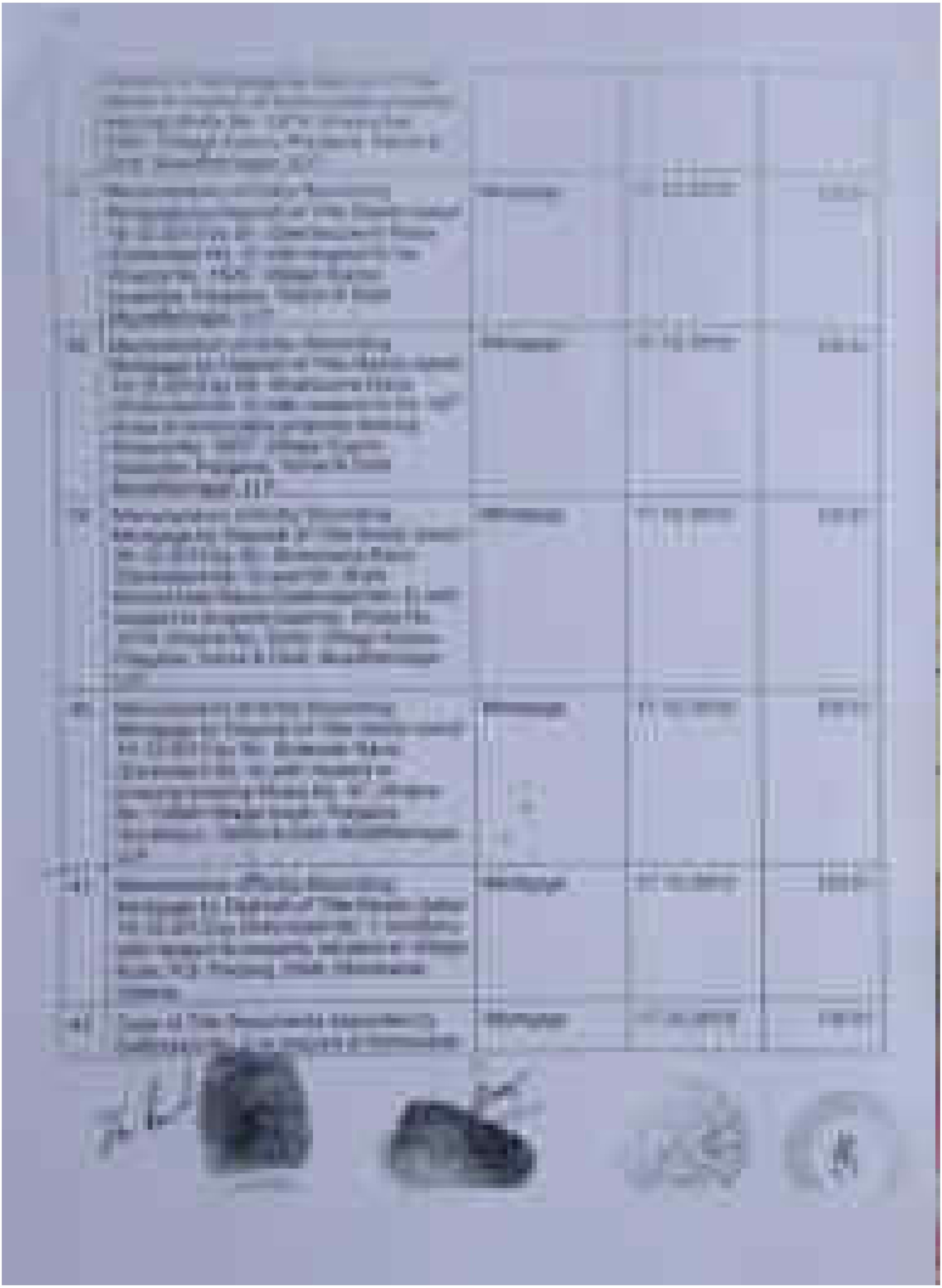
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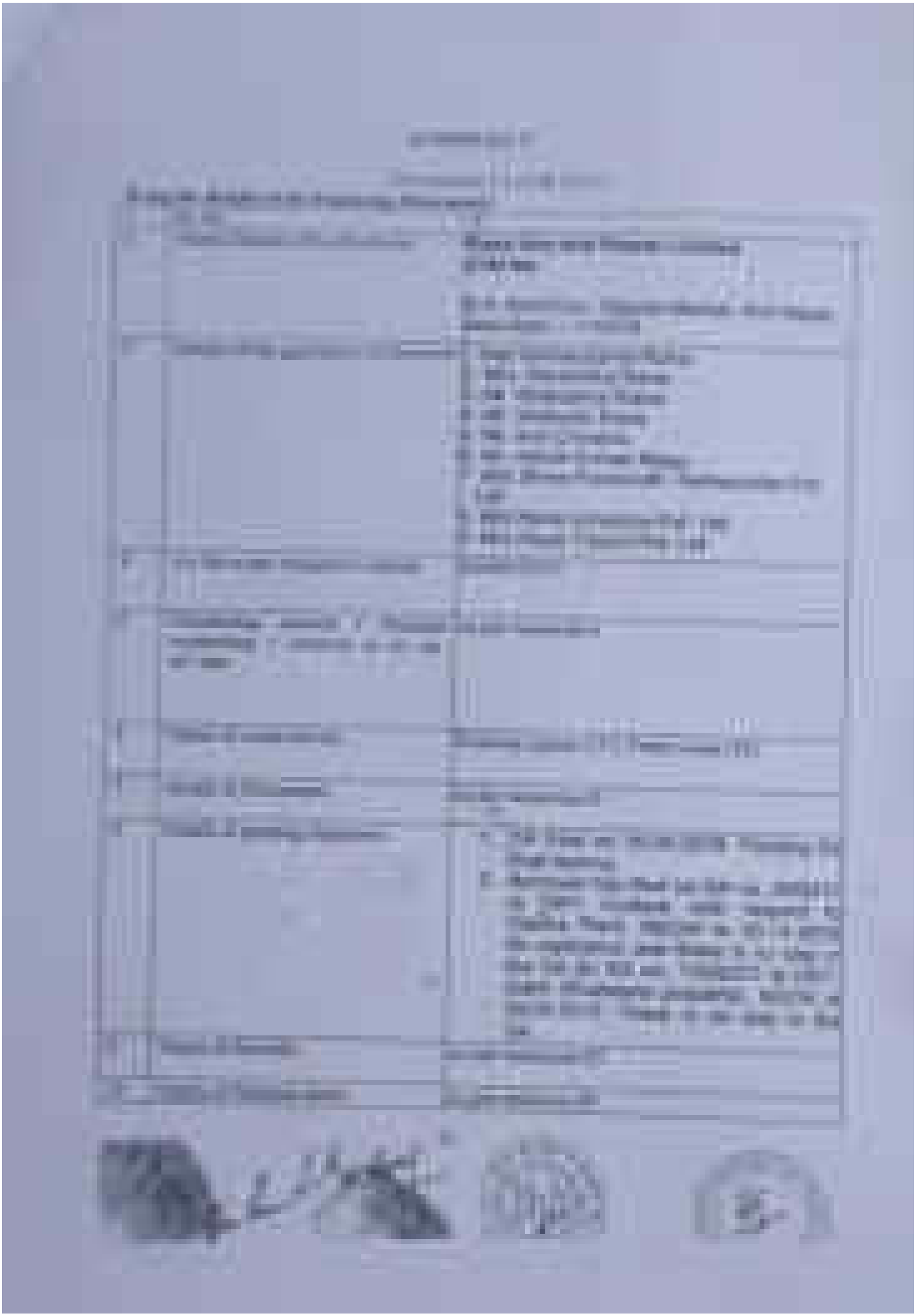
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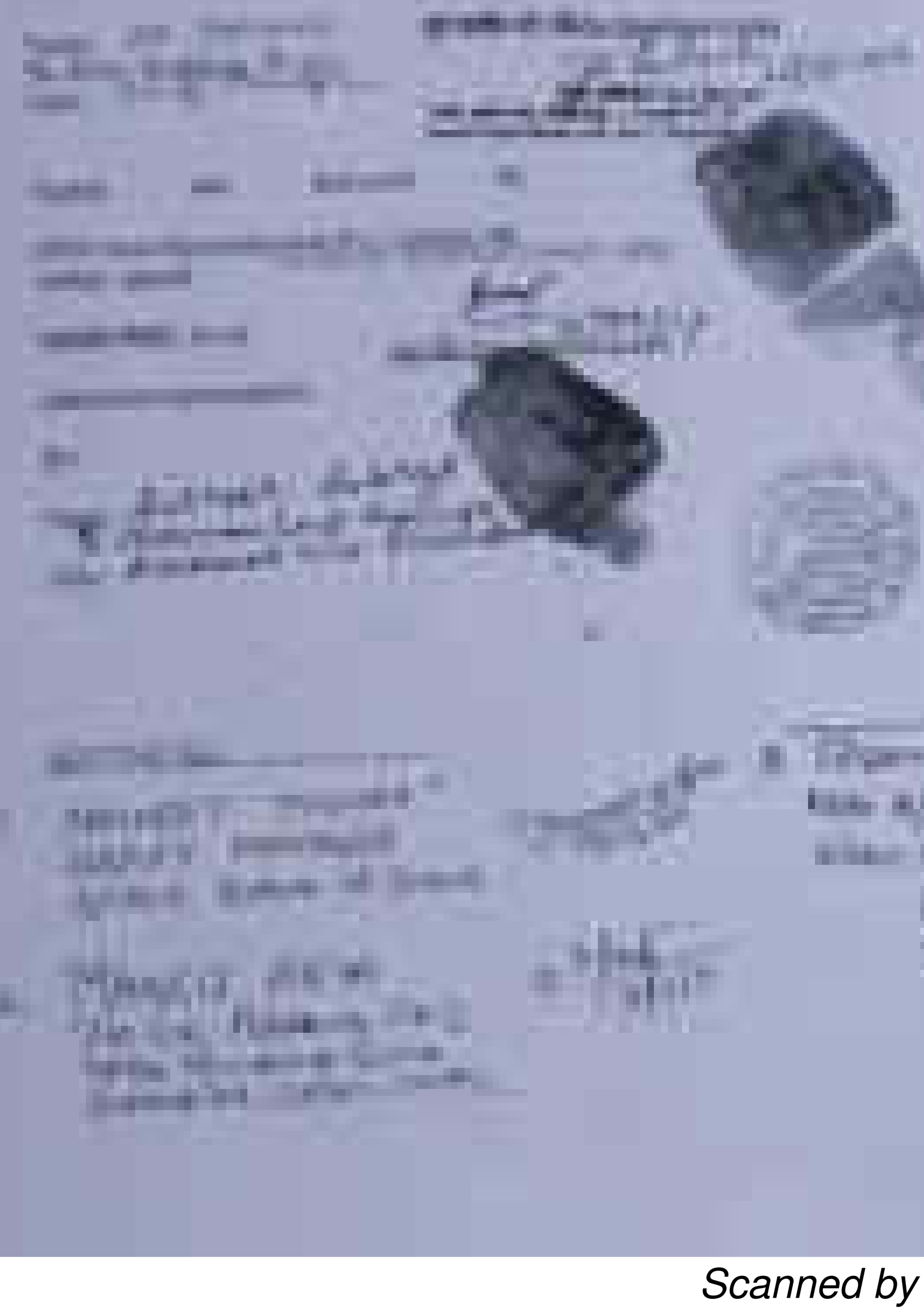
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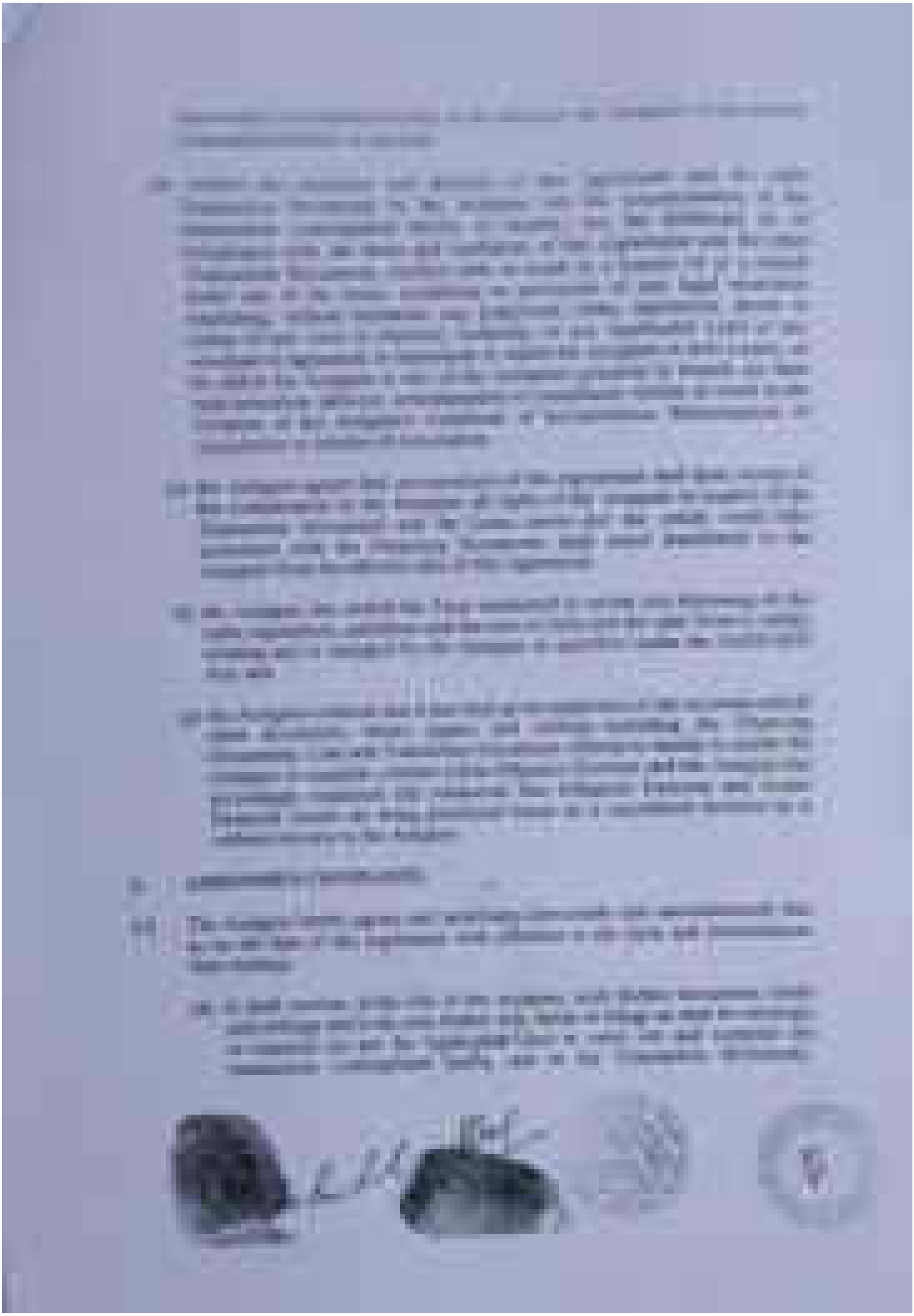


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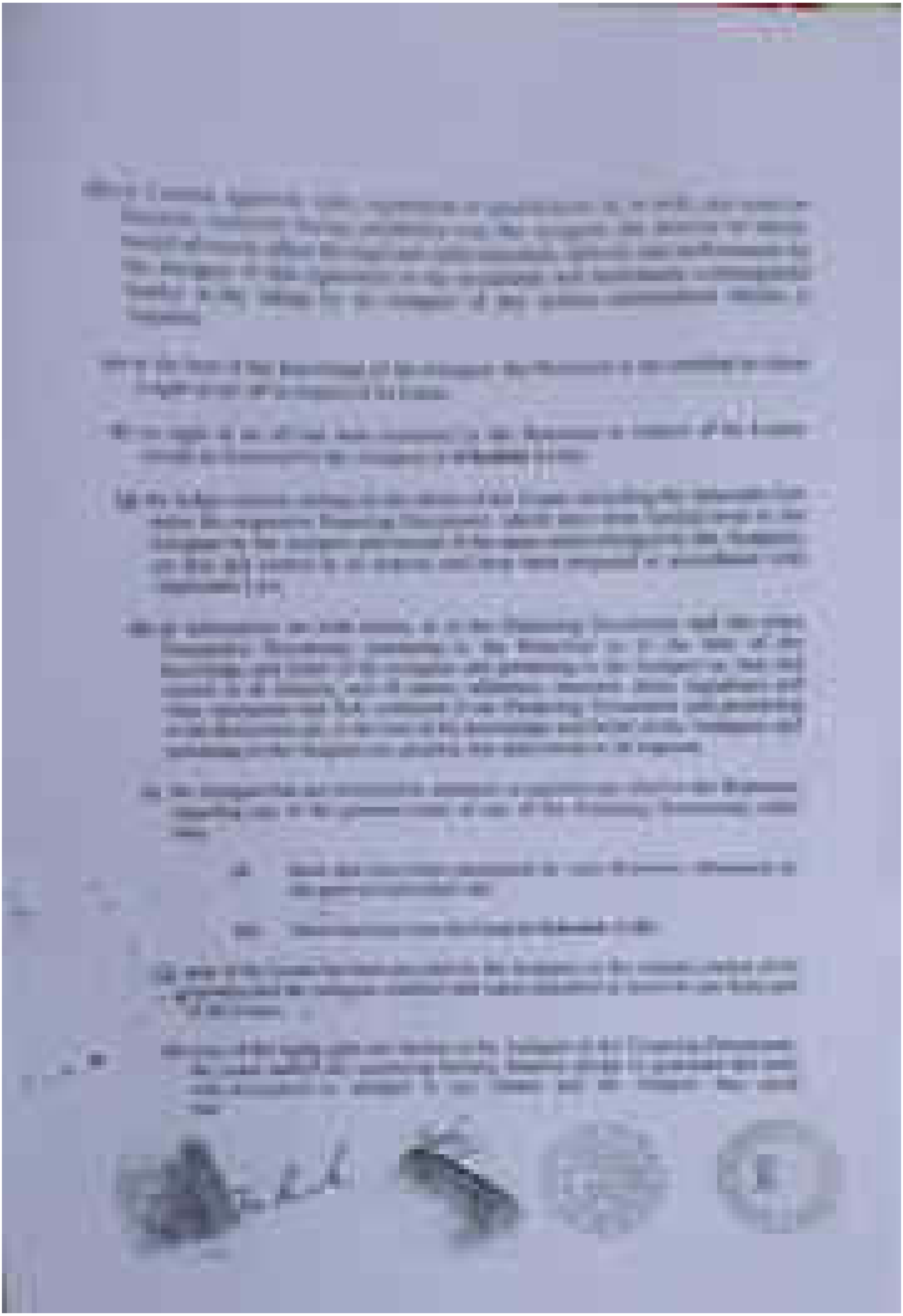
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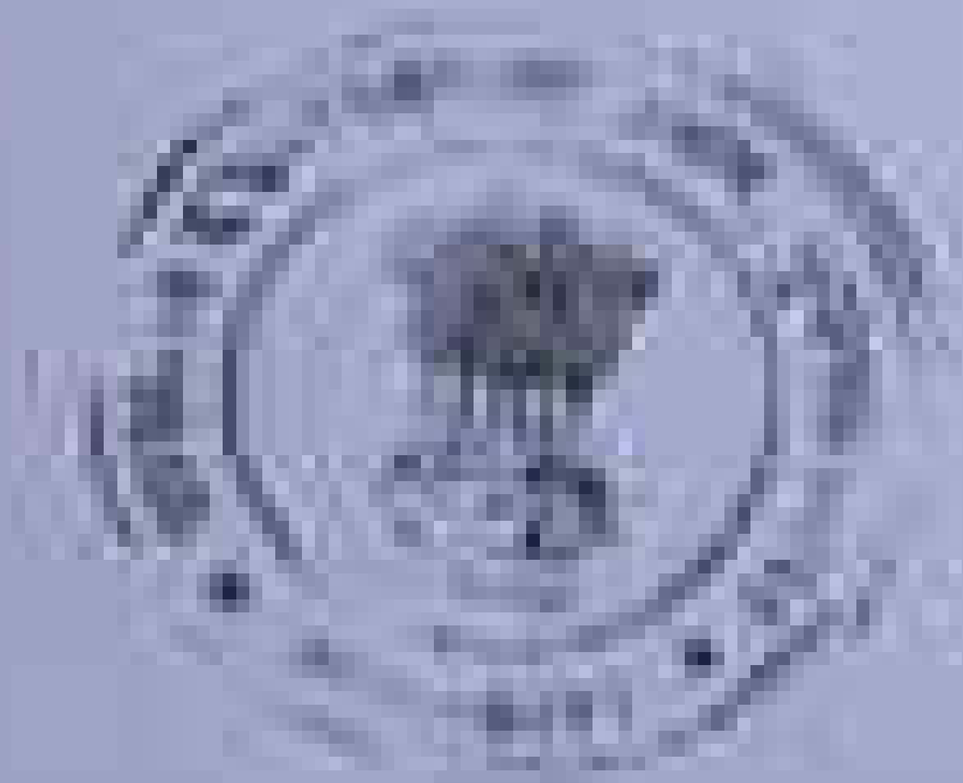
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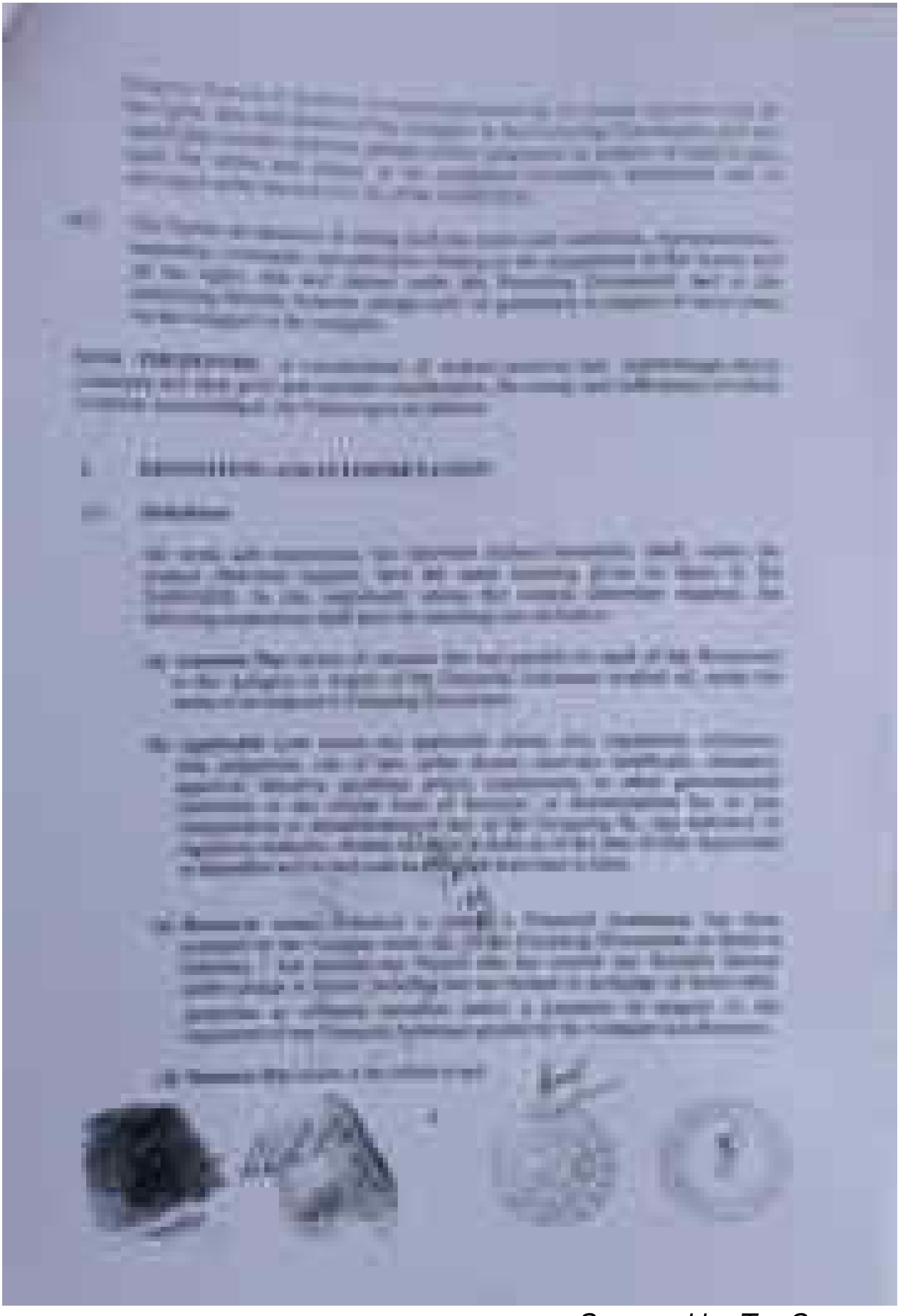


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Detail Land Schedule(Forest) of The Project of Modernisation and Expansion of existing Iron and Steel Plant By GM IRON & STEEL COMPANY LTD. At Village Kulei, in Dhenkanal District.

