DRAFT ENVIRONMENTAL IMPACT ASSESSMENT
&
ENVIRONMENTAL MANAGEMENT PLAN
For

SAND MINING PROJECT ON BRAHMANI RIVER

KANAPALA SAMIL MAHULPAL SAND QUARRY

PROPOSAL NO.	**SIA/OR/MIN/62730/2021**
AREA(Ha)	**9.967 HECTARE or 24.63 ACRES**
PRODUCTION	**25000 CUM/YEAR**
LOCATION	**KHATA NO. –452, PLOT NO. 4265, 4266 & 4267 VILLAGE- KANAPALA SAMIL MAHULPAL, TAHASIL-BHUBAN, DISTRICT-DHENKANAL, STATE-ODISHA**

APPLICANT

Proponent- Sri Ratikanta Rout
Address- At- Patala, Ps- Balaram Prasad,
District-Dhenkanal, State- Odisha

ENVIRONMENT CONSULTANT

AEGIS ENVIRONMENT RESEARCH PVT LTD
(Accredited by QCI/NABET)
Suite -B04, Block-H-61, Sector-63, Noida, U.P-201301
Email: aerpl.info@gmail.com

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INTRODUCTION

CHAPTER-I

INTRODUCTION

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1.0 PREAMBLE

Environment Impact Assessment (EIA) is a process used to identify the environmental, social & economic impacts of a project prior to decision making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for proposed projects. It aims predicting environmental impacts at an early stage of project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision makers. By using EIA, both environmental & economic benefits can be achieved. By considering environmental effects prediction & mitigation, early benefits in project planning, protection of environment, optimum utilization of resources, thus saving overall time & cost of the project.

Sand have long been used as aggregate for construction of roads and building. Today, the demand for these materials continues to rise day by day. In recent years, rapid development has led to an increased demand for river sand as a source of construction material. It is recommended to remove the sand deposition on the regular basis otherwise the river will raise the height and may pose threats of inundation of unaffected areas. Besides this, the deposited mineral is a constant source of revenue generation to the state government and ensures the constant supply of this building material. Environmental Impact Assessment report is prepared to comply with the Terms of Reference (TOR) received from SEIAA, Odisha, under EIA Notification of the MoEF dated 14th September 2006, and its subsequent amendments and EIA Guidance Manual for Mining of Minerals of MoEF, Govt. of India, for seeking environmental clearance for mining of Sand in the applied mining lease area measuring 9.967 Ha, The project falls under Category- "B-1" as per EIA Notification 2006 and its subsequent amendments thereof of the Ministry of Environment Forests & Climate Change, GOI. As per NGT Order Dated 13-09-2018 and MOEF & CC OM No L-11011/175/2018-IA-II(M) Dated 12-12-2018 the project comes under B1 Category as the area is more than 5 Ha.

1.1 DESCRIPTION OF PROJECT PROPONENT

The project is being proposed by Proponent Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha. Proposed project has been allotted to the proponent through LOI granted in favour of Shri Ratikanta Rout. Kanapala Samil Mahulpal Sand Quarry, Tahasil Bhuban, District Dhenkanal has been allotted to Sri Ratikanta Rout, the lessee through long term quarry lease basis for quarrying of sand (minor mineral) by the Tahasildar Bhuban on behalf of Government of

Odisha in accordance with the provision of the Odisha Minor Mineral Concession Rules, 2016 through long term quarry lease for the purpose of excavation of sand **Form F vide letter no. 3710 dated 22.12.2020 attached as Annexure II**. The EIA-EMP report has been prepared as per the TOR granted under the EIA Notification of September 14th 2006. In order to assess the impact on environment due to proposed mining, it is necessary to ascertain the present status of environment prevailing at the project site and identification and assessment of impacts on the environment of the proposed operations.

1.2 DESCRIPTION OF PROJECT

Name of the Project –Sand Mining Project: Kanapala Samil Mahulpal Sand Quarry, Khata No.452, Plot No. 4265, 4266 & 4267 Village- Kanapala Samil Mahulpal, Tahasil-Bhuban, District-Dhenkanal, State-Odisha; Production-25000 Cum/Year Area: 9.967 Hectares or 24.63 Acres

Village	Tahasil	District	State	Area in Ha.
Kanapala Samil Mahulpal	Bhuban	Dhenkanal,	Odisha	9.967

Table 1.1 Project Coordinate

S. No	Sand Quarry	Area (Ha)	Latitude	Longitude
1.	Kanapala Samil Mahulpal Sand Quarry	9.967	20°51'18.78"N to 20°51'26.18"N	85°52'36.16"E to 85°52'52.63"E

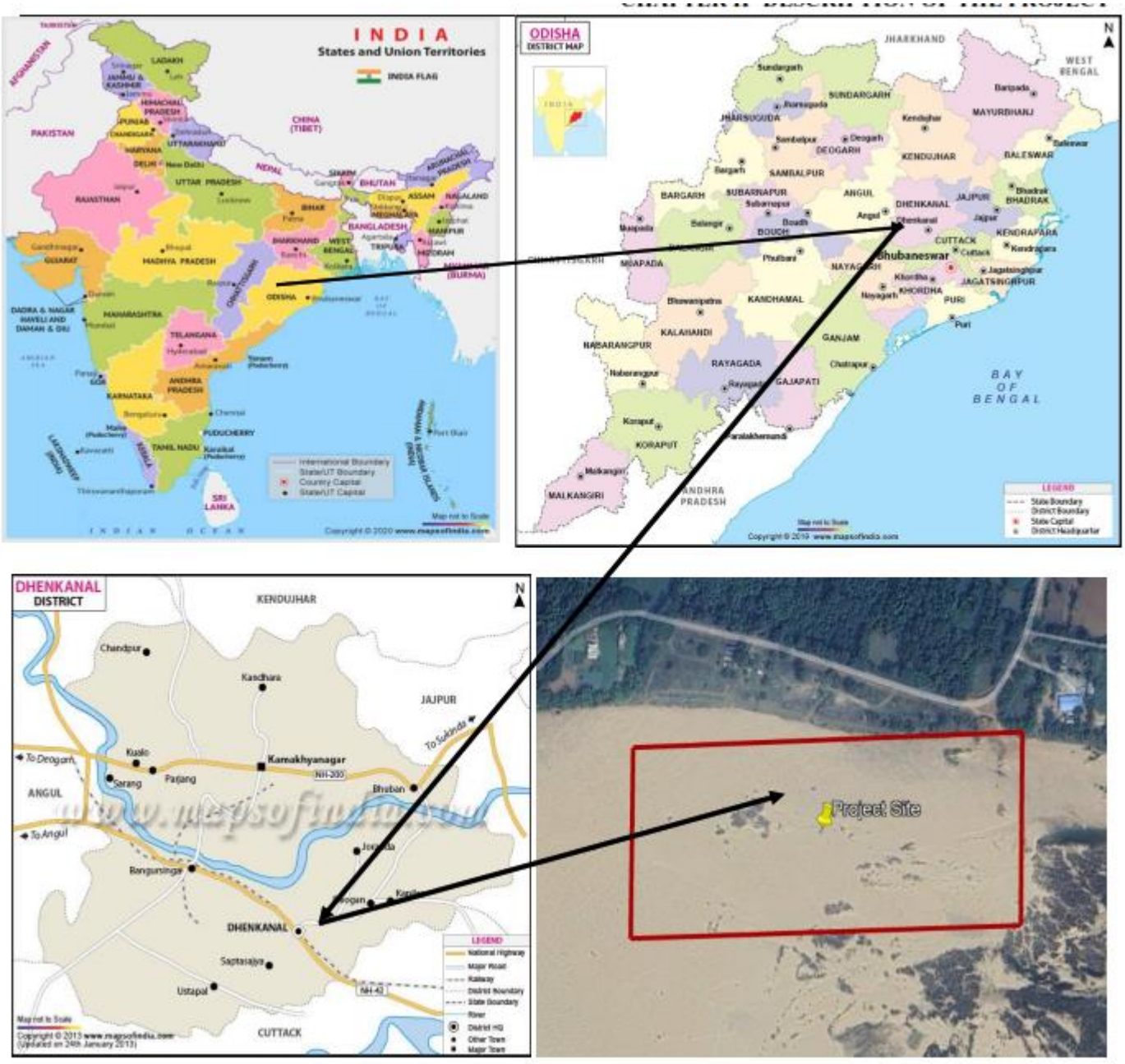


Figure-1.1 Location of the Project

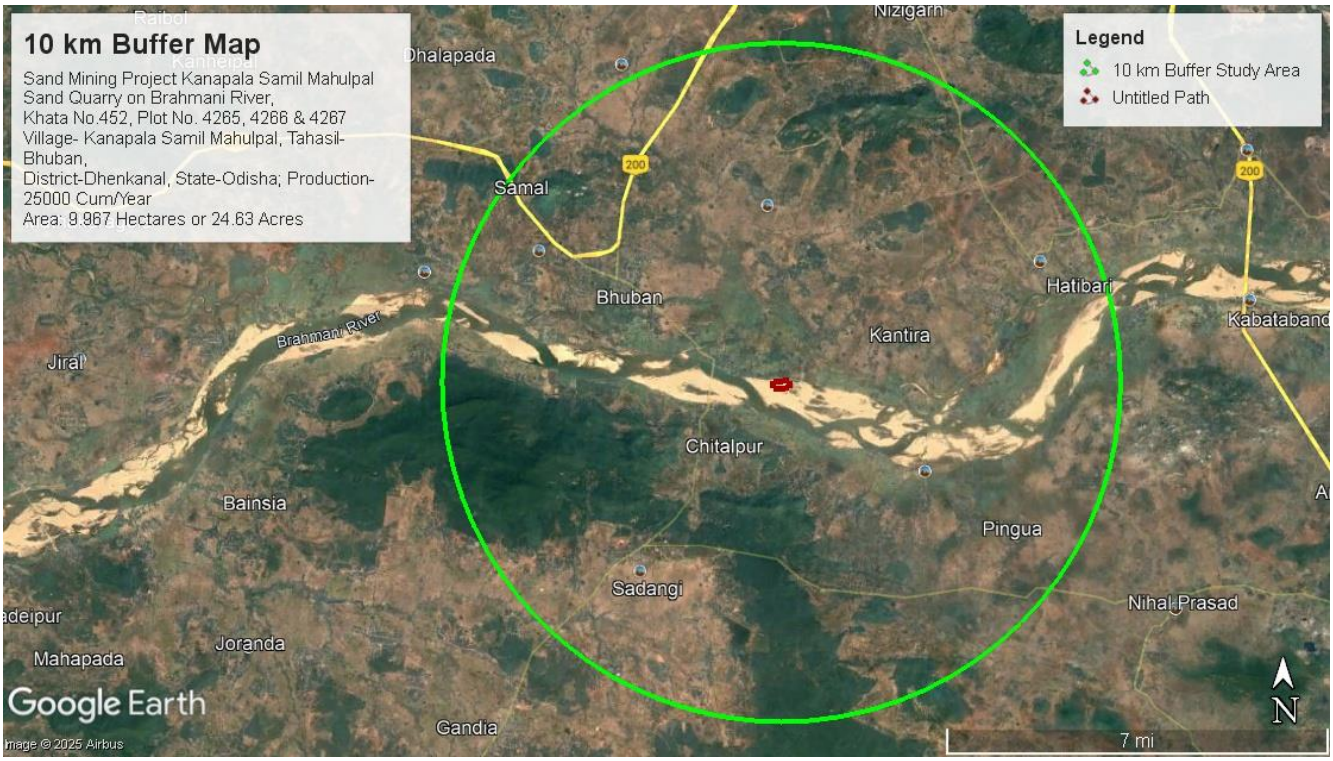


Figure 1.2: 10 Km Buffer Map

Table 1.2- Site & Surrounding

Nearest Settlements	Brahmapur Village is about 145 m in NW direction. Purastampur Village is about 330 m in W direction.
Nearest Road	NH 53 at a distance of 5.70 km in NW SH 20 at a distance of 18.60 km in NE Major District Road is Bentashalia at a distance of 1.90 km in NE
Nearest Airport	Bhubaneshwar Airport approx. at 67 km in S direction.
Nearest Railway Station	Jenapur Railway Station at distance of approx. 19 km in SE direction.
Nearest National Park/wildlife sanctuary within 10 km	No National Park/Wildlife Sanctuary within the periphery of 10 Km Radius. Nearest Kapilasa Wildlife Sanctuary at distance of 18.0 km in SW.
Water body	Project lies on Brahmani River
Nearest School/ college	Mahulpal Nodal School 1.76 km NE
Reserve/ Protected Forest	Reserve/ Protected Forest, within 10 km buffer area
Nearest Hospital	CHC Mahulpal Medical Centre at 3.50 km in NE Primary Health Centre at Bhuban at approx. 5 km in NW
Temple	Maa ghata Tarini Temple 1.17 km W Maa Mangla Temple 1.5 km NW Sri Baladev Jew Temple 4.02 km SE

Table 1.3- Project Salient Features

On-line proposal No.	SIA/OR/MIN/62730/2021	
Name of Proponent	Shri Ratikant Rout	
Full correspondence address of proponent	Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha.	
Name of Project	Sand Mining Project Kanapala Samil Mahulpal Sand Quarry on Brahmani River	
Name of River	Brahmani River	
Name of Village	Kanapala Samil Mahulpal	
Name of Tehsil/Anchal	Bhuban	
District	Dhenkanal	
Name of Minor Mineral	Sand	
Sanctioned Lease Area (in Ha.)	9.967 ha/24.63 Acres	
Category of the project	"B1"	
Total Geological Reserves	398710 Cum.	
Total Mineable Reserves	357840 Cum.	
Proposed Production/year	25000 Cum. Per Annum	
Sanctioned Period of Mine lease	5 years	
Method of Mining	Open Cast Manual Method	
No. of working days	250 days	
Working hours/day	8hrs	
No. of workers	42	
Type of Land	Government land	
Water Requirement	**Purpose**	**Requirement (KLD)**
	Drinking & Domestic	0.84
	Dust Suppression	12.0
	Green Belt Development	1.0
	Total	**13.84**
Any litigation pending against the project or land in any court	No	
Proposed Project cost (INR)	The total cost of project would be around Rs. 60, 00,000/- (60 lakh).	
Proposed EMP budget (INR)	EMP Cost- Rs.4,00,000/-	
Proposed CER (2% of Project Cost) (INR)	Rs. 1,20,000/-	
Length and breadth of Haul Road	Length: 1000 m, width: 6 m	
No. of Trees to be Planted	500 plants	

Project's Importance to the country and the region

This project operation will provide employment to the people residing in vicinity as about manpower will be required annually and approximately 42 people may be benefited directly and indirectly by the project. The project involves collection of river bed material; thus it is expected that the proposed mining project would improve the supply of construction materials like Sand making a positive impact on the infrastructural projects like construction of roads, buildings, bridges etc in the state.

The river carry sediments along with it and depositing of the sediments takes place constantly at a specific point, where they eventually results in formation of Sand. This Sand extremely influences on the river flow, obstruct navigation and cause flooding. The present project will thus ensure scraping of such Sand and prevent flooding.

1.3 REGULATORY COMPLIANCES & APPLICABLE LAWS/REGULATIONS

a) There is no legal case against the project and project proponent.

b) There is no national park / Sanctuary notified under the Wildlife Protection Act in the study area.

1.4 SCOPE OF THE STUDY In line with the Terms of Reference (TOR) prescribed by SEIAA, Odisha. With **File No: SIA/OR/MIN/62730/2021 dated 2nd December 2023**. EIA Report has been prepared. Copy of TOR attached as **Annexure-I**, the area comprising 10 km radius around the proposed mine lease boundary is considered as the study area. The detailed studies have been conducted as per prescribed TOR.

The scope of study broadly covered:

- Literature review and collection of data relevant to the study area;
- Establish the baseline environmental aspects in and around the proposed project;
- Identify various existing pollution loads due to various mining activities;
- Predict incremental levels of pollutants in the study area due to the proposed operations;
- Evaluate the predicted impacts on various environmental attributes in the study area by using scientifically developed and widely accepted environmental impact assessment methodologies;
- Prepare an Environment Management Plan (EMP) outlining the measures for improving the environmental quality.