Name of the Village - Kulei , Name of the P.S - Parajang , Police Station No -

Name of the Tahasil -Parajang, Name of the R.I Circle - Gengutia

Sl. No	AS PER HAL RECORD				AS PER SABIK RECORD			
	Khata No	Plot No	Total Area in Ac.	Kisam	Sabik Khata no.	Sabik Plot No.	Sabik Area Ac	Sabik Kisam
1	387	4083	0.770	Patita	4	1710	0.74	Jungle
2	387	4086	4.880	Jangle II	4	1716	2.25	Jora
3	387	4095	0.510	Jangle II	4	1723	1.72	Jungle
4	387	4098	2.200	Jangle II	4	1689	2.2	Jungle
					4	1705	0.31	Jungle
5	387	4118	0.530	Sarad III	4	1727	0.91	Jungle
6	387	4055	15.500	Jungle II	4	1682	9.25	Jungle
					4	1712	6.5	Jungle
7	387	4073	0.250	Sarad III	4	1643/1850	17.40	Jungle
8	387	4431	0.120	Sarad III	4	1697	0.12	Jungle
9	387	4049	3.680	Patita	4	1676	2.16	Jungle
					4	1681	1.77	Jungle
10	387	4072	0.850	Sarad III	4	1643/1850	17.40	Jungle

TOTAL LAND PURCHASED BY G M IRON & STEEL CO LTD							
Name of the Village - Kulei							
Name of the P.S - Parajang							
Police Station No -							
Name of the Tahasil -Parajang							
Name of the R.I Circle - Gengutia							
Name of the District - Dhenkanal							
Sl. No	Plot No (purchased)	Purchased Area in Ac	Area as per land schedule	Plotwise Project area	Remarks		
1	4060/4644	0.42	0.42	0.42	4060	0.4	Found in Land schedule
2	4009	0.16	0.16	0.16			
3	4075	0.76	0.76	0.76			
4	4105	0.36	0.36	0.36	4105/4429	0.29	Found in Land schedule
5	4106	0.35	0.35	0.35			
6	4067	1.25	1.25	1.25			
7	4068	0.25	0.25	0.25			
8	4070	1.3	1.3	1.3			
9	4036	0.42	0.42	0.42			
10	4016	0.42	0.42	0.42			
11	4106/4418	0.19	0.19	0.19			
12	4075/4419	0.04	0.04	0.04			
13	4074/4420	0.02	0.02	0.02			
14	4074/4421	0.08	0.08	0.08			
15	4107	0.3	0.3	0.3			
16	4109	0.7	0.7	0.7			
17	4011	1.57	1.57	1.57			
18	4063	0.73	0.73	0.73			
19	4077	0.24	0.24	0.24			
20	4013	0.26	0.26	0.26			
21	4033	0.28	0.28	0.28			
22	4034	0.61	0.61	0.61			
23	4035	0.57	0.57	0.57			
24	4112	0.4	0.4	0.4			
25	4059	0.37	0.37	0.37			
26	4046	0.15	0.15	0.15			
27	4042	0.63	0.63	0.63			
28	4066	0.22	0.22	0.22			

29	4076	0.32	0.32	0.32			
30	4069	0.44	0.44	0.44			
31	4108	0.11	0.11	0.11			
32	4060	0.4	0.4	0.4			
33	4061	2.47	2.47	2.47			
34	4113	0.23	0.23	0.23			
35	4109/4430	0.06	0.06	0.06			
36	4010	0.33	0.33	0.33			
37	4012	0.45	0.45	0.45			
38	4015	0.17	0.17	0.17			
39	4018	0.25	0.25	0.25			
40	4031	0.37	0.37	0.37			
41	4040	0.57	0.57	0.57			
42	4064	2.14	2.14	2.14			
43	4037	1.09	1.09	1.09			
44	4043	0.21	0.21	0.21			
45	4044	0.84	0.84	0.84			
46	4078	0.3	0.3	0.3			
47	4074	0.26	0.26	0.26			
48	4040/4504	0.05	0.05	0.05			
49	4014	0.18	0.18	0.18			
50	4017	0.24	0.24	0.24			
51	4032	0.34	0.34	0.34			
52	4040/4503	0.17	0.17	0.17			
53	4038	1.98	1.98	1.98			
54	4041	0.94	0.94	0.94			
55	4109/4432	0.06	0.06	0.06			
56	4114	0.51	0.51	0.51			
57	4062	0.83	0.83	0.83			
58	4045	0.16	0.16	0.16			
59	4048	1.76	1.76	1.76			
60	4050	0.57	0.57	0.57			
61	4047	0.91	0.91	0.91			
62	4052	0.7	2.56	0.7			
63	4053	0.2	0.2	0.2			
64	4054	1.06	1.06	1.06			
65	4065	0.27	0.27	0.27			
66	4079	1.53	1.53	1.53			
67	4051	0.38	0.38	0.38			
68	4057	3.62	3.62	3.62			
69	4058	1.76	1.76	1.76			
70	4115	0.61	0.61	0.61			
71	4071	0.97	0.97	0.97			

	Total	43.86		43.86			
1	4002	0.23	0.23	0.23			
2	3998	0.79	0.79	0.79			
3	3975/4523	0.23		0	Not in project area		
4	3993	0.13	0.13	0.13			
5	3994	0.06	0.06	0.06			
6	4007	0.45	0.45	0.45			
7	3996	0.31	0.31	0.31			
	Total	2.2		1.97			
1	3969	0.08		0	Not in project area		
2	3970	2.64		0	Not in project area		
3	4099	0.34	0.34	0.34			
4	4026/5348	0.73		0.73	4026	3.8	
5	4026/5347	0.44		0.44	4026/4695	0.28	
6	4027	0.04	0.04	0.04			
7	4027/4928	0.3		0	Not in Land schedule	Not in project area	
8	4027/4929	0.35		0		Not in project area	
9	3967/4508	0.1		0	Not in project area		
10	3961	1.07		0	Not in project area		
11	4093	0.28	0.28	0.28			
	Total	6.37		1.83			
	GRAND TOTAL (N F)	52.43		47.66	4.77		

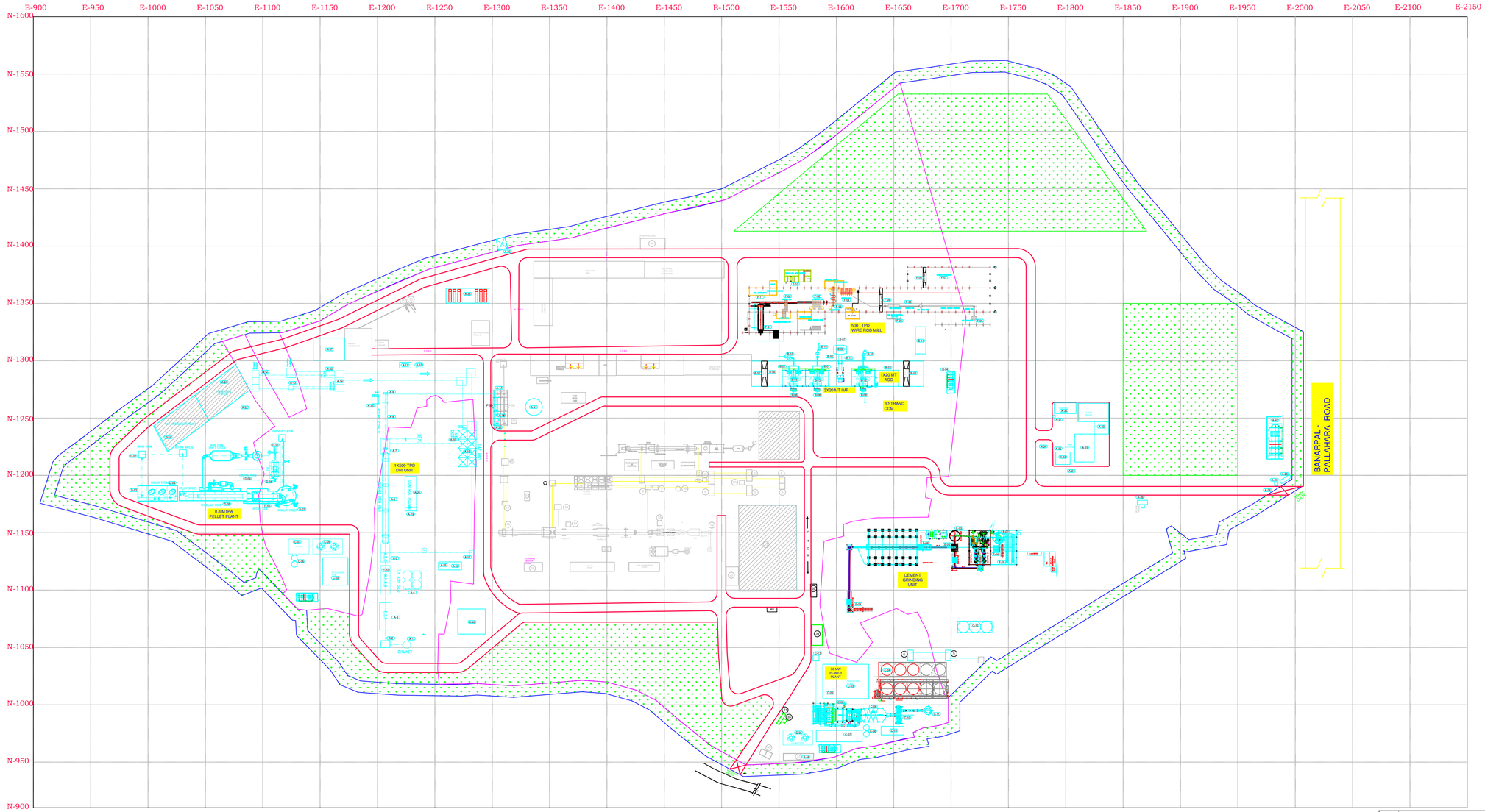
PROPOSED NON-FOREST LAND SCHEDULE

Name of the Village - Kulei
Name of the P.S - Parajang
Police Station No -
Name of the Tahasil -Parajang
Name of the R.I Circle - Gengutia
Name of the District - Dhenkanal

Sl. No	Proposed Non-Forest land				Remarks
	Khata No	Plot No	Total Area in Ac.	Kisam	
1	140	4080	0.230	SARAD III	Land for expansion
2	140	4081	0.370	SARAD III	
3	87	4082	0.310	SARAD III	
4	77	4084	3.660	SARAD II	
5	387	4085	0.370	SARAD II	
6	227	4087	0.540	SARAD III	
7	228	4088	0.750	SARAD III	
8	302	4089	0.510	SARAD III	
9	146	4090	0.470	SARAD III	
10	77	4091	1.180	SARAD II	
11	227	4092	0.260	SARAD III	
12	65	4094	0.230	SARAD III	
13	146	4096	0.320	SARAD III	
14	140	4097	1.150	Taila II	
15	227	4100	0.210	SARAD I	
16	390	4101	0.080	Gochar	
17	390	4102	0.270	Gochar	
18	390	4103	0.320	Gochar	
19	390	4104	0.320	Gochar	
20	390	4110	0.350	Gochar	
21	390	4111	0.100	Gochar	
22	227	4116	0.350	Sarad III	
23	387	4117	0.160	Sarad III	
24	17	3995	0.750	Bagayat II	
25	378/157	3997	0.290	Bagayat II	
26	290	3999	0.550	Sarad II	
27	385	4000	1.210	Sarad III	
28	141	4001	0.540	Sarad II	
29	141	4003	0.130	Mahara	
30	304	4004	0.040	Bagayat II	
31	141	4005	0.670	Bagayat II	
32	17	4006	0.080	Bagayat II	
33	141	4008	0.550	Bagayat II	
34	2	4019	0.230	Sarad II	
35	200	4020	0.400	Sarad II	
36	378/203	4021	0.290	Sarad II	
37	200	4022	0.310	Sarad II	
38	2	4023	1.040	Sarad II	
39	282	4024	0.260	Sarad II	
40	2	4025	0.150	Sarad II	
41*	140	4026	2.630	Sarad I	
42	385	4028	0.570	Sarad II	
43	2	4029	0.550	Sarad I	
44	200	4030	0.470	Sarad II	
45	378/62	4039	0.360	Sarad II	

46*	271	4052	1.860	Taila I	
47	141	4056	3.180	Sarad II	
48		4027	0.04	Sarad II	
49		4096/4779	0.12	Sarad III	
50		4096/4778	0.26	Sarad III	
51		4105/4429	0.29	Sarad III	
52		4023/4636	0.79	Sarad II	
53		4026/4695	0.28	Sarad II	
54		3998/4516	0.12	Sarad II	
Total			**31.520**		

ANNEXURE III



LEGENDS FOR SPONGE IRON/DRI PLANT	
SL.NO.	DESCRIPTION
A-1.	CHIMNEY
A-2.	ID FAN
A-3.	ESP
A-4.	ASH SILO
A-5.	ABC BUILDING
A-6.	ROTARY KILN - 500 TPD
A-7.	KILN COOLER TRANSFER BUILDIN
A-8.	ROTARY COOLER
A-9.	COOLER DISCHARGE BUILDING
A-10.	COOLING TOWER
A-11.	UNDER GROUND WATER TANK
A-12.	GROUND HOPPER FOR COAL & IRON ORE
A-13.	JUNCTION HOUSE (COAL & IRON ORE)
A-14.	CRUSHER & SCREEN HOUSE FOR COAL & IRON ORE
A-15.	STOCK HOUSE
A-16.	TRANSFER HOUSE
A-17.	I-BIN WITH PRODUCT SEPARATION
A-18.	PRODUCT STORAGE HOUSE
A-19.	D.G ROOM & COMPRESSOR
A-20.	CONTROL ROOM
A-21.	RAW MATERIAL STORAGE FOR COAL
A-22.	RAW MATERIAL STORAGE FOR IRON ORE
A-23.	ADMINISTRATIVE BUILDING
A-24.	CAR PARKING
A-25.	STORAGE
A-26.	WORK SHOP
A-27.	SECURITY OFFICE & TIME OFFICE
A-28.	WASH ROOM
A-29.	MAIN GATE
A-30.	EMERGENCY EXIT GATE
A-31.	BORE WELL
A-32.	TEMPLE
A-33.	BAG FILTER
A-34.	CYCLE SHED
A-35.	CANTEEN
A-36.	LIGHTING / WATCH TOWER
A-37.	WATER RESERVOIR
A-38.	TRUCK PARKING
A-39.	WEIGH BRIDGE / OFFICE
A-40.	SOLID WASTE STORAGE
A-41.	RAIN WATER HARVESTING
A-42.	MAIN RECEIVING SUB-STATION
A-43.	FIRST AID CENTRE
A-44.	LABOR QUARTER
A-45.	

LEGENDS FOR STEEL MELTING SHOP	
SL.NO.	DESCRIPTION
B-01	3 x 20 MT FURNACE
B-02	3 STRAND CCM
B-03	20T - AOD
B-04	SUB-STATION
B-05	EOT CRANE
B-06	CONTROL ROOM & HYD. ROOM
B-07	BILLET COOLING STAND
B-08	TRANSFORMER
B-09	RAW MATERIAL STORAGE
B-10	SUC.HOOD, HEAT EXCHANGER, CHIMNEY
B-11	OVER HEAD TANK & COOLING TOWER
B-12	SCALE PIT
B-13	VCB ROOM & LAB
B-14	

LEGENDS FOR POWER PLANT	
SL.NO.	DESCRIPTION
C-01	WHR BOILER - 40 TPH
C-02	CFBC BOILER - 150 TPH
C-03	TURBINE HOUSE
C-04	AIR COOLED CONDENSER
C-05	AUX. COOLING TOWER
C-06	DM STORAGE TANK
C-07	RO/DM WATER PLANT
C-08	ESP
C-09	MCC ROOM
C-10	ID FAN
C-11	CHIMNEY
C-12	ASH SILO
C-13	TRANSFER HOUSE
C-14	SEWAGE TREATMENT PLANT (STP)
C-15	

LEGENDS FOR PELLET PLANT	
SL.NO.	DESCRIPTION
D-01	PROPORTIONING SHED
D-02	MIXING SHED
D-03	CRUSHER SHED
D-04	BALLING SHED
D-05	TRAVEL GRATE
D-06	ROTARY KILN
D-07	ANNULAR COOLER
D-08	ESP
D-09	MCC ROOM
D-10	ID FAN & CHIMNEY

LEGENDS CEMENT GRINDING UNIT	
SL.NO.	DESCRIPTION
E-01	CLINKER YARD
E-02	WEIGH FEEDERS
E-03	FLY ASH SILO
E-04	BAG FILTERS
E-05	CRUSHER HOUSE
E-06	CEMENT MILL
E-07	CEMENT SILO
E-08	PACKING MACHINE
E-09	
E-10	

LEGENDS ROLLING MILL UNIT	
SL.NO.	DESCRIPTION
F-01	PUSHER-RE HEATING FURNACE-CHIMNEY
F-02	ROUGHING MILL STAND
F-03	INTERMEDIATE MILL STAND
F-04	FINISH MILL STAND
F-05	BLOCK MILL
F-06	COIL COMPACTOR
F-07	COIL STORAGE SHED
F-08	CONTROL ROOM/ ELECTRICAL ROOM
F-09	EOT CRANE
F-10	WATER COMPLEX
F-11	WORK SHOP

AREA SUMMARY

SL.NO	DESCRIPTION	AREA IN ACRES
1.	EXISTING MACHINERY	06.50
2.	PROPOSED MACHINERY	32.60
3.	ROAD AND PARKING	04.40
4.	RESERVOIR	02.20
5.	RAW MATERIAL/ FINISH PRODUCT STORAGE	06.30
6.	GREEN BELT AREA	31.10
7.	OPEN SPACE	08.40
8.	UTILITIES	02.50
9.	TOTAL AREA	94.00

PRESENT INSTALLED
UPGRADE / MODIFICATION
PROPOSED EXPANSION

REVN.	DESCRIPTION	REVD. BY	APPD. BY	DATE

FOR APPROVAL | FOR INFORMATION | FOR PRODUCTION | FOR ERECTION

GM IRON AND STEEL COMPANY LTD

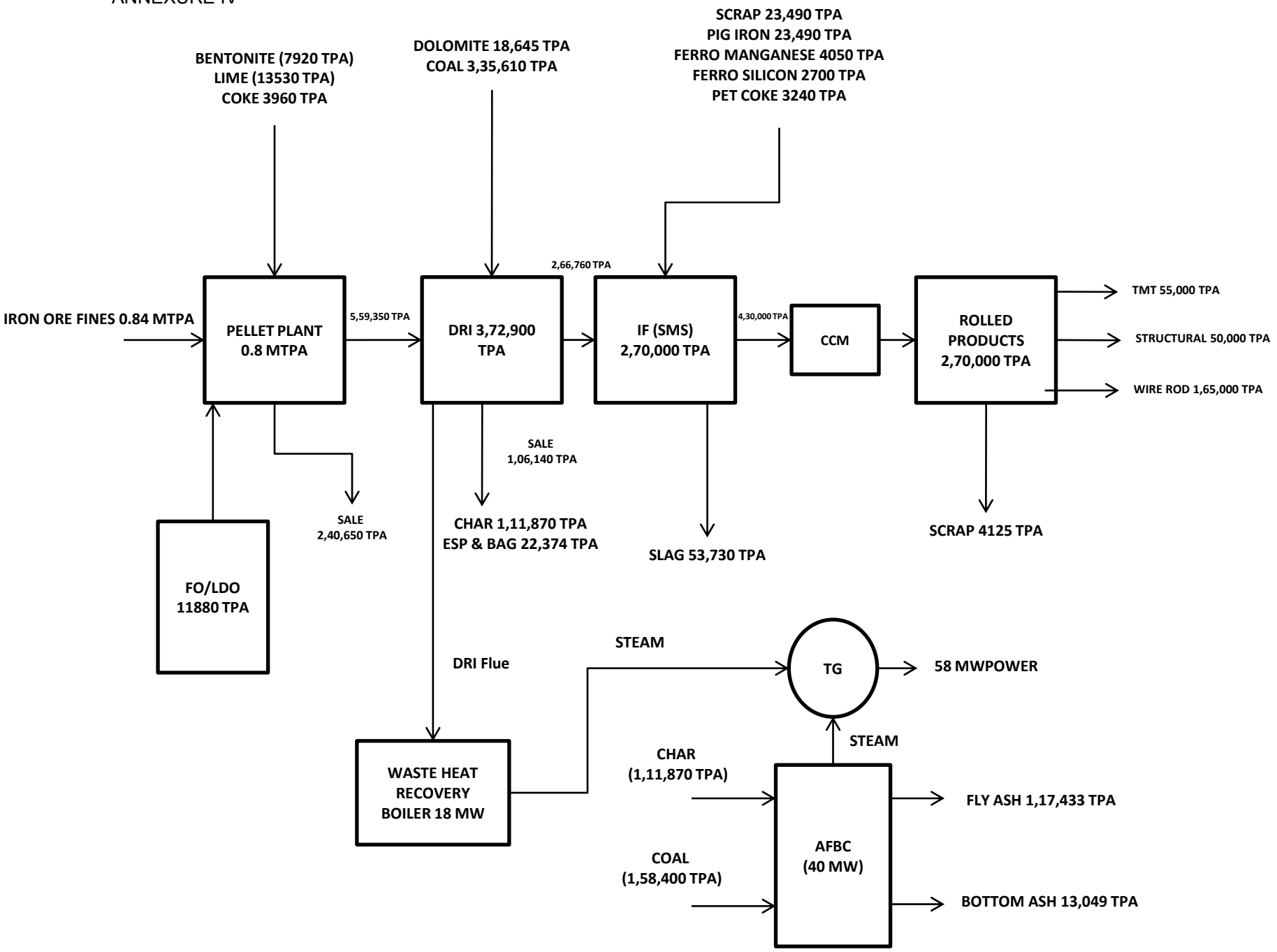
KULEI, PARJANG, DHENKANAL, ODISHA

SCALE	1:1
DATE	31.07.20
DESIGN	RAMESH
CHECKED	KVSN
APPROVED	KVSN

PROJECT ID	CONTRACT
YEAR	2020
ELEMENT ID.	
ITEM CODE	
SHEET SIZE	A1

PROJECT	INTEGRATED-STEEL-PLANT
ENVIRO CONSULTANT	VISIONTEK-CONSULTANCY-SERVICES-PVT-LTD
TECHNICAL CONSULTANT	MAA-GAYATRI-CONSULTANTS-PVT-LTD
TITLE	GENERAL-ARRANGEMENT-DRAWING
DRAWING DOCUMENT ID	MGC/GML/GA/02/01
REVISION	00

ANNEXURE IV


BENTONITE (7920 TPA)
LIME (13530 TPA)
COKE 3960 TPA
DOLOMITE 18,645 TPA
COAL 3,35,610 TPA
SCRAP 23,490 TPA
PIG IRON 23,490 TPA
FERRO MANGANESE 4050 TPA
FERRO SILICON 2700 TPA
PET COKE 3240 TPA
IRON ORE FINES 0.84 MTPA
PELLET PLANT 0.8 MTPA
5,59,350 TPA
DRI 3,72,900 TPA
2,66,760 TPA
IF (SMS) 2,70,000 TPA
4,30,000 TPA
CCM
ROLLED PRODUCTS 2,70,000 TPA
TMT 55,000 TPA
STRUCTURAL 50,000 TPA
WIRE ROD 1,65,000 TPA
SALE 2,40,650 TPA
SALE 1,06,140 TPA
CHAR 1,11,870 TPA
ESP & BAG 22,374 TPA
SLAG 53,730 TPA
SCRAP 4125 TPA
FO/LDO 11880 TPA
DRI Flue
STEAM
TG
58 MWPOWER
STEAM
CHAR (1,11,870 TPA)
WASTE HEAT RECOVERY BOILER 18 MW
AFBC (40 MW)
FLY ASH 1,17,433 TPA
COAL (1,58,400 TPA)
BOTTOM ASH 13,049 TPA

CORPORATE ENVIRONMENT POLICY

The "GM Iron & Steel Co, Limited." recognizing the disciplines of Quality, Environment, Occupational Health, Safety as integral part of its management function, focuses on exceeding customer expectations with safe, clean, green & healthy environment in & around its places of operations & projects.

The top Management is committed to

- Adopt Quality, Environment Occupational Health, Safety standards as per the Government prescribed requirements and continually improve the performance.
- Develop greenery, take action to prevent pollution & provide all pollution control measures to protect environment and implement safe operating procedures to prevent injury/incident & ensure healthy environment.
- Fulfil statutory obligations pertaining to various disciplines and others specific commitments relevant to the purpose and context of the organization, in time.
- Provide required resources of fund, man-power and cleaner & modern technology for ensuring efficient and effective functioning
- Ensure proper hierarchical structure and processes to set & achieve objectives & targets and review performance
- Train all employees including contract workmen to enhance the awareness and performance and reach higher standards across all disciplines and indicate a culture of self regulation and ownership
- Monitor and review deviation from standard/non-compliance, if any at highest management level on a regular basis and provide required guidance to take corrective/preventive measures to prevent recurrence
- Share the performance with employees, contracted personnel, public & the interested parties, as relevant
- Review periodically, update and communicate the Policy/Objectives/Targets to all concerned.

Date:

Managing Director

Ref : Envlab/21/R-0001 Date : 18.03.2021

METEROLOGICAL DATA REPORT – DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**
2.Sample Collected By : VCSPL Representative in presence of Clients Representative

Parameters			20-Dec	21-Jan	21-Feb
Temperature (^{0}C)	Maximum		34.6	39.8	39.8
	Minimum		16.2	16.2	27.7
	Average		**25.6**	**25.8**	**15.2**
Relative Humidity (%)	Maximum		88	97	96
	Minimum		23	24	17
	Average		**55.6**	**58.4**	**56.1**
Wind Speed (Km/Hr)	Max		**13**	**18**	**23**
Wind Direction (%)		**E**	**4.0**	**4.4**	**1.8**
		ENE	**3.6**	**6.9**	**1.3**
		ESE	**2.0**	**3.6**	**4.0**
		N	**1.6**	**0.8**	**1.3**
		NE	**4.3**	**13.0**	**13.4**
		NNE	**4.4**	**3.6**	**0.9**
		NNW	**14.5**	**0.8**	**4.0**
		NW	**5.0**	**10.6**	**20.5**
		S	**7.3**	**7.3**	**5.8**
		SE	**2.8**	**9.8**	**2.7**
		SSE	**0.8**	**9.3**	**5.4**
		SSW	**11.7**	**2.8**	**2.2**
		SW	**8.9**	**6.9**	**1.8**
		W	**7.3**	**6.5**	**9.8**
		WNW	**11.7**	**6.5**	**11.6**
		WSW	**10.1**	**7.3**	**8.9**
		CALM	**1.3**	**0.7**	**0.3**
Cloud Cover (%)	Maximum		**2**	**6**	**2**
	Minimum		**0**	**0**	**0**
Rainfall (mm)	Monthly Total		**3.8**	**8.2**	**14.8**

For **Visiontek Consultancy Services Pvt.Ltd**

Ref : Envlab/21/R-0002 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ1: Project Site (20^0 58' 56.05" N $85^0$16' 26.48" E)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**01.12.2020**	82.6	49.6	9.2	20.8	0.26
2	**04.12.2020**	82.8	49.7	9.4	20.6	0.28
3	**08.12.2020**	83.6	50.2	9.6	20.8	0.32
4	**11.12.2020**	83.2	49.9	9.2	21.6	0.33
5	**15.12.2020**	84.4	50.6	9.8	21.4	0.36
6	**18.12.2020**	84.6	50.8	9.4	21.2	0.38
7	**22.12.2020**	84.8	50.9	9.6	20.8	0.41
8	**25.12.2020**	84.4	50.6	9.4	20.4	0.44
9	**04.01.2021**	84.2	50.5	9.2	21.4	0.42
10	**07.01.2021**	83.6	50.2	9.1	21.6	0.4
11	**11.01.2021**	83.8	50.3	9.2	22.6	0.41
12	**14.01.2021**	84.2	50.5	9.3	22.8	0.42
13	**18.01.2021**	84.6	50.8	9.4	23.6	0.42
14	**21.01.2021**	85.2	51.1	8.8	23.8	0.38
15	**25.01.2021**	85.6	51.4	8.9	22.6	0.39
16	**28.01.2021**	85.8	51.5	8.8	22.4	0.39
17	**02.02.2021**	86.2	51.7	8.6	22.8	0.38
18	**05.02.2021**	86.8	52.1	8.7	22.6	0.36
19	**09.02.2021**	87.2	52.3	8.2	22.4	0.32
20	**12.02.2021**	87.8	52.7	8.1	22.6	0.33
21	**16.02.2021**	86.6	52.0	9.2	20.8	0.31
22	**19.02.2021**	86.4	51.8	9.6	20.6	0.3
23	**23.02.2021**	86.2	51.7	9.4	21.8	0.34
24	**26.02.2021**	88.2	52.9	9.2	21.6	0.36
Maximum		**88.2**	**52.9**	**9.8**	**23.8**	**0.44**
Minimum		**82.6**	**49.6**	**8.1**	**20.4**	**0.26**
Average		**85.1**	**51.1**	**9.1**	**21.8**	**0.36**
98th Percentile		**87.7**	**52.6**	**9.6**	**23.5**	**0.42**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0003 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ2: At Village Kulei (20^0 59'27.25"N $85^0$16'2.30"E) 0.58 Km, NW)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**01.12.2020**	78.8	47.3	8.1	19.2	0.21
2	**04.12.2020**	78.9	47.3	8.3	19.6	0.22
3	**08.12.2020**	78.2	46.9	8.2	19.4	0.18
4	**11.12.2020**	78.4	47.0	8.2	18.8	0.16
5	**15.12.2020**	77.6	46.6	8.4	18.6	0.14
6	**18.12.2020**	77.2	46.3	8.3	18.8	0.16
7	**22.12.2020**	78.4	47.0	8.1	18.2	0.15
8	**25.12.2020**	78.6	47.2	8	17.4	0.12
9	**04.01.2021**	77.8	46.7	7.8	17.2	0.14
10	**07.01.2021**	80.2	48.1	7.6	16.8	0.16
11	**11.01.2021**	80.6	48.4	8.2	16.2	0.18
12	**14.01.2021**	80.8	48.5	8.4	20.2	0.2
13	**18.01.2021**	81.2	48.7	8.6	20.6	0.21
14	**21.01.2021**	81.4	48.8	9.1	20.2	0.22
15	**25.01.2021**	80.8	48.5	9.2	21.2	0.21
16	**28.01.2021**	80.6	48.4	9.3	21.4	0.22
17	**02.02.2021**	80.2	48.1	8.9	20.6	0.23
18	**05.02.2021**	80.1	48.1	8.8	20.4	0.22
19	**09.02.2021**	78.8	47.3	8.6	19.6	0.21
20	**12.02.2021**	78.4	47.0	8.4	19.8	0.2
21	**16.02.2021**	78.2	46.9	8.1	20.6	0.19
22	**19.02.2021**	77.6	46.6	8	20.2	0.18
23	**23.02.2021**	77.4	46.4	8	19.9	0.16
24	**26.02.2021**	76.8	46.1	7.8	19.6	0.15
Maximum		**81.4**	**48.8**	**9.3**	**21.4**	**0.23**
Minimum		**76.8**	**46.1**	**7.6**	**16.2**	**0.12**
Average		**79.0**	**47.4**	**8.4**	**19.3**	**0.18**
98th Percentile		**81.1**	**48.7**	**9.2**	**21.1**	**0.22**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0004 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**
2.Sampling Location : **AAQ3: Near to Kulei –Pitiri Road (20^0 59$^{'}$15.17$^{''}$N 85^{0}16$^{'}$57.19$^{''}$E) (0.40 KM, NE)**
3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.
4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**01.12.2020**	82.6	49.6	9.8	22.4	0.24
2	**04.12.2020**	83.4	50.0	10.2	22.6	0.28
3	**08.12.2020**	83.6	50.2	10.6	23.4	0.31
4	**11.12.2020**	83.2	49.9	10.8	23.8	0.36
5	**15.12.2020**	83.8	50.3	10.6	24.6	0.33
6	**18.12.2020**	84.8	50.9	11.2	24.8	0.34
7	**22.12.2020**	85.2	51.1	11.6	26.2	0.35
8	**25.12.2020**	85.6	51.4	11.8	25.6	0.32
9	**04.01.2021**	88.2	52.9	10.6	25.8	0.33
10	**07.01.2021**	88.6	53.2	10.2	24.2	0.32
11	**11.01.2021**	88.4	53.0	9.9	24.6	0.34
12	**14.01.2021**	87.6	52.6	9.6	22.8	0.28
13	**18.01.2021**	87.2	52.3	9.8	22.6	0.29
14	**21.01.2021**	88.4	53.0	10.4	22.2	0.32
15	**25.01.2021**	89.6	53.8	10.6	23.7	0.33
16	**28.01.2021**	89.2	53.5	10.2	23.6	0.36
17	**02.02.2021**	90.2	54.1	11.2	22.8	0.32
18	**05.02.2021**	88.6	53.2	11.6	21.6	0.33
19	**09.02.2021**	88.4	53.0	11.8	21.4	0.34
20	**12.02.2021**	82.6	49.6	10.9	20.8	0.32
21	**16.02.2021**	83.8	50.3	10.6	20.6	0.31
22	**19.02.2021**	84.6	50.8	10.2	21.9	0.3
23	**23.02.2021**	84.8	50.9	10.4	21.8	0.31
24	**26.02.2021**	85.2	51.1	11.2	22.2	0.31
Maximum		**90.2**	**54.1**	**11.8**	**26.2**	**0.36**
Minimum		**82.6**	**49.6**	**9.6**	**20.6**	**0.24**
Average		**86.2**	**51.7**	**10.7**	**23.2**	**0.32**
98th Percentile		**89.5**	**53.7**	**11.8**	**25.8**	**0.36**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0005 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**
2.Sampling Location : **AAQ4: Paramahansapur Village (20^0 57'58.92"N $85^0$17'18.22"E)(1.75 KM, SE)**
3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.
4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**01.12.2020**	66.8	40.1	8.2	18.2	0.18
2	**04.12.2020**	66.6	40.0	8.1	18.8	0.19
3	**08.12.2020**	64.8	38.9	8.4	18.6	0.21
4	**11.12.2020**	68.2	40.9	8.6	19.1	0.24
5	**15.12.2020**	68.6	41.2	7.8	19.4	0.22
6	**18.12.2020**	70.2	42.1	7.7	19.2	0.23
7	**22.12.2020**	70.8	42.5	7.6	18.4	0.22
8	**25.12.2020**	71.4	42.8	7.4	18.2	0.24
9	**04.01.2021**	71.8	43.1	7.2	17.8	0.18
10	**07.01.2021**	72.6	43.6	8.1	17.6	0.17
11	**11.01.2021**	72.8	43.7	8.3	17.2	0.16
12	**14.01.2021**	73.6	44.2	8.2	17.1	0.15
13	**18.01.2021**	72.8	43.7	8.4	18.1	0.16
14	**21.01.2021**	74.6	44.8	7.8	18.4	0.18
15	**25.01.2021**	74.8	44.9	7.7	18.6	0.21
16	**28.01.2021**	72.2	43.3	7.6	18.8	0.22
17	**02.02.2021**	71.8	43.1	7.4	19.1	0.23
18	**05.02.2021**	72.2	43.3	7.2	19.2	0.21
19	**09.02.2021**	72.6	43.6	7.1	19.3	0.19
20	**12.02.2021**	71.6	43.0	8.2	18.8	0.18
21	**16.02.2021**	71.2	42.7	7.8	18.4	0.17
22	**19.02.2021**	70.8	42.5	7.6	17.8	0.16
23	**23.02.2021**	70.2	42.1	7.7	17.6	0.18
24	**26.02.2021**	71.2	42.7	7.4	18.4	0.19
Maximum		**74.8**	**44.9**	**8.6**	**19.4**	**0.24**
Minimum		**64.8**	**38.9**	**7.1**	**17.1**	**0.15**
Average		**70.9**	**42.5**	**7.8**	**18.4**	**0.19**
98th Percentile		**74.5**	**44.7**	**8.4**	**19.3**	**0.24**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0006 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ5: Near to the Post Office at Village Pitiri (85°16'23.32"E 20°56'48.83"N)(3.87 KM, S)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**01.12.2020**	74.8	44.9	7.4	17.6	0.24
2	**04.12.2020**	75.6	45.4	7.2	17.2	0.26
3	**08.12.2020**	75.8	45.5	7.6	17.4	0.33
4	**11.12.2020**	76.2	45.7	7.2	16.8	0.36
5	**15.12.2020**	76.8	46.1	7.1	16.6	0.33
6	**18.12.2020**	76.2	45.7	6.8	16.4	0.34
7	**22.12.2020**	75.4	45.2	6.9	16.2	0.29
8	**25.12.2020**	75.2	45.1	7.2	17.1	0.28
9	**04.01.2021**	74.8	44.9	7.4	17.4	0.32
10	**07.01.2021**	74.6	44.8	7.6	17.2	0.33
11	**11.01.2021**	75.1	45.1	7.8	17.1	0.34
12	**14.01.2021**	75.6	45.4	7.9	16.8	0.36
13	**18.01.2021**	76.8	46.1	8.1	16.9	0.35
14	**21.01.2021**	77.4	46.4	8.2	16.2	0.34
15	**25.01.2021**	77.6	46.6	8.6	17.4	0.33
16	**28.01.2021**	75.6	45.4	8.4	17.2	0.32
17	**02.02.2021**	75.8	45.5	8.8	17.6	0.29
18	**05.02.2021**	74.6	44.8	8.2	18.1	0.26
19	**09.02.2021**	74.8	44.9	8.3	18.4	0.28
20	**12.02.2021**	73.6	44.2	8.1	17.8	0.24
21	**16.02.2021**	73.2	43.9	8.2	17.9	0.23
22	**19.02.2021**	72.6	43.6	8.8	18.2	0.21
23	**23.02.2021**	72.8	43.7	7.8	18.4	0.22
24	**26.02.2021**	73.1	43.9	7.9	17.8	0.21
Maximum		**77.6**	**46.6**	**8.8**	**18.4**	**0.36**
Minimum		**72.6**	**43.6**	**6.8**	**16.2**	**0.21**
Average		**75.2**	**45.1**	**7.8**	**17.3**	**0.29**
98th Percentile		**77.3**	**46.4**	**8.8**	**18.4**	**0.36**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0007 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ6: At Village Kakurhi (20^0 58' 31.59" N $83^0$14' 55.86" E) (2.47 KM, WSW)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	02.12.2020	80.8	48.5	6.6	15.8	0.22
2	05.12.2020	80.2	48.1	6.8	15.6	0.25
3	09.12.2020	78.8	47.3	6.5	15.2	0.24
4	12.12.2020	79.6	47.8	6.4	14.8	0.24
5	16.12.2020	72.8	43.7	6.6	14.6	0.22
6	19.12.2020	70.6	42.4	6.2	14.2	0.21
7	23.12.2020	71.2	42.7	6.4	13.8	0.18
8	26.12.2020	72	43.2	6.8	13.6	0.19
9	05.01.2021	70.6	42.4	7.2	14.1	0.16
10	08.01.2021	70.8	42.5	7.4	14.2	0.18
11	12.01.2021	70.2	42.1	7.1	14.4	0.16
12	15.01.2021	68.8	41.3	7.3	14.6	0.15
13	19.01.2021	68.2	40.9	6.8	15.2	0.14
14	22.01.2021	70.8	42.5	6.9	15.6	0.15
15	26.01.2021	70.6	42.4	6.6	15.8	0.14
16	29.01.2021	70.2	42.1	6.2	14.8	0.13
17	03.02.2021	67.4	40.4	6.1	14.6	0.12
18	06.02.2021	65.8	39.5	6	15.1	0.21
19	10.02.2021	64.6	38.8	7.2	15.4	0.22
20	13.02.2021	64.2	38.5	7.3	13.8	0.24
21	17.02.2021	63.8	38.3	7.4	14.6	0.25
22	20.02.2021	62.6	37.6	6.8	14.2	0.26
23	24.02.2021	62.8	37.7	6.4	14.1	0.22
24	27.02.2021	70.6	42.4	6.9	14.2	0.23
Maximum		**80.8**	**48.5**	**7.4**	**15.8**	**0.26**
Minimum		**62.6**	**37.6**	**6.0**	**13.6**	**0.12**
Average		**70.4**	**42.3**	**6.7**	**14.7**	**0.20**
98th Percentile		**80.1**	**48.1**	**7.4**	**15.8**	**0.25**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0008 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ7: At Khalpal Primary School, Village Khalapal (20^0 57' 33.45" N 85^0 15' 17.14" E)(3.24 KM, SW)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	02.12.2020	46.8	28.1	4.6	10.2	0.11
2	05.12.2020	48.8	29.3	4.4	10.6	0.12
3	09.12.2020	54.6	32.8	4.2	11.2	0.12
4	12.12.2020	54.2	32.5	4.1	11.4	0.13
5	16.12.2020	49.6	29.8	4.1	10.8	0.14
6	19.12.2020	49.2	29.5	4.2	10.6	0.13
7	23.12.2020	48.8	29.3	4.6	10.2	0.12
8	26.12.2020	50.6	30.4	4.8	10.1	0.14
9	05.01.2021	50.8	30.5	4.4	10.4	0.15
10	08.01.2021	51.8	31.1	4.2	11.2	0.16
11	12.01.2021	51.2	30.7	4.1	11.1	0.12
12	15.01.2021	52.6	31.6	4.1	11.4	0.11
13	19.01.2021	52.8	31.7	4	10.8	0.11
14	22.01.2021	53.4	32.0	4.2	10.6	0.12
15	26.01.2021	53.6	32.2	4.4	10.2	0.11
16	29.01.2021	54.8	32.9	4.6	10.1	0.13
17	03.02.2021	55.6	33.4	4.8	10.2	0.13
18	06.02.2021	55.8	33.5	4.9	10.6	0.12
19	10.02.2021	56.6	34.0	4.5	11.2	0.11
20	13.02.2021	56.4	33.8	5.1	11.6	0.11
21	17.02.2021	56.2	33.7	5.2	10.6	0.12
22	20.02.2021	55.8	33.5	5.6	10.4	0.11
23	24.02.2021	55.2	33.1	4.8	10.2	0.14
24	27.02.2021	54.2	32.5	4.9	10.1	0.12
Maximum		**56.6**	**34.0**	**5.6**	**11.6**	**0.16**
Minimum		**46.8**	**28.1**	**4.0**	**10.1**	**0.11**
Average		**52.8**	**31.7**	**4.6**	**10.7**	**0.13**
98th Percentile		**56.4**	**33.8**	**5.2**	**11.4**	**0.15**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0009 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**
2.Sampling Location : **AAQ8: Talcher (20^0 57$^{'}$0.76$^{"}$N 85^{0}13$^{'}$49.20$^{"}$E)(5.73 KM,SW)**
3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.
4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	02.12.2020	88.8	53.3	8.9	24.6	0.61
2	05.12.2020	89.6	53.8	8.8	24.2	0.58
3	09.12.2020	84.6	50.8	8.6	23.8	0.56
4	12.12.2020	85.8	51.5	9.1	23.6	0.55
5	16.12.2020	86.6	52.0	9.3	23.2	0.54
6	19.12.2020	88.2	52.9	9.6	24.2	0.52
7	23.12.2020	88.4	53.0	9.4	24.8	0.51
8	26.12.2020	88.6	53.2	9.2	24.6	0.52
9	05.01.2021	90.6	54.4	9.4	25.2	0.54
10	08.01.2021	92.8	55.7	9.5	25.8	0.48
11	12.01.2021	95.6	57.4	9.6	26.2	0.46
12	15.01.2021	94.2	56.5	9.8	26.4	0.49
13	19.01.2021	94.1	56.5	9.2	26.6	0.51
14	22.01.2021	94.8	56.9	9.4	26.2	0.52
15	26.01.2021	93.6	56.2	9.6	26.1	0.56
16	29.01.2021	93.2	55.9	9.1	25.8	0.58
17	03.02.2021	92.6	55.6	8.9	25.2	0.59
18	06.02.2021	92.8	55.7	8.9	24.6	0.6
19	10.02.2021	92	55.2	8.8	24.2	0.61
20	13.02.2021	92.6	55.6	8.6	24.1	0.66
21	17.02.2021	93.8	56.3	8.4	23.8	0.68
22	20.02.2021	94.6	56.8	9.1	23.6	0.69
23	24.02.2021	95.1	57.1	9.2	24.6	0.66
24	27.02.2021	93.2	55.9	9.3	24.1	0.64
Maximum		**95.6**	**57.4**	**9.8**	**26.6**	**0.69**
Minimum		**84.6**	**50.8**	**8.4**	**23.2**	**0.46**
Average		**91.4**	**54.8**	**9.2**	**24.8**	**0.57**
98th Percentile		**95.1**	**57.0**	**9.6**	**26.4**	**0.68**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0010 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**
2.Sampling Location : **AAQ9: Parjang Hospital (20^0 55$^{'}$3.55$^{''}$N 85^{0}18$^{'}$51.92$^{''}$E)(7.90 KM,SE)**
3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.
4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	02.12.2020	44.2	26.5	4.1	18.2	0.18
2	05.12.2020	44.8	26.9	4.2	18.4	0.16
3	09.12.2020	42.6	25.6	4.4	17.8	0.22
4	12.12.2020	42.8	25.7	4.6	17.6	0.23
5	16.12.2020	43.6	26.2	4.5	17.2	0.24
6	19.12.2020	43.2	25.9	4.4	18.1	0.22
7	23.12.2020	44.8	26.9	4.2	18.3	0.16
8	26.12.2020	45.2	27.1	4.6	18.2	0.14
9	05.01.2021	45.6	27.4	4.8	17.9	0.18
10	08.01.2021	44.8	26.9	4.2	17.6	0.14
11	12.01.2021	44.2	26.5	5.2	17.2	0.16
12	15.01.2021	40.8	24.5	5.6	18.1	0.15
13	19.01.2021	40.6	24.4	5.8	18.4	0.18
14	22.01.2021	41.2	24.7	4.9	17.8	0.22
15	26.01.2021	41.8	25.1	4.8	17.6	0.18
16	29.01.2021	42.2	25.3	4.6	16.8	0.17
17	03.02.2021	42.6	25.6	4.2	16.9	0.12
18	06.02.2021	43.2	25.9	4.4	16.6	0.12
19	10.02.2021	43.8	26.3	4.5	16.2	0.13
20	13.02.2021	44.2	26.5	4.4	17.4	0.11
21	17.02.2021	44.6	26.8	4.1	17.8	0.12
22	20.02.2021	44.8	26.9	4.3	17.4	0.18
23	24.02.2021	45.4	27.2	5.2	18.2	0.16
24	27.02.2021	45.6	27.4	5.6	18.6	0.12
Maximum		**45.6**	**27.4**	**5.8**	**18.6**	**0.24**
Minimum		**40.6**	**24.4**	**4.1**	**16.2**	**0.11**
Average		**43.6**	**26.1**	**4.7**	**17.7**	**0.17**
98th Percentile		**45.6**	**27.3**	**5.6**	**18.4**	**0.23**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0011 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ10: Rangathali Weekly Market at Village Rangathali (21^0 1'32.00"N $85^0$17'4.57"E)(4.52 KM,NNE)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**02.12.2020**	53.8	32.3	7.4	20.2	0.16
2	**05.12.2020**	54.6	32.8	7.6	20.6	0.22
3	**09.12.2020**	55.2	33.1	7.8	20.2	0.24
4	**12.12.2020**	54.8	32.9	8.1	19.4	0.28
5	**16.12.2020**	55.2	33.1	6.8	19.2	0.22
6	**19.12.2020**	58.2	34.9	6.6	19.8	0.24
7	**23.12.2020**	60.2	36.1	6.4	20.4	0.22
8	**26.12.2020**	60.8	36.5	6.2	20.6	0.26
9	**05.01.2021**	61.4	36.8	6.8	21.2	0.28
10	**08.01.2021**	61.8	37.1	6.9	21.6	0.31
11	**12.01.2021**	62.6	37.6	7.2	21.8	0.29
12	**15.01.2021**	62.8	37.7	7.4	20.8	0.26
13	**19.01.2021**	63.4	38.0	7.1	20.4	0.27
14	**22.01.2021**	63.2	37.9	7.4	19.6	0.22
15	**26.01.2021**	62.8	37.7	7.8	19.8	0.24
16	**29.01.2021**	61.6	37.0	7.6	19.1	0.25
17	**03.02.2021**	61.8	37.1	6.9	18.9	0.23
18	**06.02.2021**	62.2	37.3	6.8	18.8	0.21
19	**10.02.2021**	62.4	37.4	6.4	20.4	0.18
20	**13.02.2021**	60.8	36.5	7.2	20.2	0.19
21	**17.02.2021**	59.6	35.8	7.4	20.6	0.22
22	**20.02.2021**	59.4	35.6	7	21.4	0.21
23	**24.02.2021**	58.8	35.3	6.9	21.6	0.23
24	**27.02.2021**	58.4	35.0	7.4	20.8	0.18
Maximum		**63.4**	**38.0**	**8.1**	**21.8**	**0.31**
Minimum		**53.8**	**32.3**	**6.2**	**18.8**	**0.16**
Average		**59.7**	**35.8**	**7.1**	**20.3**	**0.23**
98th Percentile		**63.1**	**37.9**	**7.8**	**21.6**	**0.29**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0012 Date : 18.03.2021