Table 1.4 Standard TOR

TOR Ref.	TOR Points for the preparation of EIA	TOR Reply
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not Applicable as it's a fresh lease area.
2.	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	District Dhenkanal has been allotted to Sri Ratikanta Rout, the lessee through long term quarry lease basis for quarrying of sand (minor mineral) by the Tahasildar Bhuban on behalf of Government of Odisha in accordance with the provision of the Odisha Minor Mineral Concession Rules, 2016 through long term quarry lease for the purpose of excavation of sand **Form F vide letter no. 3710 dated 22.12.2020** (Annexure-II LOI Attached)
3.	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	The documents including mine plan and EIA report submitted are compatible with one another w.r.t following information Mining lease area- 9.96 Ha. Lessee- Shri Ratikanta Rout No Waste generation Mining. Method-Opencast Manual Method. (Annexure-III Mining Plan and All the details given in chapter-2)
4.	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	All corner coordinates of mining lease area superimposed on high resolution imagery has been incorporated in EIA/EMP report. Refer Chapter 1 & Chapter 2
5.	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of	The land use map showing salient features of the area is given in the report. Chapter-3

	the area, important water bodies, streams and rivers and soil characteristics.	
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The Lease area is dry part of River bed. The mining process will be done by land use policy of the State & no land diversion has been proposed.
7.	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative e order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stake holders at large may also be detailed in the EIA Report	Yes, the proponent Company has a well laid down Environment Policy. The hierarchical system or administrative order of the company has been given in the Chapter 6 of report.
8.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Issue related to mine safety has been given in of chapter 2 & Chapter 7.
9.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA.	The 10 km zone from periphery of the lease has been considered as the study area. The Buffer map of the study area is attached with report in chapter-1 All the details in the EIA report are for the life of the mine period. The details of mining & production have been given in the report.
10.	Land use of the study area delineating forest area, agricultural lands, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass	Land use pattern of 10 km from the periphery of the lease area has been prepared and incorporated with the report. The study area lies on Brahmani River. There is no wildlife sanctuary or national

	preoperational, operational and post operational phases and submitted. Impact, if any of change of land use should be given.	park within the study area.
11.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.	There is no overburden outside the mine lease area.
12.	A Certificate from the competent authority in the State Forest Departments should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the project proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forest, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assists the Expert Appraised Committees.	No Forest Area involved within Project site.
13.	Status of forestry clearance for the broken-up area and virgin forestland involved in the project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	No forest land is involved in the lease area, therefore, deposition of net present value (NPV) and compensated Afforestation is not indicated
14.	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	There is no forest land involved in the lease area. Hence, this act is not applicable.
15.	The vegetation in the RF/PF areas in the study area, with necessary details, should be indicated.	Protected Forest is present within the 10 km radius of the lease area. However, the vegetation details of the study area are incorporated with the report. Details are given in chapter 1 & 3.
16.	A study shall be got done ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measure required, should be worked out with cost implications and submitted.	The details Impacts & there mitigation measures are given in chapter 4 of EIA/EMP Report.
17.	Location of National parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site	No National parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, and Ramsar

	Tiger/Elephant Reserves/(existing as well as proposed), if any within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden, Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	site Tiger/Elephant Reserves (existing as well as proposed) Within 10 km periphery of the mine lease.
18.	A detailed biological study of the study area [core zone and Buffer zone (10 Km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey clearly indicating the Schedule of the fauna present. In case of any scheduled –I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State forest and Wildlife Departments and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Biological study of core zone and buffer zone of the mine lease has been carried out and detailed in Chapter-3.
19.	Proximity of Areas declared as "Critically Polluted" or the project areas likely to come under the "Aravali Range", (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Proposed project does not come under critically polluted area.
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	The proposed project is not a coastal project. Hence not applicable.
21	R&R Plan/compensation details for the project	R&R Plan/compensation is not applicable

	Affected People (PAP) should be furnished. While preparing the R&R plan, the relevant State/National Rehabilitation & Resettlement policy should be kept in view. In respect of SCs/STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of villages including their R& R and Socio-economic aspects should be discussed in the report.	for this project
22.	One Season (non-monsoon) [i.e. March-May (Summer Season); October-December (Post monsoon seasons); December –February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so complied presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline data for one season i.e. from March 2025 to May 2025, has been collected. Detail given in Chapter-3.
23	Air quality modeling should be carried out for preparation of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of minerals. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on the location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre- dominant wind direction may also be indicated on the map.	Air Modelling is given in DEIA report. Chapter 4.

24	The water requirement for the project, its availability and sources should be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should be indicated.	The water requirement for the project is **13.84 KLD** for drinking, Domestic, dust suppression and green belt development. This water supplied from nearby area by water tanker. Details given in Chapter-2
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.	Water requirement will be fulfilled by private water tanker. So, no clearance is required.
26.	Description of water conservation measures proposed to be adopted in the project should be given.	The project do not consume any process water except for drinking, dust suppression & plantation. Hence no artificial conservation measures have been proposed. Plantation is proposed, which will increase the water holding capacity & help in recharging of ground water.
27.	Impact of the project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Mining activity will be done on Dry Bed of River so there is no impact on surface water. Mining will be up to 2 m below ground level or above the ground water table whichever comes first. This will not intersect the ground water table. (Details given in Chapter- 4)
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	Mining will be Restricted up to 2.0 m below ground level or above the ground water table whichever comes first. This will not intersect the ground water table.
29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification/diversion proposed, if any and the impact of the same on the hydrology should be brought out.	Project is on Brahmani River Bed, wherein mining will be carried out on the dry part of the river bed and no stream or water channel will be disturbed.
30.	Information on site elevation, working depth, groundwater table etc, Should be provided both in AMSL and bgl. A schematics diagram may also be provided for the same.	Detail given in chapter-2. The details are also mentioned in Mine plan, attached as Annexure III.

31.	A time bound progressive Greenbelt Development plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind; the same will have to be executed up front on commencement of the project. Phase wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Plantation/afforestation will be done as per program i.e along the road sides and near civic amenities. Post plantation, the area will be regularly monitored in every season for evaluation of success rate. List of Plant species selected for green belt is detailed in the EIA report. The plant species selected for green belt have a greater ecological value and are of good utility value to the local population. The plant species are selected by giving emphasis on local and native species and the species which are tolerant to pollution. Details of Green Belt Plantation in Chapter 10
32.	Impact on local transport infrastructure due to the project should be indicated. Projected increase in truck traffic as a result of the project in the present road network (including those outside the project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as state government) should be covered. Project proponent shall conduct impact of Transportation study as per Indian Road Congress Guidelines.	The projection has been done based on the mineral transportation. The details of traffic analysis are discussed in the report. Chapter 4
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.	A temporary rest shelter will be provided for the workers near to the site with provisions of water, first aid facility, protective equipment, etc. Details are given in the EIA/EMP Report.
34.	Conceptual post mining land use and reclamation and restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA.	Detail given in chapter-2
35.	Occupational Health impacts of the project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures schedules should be incorporated in the EMP. The project	Occupational health impact mainly is expected due air pollution due to fugitive dust emission because of movement of vehicles. However appropriate mitigation measures for air pollution control have been given in the report, discussed in Chapter-4. Each labour will undergo pre- placement medical examination. Thereafter, periodical

	specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	heath checkup will be arranged as stated in the report. Budget for Occupational Health is given in Chapter 8
36.	Public health implications of the project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The proposed project being a small scale semi-mechanized mining project, there will be hardly any process related health implication on the population of the nearby villages except fugitive dust emissions due to transportation. Budgetary allocation is given in Chapter- 8
37.	Measures of socio-economic significance and influence to the local community proposed to be provided by the project proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Detail given in chapter-3
38.	Detailed Environment Management Plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed project.	The detailed environmental management plan to mitigate the environmental impacts has been mentioned in of the EIA/EMP Report. Detail given in chapter-10
39.	Public hearing points raised and commitment of the project proponent on the same along with the time bound action plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP report of the project.	Public Hearing will be conducted as per EIA Notification 2006 Details will be incorporated in chapter 7.
40.	Details of litigation pending against the project, if any, with direction/order passed by any court of law against the project should be given.	No Litigation Pending against the project.
41.	The cost of the project (capital cost & recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	EMP Capital Cost is Rs. 4,00,000/- & EMP Recurring Cost is 6,50,000/- Detail given in chapter-10
42.	A Disaster Management Plan shall be prepared and included in the EIA/EMP report.	Detail given in chapter-7.
43.	Benefits of the project if the project is implemented should be spelt out. The benefits of the project shall clearly indicate environmental, social, economic, employment potential, etc.	2% (i.e Rs. 60,00,000/-) i.e. Rs. 1,20,000/- of the total cost of the project has been earmarked towards the Enterprise Social Commitment which will be used for the development of village.
44.	Besides the above, the below mentioned general points are also to be followed: -	
a.	All document to be properly referenced with index	Complied in the report

	and continuous page numbering	
b.	Where data are presented in the report especially in table, the period in which the data were collected and the sources should be indicated.	Complied in the report
c.	Project Proponent shall enclose all the analysis /testing reports of water, air, soil, noise, etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the project.	Complied along with the report
d.	Where the documents provided are in a language other than English, an English translation should be available during appraisal of the project.	Complied in the report
e.	The Questionnaire for environmental appraisal of mining projects as devised earlier by the ministry shall also be filled and submitted.	Attached as Annexure.
f.	While preparing the EIA report the instruction for the proponent & instruction for the consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA-II (I) dated 4th August 2009, which are available on the website of the ministry, should be followed.	Complied in the report.
g.	Changes, if any made in the basic scope and project parameter (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.	No changes done in report.
h	As per the circular no. J-11011/618/2010-I A.II (I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	This is new case for Mining. No certified compliance report is required.
i.	The EIA report should also include: (i) surface plan of the area indicating contours of main topographic features, drainage and mining area (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Complied

SPEICIFC CONDITIONS

i.	1:50,000 scale topomap with indicate the working area boundaries of the proposed sand bed, transporting route, bridge, water intake point and area proposed for plantation etc.	
ii.	NABET accredited consultant certificate along with prepared the EIA & EMP report and also bed.	Complied
iii.	The project proponent has to carry out Annual Rate of Replenishment Study (ARRS) of Sand through ORSAC empanel agency, a study of the annual replenishment rate of sand by collecting pre monsoon & post monsoon data from the field to know the quantum of volume of sand deposited/replenished & extracted in the mining lease area. The detailed comparison of both pre-monsoon and post-monsoon elevation data shall be included in the study report. As per the MOEF&CC, Govt. of India's Enforcement and Monitoring Guideline for Sand Mining, 2020, there are two methods prescribed for the study of rate of replenishment of sand on a stretch of river bed. These are (1) physical survey of the field by the conventional method and (2) use of UAV / Drone and other image data processing techniques. The second method UAV/ Drone method is the one which has been found suitable for the above purpose and recommended by the ORSAC, Bhubaneswar and there are some organization in Odisha state who are empanel by ORSAC to conduct such survey. The details of UAV / Drone method is attached a separate sheet. The finding of the study shall be submitted to SEIAA to assess the rate of replenishment of mined out sand in the lease area with geo-coordinating photographs during data collection. The finding of the study shall be submitted to SEIAA along with the final EIA / EMP report to assess the rate of replenishment of mined out sand.	Detailed Sand replenishment study will be attached as Annexure in FEIA report.
iv.	Details procedure of sand replenishment study, date of	Sand replenishment study will be

	study, pre-monsoon sand deposit and post-monsoon deposit and quantum of sand replenished with attaching real-time geo-coordinating photographs in field of different period of study and data collection.	attached as Annexure in FEIA report.
v.	Area of the 'no mining zone' specially demarcated within the lease out area for safety of the river bank / any bridge or such other structure nearby; and the dimensions and geo-co-ordinates of this zone w.r.t lease boundary.	Not applicable.
vi.	Study of river ecology (i.e. aquatic habitat, fish catching area for nearest villagers, turtle habitat and birthing place for villagers, or any other eco-sensitive area that hamper the river ecology due to sand mining if any) should be mention in the EIA report and accordingly prepare for EMP.	Details given in Chapter 3
vii.	Any approach road existing or will be constructed inside the safety zone?	Noted. Village road existing near to mine lease area, haul road will connect this road.
viii.	Mitigation measures to be taken to ensure not to disturb free flow of river.	Impact Mitigation detailed in Chapter 4. Mining will be done as per approved mining plan during dry season.
ix.	Distance of the river bank / embankment form the lease boundary. It is a river bank or embankment?	Distance of the river bank / embankment form the lease boundary will be maintained according to approved mine plan.
x.	Any ramp existing or will be constructed on the river bank / embankment for movement of vehicles to reach the nearest road.	During mine operation haul road will be prepared and maintained regularly.
xi.	Distance of the village road / city road / district road / public road for the river bank. Is this road single road / double road?	Details in Chapter 1 Table 1.2 Site and Surroundings.

xii.	No. of village (s) and name of village (s) or the city (s) or urban place (s) or semi urban place (s) through which the sand carrying vehicles will ply and the distance of it from the river bank or embankment whether there is any forest land in the intervening area through which the sand carrying trucks will ply.	Complied Details of villages given in Chapter 3 and Chapter 4 The haul road through which trucks will ply will not pass through any forest land.
xiii.	Whether schools / colleges / hospitals / health centers / bus stops / religious places existing nearby and if so, the distances of it from the bank or the road through which the vehicle will ply or existing alongside the road?	Details in Chapter 1 Table 1.2 Site and Surroundings
xiv.	Any plantation done in the safety zone or embankment in case of an existing mines and if so, the area of plantation, number of species? If not, the plan for it to arrest bank erosion.	The details of Plantation and number of species are given in Chapter 10
xv.	Any stone packing in the river bank / embankment existing in case of existing mines and if not, the plan for it.	Noted.
xvi.	Whether, any alternative mine exists or explored or can be explored if this mine is otherwise found unsuitable? Please furnish details.	No any alternative mine exists or explored as mineral is site specific.
xvii.	Whether permission taken or will be taken from Water Resource Authority or the concerned Authority of the roads to be used for plying of vehicles loaded with sand or empty vehicles for the same after the river bank.	Yes permission to be taken from concerned authority.
xviii.	Responsibility of perennial perpetual maintenance of these roads and the mechanism for the same.	Noted.
xix.	No and type of vehicles to be used daily and the frequency for the purpose of transportation and the time and duration of such transportation. Whether permission taken or will be taken for the appropriate authority for the purpose.	Traffic study details given in Chapter 4
xx.	Intersection points of the haulage roads with the main SH/NH/ public road and the traffic density study at appropriate locations by domain expert with remedial measures for decongestion and road safety.	Traffic study details given in Chapter 4

xxi.	Any bridge (road / rail) existing and the distance of it from the lease boundary.	Yes existing Mandara road bridge at a distance of 1.82 km in W direction
xxii.	Any culvert or small bridge will be used by the plying vehicles carrying the sand minerals.	Yes Mahulpal small bridge at a distance of 1.14 km NE
xxiii.	Any High Transmission Electric line existing and if yes, the distance of the same from the boundary of the lease.	No
xxiv.	The issues raised during the public hearing and commitment of the project proponent to address the same shall be complied and submitted in a time bound action plan. The action plan shall, inter alia, contain the year wise activities with corresponding financial allocations.	Will be Complied after completion of Public Hearing.

CHAPTER –II

DESCRIPTION OF THE PROJECT

CHAPTER –II

DESCRIPTION OF THE PROJECT

INDEX

2.0 GENERAL

The Environmental Impact Assessment report has been prepared in terms of EIA notification of the MoEF& CC dated 14-9-2006, amended till date and the EIA Guideline Manual for Mining of Minerals (Feb, 2010) of MoEF, Govt. of India, for seeking environmental clearance for mining in the existing area of ordinary Sand mining lease measuring 9.967Ha. Falling under category "B1".

Name of the lessee- Proponent Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha.

2.1 DESCRIPTION OF THE PROJECT

The proposed project is an opencast semi-mechanized mining project, where mining of Sand will be done from the bed of River Brahmani.

2.2 NEED FOR THE PROJECT

The project lies on the bed of BrahmaniRiver. Due to rapid infrastructure development in India, the demand of construction material has increased. To supply this demand, mining of sand is done. This project operation will provide employment directly and indirectly to the people residing in vicinity, thus improving the Socio-economic status of the area.

2.3 LOCATION DETAILS

The Project is proposed by Proponent Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha, having an area of 9.967 Ha.

Name of the Project –Sand Mining Project:KanapalaSamilMahulpal Sand Quarry.

Production-25000 Cum/Year

Area: 9.967 Hectares or 24.63 Acres

The project is proposed for excavation of sand from the bed of river Brahmaniat Khata No.452, Plot No. 4265, 4266 & 4267 Village- KanapalaSamilMahulpal, Tahasil-Bhuban, District-Dhenkanal, State-Odisha.

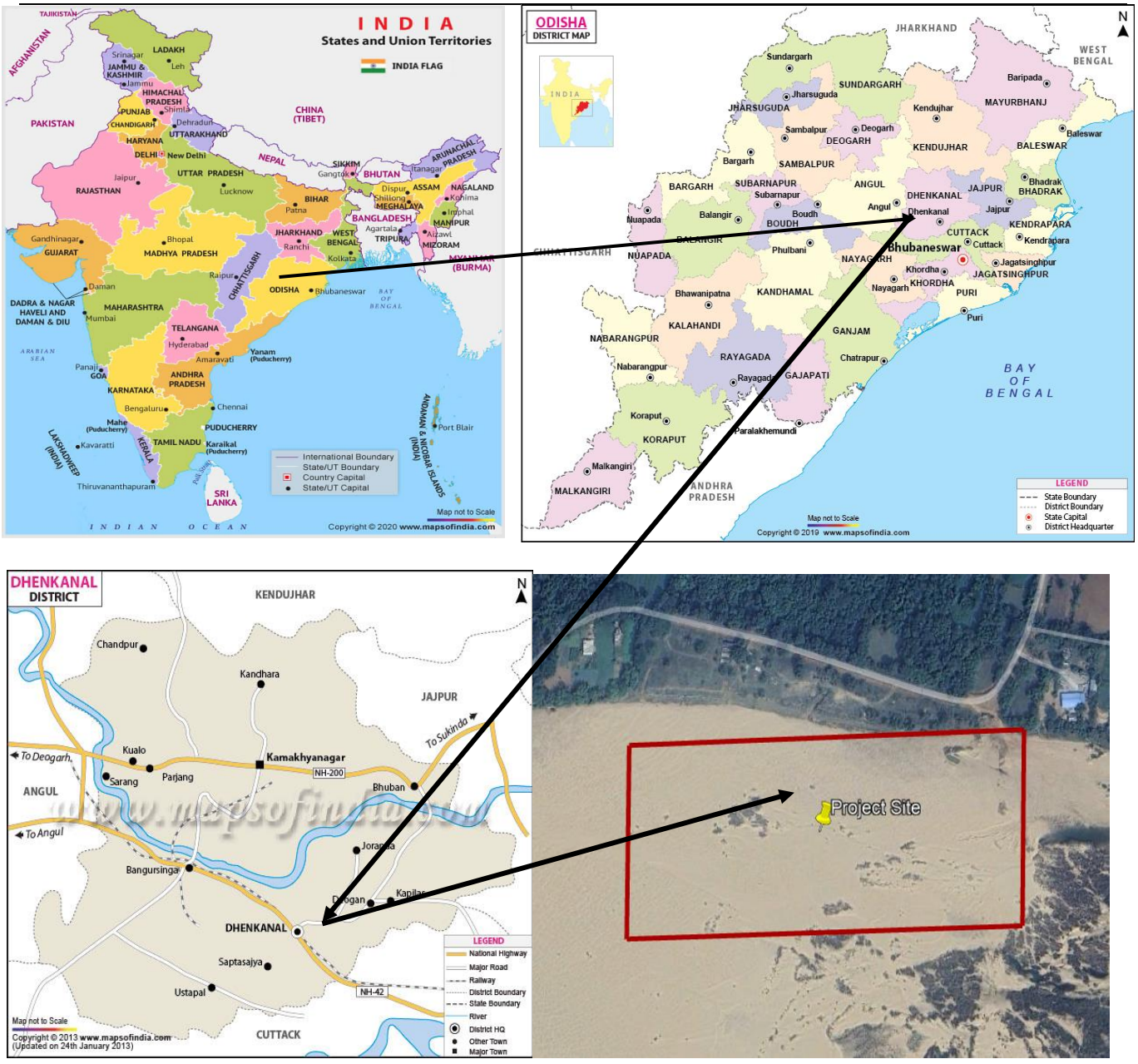


Figure-2.1 Location of the Project

Table 2.1: Salient Features of Project

On-line proposal No.	SIA/OR/MIN/62730/2021
Name of Proponent	ShriRatikant Rout
Full correspondence address of proponent	Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha.

Name of Project	Sand Mining Project KanapalaSamilMahulpal Sand Quarry on Brahmani River	
Name of River	Brahmani River	
Name of Village	KanapalaSamilMahulpal	
Name of Tehsil/Anchal	Bhuban	
District	Dhenkanal	
Name of Minor Mineral	Sand	
Sanctioned Lease Area (in Ha.)	9.967 ha/24.63 Acres	
Category of the project	"B1"	
Total Geological Reserves	398710Cum.	
Total Mineable Reserves	357840 Cum.	
Proposed Production/year	25000 Cum. Per Annum	
Sanctioned Period of Mine lease	5 years	
Method of Mining	Open Cast Manual Method	
No. of working days	250 days	
Working hours/day	8hrs	
No. of workers	42	
Type of Land	Government land	
Water Requirement	**Purpose**	**Requirement (KLD)**
	Drinking & Domestic	0.84
	Dust Suppression	12.0
	Green Belt Development	1.0
	Total	**13.84**
Any litigation pending against the project or land in any court	No	
Proposed Project cost (INR)	Thetotalcost ofproject wouldbe aroundRs.60, 00,000/- (60 lakh).	
Proposed EMP budget (INR)	RecurringCost- Rs.2,00,000/- CapitalCost –Rs.2,00,000/-	
Proposed CER (2% of Project Cost)(INR)	Rs. 1,20,000/-	
Length and breadth of Haul Road	Length:1000m,width:6 m	
No. of Trees to be Planted	500plants	

2.4 LEASE HOLD AREA

Location of the Project-Khata No.452, Plot No. 4265, 4266 & 4267 Village-KanapalaSamilMahulpal, Tahasil-Bhuban, District-Dhenkanal, State-Odisha.

Table 2.2 Project Coordinate

S. No	SandQuarry	Area(Ha)	Latitude	Longitude

1.	KanapalaSamilMahulpal Sand Quarry	9.967	20°51'18.78"N to 20°51'26.18"N	85°52'36.16"E to 85°52'52.63"E

Table 2.3 -Area Details

S. No.	Landuse	Riverbed (Ha)	ForestLand (Ha)	Barrenland (Ha)	GrazingLand (Ha)
1	MiningpitsQuarry	-	-	-	-
2	ApproachRoad	-	-		-
3	Dumps	-	-	-	-
4	Office,ReshtShelteretc.	-	-	-	-
5	Balanceundisturbed land	9.967	-	-	-
	Total	**9.967**	-	-	-

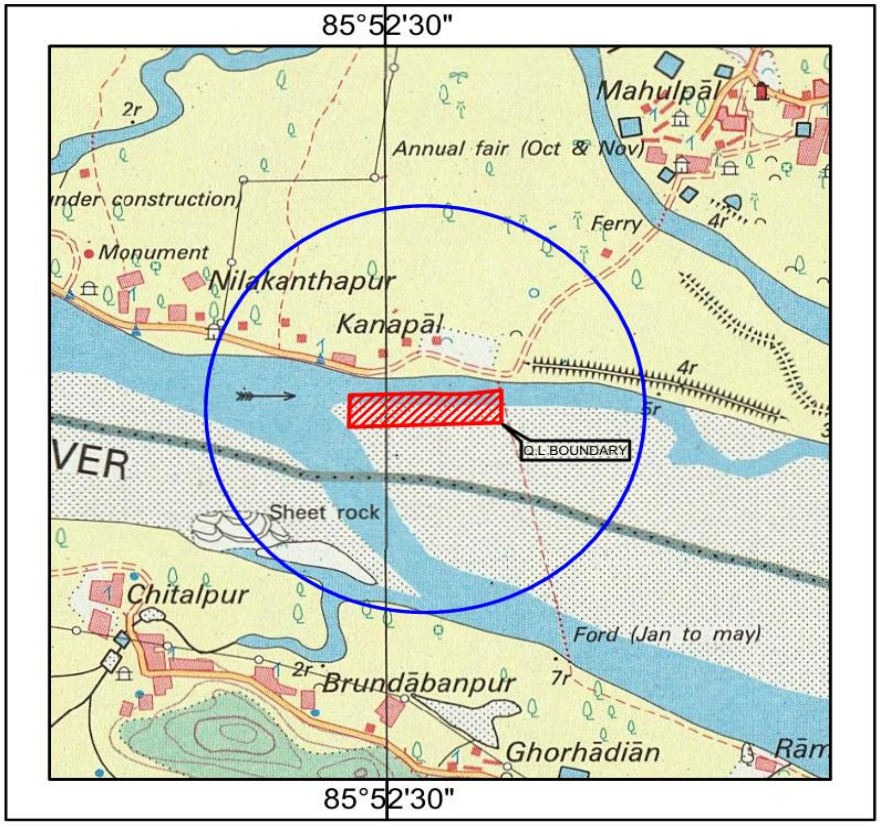


Figure-2.2(a) Location Map on Toposheet

Figure-2.2(b) Project Mine Lease Area on Google earth

The area under reference featured in the survey of India toposheet No. F45T13 and the area bounded between the latitudes 20°51'18.78"N to 20°51'26.18"Nand longitudes of 85°52'36.16"E to85°52'52.63"E. Geologically, the lease area belongs to quaternary deposits from Holocene period which located in the Brahmani River Bed at KanapalaSamilMahulpal, under BhubanTahasil of Dhenkanal district of Odisha. The Quaternaries overlie directly on the Tertiaries and are composed of younger and Older Alluvia. The sediments of older Alluvia are grayish to brownish in colour, unfossilferous, but contain calcareous concretions. Thin younger alluvial deposits of recent age are found in the flood plains and by the side of the river. They also consist of sand, silt, clay and gravel.

2.5 RAINFALL & CLIMATE

The southwest monsoon is the principal source of rainfall in the district.Theaverage annual rainfall is 1472.0 mm and the block wise average rainfall varies from888.0 to 1282.0 mm. About 80% of the rainfall is received during the period fromJune to August. Water scarcity is prevalent during the summer season, which quiteoften leads to mild drought in the area. The rainfall is more or less evenly distributedover the district.The climate of the district is tropical with hot and dry summer and pleasantwinter. The summer season extends from March to middle of June followed by therainy season from June to September and the winter from November to February.Humidity is high and varies from 26% in summer to 82% in rainy season. Thetemperature ranges from 6.7°C in winter to 46°C in the summer. The mean monthlypotential evapotranspiration value ranges from 40 mm in

December to 326 mm inMay, the wind velocity in general is low to moderate with slight increase in speed insummer as well as in the rainy season. The mean annual wind speed is 6.80km/hour.

Figure 2.3 Drainage Map

2.6 GEOLOGY

Physiography

The Sand bed is on the River Brahmani. The Brahmani is formed by the confluence of the Sankh and South Koel rivers, and flows through the districts of Sundargarh, Deogarh, Angul, Dhenkanal, Cuttack, Jaipur&Kendrapara. It is the second largest river in Odisha. Two major rivers, the Sankh and the Koel, originate from the Chhotanagpur Plateau and join at Vedavyasa near Rourkela in Sundargarh district of Odisha to form a major river called the Brahmani. It flows through Sundargarh, Keonjhar, Dhenkanal, Cuttack and Jajpur districts in the Coastal Plains and enters into the Bay of

Bengal at Dhamra. The Brahmani is 799 km long. There are 45 major tributaries of the Brahmani, of which the important ones are Sankha, Chandrinalla, Katangamundanalla, Rukura, Badjore, Kaunishnalla, Kalanalla, Usthalinalla, Chudakhainallah, Gohira, Chilanti river, Tikira, Singadajore, Bangaru river, Nandiranalla, Nigra river, Bangusinghanalla, Barha, Daunri, Kumaria, Kelua river, Birupa, Hansua, Kharsuan, Patasala in right side and Koel, Suidihi, Champalijore, Kuradihi, Amrudi, Korapani, Mankada, Ambahari, Samakoi, Gambhiria, Raijore, Indrajeet, Ramiala, Pandra, Kharasuan, Daudi in the left side.

Regional Geology

Geologically, the Lease area belongs to Quaternary deposit from Holocene period which located in the Brahmani River bed in KanapalaSamilMahulpal of Tahasil- Bhuban, District- Dhenkanal. The quaternaries overlie directly on the Tertiaries and are composed of younger and older alluvia. The sediments of older alluvia are grayish to brownish in colour, unfossilferous, but contain calcareous concretions. Thin younger alluvial deposits of recent age are found in the flood plains and by the side of the river. They also consist of sand, silt, clay and gravel.

Local Geology of the area

The sand deposit in Brahmani River near KanapalaSamilMahulpal belongs to recent deposits of Holocene age. Beach sand, younger and older alluvium also belongs to the same age. The auction area is occupied by a gently sloping to almost flat deposits of sand. The basement consists of Tertiary deposits and the sequence of litho-units encountered in the Lease area is as follows:

Sand

Alluvium

Lithology:

The characteristic features of the litho units of the area are described below:

Sand: Grey to white sand deposits is mainly covered with 1.75 m to 2.25 m thickness throughout the area. Sand by definition is a loose, incoherent mass of mineral materials and is a product of natural processes. These processes are the disintegration of rocks and corals under the influence of weathering and abrasion. When sand is freshly formed the particles are usually angular and sharply pointed but they grow gradually smaller and more rounded as they become constantly worn down by the wind or water. Clean sand is indeed a rare commodity on land, but common in sand dunes and beaches.

The composition of sand is highly variable, depending on the local rock sources and conditions, but the most common constituent of sand in inland continental settings and non-tropical coastal settings is silica(silicon dioxide or SiO2), usually in the form of quartz which because of its chemical inertness and considerable hardness, is the most common mineral resistant to weathering.

Alluvium: Alluvial deposits sometimes underlain by the sand bed with some clayey matter.

2.7 RESERVE ESTIMATION

The reserve has been estimated by considering the following parameters.

i. Surface area method has been adopted for estimation of reserve of sand in Cu.m.

ii. The reserve has been calculated under proved category only

iii. Recovery factor is established as per the actual field practice as follows.

Parameters	**Quantity**
Recovery Factor: -	100%

iv. Out of total volume 100% of sand is assumed to be replenished in the absence of monitored database within the quarry lease area for the lease period of five years. Based on the above consideration & chosen local parameter, the reserve has been calculated for sand as per the present scenario. Depending upon the pattern of deposit, position and quantity of the river sand at present, it is impossible to estimate for the ensuing period. Inorder to overcome this, total area has been considered as potential zone for sand deposition of sand after excluding the area under water cover (if located any within the lease area, ref PLATE-IV). The geological reserve has been calculated by surface area method by multiplying total effective area multiplied with average thickness of sand in lease area to attain the volume and there by multiplying recovery factor to attain the geological reserves. The thickness of the sand varies from 1.75 m to 2.25 mtr and the average thickness will be 2 m. Total geological reserve has been calculated by doubling the above calculated reserve.

v. The resource of river sand has been categorized as probable reserve.

vi. It is assumed that the mineable reserve has been estimated in same manner as geological reserve after allowing for loss due to mining, and safety of mine working including 7.5m safety zone all along the boundary and 10m barrieraround the water channel area. Thus, the mineable reserve for Sand bed works out to 178920cu.m/annum. This quantity is existing quantity and the same quantity will be replenished during subsequent flood/rainy season.