AMBIENT AIR QUALITY MONITORING REPORT- DECEMBER 2020 TO FEBRUARY 2021

1.Name of the Project : **M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal**

2.Sampling Location : **AAQ11: Bharat Petroleum Petrol Pump Tunga Filling Station, Near to Bankadhara Square(20^0 57' 43.71" E $85^0$13' 2.15" N)(6.26 KM,WWS)**

3.Instrument Used : RDS (APM 460 BL), FPS (APM 550) Envirotech, CO Analyzer.

4.Sample Collected By : VCSPL Representative in presence of Clients Representative

Sl. No.	Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	CO (mg/m^3)
1	**02.12.2020**	86.8	52.1	10.6	26.8	0.61
2	**05.12.2020**	86.9	52.1	10.8	26.9	0.68
3	**09.12.2020**	87.8	52.7	11.2	27.4	0.74
4	**12.12.2020**	87.4	52.4	11.6	25.2	0.77
5	**16.12.2020**	86.8	52.1	12.4	25.6	0.72
6	**19.12.2020**	90.6	54.4	12.6	25.9	0.73
7	**23.12.2020**	90.8	54.5	12.8	26.4	0.77
8	**26.12.2020**	91.4	54.8	13.4	26.8	0.74
9	**05.01.2021**	91.6	55.0	13.6	27.4	0.72
10	**08.01.2021**	91.2	54.7	13.2	27.8	0.71
11	**12.01.2021**	91.8	55.1	12.8	26.8	0.69
12	**15.01.2021**	92.2	55.3	12.6	26.4	0.68
13	**19.01.2021**	92.6	55.6	12.2	25.8	0.68
14	**22.01.2021**	92.8	55.7	13.1	25.2	0.66
15	**26.01.2021**	94.6	56.8	13.8	24.8	0.65
16	**29.01.2021**	94.8	56.9	13.6	24.2	0.64
17	**03.02.2021**	92.6	55.6	14.1	26.8	0.68
18	**06.02.2021**	90.8	54.5	14.2	26.2	0.7
19	**10.02.2021**	90.6	54.4	13.9	25.4	0.72
20	**13.02.2021**	96.2	57.7	13.6	25.2	0.77
21	**17.02.2021**	97.4	58.4	13.2	24.8	0.72
22	**20.02.2021**	97.2	58.3	12.9	24.6	0.74
23	**24.02.2021**	98.1	58.9	12.6	23.8	0.75
24	**27.02.2021**	96.2	57.7	13.1	23.2	0.69
Maximum		**98.1**	**58.9**	**14.2**	**27.8**	**0.77**
Minimum		**86.8**	**52.1**	**10.6**	**23.2**	**0.61**
Average		**92.1**	**55.2**	**12.8**	**25.8**	**0.71**
98th Percentile		**97.4**	**58.4**	**14.1**	**27.4**	**0.77**
NAAQ Standard		**100**	**60**	**80**	**80**	**4**
Test Method		**Gravimetric**	**Gravimetric**	**Improved West & Geake Method**	**Modified Jacob & Hochheiser Method**	**Non-Dispersive Infrared Method**

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0013 Date : 18.03.2021

SURFACE WATER QUALITY ANALYSIS REPORT-DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sampling Location : SW1- Brahmani River U/S Near Village Kankili (25^0 12'46.828"N $83^0$26'7.832"E) (2.64 KM, NW)
SW2- Brahmani River D/S Near Village Biraharpali (25^0 12'22.427"N $83^0$24'57.422"E) (3.98 KM, SW)
SW3- Gambharia Nalla (20^0 58'55.20"N $85^0$16'49.70"E) (0.15 KM, E)
SW4- Ghorhadian Nalla (200 55'43.51''N 83018'41.21''E) (6.68 KM, SE)
3.Date of Sampling : 12.01.2021
4. Date of Analysis : 13.01.2021 TO 19.01.2021
5. Sample Collected By : VCSPL Representative in presence of Client's representative

Sl. No.	Parameter	Testing Methods	Unit	Standards as per IS-2296:1992 Class –'C'	Analysis Results			
					SW-1	SW-2	SW-3	SW-4
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	**300**	<5	<5	5	5
2	pH at 25^0C	**pH Meter** APHA 23RD Ed,2017 4500H^+ B	--	**6.0-9.0**	7.3	7.33	7.2	7.2
3	Dissolved Oxygen (min)	**Modified Winkler Method** APHA 23RD Ed,2017 : 4500 O^- C	mg/l	**4.0**	7.9	7.2	6.0	6.2
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017: 2130 B	NTU	**--**	0.5	0.8	1.5	1.1
5	Chloride (max)	**Titrimetric Method** APHA 23RD Ed,2017: 4500Cl^- B	mg/l	**600**	13.0	12.0	12.0	11.5
6	Total Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017: 2540 C	mg/l	**1500**	62	62	76	67
7	Oil & Grease (max)	**Gravimetric Method (Solvent Extraction)** APHA 23RD Ed,2017:5520-B	mg/l	**--**	ND	ND	ND	ND
8	BOD (3) days at 27^0C (max)	**Oxygen Depletion Method** IS 3025(P-44) : 1993 RA 2003	mg/l	**3.0**	BDL (<1.8)	BDL (<1.8)	1.9	2.1
9	Chemical Oxygen Demand (COD)	**Open Reflux Method** APHA 23RD Ed,2017: 5220 C	mg/l	**--**	23	23	47	47
10	Arsenic as As	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.2**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
11	Lead as Pb	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.1**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
12	Cadmium as Cd (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.01**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
13	Hexa Chromium as Cr^{+6}	**Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B	mg/l	**0.05**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
14	Copper as Cu (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
15	Zinc as Zn(max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**15**	3.8	4.1	3.6	3.2
16	Selenium as Se (max)	By AAS Method APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.05**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
17	Cyanide as CN (max)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN- C,D	mg/l	**0.05**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
18	Fluoride as F (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F- C	mg/l	**1.5**	0.31	0.42	0.34	0.51
19	Sulphates (SO_4) (max)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 SO_4^{2-} E	mg/l	**400**	4.8	4.8	7.4	5.8
20	Phenolic Compounds as C_6H_5OH (max)	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.005**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)

21	Iron as Fe (max)	**By AAS Method** APHA 23RD Ed,2017: 3500Fe, B	mg/l	**0.5**	0.48	0.5	0.46	0.32
22	Nitrate as NO_3 (max)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**50**	BDL (<1.0)	BDL (<1.0)	BDL (<1.0)	1.2
23	Anionic Detergents (max)	**Anionic Surfactants as MBAS** APHA 23RD Ed,2017: 5540 C	mg/l	**1.0**	ND	ND	ND	ND
24	Total Coli form	**By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	MPN/ 100 ml	**5000**	687	833	2213	1631

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0014 Date : 18.03.2021

SURFACE WATER QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal

2. Sampling Location : SW5- Dadaraghati Main Canal (21^0 1'43.95"N $85^0$16'25.95''E)(4.59 KM,N)
SW6- Dadaraghati Reservoir (21^0 3'25.61"N $85^0$17'17.19''E)(7.92 KM, N)
SW7- Bagchera Nalla (21^0 0'15.75"N $85^0$18'47.12''E) (4.09 KM, NE)
SW8- Mundamala Jor (20^0 56'56.07"N $85^0$20'29.31''E) (7.42 KM, SE)

3.Date of Sampling : 12.01.2021

4. Date of Analysis : 13.01.2021 to 19.01.2021

5. Sample Collected By : VCSPL Representative in presence of Client's representative

Sl. No.	Parameter	Testing Methods	Unit	Standards as per IS-2296:1992 Class –'C'	Analysis Results			
					SW-5	SW-6	SW-7	SW-8
1	Colour	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	Hazen	**300**	5	5	20	5
2	pH at 25^0C	**pH Meter** APHA 23RD Ed,2017 4500H^+ B	--	**6.0-9.0**	7.1	7.15	7.0	6.75
3	Dissolved Oxygen (min)	**Modified Winkler Method** APHA 23RD Ed,2017 : 4500 O^- C	mg/l	**4.0**	4.6	4.2	6.1	5.1
4	Turbidity	**Nephelometric Method** APHA 23RD Ed,2017: 2130 B	NTU	**--**	2.5	6.0	19.0	14.0
5	Chloride (max)	**Titrimetric Method** APHA 23RD Ed,2017: 4500Cl^- B	mg/l	**600**	11	12	20	9
6	Total Dissolved Solids	**Gravimetric Method** APHA 23RD Ed,2017: 2540 C	mg/l	**1500**	67	65	191	68
7	Oil & Grease (max)	**Gravimetric Method (Solvent Extraction)** APHA 23RD Ed,2017:5520-B	mg/l	**--**	ND	ND	ND	ND
8	BOD (3) days at 27^0C (max)	**Oxygen Depletion Method** IS 3025(P-44) : 1993 RA 2003	mg/l	**3.0**	8.4	22.4	2.1	6.9
9	Chemical Oxygen Demand (COD)	**Open Reflux Method** APHA 23RD Ed,2017: 5220 C	mg/l	**--**	71	141	BDL (<4.0)	47
10	Arsenic as As	**By AAS Method** APHA 23RD Ed,2017: 3114 B	mg/l	**0.2**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
11	Lead as Pb	**By AAS Method** APHA 23RD Ed,2017 3111 B	mg/l	**0.1**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
12	Cadmium as Cd (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**0.01**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
13	Hexa Chromium as Cr^{+6}	**Diphenyl Carbazide Method** APHA 23RD Ed,2017: 3500Cr B	mg/l	**0.05**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
14	Copper as Cu (max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
15	Zinc as Zn(max)	**By AAS Method** APHA 23RD Ed,2017: 3111 B	mg/l	**15**	4.2	4.8	5.1	4.8
16	Selenium as Se (max)	By AAS Method APHA 23RD Ed,2017: 3500 Se C	mg/l	**0.05**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
17	Cyanide as CN (max)	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	mg/l	**0.05**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
18	Fluoride as F (max)	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F- C	mg/l	**1.5**	0.42	0.61	0.52	0.42
19	Sulphates (SO_4) (max)	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 SO_4^{2-} E	mg/l	**400**	4.8	5.5	14.5	6.1
20	Phenolic Compounds as C_6H_5OH (max)	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	mg/l	**0.005**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)

21	Iron as Fe (max)	**By AAS Method** APHA 23RD Ed,2017: 3500Fe, B	mg/l	**0.5**	0.48	0.17	0.45	0.16
22	Nitrate as NO_3 (max)	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	mg/l	**50**	1.2	1.3	1.4	1.6
23	Total Coli form	**By Multiple Tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	MPN/ 100 ml	**5000**	1284	1364	1100	680

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0015 Date : 18.03.2021

GROUND WATER QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal

2. Sampling Location : GW1- Project Site (20°59'3.87" N 85°16'26.33"E)
GW2 - Kulei (20°59'23.36"N 85°16'48.06"E) (0.85 KM, NE)
GW3 – Gengutia (20°59'59.24"N 85°15'56.88"E)(1.85 KM, NW)
GW4 – Raghunathpur (21°0'48.59"N 85°16'48.21"E)(3.28 KM,N)

3.Date of Sampling : 12.01.2021

4. Date of Analysis : 13.01.2021 TO 19.01.2021

5. Sample Collected By : VCSPL Representative in presence of Client's representative

Sl. No.	Parameter	Unit	Testing Methods	Standard as per IS:10500:2012 Amended on 2015 & 2018		Analysis Results			
				Acceptable Limit	Permissible Limit	GW-1	GW-2	GW-3	GW-4
Essential Characteristics									
1.	Colour	Hazen	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	**5**	**15**	CL	CL	CL	CL
2.	Odour	--	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	--	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	**1**	**5**	<1	<1	1.1	40.0
5.	pH	--	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	**6.5-8.5**	**No Relaxation**	7.3	7.5	6.0	6.9
6.	Total Hardness (as $CaCO_3$)	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	**200**	**600**	349.0	507.0	216.0	106.0
7.	Iron (as Fe)	mg/l	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	**1.0**	**No Relaxation**	<0.1	0.32	0.18	2.2
8.	Chloride (as Cl)	mg/l	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl^- B	**250**	**1000**	94.0	112.0	98.0	23.0
9.	Residual Free Chlorine	mg/l	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	**0.2**	**1**	ND	ND	ND	ND
Desirable Characteristics									
10	Total Dissolved Solids as TDS	mg/l	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	**500**	**2000**	542.0	786.0	376.0	207.0
11	Calcium as Ca	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	**75**	**200**	65.0	98.0	65.0	39.0
12	Magnesium as Mg	mg/l	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	**30**	**100**	45.0	64.0	13.0	2.0
13	Copper as Cu	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**0.05**	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
14	Manganese as Mn	mg/l	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	**0.1**	**0.3**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
15	Sulphate as SO_4	mg/l	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	**200**	**400**	1.8	22.4	26.9	9.4
16	Nitrate as NO_3	mg/l	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	**45**	**No Relaxation**	7.0	2.6	39.0	7.1
17	Fluoride as F	mg/l	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	**1.0**	**1.5**	1.1	1.0	0.51	0.82
18	Phenolic Compounds as C_6H_5OH	mg/l	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	**0.001**	**0.002**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
19	Mercury as Hg	mg/l	**AAS Method** APHA 23RD Ed,2017: 3112 B	**0.001**	**No Relaxation**	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)
20	Cadmium as Cd	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 B	**0.003**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
21	Selenium as Se	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	**0.01**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
22	Arsenic as As	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3114 B	**0.01**	**No Relaxation**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
23	Cyanide as CN	mg/l	**Distillation followed by Spectophotometric Method** APHA 23RD Ed,2017: 4500 CN^- C,D	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
24	Lead as Pb	mg/l	**By AAS Method**	**0.01**	**No**	BDL	BDL	BDL	BDL

			APHA 23RD Ed,2017 3111 B		**Relaxation**	(<0.01)	(<0.01)	(<0.01)	(<0.01)
25	Zinc as Zn	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**5**	**15**	0.58	0.62	0.66	0.61
26	Total Chromium as Cr	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
27	Alkalinity	mg/l	**Titration Method** APHA 23RD Ed,2017:2320 B	**200**	**600**	31.0	587.0	122.0	122.0
28	Aluminium as Al	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 D	**0.03**	**0.2**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
29	Boron	mg/l	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	**2.4**	**No Relaxation**	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
30	Total Coliform as TC	MPN/ 100ML	**By Multiple tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	**Shall not be detectable in any 100 ml sample**	**---**	<1.1	<1.1	<1.1	<1.1

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0016 Date : 18.03.2021

GROUND WATER QUALITY ANALYSIS REPORT DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sampling Location : GW5- Talaburisahi (20°58'40.11"N 85°18'22.91"E) (3.45 KM, ESE)
GW6- Purunapani (21°1'10.64"N 85°16'33.41"E) (3.84 KM, N)
GW7- Pitiri (20°56'35.81"N 85°16'49.66"E)(4.62 KM, S)
GW8-Ramchandrapur (20°59'18.78"N 85°13'37.76"E)(4.9 KM,W)
3.Date of Sampling : 12.01.2021
4. Date of Analysis : 13.01.2021 to 19.01.2021
5. Sample Collected By : VCSPL Representative in presence of Client's representative