Besides this 60%of the calculated mineable reserve has been taken as extractable mineable reserve during plan period of the area as per the MoEF Notification dated 25.07.2018.

The total area is 9.967 ha out of which the effective surface after excluding safety zone area and the area covered under water, the surface area considered for mineable reserve is 8.00ha. The geological reserve & mineable reserve of sand quarry calculated under various categories are given in table no. 1 & 2 respectively as follows:

Table 2.4 (a) Geological Reserve of Sand Bed (Existing at Present)

Category	Surface area in Sq.mt	Thickness of sand in mtr	Volume of ore in Cu.m	Recovery Factor (100%)	Reserve in Cu.m
Proved	99676	2	199352	2	398710
Total					**398710**

Table 2.4(b) Category wise Mineable Reserve of Sand Bed

Category	Potential Surface area excluding safety zone in Sq.mt	Thickness of sand in mtr	Replenishment Factor (100%)	Mineable reserve of sand in Cu.m	Extractable mineable reserve
A	**B**	**C**	**D**	**E= BXCXD**	**F= EX0.6**
Probable	89460	2	1	357840	214704
Total					**214704**

2.8 PROPOSED METHOD OF MINING

Whether manual or semi-mechanized or mechanized: The mining will be done by manual method. Most of the methodologies and guidelines undertaken for hard rock quarries are not applicable to river bed mining. However, the major differences include higher incidence of land use changes and relatively shallow depths of workings, which cause more environmental imbalances for riverbed mining. The most applicable practices of sand/gravel mining are given below:

Dry pit mining: Pits excavated on dry ephemeral stream beds and exposedchannel/ point bars, with conventional bulldozers, scrapers and loaders.

Wet pit mining: This involves the use of a dragline or hydraulic excavator to remove sand or gravel from below the water table or in a perennial stream channel generally during lease period. In wet pits dewatering or partial dewatering is frequently undertaken to allow the site to

be more easily excavated. The decision to dewater or not will depend on the deposit thickness, permeability of the sand and gravel, the use of ground water aquifer and the intended after-use and restoration requirements.

Bar skimming or scraping: Scraping of top portion of the bar deposits aregenerally undertaken for sustainable mining of sand/gravel grade material.

Pits on the adjacent floodplain or river terrace: In this case dry or wetpitting/ mining are involved depending upon geomorphology of the areas. Dry pits are located above the water table and wet pits are developed below the groundwater table, depending on the elevation of the floodplain or terrace relative to baseflow water elevation of the channel.

Existing Mining Method:

The mode of the deposits, geomorphology of the area and its hydrological condition are some of the factors that favours the open cast method of mining. In this deposit, the mining is done by manual dry-pit mining method The sands are extracted, loaded and transferred from pits to the users through trucks. The mining is done on single shift basis. The local man power has been engaged in the mine.

No machineries shall be used as it is a river bed mining project except tippers/tractors for the haulage/transportation of sand from the lease area to the consumer.

The number, type and capacity of machines to be used are described in the table below;

Type of Machines	Capacity	No. of Machines
Tipper/Tractor	6 Cu.m/2.5 Cu.m	2 tippers/6 tractors
Safety equipment such as helmets, safety shoes, googles& hand gloves	--	As required

1. Abandoned stream channels on terrace and inactive floodplains has been preferred rather than active channels and their deltas and floodplains. Replenishment of ground water has to be ensured if excessive pumping out of water is required during mining.
2. Stream will not be diverted to form inactive channel.
3. Mining below subterranean water level will be avoided as a safeguard against environmental contamination and over exploitation of resources,
4. Scraping of sediment bars above the water flow level in the lean period have been preferred for sustainable mining,

5. Mining of sand from the riverbed has been restricted to a maximum depth of 3m from the surface. For surface mining operations beyond this depth of 3m, it is imperative to adopt quarrying in a systematic bench like disposition, which is generally not feasible in riverbed mining.

   Hence, for safety and sustainability restriction of mining of riverbed material to maximum depth of 3m. has been recommended

6. Quarry Floor Level (RL) at the end of the year or period of the concession:

   During plan period one pit will be developed. The average production for these years will be around 25000 cu.m. The quarry floor will be 27 mRL. The proposed pit lay out have been shown in the development plan and also in environment management plan (ref Plate V & Plate - VI).

7. Quantity of mineral to be won (Annual Level of Production):

   Based on the present market demand, the year wise production schedule for ensuring five years has been formulated at a steady and uniform rate of 25000cu.m/annum for sand. As the sand sized particles will be produced the production has been calculated and represented in cubic meter irrespective of the tonnage factor, to facilitate to get the correct quantity of sand. Based on the past experience, the geo-mining parameters taken into consideration for mine planning are as follows:

Geo- Mining Parameters	Quantitative description
Sand Recovery Factor	100%
Bench Height	Benching pattern is not feasible in case of sand mining. The maximum depth of mining is 2m
Sand to Waste/rejects	Nil

On the basis of the above data, year wise production of sand is estimated as per the following formula: M = CLI

Where,

M = Quantity of sand in cu.m

C = Surface area in square meters

L = Length of influence in meters

I = Recovery factor of sand deposits

The year wise production of sand during plan period are given in table no, as follows:

Table 2.5Year Wise Production of sand during plan period

Year	Production of sand in cu.m/annum
1ST	25000

2ND	25000
3RD	25000
4TH	25000
5TH	25000
Total	**1,25,000**

The average production/excavation sand is 25000 cu.m/annum. If the reserve of sand is not sufficient and to meet the production quantity, the lessee may modify the plan within the lease period after seeking permission from the competent authority just after the monsoon of substantial year.

Mine drainage

(Give details of total make of water during dry and rainy season and its method of handling) The surface run-off and drainage of the river will not be disturbed. Shallow depth excavation towards the river has been proposed which will have negligible or no impact on the mining process. Abandoned stream channels on terrace and inactive flood plains has been preferred rather than active channels and their deltas and floodplains. Replenishment of ground water has to be ensured if excessive pumping out of water is required during mining. Stream will not be diverted to form inactive channel. Mining below subterranean water level will be avoided as a safeguard against environmental contamination and over exploitation of resources, Segments of braided river system has been used preferably falling within the lateral migration area of the river regime that enhances the feasibility of sediment replenishment. Mining at the concave side of the river channel have been avoided to prevent bank erosion.

It is observed from the dug well in the adjacent plain area and in village, the ground water level varies between 3m to 8m from the surface level depending upon seasonal variations. During dry season the water table falls to 10m from the surface whereas during the rainy season the water table remains at 4m from the surface. As the mining activities presently proposed are maximum upto 2m so there will be no effect on ground water table.

Hydrogeology:

The geological set-up of the area, to a large extent, governs the occurrence as well as the movement of groundwater in the district. The major part of the district is underlain by hard crystalline rocks and is devoid of any primary porosity and hence when weathered and fractured, secondary porosity is developed. The semi-consolidated Gondwana sandstone forms moderately good aquifer, when weathered and fractured. The recent alluvium, which occurs in limited patches, sustains very good yield. Since major part of the district is underlain by hard rocks of diverse lithological compositions

and structures, the water-bearing properties of the formations vary widely (Fig –5). Hydrogeological surveys reveal the lithological characteristics and the role of the tectonic deformation thus resulting deep-seated intersecting fractures, on the occurrence and distribution of groundwater reservoirs and their water-bearing as well as water-yielding properties. The lineaments formed due to tensile deformations have been picked up from the Remote Sensing Studies. Groundwater occurs under water table condition in recent alluvium as well as in the semi-consolidated formations whereas in the deeper fractured rocks, the groundwater occurs under semi-confined to confined condition. Depending on the different aquifer systems and their parameters in different lithounits, the major hydrogeological units in the state can be divided into three categories: i) Consolidated formations, ii) Semi-consolidated formations and iii) Un-consolidated formations.

2.9 DRILLING AND BLASTING

No drilling and blasting shall be required to for the exploitation of river sand. Explosives are not used. No safety measures are to be taken as there will no blasting operations.

2.10 CONCEPTUAL MINING PLAN

During plan period the mined-out land will be 8.00 Ha. The safety zone all along the quarry lease area will be maintained as 7.5-meter width and which will cover 1.022 Ha. The area will reclaimed naturally every year during rainy season. The river will carry sand and sediments which will be eventually filled in the pits. No further reclamation proposal is required.

The existing land use as well as proposed land use of the area is given in table as below

Table 2.6 Land use cover of the project study area

S. No.	Type of Land Use	Area in Hectares	
		At present (Existing)	**At the end of Plan Period**
1	Area Under Excavation	--	8.000
2	Safety Zone	1.022	1.022
3	Unutilized area	8.945	0.965
	Total	**9.967**	**9.967**

2.10.1Waste Management

There will be no proposed dump during the plan period so no reclamation and rehabilitation measures have been suggested. There will be no generation of top soil in this quarry since the mining will be carried out in river bed sand.

2.10.2 Reclamation/Rehabilitation:

Every year in monsoon season, the extracted sand area will be replenishednaturally. No other Reclamation/Rehabilitation is proposed.

2.10.3 Mineral Processing

(Give details of processing including sizing, Sorting, generation of rejects/fines etc) Mineral processing in case of Riverbed mining of the sandy, gravelly material may consist of simple washing to remove clay and silty area. It may involve crushing, grinding and separation of valueless rock fragments from the desirable material. The KanapalaSamilMahulpal sand bed also do not contain valuable heavy minerals or any trace elements for which any separation of such mineral is required. The sand excavated from the KanapalaSamilMahulpal sand bed would not require such processing. The sand will be supplied directly to the user as per the demand of construction materials.

2.11 UTILITIES

2.11.1 Power

There is no power requirement proposed for the project.

2.11.2 Water Supply

In the river bed mining projects, there is as such no need of water to carry out operations, except for dust suppression& drinking. The number of working people is **42**& the total water requirement will be around **13.84 KLD.** This water will be supplied from the nearby area.

Table 2.7Water Demand

S. No.	Purpose	Manpower/Area	Water Demand KLD	Source
1.	Drinking & Domestic	Manpower(42) (42*20=840L/D)	0.84	Nearby Village
2.	Green Belt Development	500trees*2L=1000L/D	1.0	Private Tanker
3.	Dust Suppression	HaulRoad=1000m length, *6mwidth=6000m^2*2L= 12000 L/D	12.0	Private Tanker
Total			**13.84**	

2.11.3 Infrastructure:

The site services like a temporary rest room shelter, first aid box, and drinking water facility will be provided to workers at the mine site.

2.11.4 Manpower requirement

The manpower requirement for the proposed project is tabulated below. This manpower is the permanent resource which excludes personnel's coming along with trucks / Tractors.

Management (Supervising personnel):

Designation	Qualification	Nos.
Supervisor	As per DGMS norms	1
Total		**1**

Non- Supervisory (Skilled, Semi-skilled & Un-skilled): Around 42 numbers of non-supervisory personel's will be employed. The details are given as follows:

Table 2.8 Employment Details

S. No.	Category	Post	Numbers
1.	Skilled	Loading supervisor	2
2.	Semi-skilled	Assistant Loading Supervisor	2
3.	Un-skilled	Labourers	38
Total			**42**

OMS

Total Production during plan period: 125000 cum

Average production of sand/annum: 25000 cum

Working days in the year: 210 days (in an average)

Production per day: 25000/210 = 119.04 or say 119 Cu.m

Output per man shift (O.M.S): O.M.S can be calculated by production per day divided by manpower.

O.M.S =119 Cu.m/42 No. = 2.83 cum

2.11.5Machinery

The proposed project being semi mechanized in nature, other than vehicles, few types of machinery shall be engaged for mining activities like excavating, loading, etc. The equipment's are enlisted in the table below:

2.11.6 Use of Mineral

The Sand will be used for making buildings, bridges, infrastructure etc. Sand is an essential minor mineral used extensively across the country for construction.

For domestic use: for construction purpose the sand of KanapalaSamilMahulpal will be used. Around 2975 cu.m of sand on monthly basis will be sold in domestic market.

For export: No material will be exported at present.

CHAPTER-III

DESCRIPTION OF THE ENVIRONMENT

CHAPTER-III

DESCRIPTION OF THE ENVIRONMENT

INDEX

3.0 INTRODUCTION

Information on the existing environmental status is essential for assessing the likely environmental impacts of the project. In order to get an idea about the existing state of the environment, various environmental attributes such as meteorology, air quality, water quality, soil quality, noise level, ecology and socio-economic environment have been studied/ monitored. This section contains the description of baseline studies of the 10 km radius of the area Sand mining Project on Brahmani River located at, Village Kanapala Samil Mahulpal, Tahasil-Bhuban, District-Dhenkanal, State-Odisha; Production-25000 cum/Year. The data collected has been used to understand the existing environment scenario around the proposed mining project against which the potential impacts of the project can be assessed.

3.1 BASELINE DATA

Baseline environmental data generation for air, water, noise and soil quality monitoring has been conducted at project site and other locations from March 2025 to May 2025.

3.2 LAND ENVIRONMENT

To assess the land use pattern of the study area i.e. 10 km radius of the site, a detailed study was carried out and using the Survey of India Toposheet a land use map has been prepared as shown in the figure below. The land use pattern reveals that the 10 km environs is predominantly agricultural land.

Also the land use cover of the study area is tabulated below wherein it shows that the project area is completely river bed which is completely an undisturbed land where presently no mining activity is being carried out.

Table 3.1 Land use cover of the project area

S. No.	Land use	River bed (Ha)	Forest Land (Ha)	Barren land (Ha)	Grazing Land (Ha)
1	Mining pits Quarry	-	-	-	-
2	Approach Road	-	-		-
3	Dumps	-	-	-	-
4	Office, Resht Shelter etc.	-	-	-	-
5	Balance undisturbed land	9.967	-	-	-
Total		**9.967**	**-**	**-**	**-**

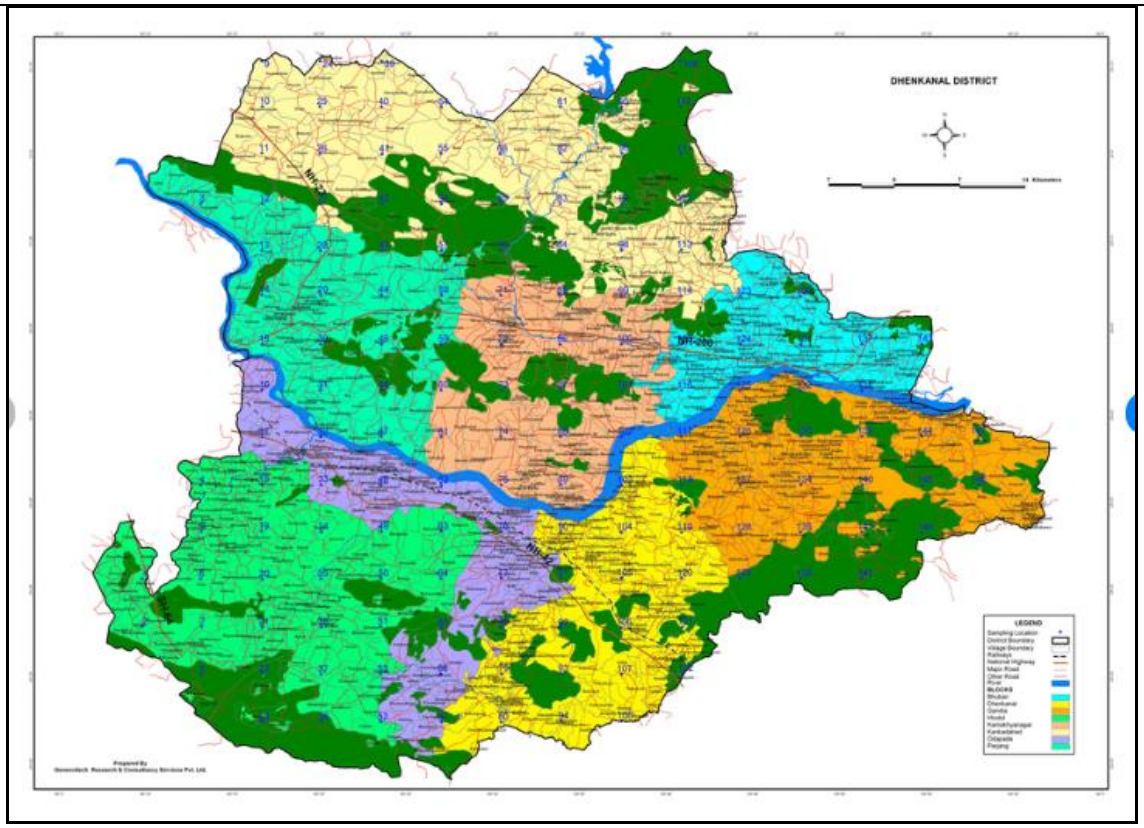


Figure 3.1 Land Use Map of Dhenkanal District

Land Use Pattern of Dhenkanal District

Geographical Area	Area under Forest (Ha.)	Net Sown Area (Ha.)	Cropped Area (Ha.)	Area Irrigated (Ha.)	Percentage of net area irrigated to total area sown
430477	174000	168536	183841	93287	50.74

(Source: Chief District Agriculture Officer Dhenkanal)

3.2.1 Seismic Considerations

Based on the inputs obtained from Indian Meteorological Department (IMD) and other agencies, Bureau of Indian Standards [IS-1893 – part – 1: 2002], have classified the whole country into four seismic zones namely Zone II, III, IV and V. Of these, zone V is rated as the most seismically active region, while zone II is the least. The Modified Mercalli (MM) intensity, which measures the impact of the earthquakes on the surface of the earth, broadly associated with various zones is as follows:

Seismic Zone	Intensity on MM scale
II (Low Intensity Zone)	VI (or less)
III (Moderated Intensity Zone)	VII
IV (Severe Intensity Zone)	VIII
V (Very Severe Intensity Zone)	IX (and above)

According to the Seismic-zoning Map of India [IS 1893: 2002], the state of Odisha lies in Zones II and III. The study region falls in Zone III of the seismic zoning map of India. The Seismic Zoning Map is shown in **Figure 4.4**.