Sl. No.	Parameter	Unit	Testing Methods	Standard as per IS:10500:2012 Amended on 2015 & 2018		Analysis Results			
				Acceptable Limit	Permissible Limit	GW-5	GW-6	GW-7	GW-8
Essential Characteristics									
1.	Colour	Hazen	**Visual Comparison Method** APHA 23RD Ed,2017 : 2120 B, C	**5**	**15**	5	45	<5	25
2.	Odour	--	**Threshold Odour Test** APHA 23RD Ed,2017 :2150 B	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
3.	Taste	--	**Flavor Threshold Test** APHA 23RD Ed,2017 : 2160 C	**Agreeable**	**Agreeable**	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity	NTU	**Nephelometric Method** APHA 23RD Ed,2017 :2130 B	**1**	**5**	4.5	46.5	0.4	26.0
5.	pH	--	**pH Meter** APHA 23RD Ed,2017 : 4500H^+ B	**6.5-8.5**	**No Relaxation**	6.6	7.2	5.51	7.31
6.	Total Hardness (as $CaCO_3$)	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 2340 C	**200**	**600**	189.0	293.0	85.0	293.0
7.	Iron (as Fe)	mg/l	**By AAS Method** APHA 23RD Ed,2017 : 3111, B	**1.0**	**No Relaxation**	0.5	1.5	<0.1	6.1
8.	Chloride (as Cl)	mg/l	**Argentometric Method** APHA 23RD Ed,2017 : 4500Cl^- B	**250**	**1000**	105	20	50	21
9.	Residual Free Chlorine	mg/l	**Iodometric Method** APHA 23RD Ed,2017 : 4500Cl, B	**0.2**	**1**	ND	ND	ND	ND
Desirable Characteristics									
11.	Total Dissolved Solids as TDS	mg/l	**Gravimetric Method** APHA 23RD Ed,2017 : 2540 C	**500**	**2000**	388.0	452.0	186.0	448.0
12.	Calcium as Ca	mg/l	**EDTA Titrimetric Method** APHA 23RD Ed,2017 : 3500Ca B	**75**	**200**	67.0	55.0	30.0	62.0
13.	Magnesium as Mg	mg/l	**Calculation Method** APHA 23RD Ed,2017 : 3500Mg B	**30**	**100**	5.6	38.0	2.5	34.0
14.	Copper as Cu	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**0.05**	**1.5**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
15.	Manganese as Mn	mg/l	**Persulfate Method** APHA 23RD Ed,2017: 3500Mn B	**0.1**	**0.3**	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
16.	Sulphate as SO_4	mg/l	**Turbidimetric Method** APHA 23RD Ed,2017: 4500 $SO4^{2-}$ E	**200**	**400**	7.2	7.2	<1.0	6.3
17.	Nitrate as NO_3	mg/l	**By UV-Screen Method** APHA 23RD Ed,2017: 4500 NO_3^- E	**45**	**No Relaxation**	4.8	<1.0	39.8	<1.0
18.	Fluoride as F	mg/l	**Distillation followed by Spectrophotometric Method** APHA 23RD Ed,2017: 4500F^- C	**1.0**	**1.5**	0.52	0.61	0.44	0.62
19.	Phenolic Compounds as C_6H_5OH	mg/l	**Chloroform extraction by Colorimetric Method** APHA 23RD Ed,2017: 5530 B,D	**0.001**	**0.002**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
20.	Mercury as Hg	mg/l	**AAS Method** APHA 23RD Ed,2017: 3112 B	**0.001**	**No Relaxation**	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)	BDL (<0.002)
21.	Cadmium as Cd	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 B	**0.003**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
22.	Selenium as Se	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3500 Se C	**0.01**	**No Relaxation**	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
23.	Arsenic as As	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3114 B	**0.01**	**No Relaxation**	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)	BDL (<0.004)
24.	Cyanide as CN	mg/l	**Distillation followed by Spectophotometric Method**	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)

			APHA 23RD Ed,2017: 4500 CN^- C,D						
25.	Lead as Pb	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.01**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
26.	Zinc as Zn	mg/l	**By AAS Method** APHA 23RD Ed,2017: 3111 B	**5**	**15**	0.68	0.64	0.62	0.58
27.	Total Chromium as Cr	mg/l	**By AAS Method** APHA 23RD Ed,2017 3111 B	**0.05**	**No Relaxation**	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
29.	Alkalinity	mg/l	**Titration Method** APHA 23RD Ed,2017:2320 B	**200**	**600**	145	381	10	388
30.	Aluminium as Al	mg/l	**AAS Method** APHA 23RD Ed,2017: 3111 D	**0.03**	**0.2**	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
31.	Boron	mg/l	**Curcumin Method** APHA 23RD Ed,2017: 4500B, B	**2.4**	**No Relaxation**	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
32.	Total Coliform as TC	MPN/ 100ML	**By Multiple tube Fermentation Technique** APHA 23RD Ed,2017: 9221 B	**Shall not be detectable in any 100 ml sample**	**--**	<1.1	<1.1	<1.1	<1.1

For Visiontek Consultancy Services Pvt.Ltd

Ref : Envlab/21/R-0017 Date : 18.03.2021

SOIL QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sampling Location : S1- Project Site (20°59'3.87"N 85°16'26.33"E)
S2 – Jharanabahali (21°0'25.03"N 85°17'40.45"E) (3.3 KM, NE)
S3 – Gunthbahal (20°59'10.92"N 85°16'24.414"E) (4.09 KM, W)
S4 – Bherubania (20°59'57.308"N 85°16'24.414"E) (1.65 KM, N)
3.Date of Sampling : 12.01.2021
4. Date of Analysis : 13.01.2021 to 19.01.2021
5. Sample Collected By : VCSPL Representative in presence of Client's representative

Sl No.	Parameters	Method	Unit	Analysis Results			
				S-1	S-2	S-3	S-4
1	Colour	Visual		Light Gray	Light Gray	Light Gray	Light Brown
2	Type of soil	--	--	Acidic	Acidic	Acidic	Acidic
3	pH	IS 2720 Part 26 RA2016	--	6.89	7.21	7.24	7.26
4	Soil Texture	Method of Analysis of Soil by HLS.Tandon	--	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
5	Bulk Density	USDA :1954 RA 2010 Pg : 121	gm/cc	1.26	1.34	1.24	1.31
6	Porosity	Method of Analysis of Soil by HLS.Tandon	--	20.0	24.0	18.0	21.0
7	Moisture Content	IS 2720 Part 2 RA2015	%	6.8	6.4	6.2	6.8
8	Silica as SiO2	Method of Analysis of Soil by HLS.Tandon	%	24.6	38.8	35.2	37.2
9	Chloride as Cl^-	USDA :1954 RA 2010 Pg : 133	%	0.26	0.22	0.26	0.22
10	Sulphate as So^{4-}	IS 2720 (P-27)1977 RA2015	%	0.28	0.24	0.28	0.25
11	Potassium as K	EPA 3050B,7000B Rev 02,1996	%	0.026	0.028	0.026	0.036
12	Magnesium as Mg		%	0.34	0.37	0.40	0.42
13	Calcium as Ca		%	0.36	0.44	0.41	0.44
14	Iron as Fe		%	0.29	0.36	0.28	0.31
15	Nickel as Ni		%	BDL	BDL	BDL	BDL
16	Lead as Pb		%	BDL	BDL	BDL	BDL
17	Cadmium as Cd		%	BDL	BDL	BDL	BDL
18	Chromium as Cr		%	BDL	BDL	BDL	BDL
19	Mercury as Hg		%	BDL	BDL	BDL	BDL
20	Zinc as Zn		%	0.016	0.021	0.014	0.016
21	Available Organic Carbon	Method of Analysis of Soil by HLS.Tandon	%	1.16	1.28	1.38	1.32
22	Available Nitrogen as N		%	0.28	0.29	0.22	0.26
23	Phosphorus as P		%	0.021	0.024	0.028	0.025

Note : *BDL Values: Ni<0.01%, Pb<0.005%, Cd<0.005%, Cr<0.025%, Hg<0.001%.*

***For* Visiontek Consultancy Services Pvt.Ltd**

SOIL QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sampling Location : S5- Gaurhasahi (20°58'31.244"N 85°14'28.101"E) (3.50 KM, WSW)
S6- Kalada (20°58'24.55"N 85°19'53.66"E) (5.94 KM, ESE)
3.Date of Sampling : 12.01.2021
4. Date of Analysis : 13.01.2021 TO 19.01.2021
5. Sample Collected By : VCSPL Representative in presence of Client's representative

Sl No.	Parameters	Method	Unit	Analysis Results	
				S-5	S-6
1	Colour	Visual		Light Brown	Light Brown
2	Type of soil	--	--	Acidic	Acidic
3	pH	IS 2720 Part 26 RA2016	--	6.88	7.14
4	Soil Texture	Fundamental of Soil Science by Henry D.foth	--	Sandy Loam	Sandy Loam
5	Bulk Density	USDA :1954 RA 2010 Pg : 121	gm/cc	1.26	1.28
6	Porosity	Funtamental of Soil Science by Henry D.foth	--	22	26
7	Moisture Content	IS 2720 Part 2 RA2015	%	6.8	6.4
8	Silica as SiO_2	Soil chemical analysis by Y.K.soon &W.H.Hender Shot	%	41.6	38.2
9	Chloride as Cl^-	USDA :1954 RA 2010 Pg : 133	%	0.29	0.24
10	Sulphate as So^{4-}	IS 2720 (P-27)1977 RA2015	%	0.26	0.28
11	Potassium as K	EPA 3050B,7000B Rev 02,1996	%	0.031	0.026
12	Magnesium as Mg		%	0.32	0.34
13	Calcium as Ca		%	0.44	0.46
14	Iron as Fe		%	0.32	0.31
15	Nickel as Ni		%	BDL	BDL
16	Lead as Pb		%	BDL	BDL
17	Cadmium as Cd		%	BDL	BDL
18	Chromium as Cr		%	BDL	BDL
19	Mercury as Hg		%	BDL	BDL
20	Zinc as Zn		%	0.015	0.018
21	Available Organic Carbon	Method of analysis of Soil,plant,water, Fertilizer, organic manure by HLS.Tandon	%	1.29	1.34
22	Available Nitrogen as N		%	0.26	0.28
23	Phosphorus as P		%	0.026	0.028

Note : *BDL Values: Ni<0.01%, Pb<0.005%, Cd<0.005%, Cr<0.025%, Hg<0.001%.*

***For* Visiontek Consultancy Services Pvt.Ltd**

Ref : Envlab/21/R-0019 Date : 18.03.2021

NOISE QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sample Collected By : VCSPL Representative in presence of Client's representative

Day Time Noise monitoring results (Noise Level in dB (A) Leq December-2020

TIME (6.00AM to 10.00PM)	N-1:Project Site	N-2: Near to the NH-23	N-3: Near to Kulei-Pitiri Road	N-4: At Village Kulei	N-5:Near to the Hanuman Temple at Village Kankili	N-6-Paramhansapur	N-7: Kualo	N-8: Rangathali	N9: Lingaraj Opencast Project	N10: Village Kankanasorha
	07.12.2020	07.12.2020	14.12.2020	14.12.2020	21.12.2020	21.12.2020	28.12.2020	28.12.2020	30.12.2020	30.12.2020
6:00 AM	70.2	58.8	57.4	45.2	49.6	55.2	56.8	38.8	68.8	56.8
7:00 AM	70.6	58.2	58.2	46.2	49.2	59.6	57.4	39.2	69.2	56.6
8: 00 AM	71.4	59.6	58.6	46.8	48.8	60.2	59.6	39.6	69.6	58.4
9: 00 AM	71.6	59.4	59.4	47.4	48.6	60.8	59.8	40.8	69.4	58.8
10: 00 AM	71.8	58.6	59.2	47.8	50.2	61.2	60.8	41.2	69.2	59.2
11: 00 AM	72.2	60.2	60.2	48.8	50.8	61.4	61.2	41.4	70.2	59.6
12.00Noon	72.6	60.4	60.4	48.8	51.2	62.2	61.4	42.2	70.6	60.6
1:00 PM	72.8	60.8	60.8	49.2	51.4	62.6	62.2	42.6	70.8	60.8
2: 00 PM	73.1	61.2	61.8	49.6	51.6	63.2	62.6	42.8	70.6	60.4
3: 00 PM	73.4	61.6	61.4	50.2	51.8	63.6	62.8	42.8	70.4	60.2
4: 00 PM	73.6	61.8	62.2	50.8	52.2	64.1	62.2	42.8	70.8	61.8
5: 00 PM	74.1	62.2	63.1	51.2	52.4	64.2	61.4	43.1	71.6	62.2
6: 00 PM	74.2	62.2	62.6	51.6	52.6	63.8	60.6	44.1	71.2	62.8
7: 00 PM	73.8	61.4	61.4	52.8	52.8	63.2	60.2	44.6	70.8	63.2
8: 00 PM	72.6	61.2	60.8	53.2	50.6	61.6	59.6	45.2	72.2	63.6
9: 00 PM	71.4	60.8	60.2	53.4	50.2	60.6	59.2	45.6	72.6	62.6
10:00PM	70.8	56.4	60.1	52.6	49.4	58.2	58.8	46.1	70.8	62.6
Avg.	**72.4**	**60.3**	**60.5**	**49.7**	**50.8**	**61.5**	**60.4**	**42.5**	**70.5**	**60.6**
Standard as per CPCB	75	65	65	55	55	65	65	50	75	65

Night Time Noise monitoring results (Noise Level in dB (A) Leq December-2020

TIME (6.00AM to 10.00PM)	N-1:Project Site	N-2: Near to the NH-23	N-3: Near to Kulei-Pitiri Road	N-4: At Village Kulei	N-5:Near to the Hanuman Temple at Village Kankili	N-6-Paramhansapur	N-7: Kualo	N-8: Rangathali	N9: Lingaraj Opencast Project	N10: Village Kankanasorha
	07.12.2020	07.12.2020	14.12.2020	14.12.2020	21.12.2020	21.12.2020	28.12.2020	28.12.2020	30.12.2020	30.12.2020
11: 00 PM	68.8	54.8	54.6	44.8	44.6	54.4	53.8	38.9	69.6	54.6
12. 00 Mid Night	66.8	54.2	54.2	44.2	44.2	54.8	52.2	38.4	68.8	54.2
1: 00 AM	66.2	53.6	53.8	43.8	43.8	54.2	50.6	36.2	65.6	53.8
2: 00 AM	65.8	52.8	52.6	42.6	42.6	54.6	49.6	35.8	64.8	53.2
3: 00 AM	66.2	51.6	51.4	41.4	42.8	53.8	49.2	36.8	63.6	52.6
4: 00 AM	68.8	52.8	53.6	42.8	43.4	54.1	52.8	37.4	64.8	51.8
5: 00 AM	69.1	54.2	54.2	43.2	44.2	54.8	53.6	37.9	64.9	53.4
Avg.	**67.4**	**53.4**	**53.5**	**43.3**	**43.7**	**54.4**	**51.7**	**37.3**	**66.0**	**53.4**
Standard as per CPCB	70	55	55	45	45	55	55	40	70	55

***For* Visiontek Consultancy Services Pvt.Ltd**

Ref : Envlab/21/R-0020 Date : 18.03.2021

NOISE QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal

2. Sample Collected By : VCSPL Representative in presence of Client's representative

Day Time Noise monitoring results (Noise Level in dB (A) Leq January-2021

TIME (6.00AM to 10.00PM)	N-1:Project Site	N-2: Near to the NH-23	N-3: Near to Kulei-Pitiri Road	N-4: At Village Kulei	N-5:Near to the Hanuman Temple at Village Kankili	N-6-Paramhansapur	N-7: Kualo	N-8: Rangathali	N9: Lingaraj Opencast Project	N10: Village Kankanasorha
	04.01.2021	04.01.2021	11.01.2021	11.01.2021	18.01.2021	18.01.2021	25.01.202	25.01.2021	28.01.2021	28.01.2021
6:00 AM	70.8	59.4	59.6	47.7	50.2	56.8	60.8	39.6	70.2	59.6
7:00 AM	71.1	59.6	59.8	48.6	50.6	57.4	60.9	40.2	70.4	59.6
8: 00 AM	71.2	60.2	60.6	48.8	51.4	57.8	60.6	40.6	70.6	59.8
9: 00 AM	71.6	60.8	60.8	49.4	51.6	58.8	60.2	40.8	70.8	60.2
10: 00 AM	71.6	60.6	61.2	49.6	52.2	59.4	61.6	41.2	71.2	60.6
11: 00 AM	72.1	60.4	61.4	50.6	52.8	59.2	61.8	41.6	71.4	60.8
12.00Noon	72.4	61.2	62.2	50.8	53.6	60.2	61.9	41.8	71.6	60.6
1:00 PM	72.5	61.6	62.8	51.2	53.8	60.8	62.2	42.2	72.2	61.4
2: 00 PM	72.6	62.8	62.6	51.4	54.1	61.6	62.4	42.6	72.6	61.8
3: 00 PM	73.1	62.6	63.4	51.6	54.4	61.8	62.6	43.8	72.8	62.2
4: 00 PM	73.2	63.4	63.6	52.2	54.6	62.2	63.8	43.6	73.1	62.6
5: 00 PM	73.4	63.8	64.4	52.4	53.8	62.8	63.6	42.8	73.4	63.4
6: 00 PM	73.6	63.6	64.6	52.6	53.5	63.4	61.8	42.6	72.2	63.8
7: 00 PM	72.2	62.6	63.2	51.4	53.2	63.6	61.2	41.4	72.6	62.6
8: 00 PM	70.8	62.8	60.6	51.2	52.2	62.6	60.2	40.8	70.8	62.8
9: 00 PM	70.6	61.6	60.1	52.6	51.6	62.8	59.6	40.6	70.2	64.2
10:00PM	70.2	60.8	56.8	52.8	50.8	60.8	59.4	40.2	69.8	62
Avg.	**71.9**	**61.6**	**61.6**	**50.9**	**52.6**	**60.7**	**61.4**	**41.6**	**71.5**	**61.6**
Standard as per CPCB	**75**	**65**	**65**	**55**	**55**	**65**	**65**	**50**	**75**	**65**

Night Time Noise monitoring results (Noise Level in dB (A) Leq January-2021

TIME (6.00AM to 10.00PM)	N-1:Project Site	N-2: Near to the NH-23	N-3: Near to Kulei-Pitiri Road	N-4: At Village Kulei	N-5:Near to the Hanuman Temple at Village Kankili	N-6-Paramhansapur	N-7: Kualo	N-8: Rangathali	N9: Lingaraj Opencast Project	N10: Village Kankanasorha
	04.01.2021	04.01.2021	11.01.2021	11.01.2021	18.01.2021	18.01.2021	25.01.2(	25.01.2021	28.01.2021	28.01.2021
11: 00 PM	69.4	54.9	54.1	43.6	44.2	53.8	53.6	39.6	69.2	56.8
12. 00 Mid Night	69.2	54.6	53.6	43.2	43.6	53.6	53.2	38.8	68.8	55.4
1: 00 AM	68.4	53.8	53.2	42.6	43.4	52.2	52.6	37.4	66.8	54.6
2: 00 AM	68.1	53.2	52.8	42.2	42.8	52.8	52.4	36.8	64.6	53.8
3: 00 AM	67.8	52.2	52.6	41.8	42.6	51.6	51.6	35.2	63.8	53.2
4: 00 AM	68.6	52.4	53.6	41.2	43.8	50.8	52.6	38.2	66.8	54.8
5: 00 AM	64.4	54.8	54.2	44.2	44.2	54.2	54.2	39.4	69.2	55.2
Avg.	**68.0**	**53.7**	**53.4**	**42.7**	**43.5**	**52.7**	**52.9**	**37.9**	**67.0**	**54.8**
Standard as per CPCB	**70**	**55**	**55**	**45**	**45**	**55**	**55**	**40**	**70**	**55**

***For* Visiontek Consultancy Services Pvt.Ltd**

Ref : Envlab/21/R-0021 Date : 18.03.2021

NOISE QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sample Collected By : VCSPL Representative in presence of Client's representative

Day Time Noise monitoring results (Noise Level in dB (A) Leq February-2021

TIME (6.00AM to 10.00PM)	N-1:Project Site	N-2: Near to the NH-23	N-3: Near to Kulei-Pitiri Road	N-4: At Village Kulei	N-5:Near to the Hanuman Temple at Village Kankili	N-6-Paramhansapur	N-7: Kualo	N-8: Rangathali	N9: Lingaraj Opencast Project	N10: Village Kankanasorha
	02.02.2021	02.02.2021	09.02.2021	09.02.2021	16.02.2021	16.02.2021	23.02.2021	23.02.2021	25.02.2021	25.02.2021
6:00 AM	71.4	60.2	60.8	48.9	51.2	58.4	61.6	40.8	70.8	60.8
7:00 AM	71.6	60.6	61.4	49.4	51.4	58.9	61.8	40.9	70.9	60.9
8: 00 AM	72.1	60.8	61.6	49.6	51.6	59.2	62.2	41.2	71.2	61.2
9: 00 AM	72.2	61.4	62.2	50.2	52.2	60.2	62.6	41.2	71.6	61.5
10: 00 AM	72.4	61.6	62.6	50.6	52.4	60.8	63.1	42.6	72.6	62.8
11: 00 AM	72.6	62.8	62.8	51.4	52.6	61.6	63.4	42.8	72.8	62.6
12.00Noon	73.2	63.4	63.4	51.6	53.2	61.8	63.6	43.2	73.2	63.2
1:00 PM	73.4	63.6	63.6	52.2	53.4	62.2	63.8	43.8	73.6	63.8
2: 00 PM	73.6	64.2	63.6	52.6	53.8	62.2	62.6	44.2	74.2	64.2
3: 00 PM	74.1	64.8	63.8	51.6	52.2	62.6	62.9	44.6	74.6	64.2
4: 00 PM	74.4	64.1	62.6	51.2	52.6	62.8	62.6	45.8	73.2	63.8
5: 00 PM	74.4	62.6	62.8	50.6	51.6	63.4	61.9	45.6	73.1	63.2
6: 00 PM	72.6	60.8	61.9	50.2	51.4	63.6	61.6	45.2	72.6	63.1
7: 00 PM	72.2	60.2	61.4	49.8	50.8	64.2	60.8	44.8	72	60.2
8: 00 PM	70.6	59.6	60.8	49.2	50.6	64.8	60.2	44.2	71.6	61.8
9: 00 PM	70.4	59.2	60.6	48.8	50.2	62.6	61.2	43.2	71.2	62.2
10.00 PM	70.2	58.8	60.2	48.2	51.8	60.6	61.8	42.2	70.8	62.6
Avg.	**72.4**	**61.7**	**62.1**	**50.4**	**51.9**	**61.8**	**62.2**	**43.3**	**72.4**	**62.5**
Standard as per CPCB	**75**	**65**	**65**	**55**	**55**	**65**	**65**	**50**	**75**	**65**