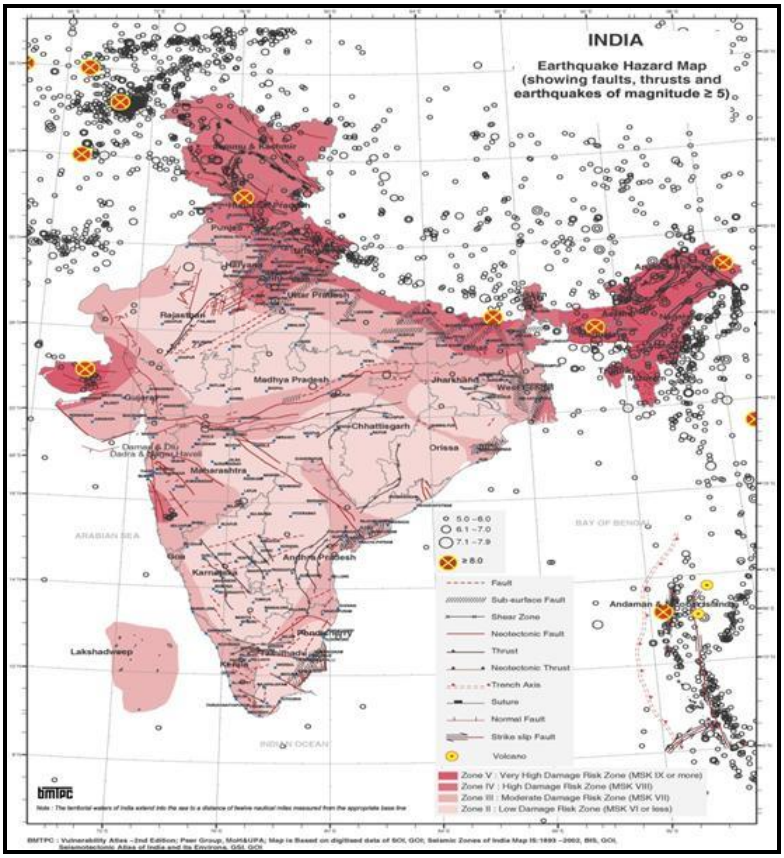


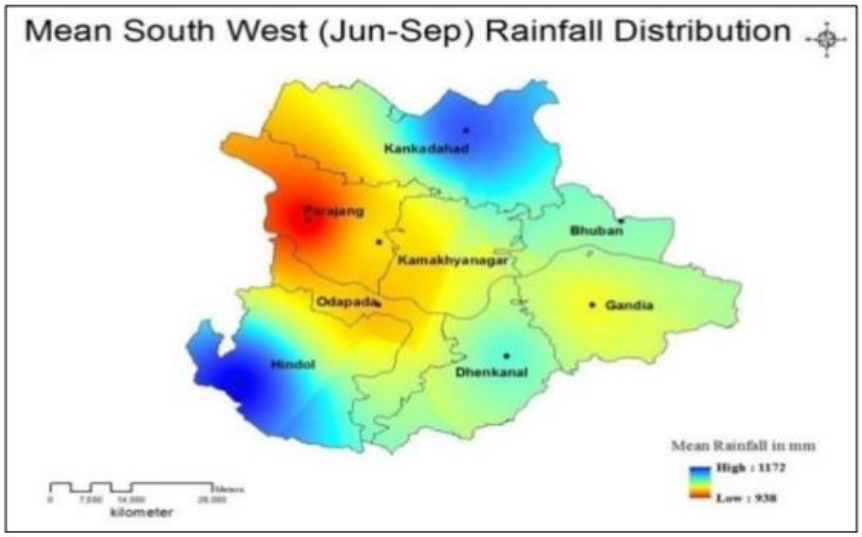
Figure 3.2 Seismic Zonation Map

3.2.2 Climate and Meteorology

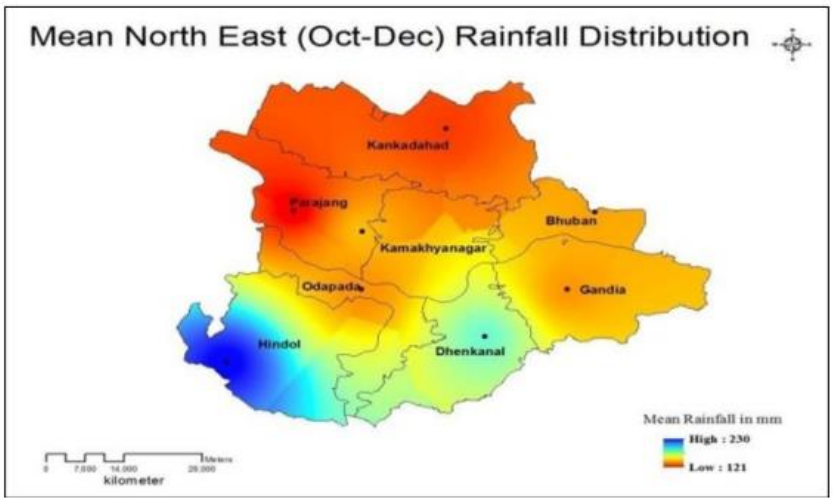
Dhenkanal district in Odisha has a tropical wet-dry or savanna climate. The district experiences hot and humid weather during the summer months (April and May) and cooler temperatures during the

winter months (December and January). April and May are the hottest months, with average high temperatures reaching 38°C. December and January are the coolest months, with average low temperatures around 16°C.

The monsoon season arrives in June, bringing an average annual rainfall of 1421.1 mm. The monsoon season (June to September) accounts for the majority of the rainfall. The district experiences a moderate climate overall, with variations throughout the year. The higher elevations of the district offer some relief from the summer heat, especially in the central part of the district.



Mean South West Rainfall Distribution of Dhenkanal *(Source: Chemical Journal)*



Mean North East Rainfall Distribution of Dhenkanal *(Source: Chemical Journal)*

3.2.3 Agro-Climatic Zones

According to the Agro Climatic Zone of Odisha the Dhenkanal district comes under the Mid Central Table Land Category as shown in Figure 3.3 Rice is a major crop across all zones, but the specific characteristics of each zone influence the suitability of different crops and agricultural practices. The zone experiences hot and dry sub humid climate. Broad soil groups of the region are red, lateritic, mixed red and black. Hill plateau are major land features of the region. Land type varies from unbunded upland to shallow lowland. Brahmani and Baitarani are the two river basins that enriches the agriculture of the zone. Rice the major food crop grown in two distinct season Rabi and Kharif.

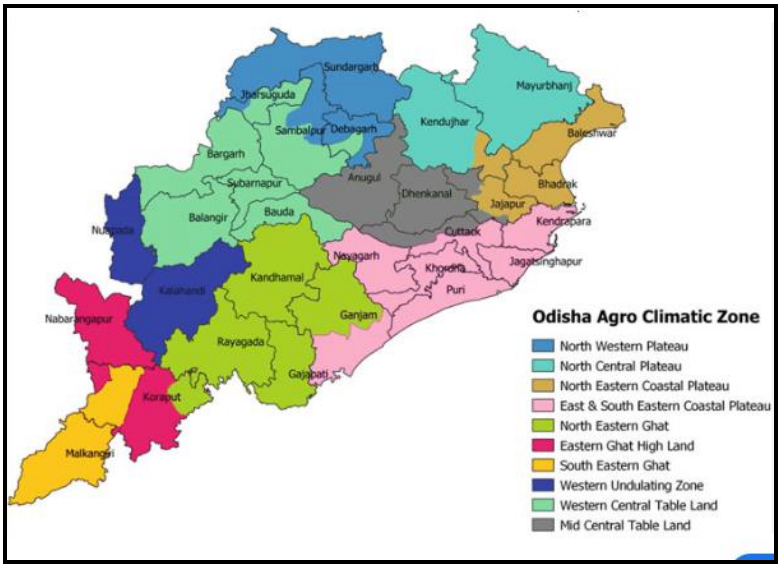


Figure : 3.3 Agro-Climatic Zones of Odisha

3.3 AIR ENVIRONMENT

The prime objective of the baseline study with respect to ambient air quality is to establish the present air quality and its conformity to National Ambient Air Quality Standards. This data has been further used during impact assessment to predict the final air quality. Ambient air quality monitoring stations were selected primarily on the basis of surface influence, demographic influence and meteorological influence. 24 hourly monitoring was carried out for SO_2, NO_2, and PM10 & $PM_{2.5}$ twice a week at each station. This study was done during pre-monsoon season for a period of 3 months (March 2025 to May 2025).

METHODS FOR MONITORING

The Central Pollution Control Board (CPCB) has published comprehensive document on emission testing regulations ("Emission Regulations Part-3, 1985"). Those procedures relevant to the particulate monitoring are summarized below:

Table 3.2 Methods adopted for $PM_{2.5}$, PM_{10}, SO_2 and NO_X (as NO_2)

Parameters	Technique	Technical Protocol	Minimum Detectable Limit
PM2.5	Gravimetric method	US EPA Method	5 ($\mu g/m^3$)
PM 10	Gravimetric method	IS 5182 (Part-XXIII)	5 ($\mu g/m^3$)
Sulphur Dioxide	West and Gaeke	IS-5182 (Part-II)	3 ($\mu g/m^3$)
Nitrogen Oxide	Jacob & Hochheiser	IS-5182 (Part-VI)	7 ($\mu g/m^3$)

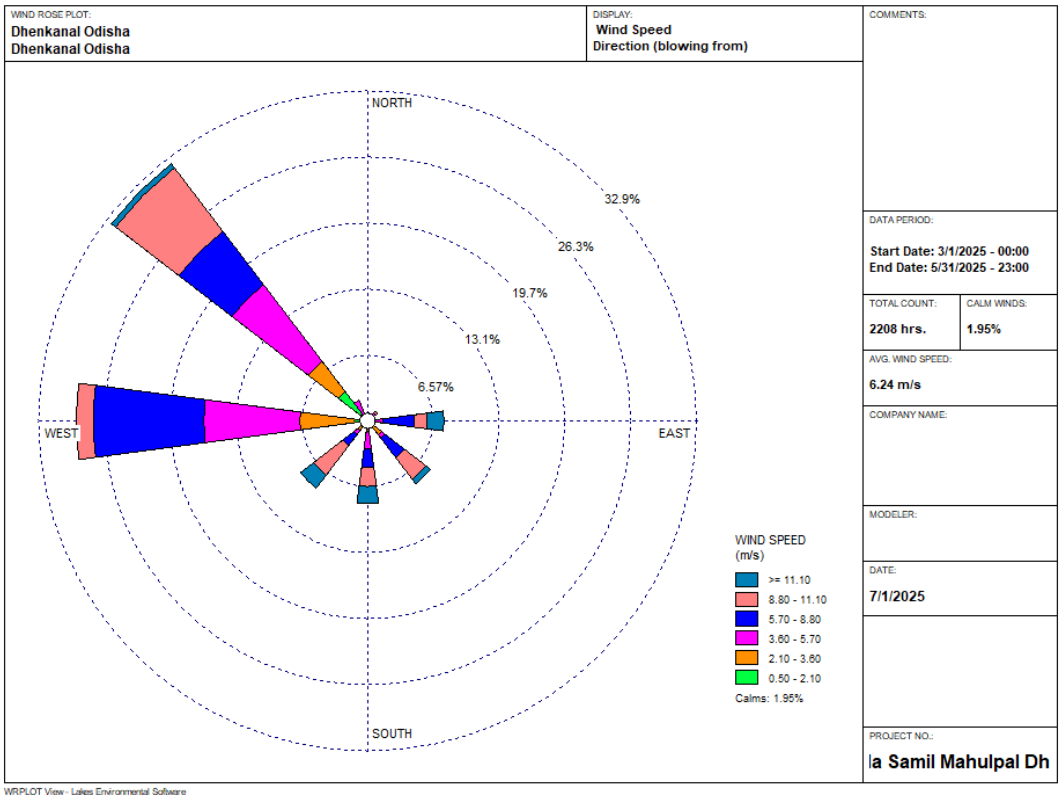


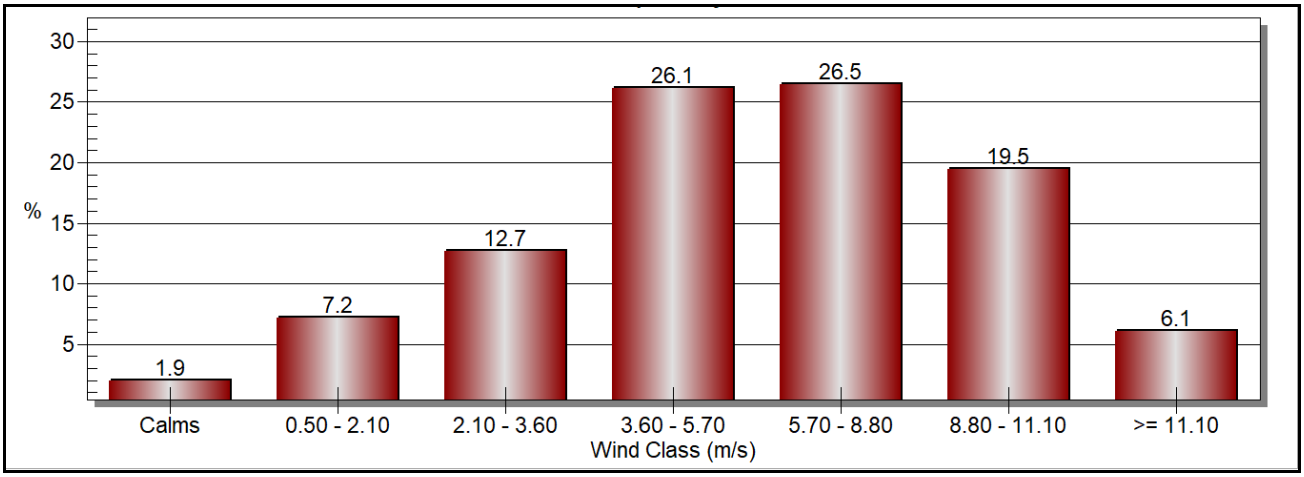
Figure 3.4 – Wind Rose Diagram

Equipment Calibration: For accurate testing of emission sources, the components of the sampling train is calibrated by outsource and supplier (Master Calibrator) standards and solutions are used, calibrated under certified reference material. The Ambient air quality monitoring locations are marked in Map. The ambient air quality data were collected to find the existing GLC.

To quantify the impact of the project on the ambient air quality, it is necessary at first to evaluate the existing ambient air quality of the area. The existing ambient air quality, in terms of Particulate Matter – 10 (PM_{10}), Particulate Matter- 2.5 ($PM_{2.5}$), Sulphur-dioxide (SO_2) and Oxides of Nitrogen (NO_2), has been measured through a planned field monitoring. Table 3.2(i) gives location of the ambient air quality monitoring stations.

Table 3.3 (i) Ambient Air quality monitoring stations

Location Code	Location	Direction	Distance (km)
AAQ1	Project Site (Nilkanthapur)	NW	0.28
AAQ2	Mahulpal Village	NE	1.35
AAQ3	Digamberpur Village	SE	3.60
AAQ4	Solapur village	E	4.29
AAQ5	Kalunigoda Village	SE	6.6
AAQ6	Bhuban	NNW	5.21
AAQ7	Chitalpur Village	W	1.67
AAQ8	Rajagola Village	ENE	4.52



Wind Class Frequency Distribution Bar Graph

The pre-dominant wind direction is NW direction with percentage class of 26.1-26.5% Wind Speed class in the range of 3.60 to 8.80 m/s

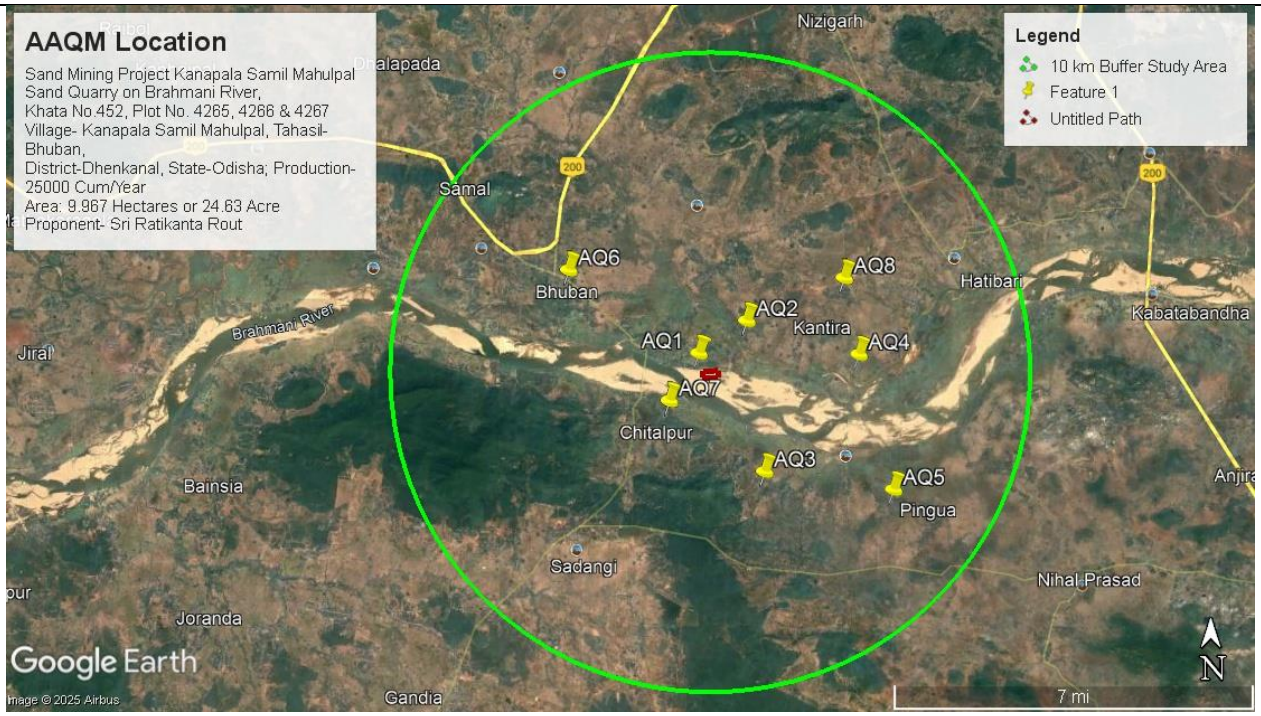


Figure 3.5 (a) Air Quality Monitoring Locations

Table 3.3 (ii): Ambient Air Quality Status

(a) Near Project site within 500m

AAQ1

S.No	Date	PM 10, µg/m3	PM2.5, µg/m3	SO2 µg/m3	NOx, µg/m3
		IS:5182:Pt-23	Gravimetric	IS:5182:Pt-2	IS:5182:Pt-6
1	01.03.2025	85.45	48.65	12.50	16.50
2	04.03.2025	76.90	37.65	9.60	10.45
3	08.03.2025	88.20	47.58	11.52	15.60
4	12.03.2025	72.40	40.12	8.60	9.65
5	16.03.2025	93.20	46.20	12.85	13.58
6	20.03.2025	73.60	39.25	10.50	9.60
7	24.03.2025	86.40	44.95	8.96	12.57
8	28.03.2025	77.30	48.60	12.85	15.95
9	01.04.2025	89.70	39.52	9.80	11.25
10	04.04.2025	79.54	43.85	10.50	9.54
11	08.04.2025	92.60	39.93	9.56	12.65
12	12.04.2025	85.70	42.50	12.85	9.45
13	16.04.2025	78.50	48.65	8.85	13.52
14	20.04.2025	91.40	42.85	11.45	10.02
15	24.04.2025	79.84	39.78	9.31	14.60
16	28.04.2025	87.60	44.84	10.50	9.85
17	01.05.2025	79.96	38.45	8.98	16.54
18	04.05.2025	92.40	46.52	10.50	14.65

19	08.05.2025	87.50	49.50	13.56	9.95
20	12.05.2025	79.93	41.25	11.60	15.45
21	16.05.2025	86.50	38.96	9.90	10.56
22	20.05.2025	73.60	45.63	11.45	13.96
23	24.05.2025	90.50	37.56	12.50	9.45
24	28.05.2025	82.10	48.98	9.50	14.36
	Min	**72.40**	**37.56**	**8.60**	**9.45**
	Max	**93.20**	**49.50**	**13.56**	**16.54**
	Average	**83.78**	**43.41**	**10.76**	**12.49**
	98 Percentile	**92.92**	**49.26**	**13.23**	**16.52**
NAAQS, For 24 hourly		**100**	**60**	**80**	**80**

(b) AAQ2

S.No	Date	Particulate Matter PM10 (µg /m^3)	Particulate Matter PM2.5 (µg /m^3)	Sulphur Dioxide SO_2 (µg /m^3)	Nitrogen Dioxide NO_2 (µg /m^3)
		IS:5182(Part-23)	IS:5182(Part-24)	IS:5182(Part-2)	IS:5182(Part-6)
1	01.03.2025	84.45	43.89	12.55	8.50
2	04.03.2025	72.56	34.95	9.68	10.45
3	08.03.2025	89.62	47.58	11.59	14.52
4	12.03.2025	72.56	41.65	7.19	9.45
5	16.03.2025	85.20	45.20	13.45	10.58
6	20.03.2025	75.20	35.25	10.50	9.60
7	24.03.2025	81.40	46.95	9.95	12.57
8	28.03.2025	76.80	45.90	12.45	14.56
9	01.04.2025	89.06	34.52	9.80	13.25
10	04.04.2025	75.54	44.00	11.55	9.99
11	08.04.2025	86.70	39.93	9.56	12.65
12	12.04.2025	85.65	42.50	12.23	9.45
13	16.04.2025	73.32	48.65	8.85	13.52
14	20.04.2025	84.12	41.85	11.45	10.95
15	24.04.2025	72.84	39.78	9.31	14.60
16	28.04.2025	85.56	44.84	11.50	9.15
17	01.05.2025	68.20	35.45	8.98	14.85
18	04.05.2025	75.90	49.52	10.50	12.58
19	08.05.2025	88.95	47.65	12.12	10.46
20	12.05.2025	68.30	41.25	13.60	14.29
21	16.05.2025	86.50	37.96	9.90	11.52
22	20.05.2025	77.36	45.63	12.45	13.96
23	24.05.2025	88.70	38.56	15.50	9.45
24	28.05.2025	82.10	43.15	9.50	12.36
Minimum		**68.2**	**34.52**	**7.19**	**8.5**

Maximum	**89.62**	**49.52**	**15.5**	**14.85**
Average	**80.27**	**42.36**	**11.01**	**11.80**
98th Percentile	**89.36**	**49.12**	**14.63**	**14.74**
NAAQS, For 24 Hourly Monitoring	**100.0**	**60.0**	**80.0**	**80.0**

(c) AAQ3

S.No	**Date**	**PM 10, µg/m3**	**PM2.5, µg/m3**	**SO2 µg/m3**	**NOx, µg/m3**
		IS:5182:Pt-23	**Gravimetric**	**IS:5182:Pt-2**	**IS:5182:Pt-6**
1	01.03.2025	71.86	42.35	7.10	13.22
2	04.03.2025	83.26	36.50	8.99	9.85
3	08.03.2025	67.80	43.85	6.78	12.21
4	12.03.2025	82.65	39.50	7.15	9.78
5	16.03.2025	65.20	43.90	8.96	13.18
6	20.03.2025	80.22	42.65	10.12	11.29
7	24.03.2025	66.14	39.80	6.51	8.98
8	28.03.2025	87.90	44.85	8.96	13.13
9	01.04.2025	76.65	38.50	6.85	11.60
10	04.04.2025	85.17	43.98	7.45	9.78
11	08.04.2025	65.89	41.04	6.45	12.25
12	12.04.2025	79.56	36.98	8.99	7.98
13	16.04.2025	85.79	44.98	6.98	13.12
14	20.04.2025	78.65	39.56	8.85	9.78
15	24.04.2025	70.18	32.45	6.51	12.56
16	28.04.2025	67.25	43.90	8.87	9.40
17	01.05.2025	84.60	38.45	7.78	14.12
18	04.05.2025	79.65	47.80	6.56	10.10
19	08.05.2025	85.65	36.90	8.52	12.83
20	12.05.2025	78.54	40.25	7.56	8.74
21	16.05.2025	81.49	42.54	6.54	9.25
22	20.05.2025	69.78	39.90	8.45	13.19
23	24.05.2025	76.50	44.12	6.75	11.45
24	28.05.2025	81.45	41.02	8.13	13.26
	Min	**65.20**	**32.45**	**6.45**	**7.98**
	Max	**87.90**	**47.80**	**10.12**	**14.12**
	Average	**77.16**	**41.07**	**7.74**	**13.18**
	98 Percentile	**86.93**	**46.50**	**9.60**	**15.90**
NAAQS, For 24 hourly		**60**	**100**	**80**	**80**

(d) AAQ4

S.No	Date	Particulate Matter PM10 (µg /m^3)	Particulate Matter PM2.5 (µg /m^3)	Sulphur Dioxide SO_2 (µg /m^3)	Nitrogen Dioxide NO_2 (µg /m^3)
		IS:5182(Part-23)	IS:5182(Part-24)	IS:5182(Part-2)	IS:5182(Part-6)
1	01.03.2025	66.79	42.11	5.80	11.43
2	04.03.2025	79.16	36.50	6.94	9.85
3	08.03.2025	65.15	35.70	5.96	12.51
4	12.03.2025	80.10	29.65	7.15	9.78
5	16.03.2025	76.80	40.56	9.85	7.07
6	20.03.2025	60.14	24.65	7.05	11.29
7	24.03.2025	68.78	30.85	9.51	8.09
8	28.03.2025	59.70	36.85	10.64	7.56
9	01.04.2025	76.45	40.28	11.85	11.62
10	04.04.2025	62.14	39.68	7.85	7.56
11	08.04.2025	78.30	57.02	6.55	11.15
12	12.04.2025	65.50	36.98	4.42	6.95
13	16.04.2025	75.60	25.50	6.68	10.56
14	20.04.2025	66.32	35.65	7.13	9.88
15	24.04.2025	74.50	56.64	6.61	12.56
16	28.04.2025	72.36	39.60	5.98	9.40
17	01.05.2025	79.10	50.25	6.55	11.66
18	04.05.2025	69.18	49.70	4.55	10.10
19	08.05.2025	80.14	32.82	6.65	11.44
20	12.05.2025	79.54	59.05	4.78	6.99
21	16.05.2025	78.15	34.65	6.54	9.25
22	20.05.2025	69.45	58.01	5.95	11.58
23	24.05.2025	76.50	35.80	4.65	10.54
24	28.05.2025	43.58	43.56	5.95	8.25
Minimum		**43.58**	**24.65**	**4.42**	**6.95**
Maximum		**80.14**	**59.05**	**11.85**	**12.56**
Average		**70.98**	**40.86**	**6.90**	**9.88**
98th Percentile		**80.12**	**59.13**	**11.29**	**12.54**
NAAQS, For 24 Hourly Monitoring		**100.0**	**60.0**	**80.0**	**80.0**

(e) AAQ5

S.No	Date	Particulate Matter PM10 (µg /m^3)	Particulate Matter PM2.5 (µg /m^3)	Sulphur Dioxide SO_2 (µg /m^3)	Nitrogen Dioxide NO_2 (µg /m^3)
		IS:5182 (Part-23)	CPCB Volume – 1 Gravimetric	IS:5182 (Part-2)	IS:5182 (Part-6)
1	01.03.2025	61.38	51.2	7.3	13.2
2	04.03.2025	63.86	50.7	6.0	14.9
3	08.03.2025	83.62	53.3	7.4	14.9

4	12.03.2025	81.48	50.5	7.8	15.5
5	16.03.2025	75.45	41.8	8.9	17.4
6	20.03.2025	70.42	46.5	6.2	18.8
7	24.03.2025	80.36	43.2	6.8	15.8
8	28.03.2025	73.43	47.3	8.5	16.3
9	01.04.2025	74.70	51.3	5.8	14.8
10	04.04.2025	71.51	44.2	8.4	17.2
11	08.04.2025	78.90	45.5	8.9	17.7
12	12.04.2025	63.64	52.8	8.9	18.9
13	16.04.2025	66.78	44.5	6.8	18.3
14	20.04.2025	72.81	48.5	7.9	16.8
15	24.04.2025	71.92	42.0	5.7	17.2
16	28.04.2025	74.22	43.8	7.6	14.9
17	01.05.2025	73.78	44.5	6.8	15.7
18	04.05.2025	71.50	47.2	8.2	17.5
19	08.05.2025	64.49	56.6	7.6	14.9
20	12.05.2025	81.23	47.5	7.4	16.4
21	16.05.2025	67.45	52.5	7.6	15.8
22	20.05.2025	71.46	47.5	8.2	16.2
23	24.05.2025	70.23	41.8	5.6	16.7
24	28.05.2025	68.54	48.6	5.2	18.4
Minimum		**61.38**	**41.8**	**5.2**	**13.2**
Maximum		**83.62**	**56.6**	**8.9**	**18.9**
Average		**72.22**	**47.64**	**7.31**	**16.43**
98th Percentile		**82.64**	**55.08**	**8.90**	**18.85**
NAAQS, For 24 Hourly Monitoring		**100.0**	**60.0**	**80.0**	**80.0**

(f) AAQ6

S.No	**Date**	**Particulate Matter PM10 (µg /m³)**	**Particulate Matter PM2.5 (µg /m³)**	**Sulphur Dioxide SO_2 (µg /m³)**	**Nitrogen Dioxide NO_2 (µg /m³)**
		IS:5182(Part-23)	**IS:5182(Part-24)**	**IS:5182(Part-2)**	**IS:5182(Part-6)**
1	01.03.2025	84.45	43.89	6.01	8.50
2	04.03.2025	72.56	34.95	9.68	10.45
3	08.03.2025	89.62	47.58	11.59	14.52
4	12.03.2025	72.56	41.65	7.19	9.45
5	16.03.2025	85.20	45.20	13.45	10.58
6	20.03.2025	75.20	35.25	10.50	9.60
7	24.03.2025	81.40	46.95	9.95	12.57
8	28.03.2025	76.80	45.90	12.45	14.56
9	01.04.2025	89.06	34.52	9.80	13.25