Night Time Noise monitoring results (Noise Level in dB (A) Leq February-2021

TIME (6.00AM to 10.00PM)	N-1:Project Site	N-2: Near to the NH-23	N-3: Near to Kulei-Pitiri Road	N-4: At Village Kulei	N-5:Near to the Hanuman Temple at Village Kankili	N-6-Paramhansapur	N-7: Kualo	N-8: Rangathali	N9: Lingaraj Opencast Project	N10: Village Kankanasorha
	02.02.2021	02.02.2021	09.02.2021	09.02.2021	16.02.2021	16.02.2021	23.02.2021	23.02.2021	25.02.2021	25.02.2021
11: 00 PM	69.4	54.6	54.8	46.8	44.6	52.8	54.6	39.4	68.8	59.6
12. 00 Mid Night	69.2	53.8	54.6	46.4	44.2	52.6	54.2	39.2	68.2	58.8
1: 00 AM	68.4	53.6	54.2	45.8	43.8	50.6	53.8	38.1	66.9	58.2
2: 00 AM	68.1	53.1	53.6	45.2	43.2	50.4	53.2	37.4	66.4	57.4
3: 00 AM	67.8	52.8	53.2	44.6	42.2	52.6	52.6	37.2	65.2	56.8
4: 00 AM	68.6	52.6	52.8	43.8	42.8	52.8	51.8	38.4	64.8	55.25
5: 00 AM	64.4	54.6	53.4	44.6	43.4	53.2	53.9	38.6	69.2	58.4
Avg.	**68.0**	**53.6**	**53.8**	**45.3**	**43.5**	**52.1**	**53.4**	**38.3**	**67.1**	**57.8**
Standard as per CPCB	**70**	**55**	**55**	**45**	**45**	**55**	**55**	**40**	**70**	**55**

***For* Visiontek Consultancy Services Pvt.Ltd**

Ref : Envlab/21/R-0022 Date : 18.03.2021

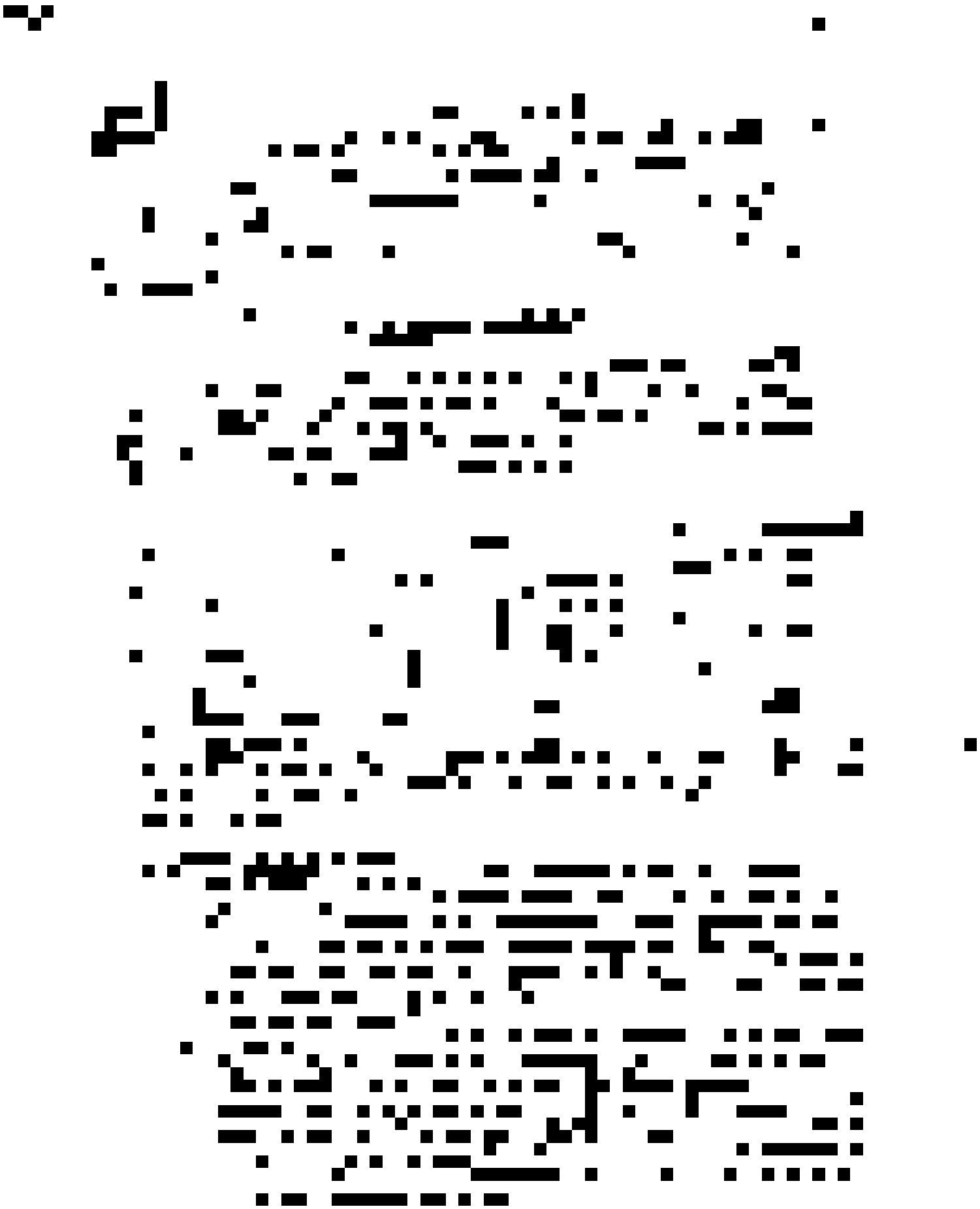
NOISE QUALITY ANALYSIS REPORT- DECEMBER 2020 TO FEBRUARY 2021

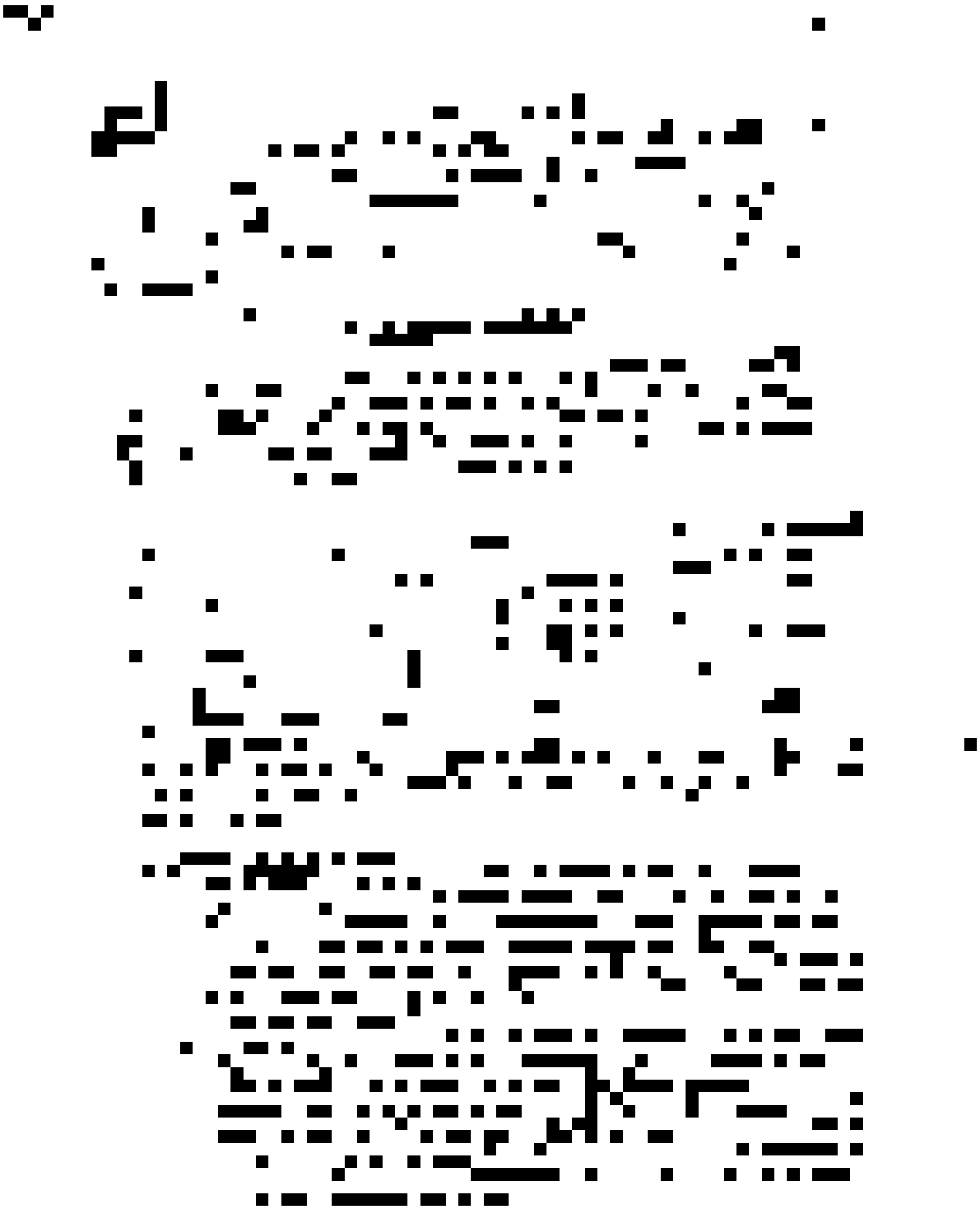
1. Name of the Project : M/s GM Iron & Steel Co.Ltd, Block-Parajang, Dhenkanal
2. Sample Collected By : VCSPL Representative in presence of Client's representative

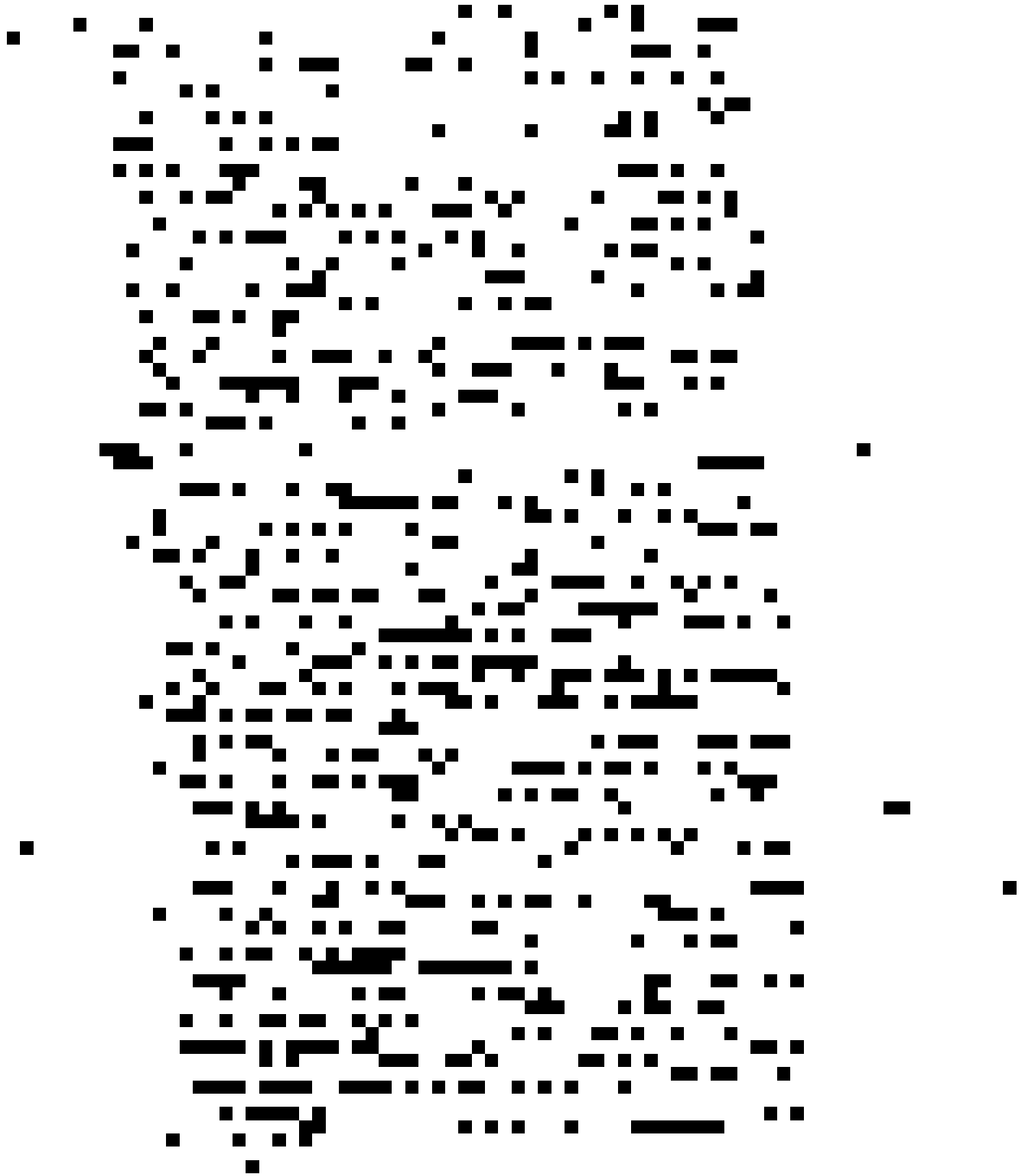
Location	Distance from Plant Site (Km) & Direction	Co-ordinate	December-20		January-21		February-21		Type of Area
			Day Time	Night Time	Day Time	Night Time	Day Time	Night Time	
			dB (A)	dB (A)	dB (A)	dB (A)	dB (A)	dB (A)	
N1-Project Site	--	20°58'53.60"N 85°16'48.35"E	72.4	67.4	71.9	68.0	72.4	68.0	Industrial
N2-Near to the NH 23	0.41 KM, SSE	20°58'38.51"N 85°16'44.36"E	60.3	53.4	61.6	53.7	61.7	53.6	Commercial
N3-Near to Kulei –Pitiri Road	0.40 KM, NE	20°59'15.17"N 85°16'57.19"E	60.5	53.5	61.6	53.4	62.1	53.8	Commercial
N4-At Village Kulei	0.58 KM, NW	20°59'27.90"N 85°16'14.51"E	49.7	43.3	50.9	42.7	50.4	45.3	Residential
N5-Near to the Hanuman Temple at village Kankili	0.53 KM, WNW	20°59'16.85"N 85°15'52.71"E	50.8	43.7	52.6	43.5	51.9	43.5	Residential
N6-Paramhanspur	2.43 KM, SSE	20°57'36.51"N 85°17'11.16"E	61.5	54.4	60.7	52.7	61.8	52.1	Commercial
N7-Kualo	3.84 KM, SSE	20°57'5.18"N 85°17'55.14"E	60.4	51.7	61.4	52.9	62.2	53.4	Commercial
N8-Rangathali	7.88 KM, NNE	21°3' 23.69"N 85°17'15.55"E	42.5	37.3	41.6	37.9	43.3	38.3	Silence
N9-Lingaraj Opencast Project	6.08 KM, WSW	20°57' 47.64"N 85°12'59.09"E	70.5	66.0	71.5	67.0	72.4	67.1	Industrial
N10-Village Kankanasorha	6.66 KM, EES	20°57' 48.69"N 85°20'30.06"E	60.6	53.4	61.6	54.8	62.5	57.8	Commercial

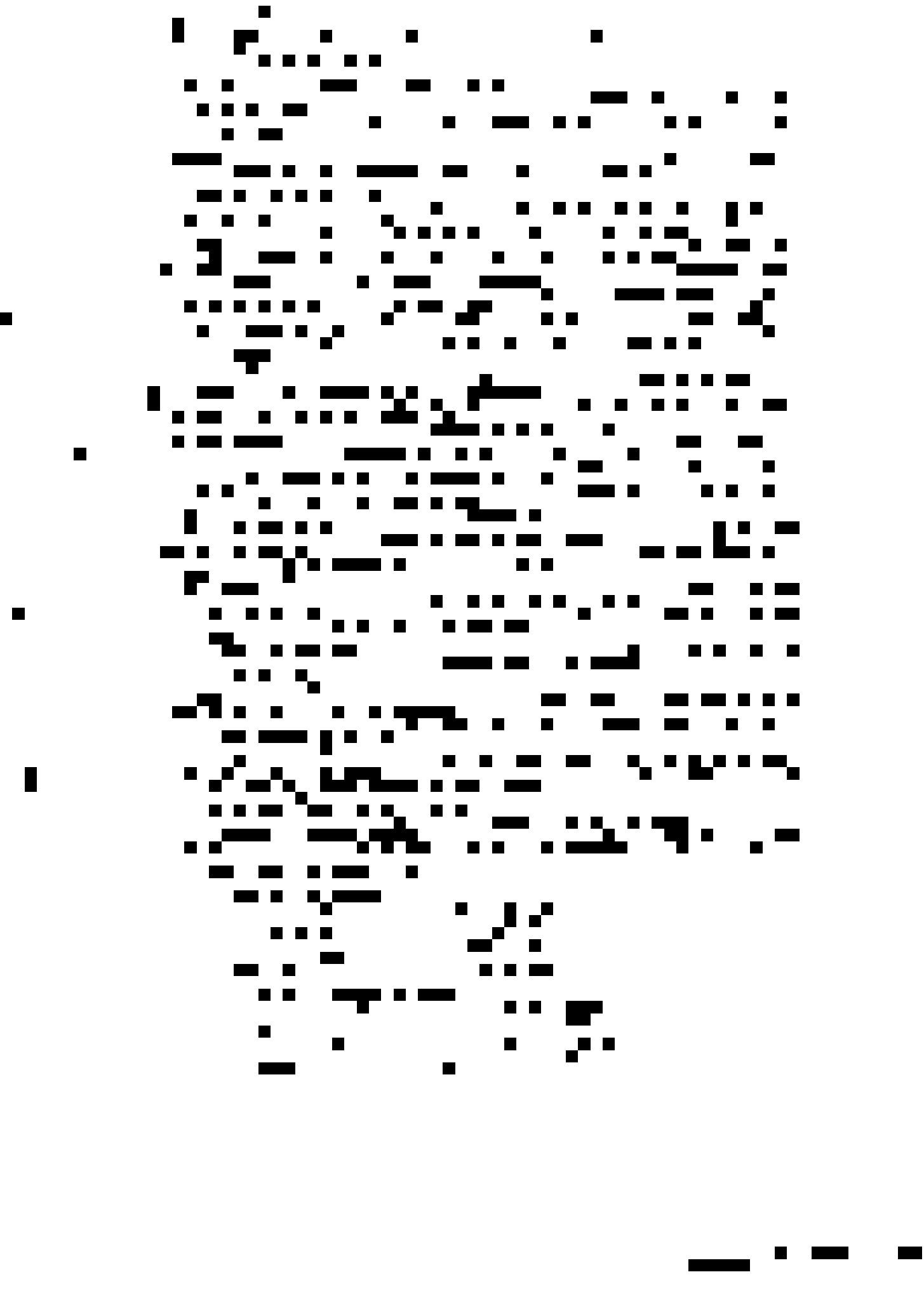
***For* Visiontek Consultancy Services Pvt.Ltd**

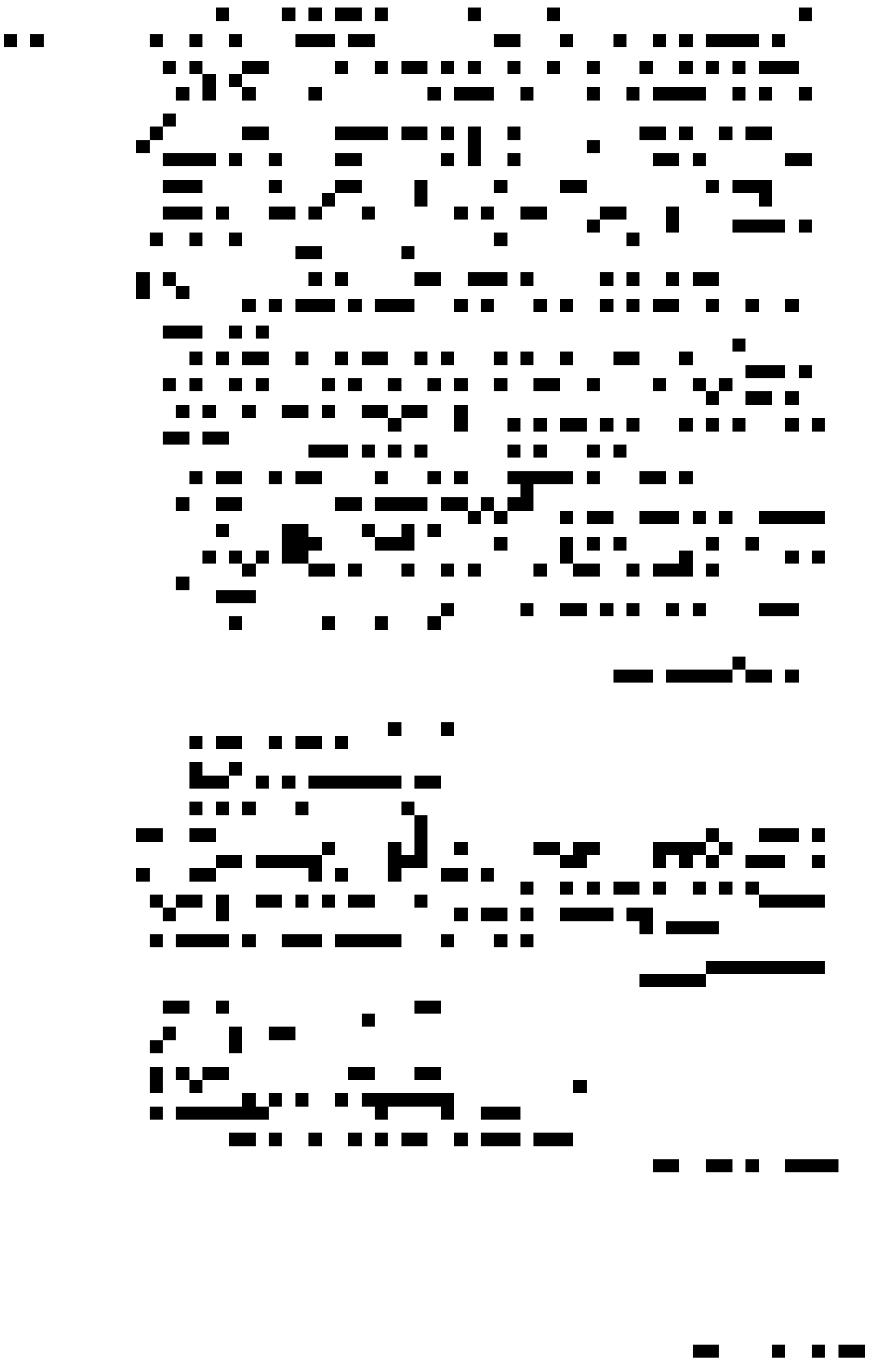
ANNEXURE VII

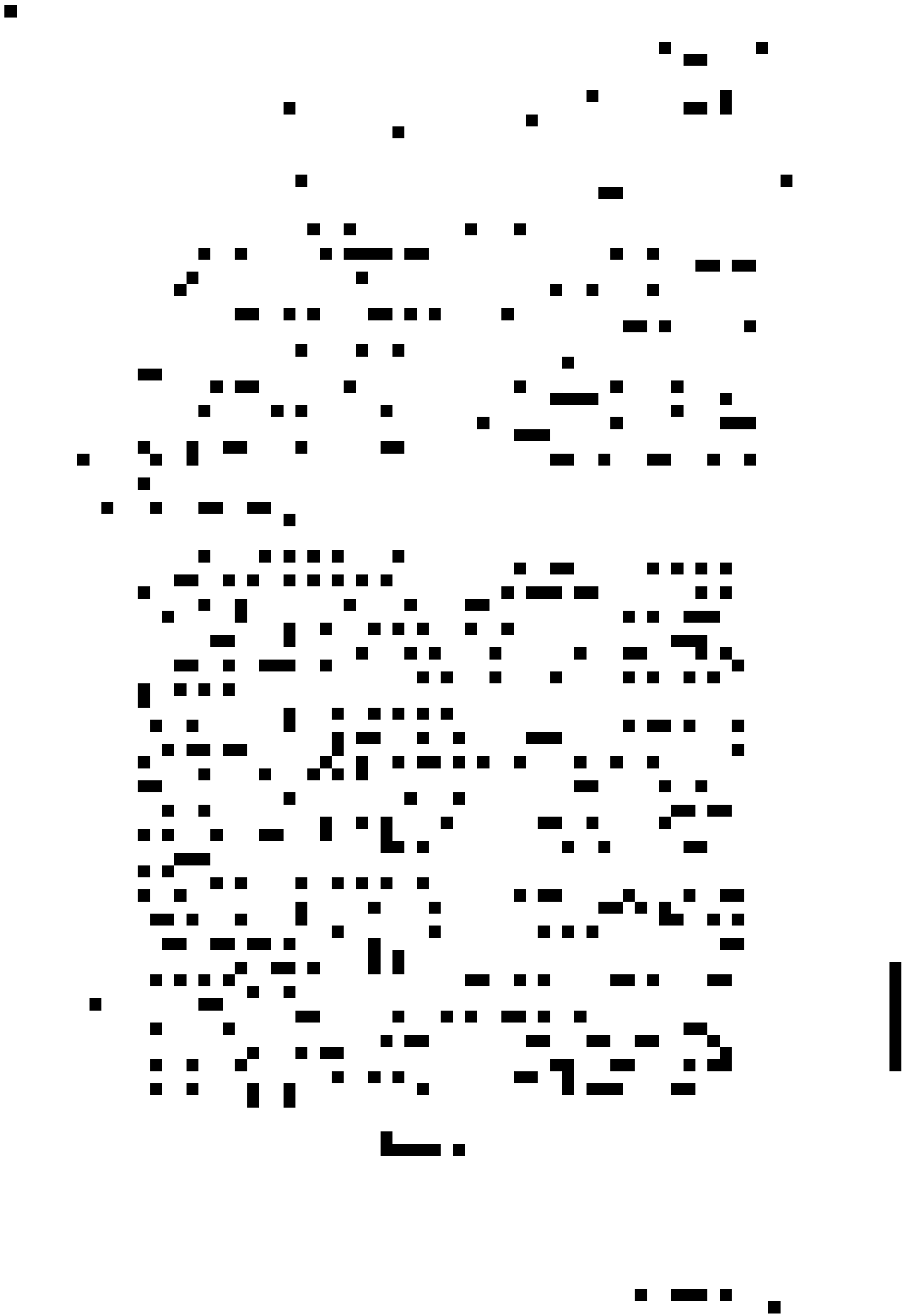


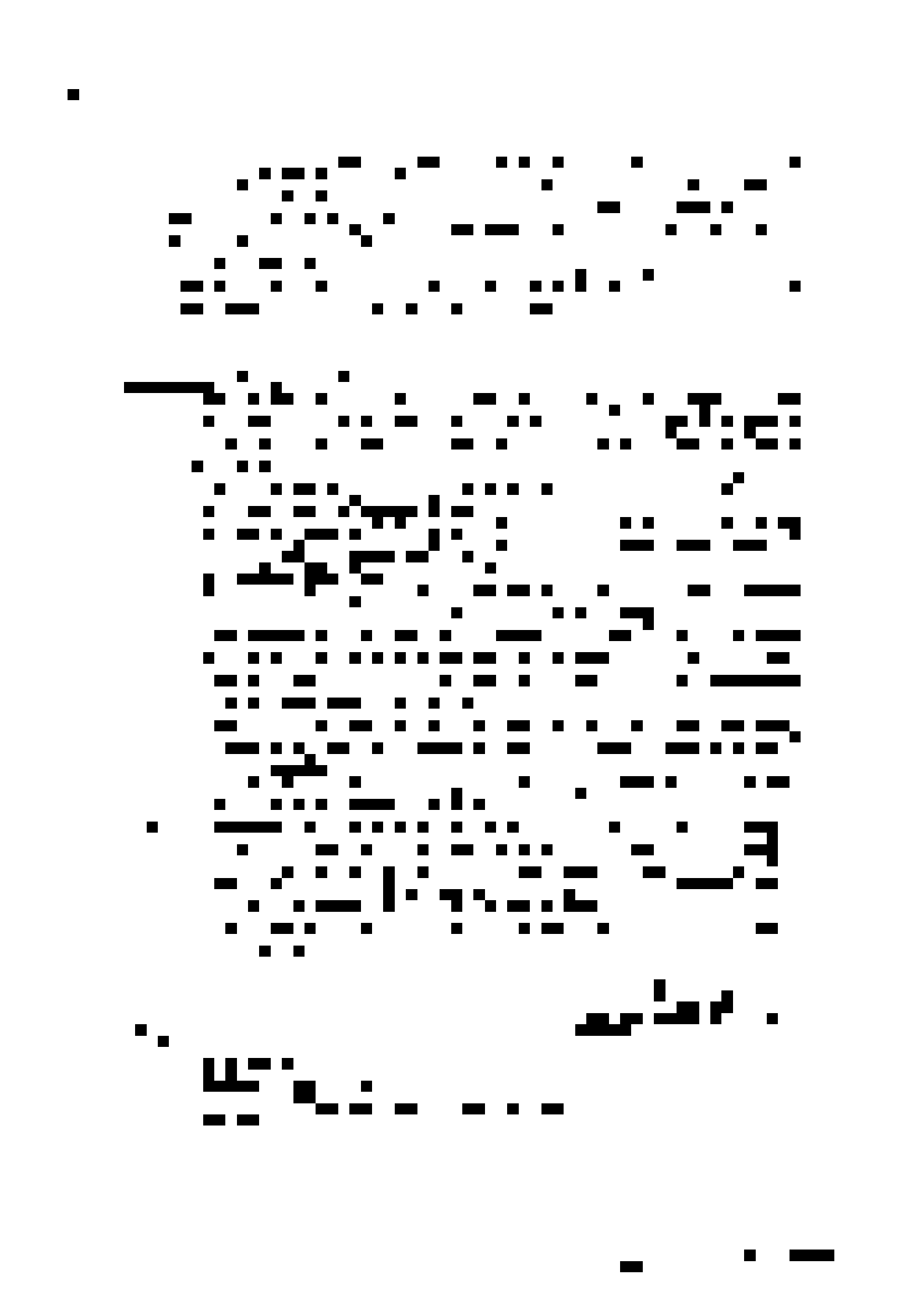


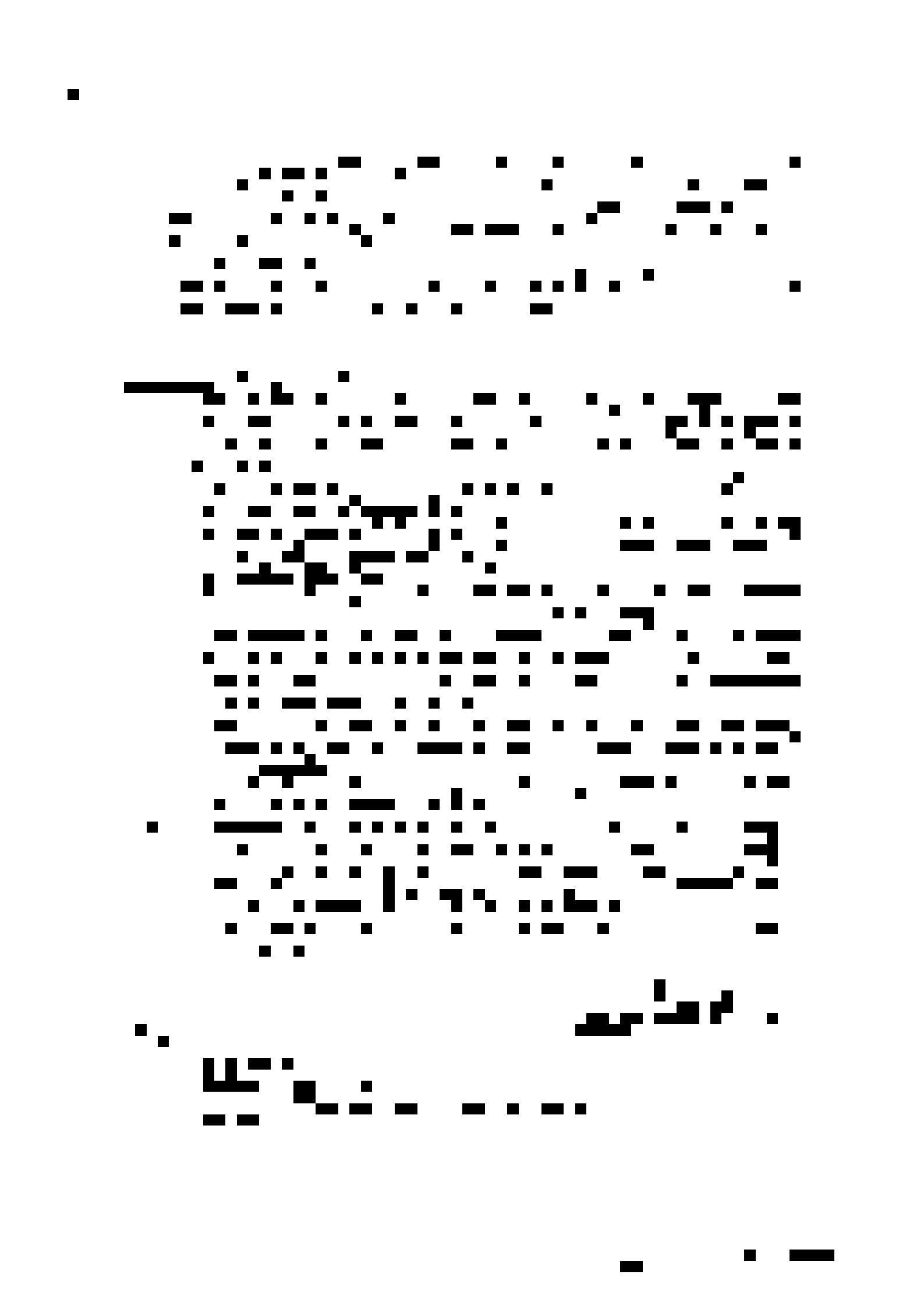


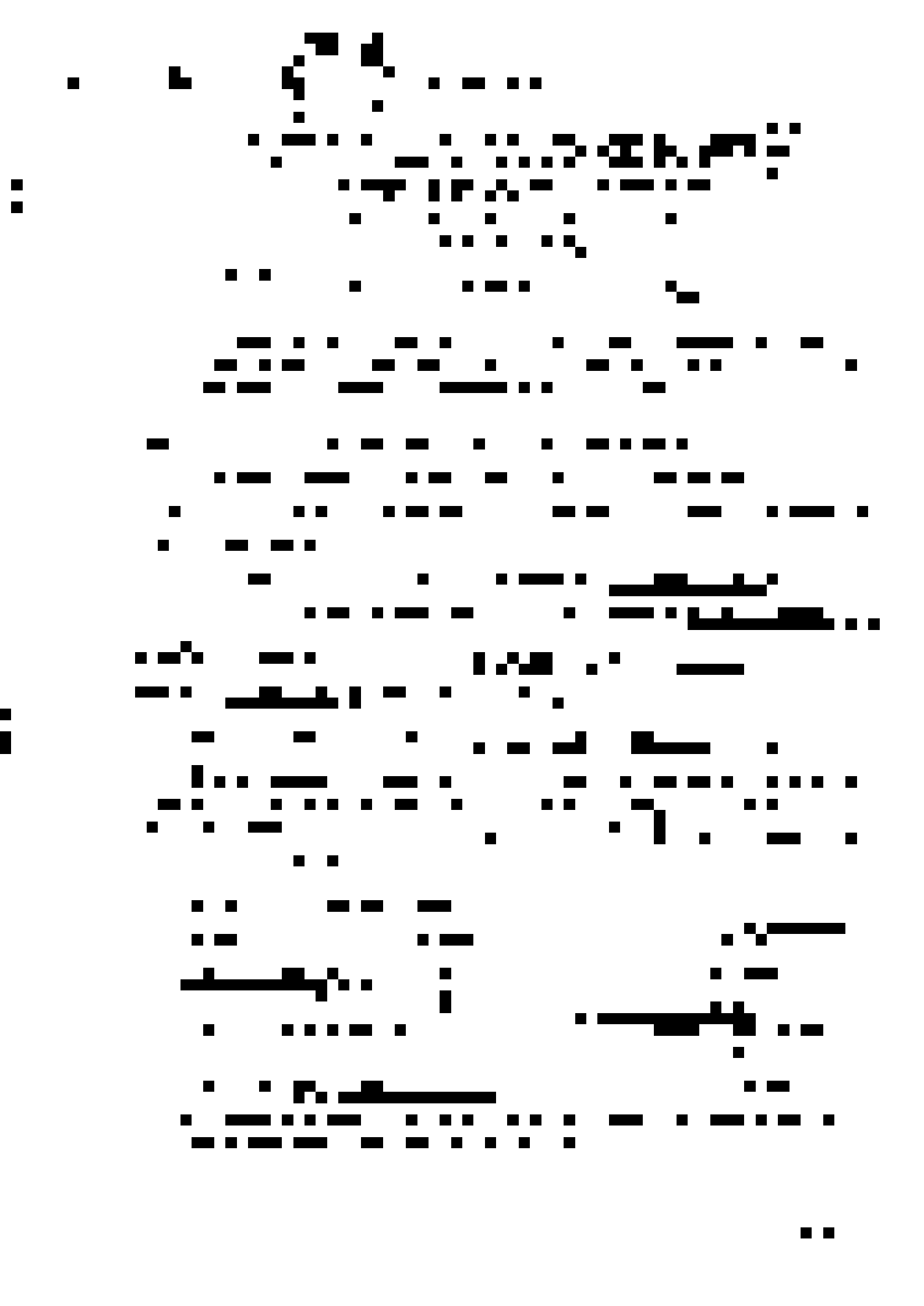


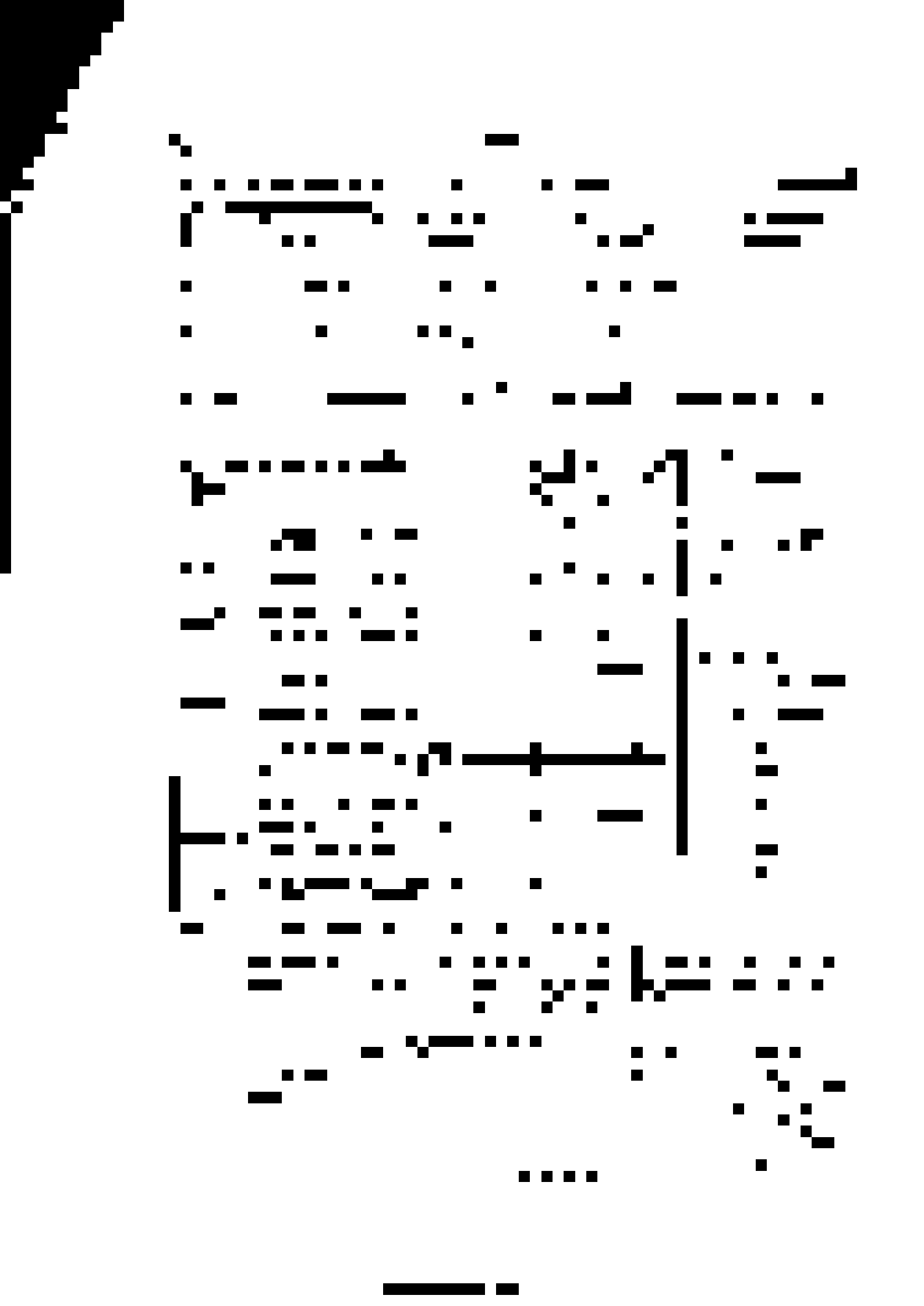


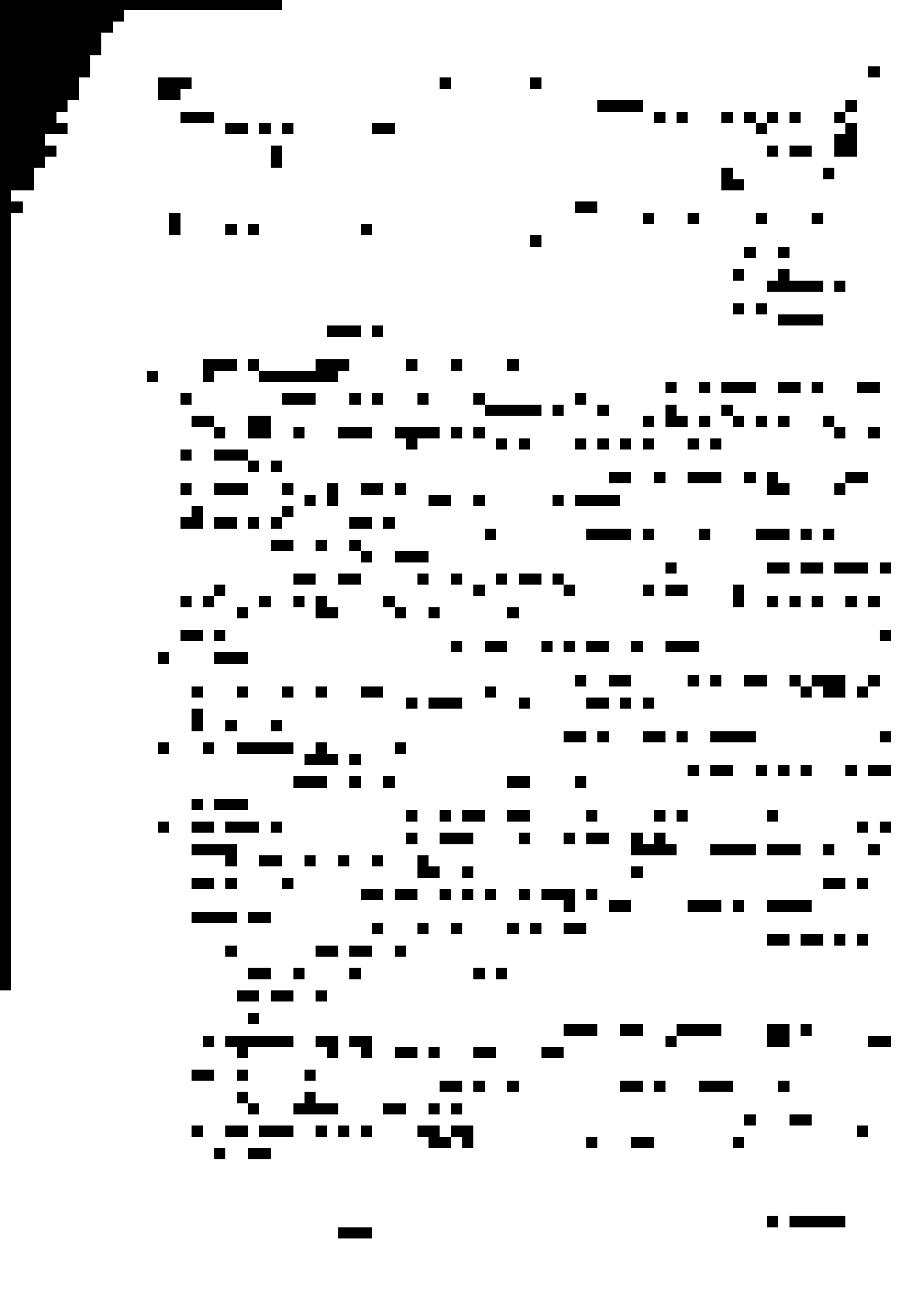


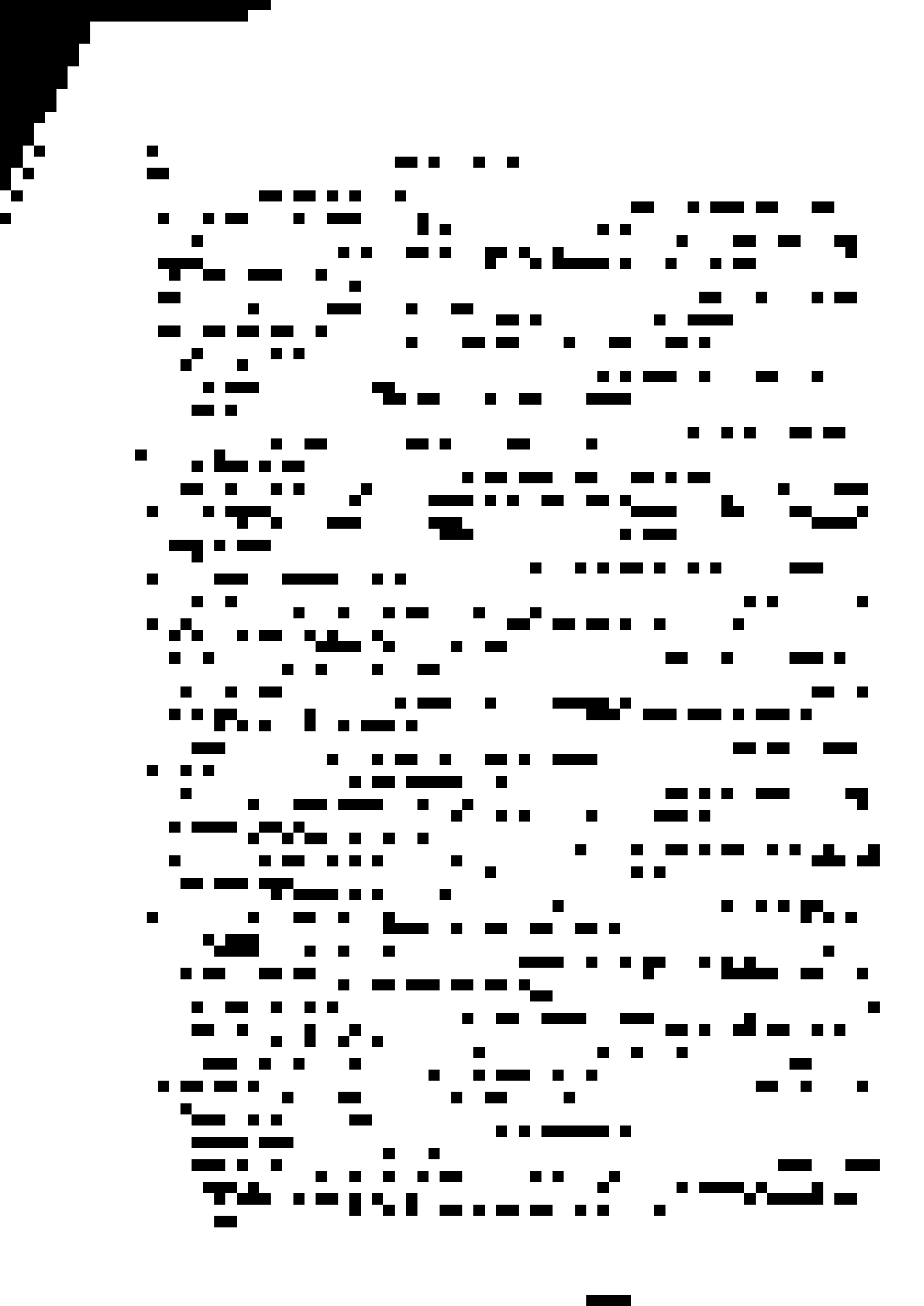