10	04.04.2025	75.54	44.00	11.55	9.99
11	08.04.2025	86.70	39.93	9.56	12.65
12	12.04.2025	85.65	42.50	12.23	9.45
13	16.04.2025	73.32	48.65	8.85	13.52
14	20.04.2025	84.12	41.85	11.45	10.95
15	24.04.2025	72.84	39.78	9.31	14.60
16	28.04.2025	85.56	44.84	11.50	9.15
17	01.05.2025	68.20	35.45	8.98	14.85
18	04.05.2025	75.90	49.52	10.50	12.58
19	08.05.2025	88.95	47.65	12.12	10.46
20	12.05.2025	68.30	41.25	13.60	14.29
21	16.05.2025	86.50	37.96	9.90	11.52
22	20.05.2025	77.36	45.63	12.45	13.96
23	24.05.2025	88.70	38.56	14.5	9.45
24	28.05.2025	82.10	43.15	9.50	12.36
Minimum		**68.2**	**34.52**	**6.01**	**8.5**
Maximum		**89.62**	**49.52**	**14.5**	**14.85**
Average		**80.27**	**42.36**	**11.01**	**11.80**
98th Percentile		**89.36**	**49.12**	**14.63**	**14.74**
NAAQS, For 24 Hourly Monitoring		**100.0**	**60.0**	**80.0**	**80.0**

(g) AAQ7

S.No	Date	PM 10, µg/m3	PM2.5, µg/m3	SO2 µg/m3	NOx, µg/m3
		IS:5182:Pt-23	Gravimetric	IS:5182:Pt-2	IS:5182:Pt-6
1	01.03.2025	66.79	26.58	4.50	11.13
2	04.03.2025	79.16	36.50	6.54	9.85
3	08.03.2025	62.15	39.70	4.96	12.21
4	12.03.2025	75.89	29.65	7.15	9.78
5	16.03.2025	69.78	38.56	4.85	7.77
6	20.03.2025	60.14	28.65	7.05	11.29
7	24.03.2025	68.78	30.25	6.51	8.97
8	28.03.2025	55.58	36.21	5.64	7.56
9	01.04.2025	76.45	39.30	6.85	11.60
10	04.04.2025	62.14	26.45	7.15	7.56
11	08.04.2025	78.30	32.50	6.45	11.12
12	12.04.2025	62.50	28.65	4.12	6.90
13	16.04.2025	78.60	38.70	6.98	10.56
14	20.04.2025	66.32	35.65	7.13	9.78
15	24.04.2025	70.50	25.12	6.51	11.80
16	28.04.2025	72.36	39.60	5.98	9.40
17	01.05.2025	79.10	30.25	6.45	11.56
18	04.05.2025	64.18	38.90	4.85	10.10

19	08.05.2025	71.25	32.52	6.65	11.54
20	12.05.2025	78.54	39.90	4.78	6.14
21	16.05.2025	70.15	35.65	6.45	9.25
22	20.05.2025	66.45	39.90	5.45	9.58
23	24.05.2025	76.50	37.80	4.41	10.54
24	28.05.2025	64.58	32.56	5.45	7.25
	Min	**55.58**	**25.12**	**4.12**	**6.14**
	Max	**79.16**	**39.90**	**7.15**	**12.21**
	Average	**69.84**	**34.15**	**5.95**	**9.72**
	98 Percentile	**79.13**	**39.90**	**7.15**	**12.02**
NAAQS, For 24 hourly		**100**	**60**	**80**	**80**

(h) AAQ8

S.No	Date	Particulate Matter PM10 (µg /m^3)	Particulate Matter PM2.5 (µg /m^3)	Sulphur Dioxide SO_2 (µg /m^3)	Nitrogen Dioxide NO_2 (µg /m^3)
		IS:5182 (Part-23)	CPCB Volume – 1 Gravimetric	IS:5182 (Part-2)	IS:5182 (Part-6)
1	01.03.2025	69.36	48.3	7.9	14.9
2	04.03.2025	72.48	45.9	8.4	15.6
3	08.03.2025	60.38	41.4	8.9	5.2
4	12.03.2025	71.65	42.8	8.5	16.3
5	16.03.2025	74.69	41.7	7.2	15.8
6	20.03.2025	75.49	44.6	6.3	12.8
7	24.03.2025	64.68	47.0	5.1	11.8
8	28.03.2025	60.40	42.5	7.9	8.9
9	01.04.2025	58.76	51.9	7.8	14.8
10	04.04.2025	54.58	42.4	8.2	16.7
11	08.04.2025	64.94	46.5	9.6	10.8
12	12.04.2025	59.53	39.9	8.9	11.6
13	16.04.2025	69.56	37.5	5.5	14.6
14	20.04.2025	50.81	50.7	9.5	17.2
15	24.04.2025	52.67	39.7	10.8	8.9
16	28.04.2025	66.28	45.2	6.5	12.4
17	01.05.2025	43.51	39.5	5.6	11.6
18	04.05.2025	57.74	46.5	7.6	12.8
19	08.05.2025	69.46	42.8	5.9	15.7
20	12.05.2025	52.82	48.5	7.0	14.3
21	16.05.2025	56.45	43.5	6.5	13.6
22	20.05.2025	59.43	54.9	7.9	11.9
23	24.05.2025	47.23	41.9	5.2	10.3
24	28.05.2025	57.54	41.8	6.9	9.8
Minimum		**43.51**	**37.5**	**5.1**	**5.2**

Maximum	**75.49**	**54.9**	**10.8**	**17.2**
Average	**61.27**	**44.48**	**7.48**	**12.85**
98th Percentile	**75.12**	**53.52**	**10.25**	**16.97**
NAAQS, For 24 Hourly Monitoring	**100.0**	**60.0**	**80.0**	**80.0**

Observations:

Ambient Air Quality Monitoring (AAQM) has been carried out at eight locations during pre-monsoon season from March 2025 to May 2025. The minimum and maximum level of PM2.5 recorded within the study area was in the range of 25.12 µg/m^3 to 59.05µg/m^3 with the 98th percentile 39.90 µg/m^3 to 59.13 µg/m^3 at. The minimum and maximum level of PM10 recorded within the study area was in the range of 43.51µg/m^3 to 93.20 µg/m^3 with the 98th percentile 75.12 µg/m^3 to 92.92 µg/m^3. The minimum and maximum concentration of SO_2 recorded within the study area was in the range of was 4.12 µg/m^3 to 15.5µg/m^3 with the 98th percentile 7.15µg/m^3 to 14.63µg/m^3. The minimum and maximum level of NO_2 recorded within the study area was in the range of was 5.2 µg/m3 to 18.9 µg/m^3 with the 98th percentile 12.02 µg/m3 to 18.85 µg/m^3. The results thus obtained indicate that the concentrations of PM10, PM2.5, SO2 and NO2 in the Ambient Air are well within the National Ambient Air Quality (NAAQ) standards for Industrial, Residential, Rural and other areas.

Free SiO_2 (in µg/m^3):

SiO_2	AAQ-1	AAQ-2	AAQ-3	AAQ-4
Maximum	0.98	0.97	0.91	0.74
Minimum	0.54	0.60	0.61	0.52

SiO_2	AAQ-5	AAQ-6	AAQ-7	AAQ-8
Maximum	0.94	0.89	0.69	0.86
Minimum	0.65	0.74	0.51	0.69

Observations:

The minimum & maximum concentrations of SiO2 were found to be 0.51µg/m^3 at AAQ-7 & 0.98µg/m^3 at AAQ-1 respectively.

3.4 WATER ENVIRONMENT

Water quality assessment is one of the essential components of EIA study. Such assessment helps in evaluating the existing health of water body and suggesting appropriate mitigation measures to

minimize the potential impact from development projects. Water quality of ground water has been studied in order to assess proposed water-uses in construction, drinking, cooling and horticulture purpose. The water quality at project site and other locations within the 10 km impact zone was monitored during March 2025 to May 2025.

A) Ground water

Four water samples were collected from the study area. The locations of the monitoring are given below:-

Table 3.3 (iii) Ground water sampling locations

Location Code	Location	Direction	Distance (km)
GW – 1	Project Site (Nilkanthapur)	NW	0.28
GW – 2	Mahulpal Village	NE	1.35
GW – 3	Digamberpur Village	SE	3.60
GW - 4	Solapur village	E	4.29

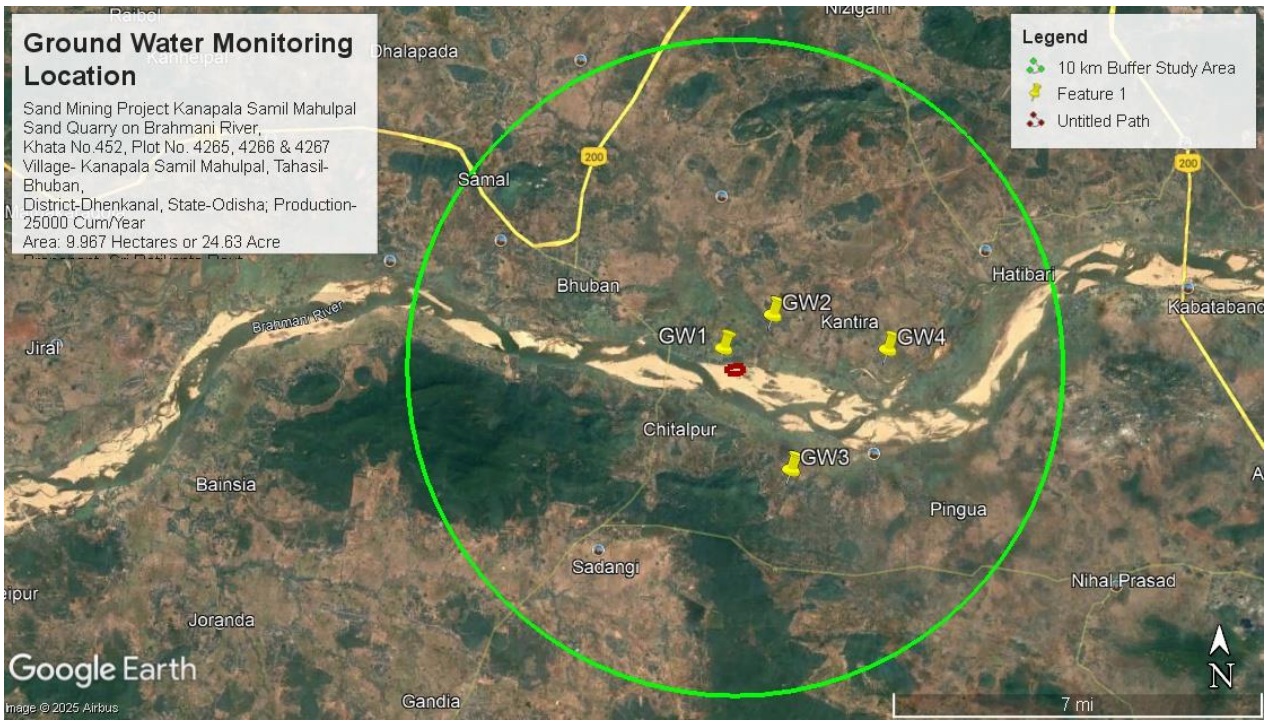


Figure 3.5 (b) Ground water Quality Monitoring Locations

Table 3.3 (iv) Physico-chemical properties of ground water Study

S.No	Parameter	Results				Units	Acceptable Limit	Permissible Limit in the Absence of Alternate Source
		Location						
		GW-1	*GW-2*	*GW-3*	*GW-4*			

1	pH	7.1	7.2	7.2	7.1	-	6.5-8.5	-
2	Colour	<5.0	<5.0	<5.0	<5.0	-		
3	Odour	Agreeable	Agreeable	Agreeable	Agreeable	-	Agreeable	Agreeable
4	Taste	Agreeable	Agreeable	Agreeable	Agreeable	-	Agreeable	Agreeable
5	Turbidity	<1.0	<1.0	<1.0	<1.0	NTU	1	5
6	Total Hardness (as $CaCO_3$)	81	92	95	89	mg/l	200	600
7	Calcium(as Ca)	17	18	17	19	mg/l	75	200
8	Magnesium(as Mg)	9.0	10.0	9.5	9.8	mg/l	30	100
9	Chloride(as Cl)	10	9	11	10	mg/l	250	1000
10	Iron(as Fe)	0.4	0.5	04	0.3	mg/l	0.3	No Relaxation
11	Fluoride(as F)	0.1	0.2	0.1	0.2	mg/l	1	1.5
12	Free Residual chlorine	<0.1	<0.1	<0.1	<0.1	mg/l	0.2	1
13	Total Dissolved Solid	95	98	97	99	mg/l	500	2000
14	Phenolic Compound (as C_6H_5OH)	<0.001	<0.001	<0.001	<0.001	mg/l	0.001max	0.002 Max
15	Anionic Detergents (as MBAS)	<0.1	<0.1	<0.1	<0.1	mg/l	0.2	1.0
16	Sulphate (as SO4)	2.3	2.6	2.8	3.0	mg/l	200	400
17	Nitrate (as NO3)	3.1	3.2	3.2	3.1	mg/l	45	No Relaxation
18	Alkalinity(as CaCO3)	16	21	28	20	mg/l	200	600
19	Chloramines (as Cl2)	< 1.0	< 1.0	< 1.0	< 1.0	mg/l	4	No Relaxation
20	Cadmium (as Cd)	<0.001	<0.001	<0.001	<0.001	mg/l	0.003	No Relaxation
21	Lead (as Pb)	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	No Relaxation
22	Total Chromium (as Cr)	<0.01	<0.01	<0.01	<0.01	mg/l	0.05	No Relaxation
23	Copper (as Cu)	<0.01	<0.01	<0.01	<0.01	mg/l	0.05	1.5
24	Total Ammonia	<0.5	<0.5	<0.5	<0.5	mg/l	0.5	No Relaxation
25	Nickel (as Ni)	<0.01	<0.01	<0.01	<0.01	mg/l	0.02	0.2
26	Zinc (as Zn)	<0.1	<0.1	<0.1	<0.1	mg/l	5	15
27	Manganese (as Mn)	<0.1	<0.1	<0.1	<0.1	mg/l	0.1	0.3
28	Boron (as B)	<0.1	<0.1	<0.1	<0.1	mg/l	0.5	1
29	Selenium (Se)	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	No Relaxation
30	Arsenic (as As)	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	0.05

RESULTS **As per IS 10500:2012**					
S.N	**Parameter**	**Test**	**Results**	**Units**	**Requirements**

o		Method	GW-1	GW-2	GW3	GW-4		
1	E.coli	IS-1622	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	Not Detected (<2)	E.Coli/100ml	Shall not be detectable in100 ml sample
2	Total Coliform	IS-1622	Absent	Absent	Absent	Absent	MPN/100ml	Shall not be detectable in100 ml sample

Note: Un- Objectionable

Observation:

Analysis results of ground water reveal the following: -

- pH varies from 7.1 to 7.2.
- Total hardness varies from 81 mg/l to 95 mg/l.
- Total dissolved solids vary from 95 mg/l to 99 mg/l.

The ground water from all sources remains suitable for drinking purposes as all the constituents are within the limits prescribed by drinking water standards promulgated by Indian Standards IS: 10500. Fluorides and nitrates are within the permissible limits. Most of the parameter in ground water sources are well within the permissible limits as per IS – 10500, drinking water standards.