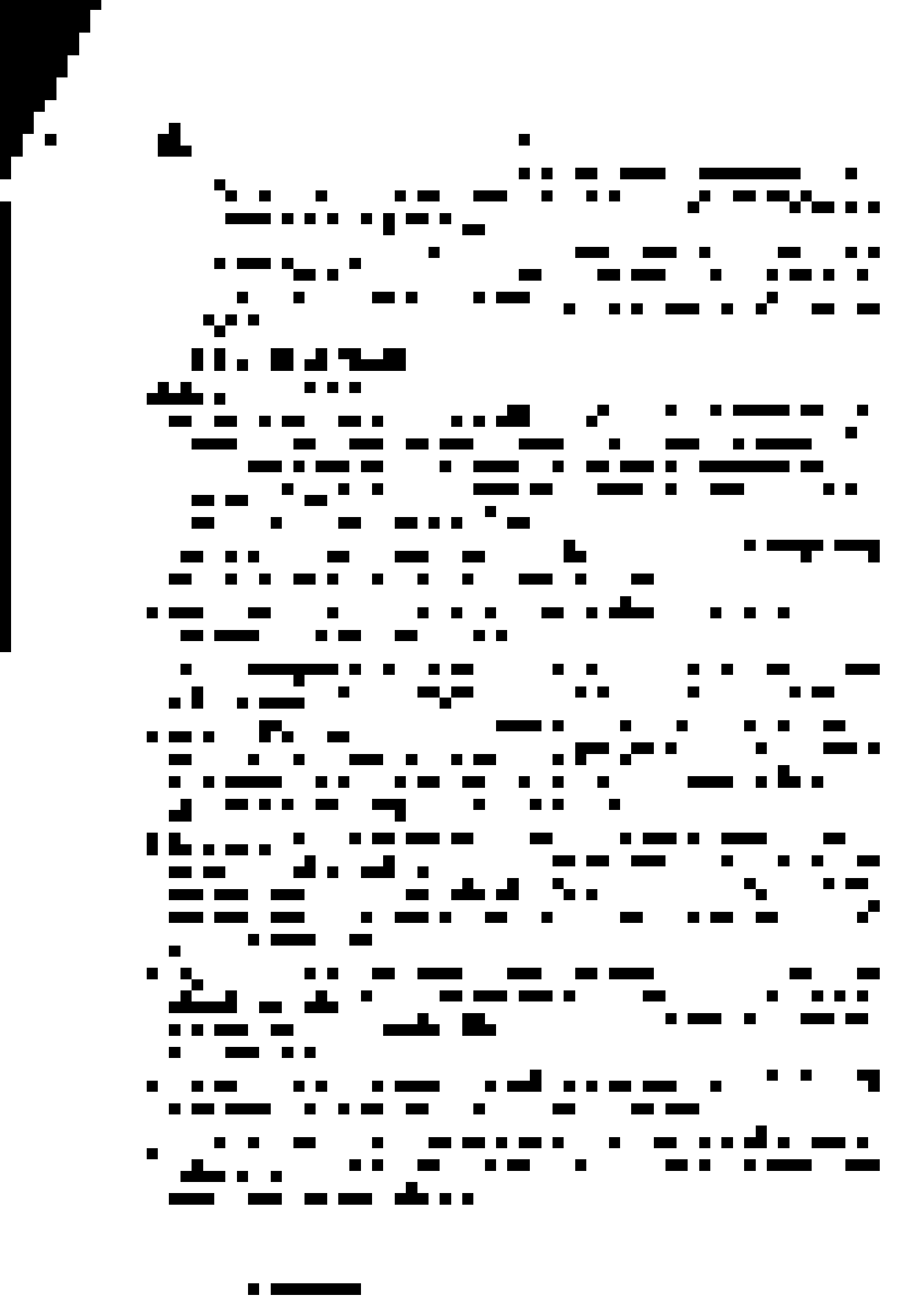


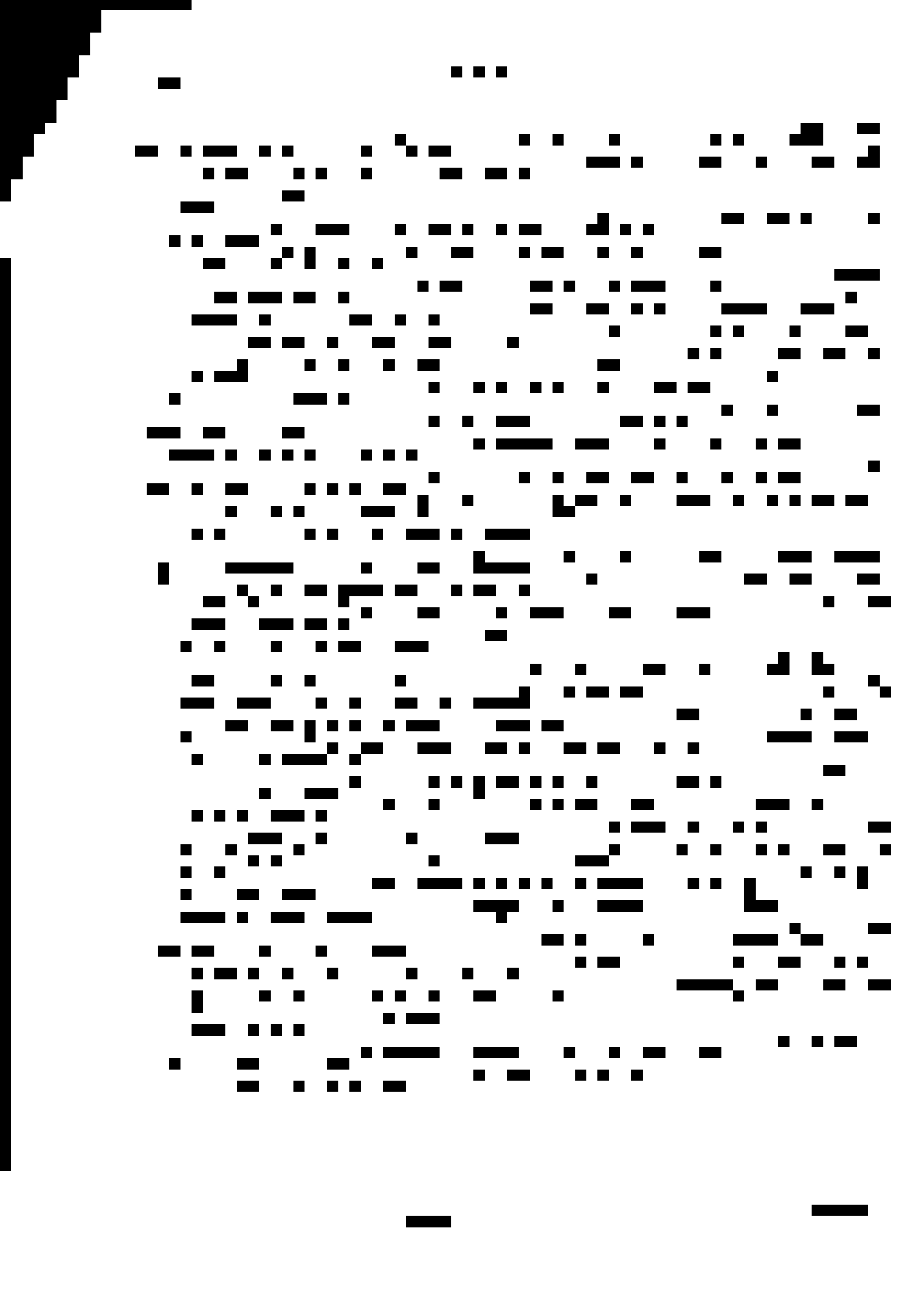


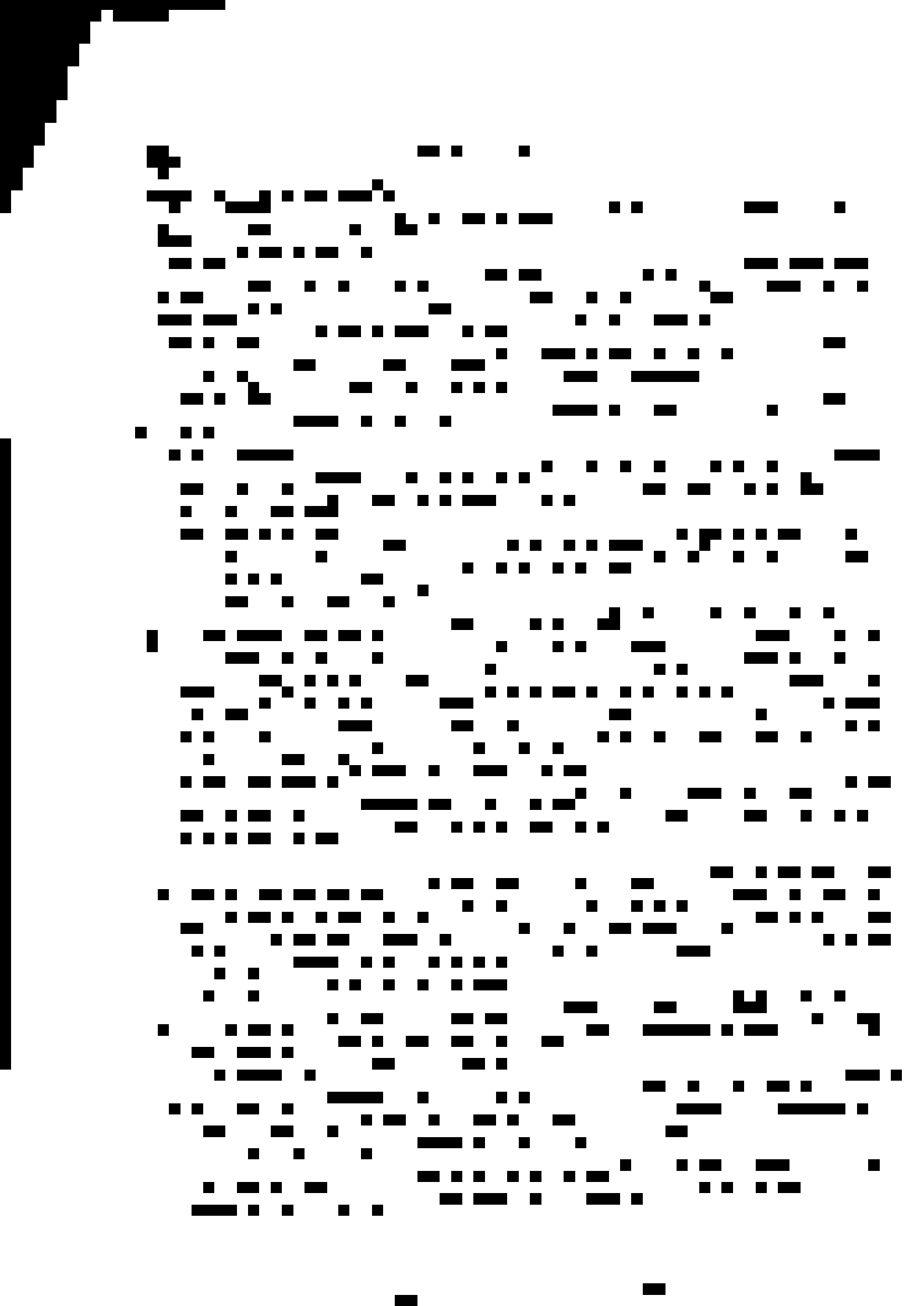


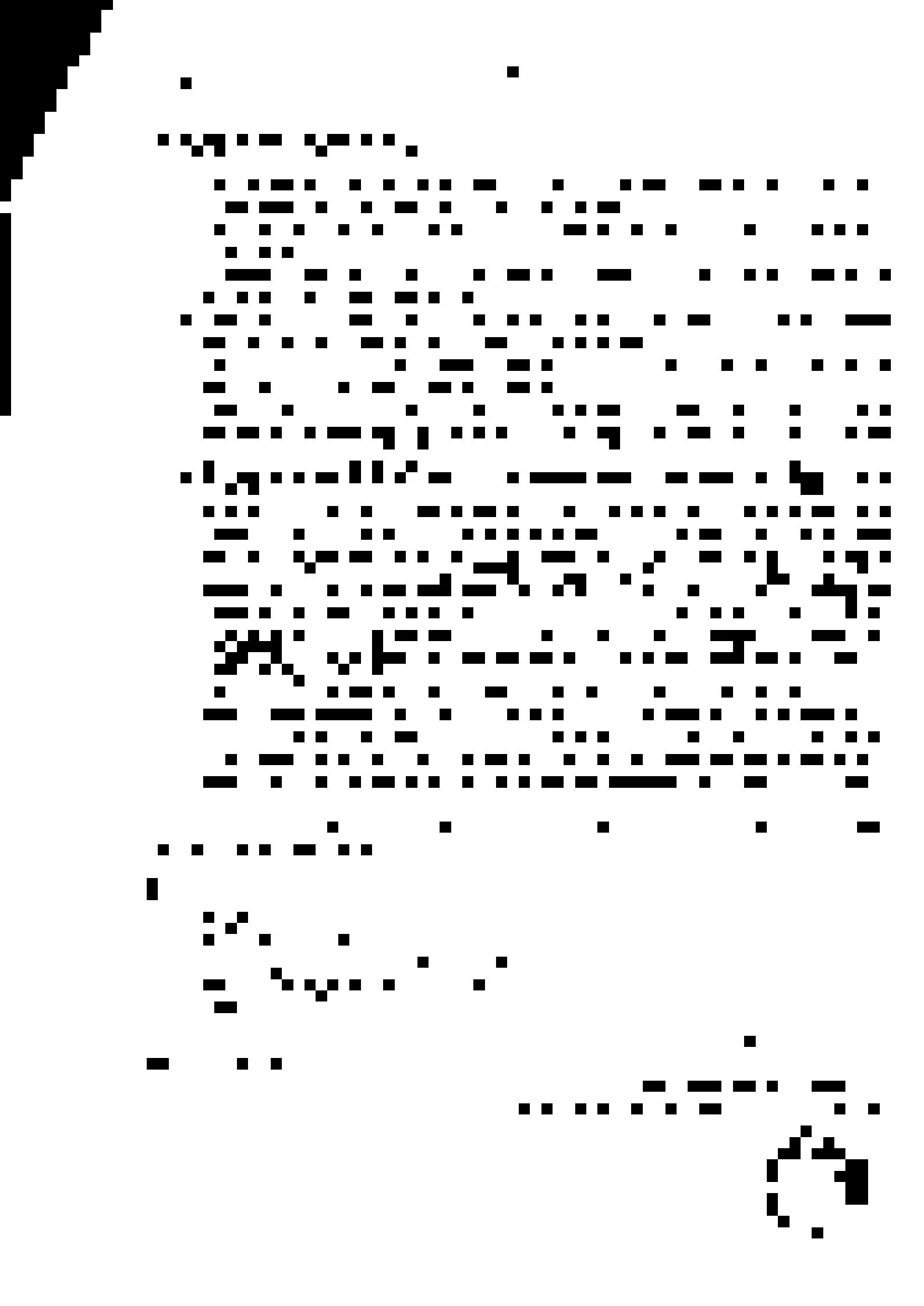




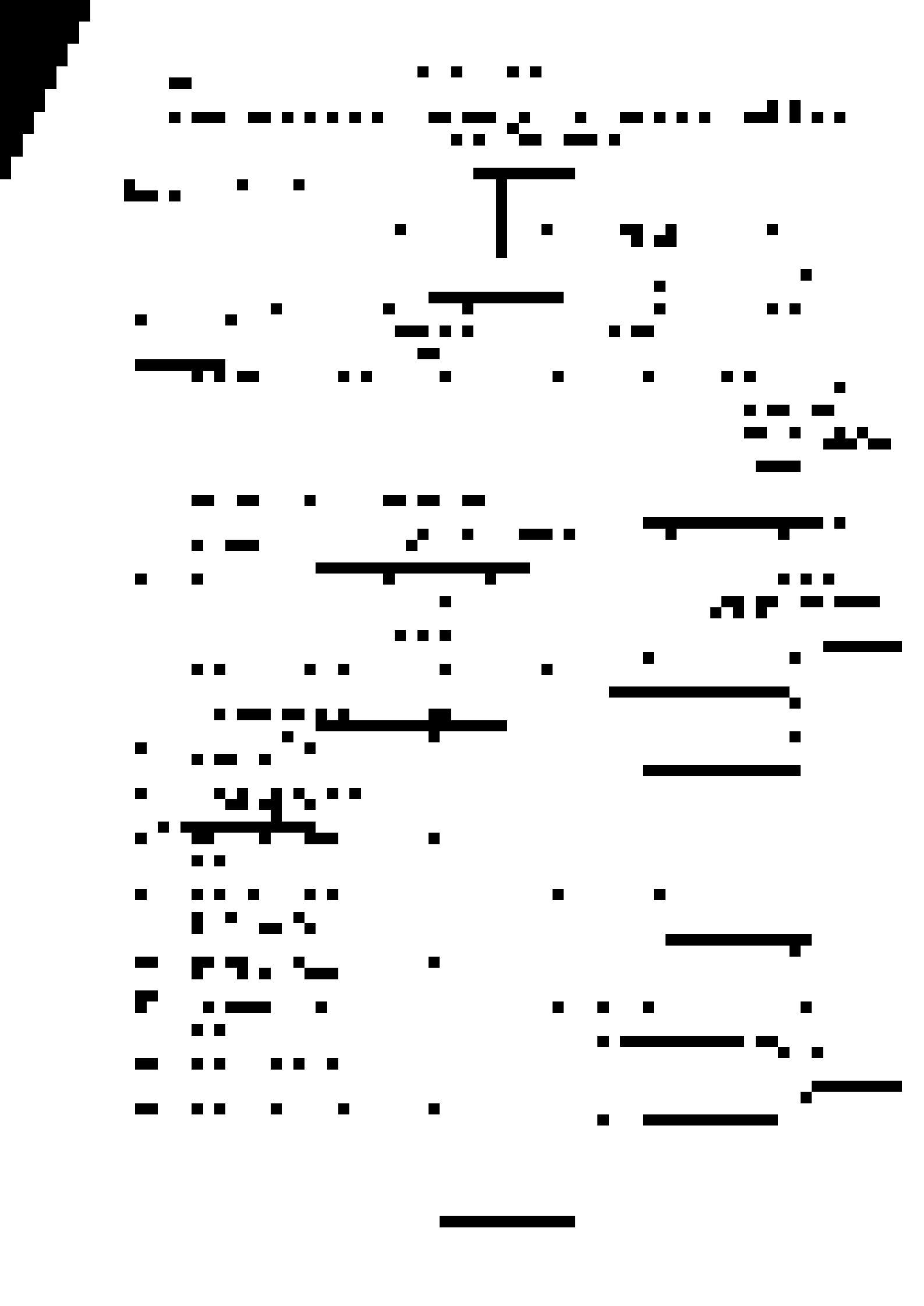
















Visiontek Consultancy Services Pvt. Ltd

(Committed for Better Environment)

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