B). Surface water

Two water samples were collected from the study area. The physico-chemical analysis of the water samples is given in the Table 3.2(vi). The Surface water sampling locations are marked in **Figure no. 3.2(c)**

Table 3.3 (v) Surface water sampling locations

Location Code	Sample collected from	Direction & Distance
SW – 1	Brahmani River	5 km in W direction in Downstream
SW – 2	Brahmani River	5 km in E direction in Upstream

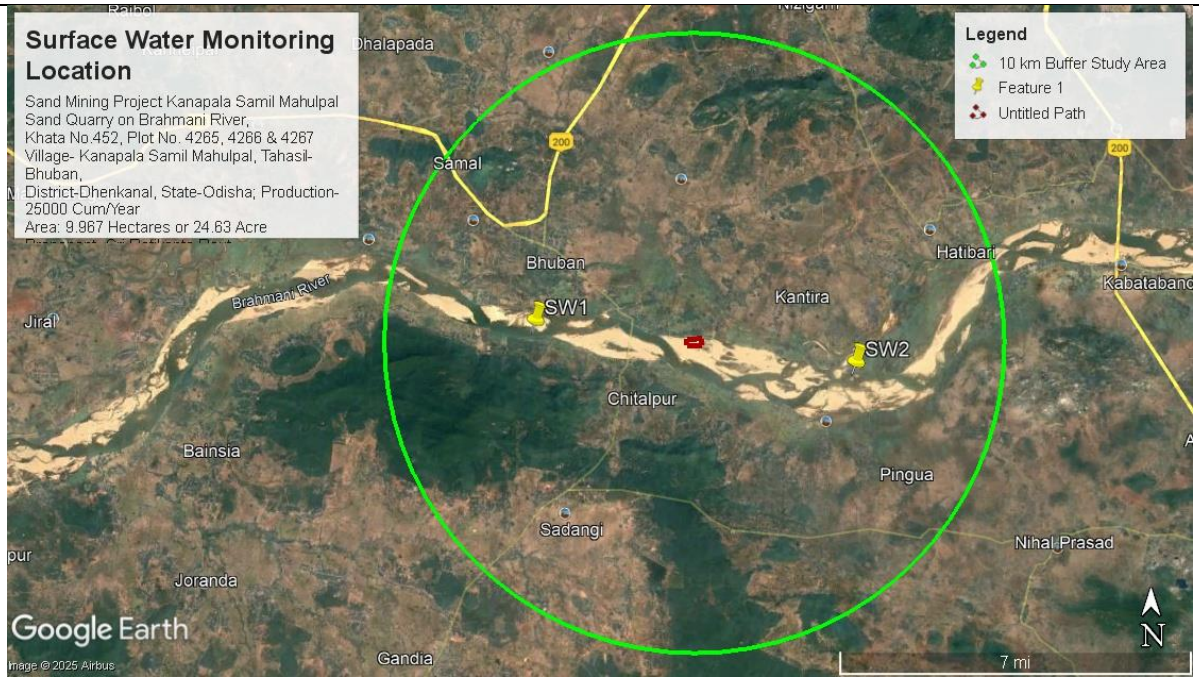


Figure 3.5 (c) - Surface water sampling locations in the study area

Table 3.3 (vi) Physico-chemical properties of Surface water

S.No	Parameter	SW-1 Brahmani River	SW-2 Brahmani River	Units
1	pH	7.2	7.3	-
2	Temperature	24	24	^{O}C
3	Turbidity	16.52	17.21	NTU
4	Conductivity @25°C	152	147	µs/cm.
5	Total Suspended Solid	40.2	42.7	mg/l
6	Total Alkalinity (as $CaCO_3$)	162	171	mg/l
7	Biological Oxygen Demand (Max.) (at 270C for 3 days)	1.9	1.8	mg/l
8	Dissolved Oxygen (as O_2) Min.	6.1	6.0	mg/l
9	Calcium (as Ca)	57	61	mg/l
10	Magnesium (as Mg)	47.03	45.01	mg/l
11	Chloride (as Cl), Max	51.1	50.3	mg/l
12	Iron (as Fe), Max	1.2	1.3	mg/l
13	Fluoride (as F), Max	0.52	0.49	mg/l
14	Total Dissolved Solid	510	524	mg/l
15	Total Hardness (as CaCO3)	198	196	mg/l
16	Sulphate (as SO4) Max	10.3	10.8	mg/l
17	Phosphate (as P)	0.09	<0.2	mg/l
18	Sodium (as Na)	15.2	14.7	mg/l
19	Manganese (as Mn)	<0.1	<0.1	mg/l

20	Total Chromiun (as Cr)	<0.05	<0.05	mg/l
21	Zinc (as Zn)	0.11	0.17	mg/l
22	Potassium (as K)	3.67	3.86	mg/l
23	Nitrate (as NO3), Max	<0.5	<0.5	mg/l
24	Cadmium (as Cd)	<0.01	<0.01	mg/l
25	Lead (as Pb)	<0.01	<0.01	mg/l
26	Copper (as Cu)	<0.01	<0.01	mg/l
27	Arsenic (as As)	<0.01	<0.01	mg/l

RESULTS									
S.No	**Parameter**	**Test Method**	**Results**	**Units**	**Tolerance Limit as per IS:2296**				
					Class A	**Class B**	**Class C**	**Class D**	**Class E**
SW-1	Total Coli Form	IS:1622	398	MPN/100ml	50	500	5000	-	-
SW-2	Total Coli Form	IS:1622	410	MPN/100ml	50	500	5000	-	-

Observation:

The analysis results indicate that the pH ranges between 7.2 and 7.3

Dissolved Oxygen (DO) was observed in the range of 6.0 -6.1 mg/l

BOD values were observed to be in the range of 1.8 mg/l. to 1.9 mg/l.

The chlorides and Sulphates were found to be in the range of 50.3 – 51.1 mg/l and 10.3– 10.8 mg/l respectively.

Bacteriological examination of surface water samples revealed the presence of total coliform in range of 398 MPN/100ml to 410 MPN/100ml. Based on the results it is evident that most of the parameters of the samples comply with 'Category 'B' standards of CPCB indicating their suitability for Drinking water source after conventional treatment and disinfection.

3.5 SOIL ENVIRONMENT

Soil may be defined as a thin layer of earth's crust, medium for the growth of plants. The soil characteristics include both physical and chemical properties. The soil survey and soil sample were carried out / collected to assess the soil characteristics of the study area. Soil samples were collected from 5 locations and analyzed as per CPCB norms.

The soil sampling locations are marked in **fig. 3.2 (d)** the Physico-chemical characteristic of these soil samples is given in Table No. 3.2(viii).

Table No. 3.3 (vii) Soil sampling locations

Location Code	Location	Direction	Distance

SQ1	Project Site (Nilkanthapur)	NW	0.28
SQ2	Mahulpal Village	NE	1.35
SQ3	Digamberpur Village	SE	3.60
SQ4	Chitalpur Village	W	1.67

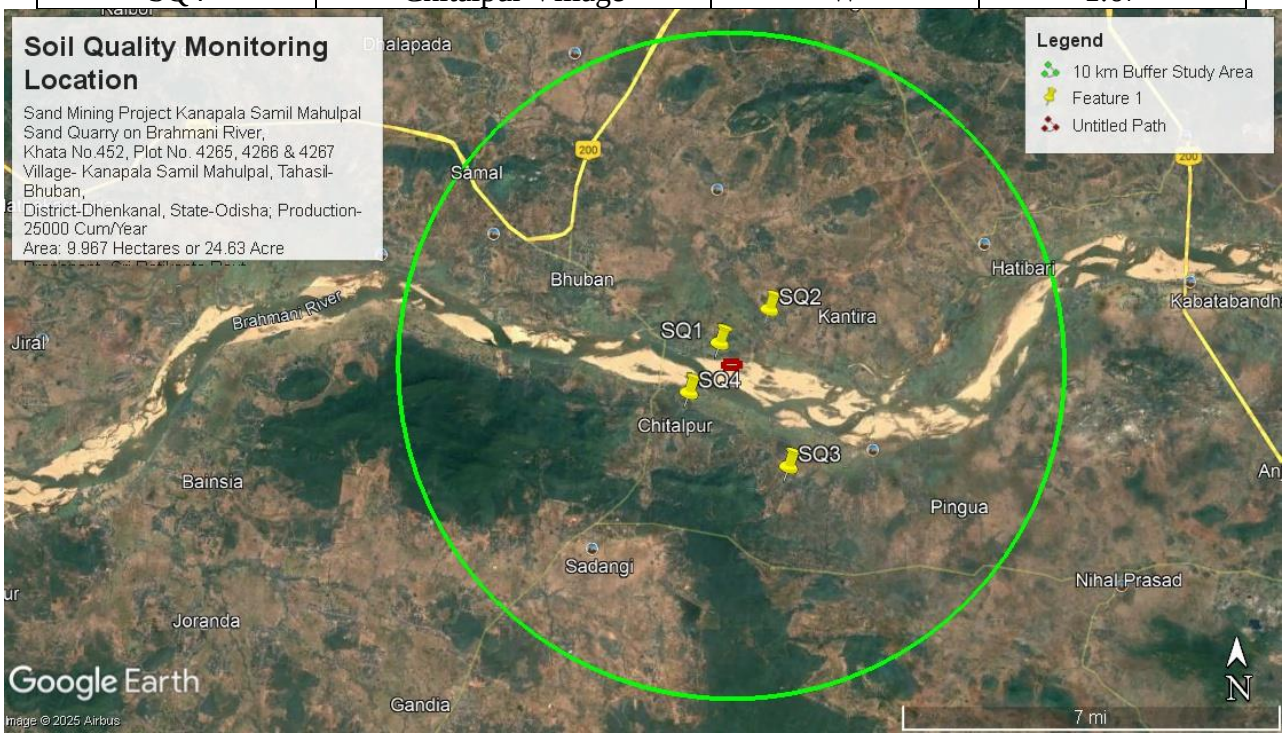


Figure 3.5 (d) Soil sampling Location

Table 3.3 (viii) Physico-chemical properties of soil

S. No	Parameter	Units	Result			
			Location			
			SQ-1	SQ-2	SQ-3	SQ-4
1	Texture	-	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
	Sand	%	49.25	47.59	48.59	46.46
	Clay	%	37.2	32.76	33.76	32.24
	Silt	%	12.6	20.55	18.55	20.49
2	Ph (1:2.5 Suspension)	-	6.32	6.41	6.49	6.70
3	Electrical Conductivity	µmhos/cm	495	415	428	418
4	Potassium (as K)	mg/kg	163	168	167	170
5	Sodium (as Na)	mg/kg	186	191	192	189
6	Iron (as Fe)	mg/kg	518	521	563	547
7	Magnesium (as Mg)	mg/kg	678	692	684	694

8	Sodium Absorption Ratio	-	0.48	0.51	0.54	0.49
9	Water Holding Capacity	%	41.12	43.54	40.87	44.15
10	Total Kjehdahl Nitrogen	%	0.87	0.82	0.87	0.84
11	Phosphorous	mg/kg	74.22	72.34	71.48	70.57
12	Bulk Density	gm/cc	1.76	1.78	1.80	1.79
13	Organic Matter	%	2.1	2.3	2.4	2.4
14	Porosity	%	39.97	38.24	39.15	36.54

Observations:

Samples collected from identified locations indicate the soil is sandy loam type and the pH value ranging from 6.32 – 6.70, which shows that the soil is acidic in nature. Iron is found to be from 518 mg/kg to 563 mg/kg. The water holding capacity is found in between 40.87% to 44.15%.

3.6 NOISE ENVIRONNENT

The noise levels within the study area were recorded using Sound Level Meter and noise monitoring results were compared with the Ambient Noise Quality Standard notified under Environment Protection Act, 1986. The levels recorded are as stated in Table 3.3 (x).

The noise level monitoring locations are marked in Fig. no.3.3 (e)

Table 3.3 (ix) Noise quality monitoring stations

Location Code	Location	Direction	Distance (km)
NQ1	Project Site (Nilkanthapur)	NW	0.28
NQ2	Mahulpal Village	NE	1.35
NQ3	Digamberpur Village	SE	3.60
NQ4	Chitalpur Village	W	1.67
NQ5	Rajagola Village	ENE	4.52

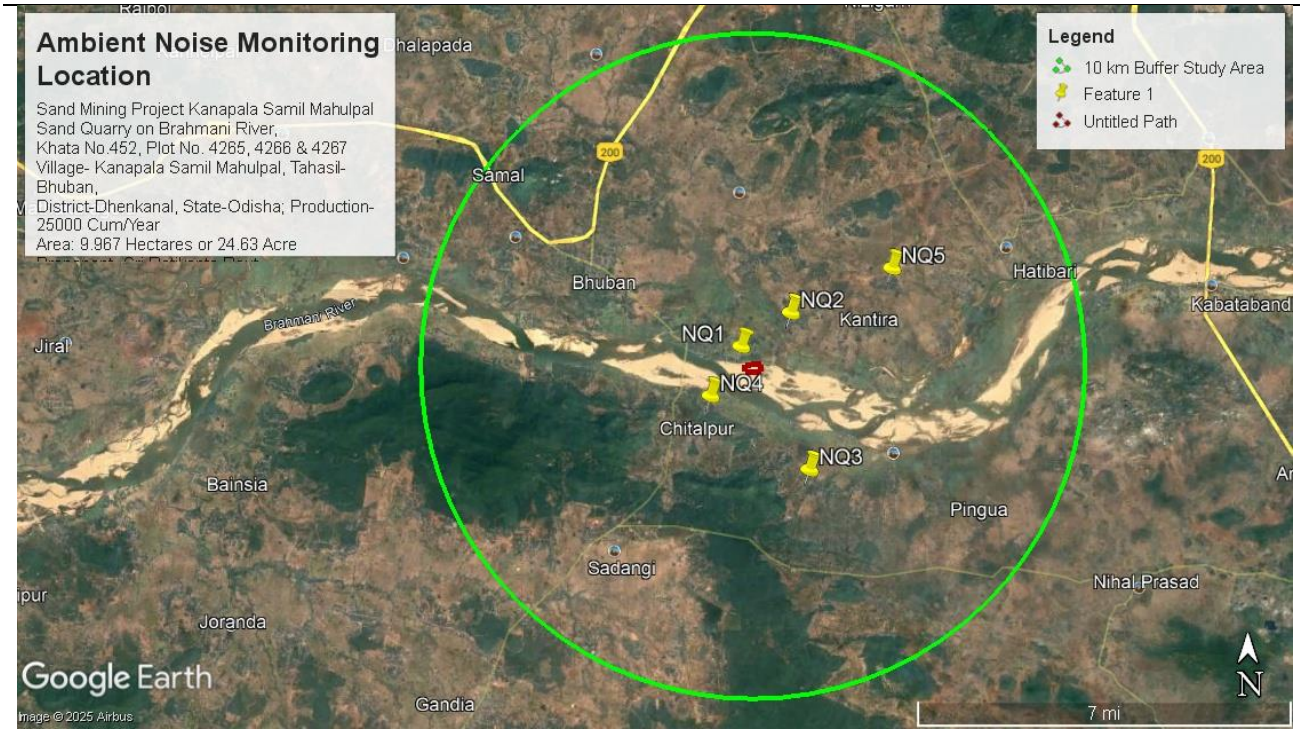


Figure 3.5 (e) - Noise quality monitoring stations

Table 3.3 (x) Noise level status

TEST RESULT					
S. No	**Location**	**Observed Value Leq dB(A)**			**Zone**
		Day*	**Night***	**Day/Night**	
1	NQ1	64.23	49.62	56.92	Industrial
2	NQ2	62.6	43.4	53.0	Industrial
3	NQ3	53.0	40.1	46.55	Industrial
4	NQ4	51.4	42.3	46.85	Industrial
5	NQ5	48.8	36.2	42.5	Residential
***Day Time**		Leq (6.00AM TO 10.00 PM)			
***Night Time**		Leq (10.00PM TO 6.00 AM)			
Limit as per CPCB Guidelines Leq. dB(A) (Day-Night)		Residential Zone = 55 - 45 Leq. dB(A)			
		Industrial Zone = 75 - 70 Leq. dB(A)			

Results

Noise monitoring reveals that the maximum & minimum noise levels at day time were recorded as 64.23 dB (A) & 48.8 dB (A), respectively. The maximum & minimum noise levels at night time were found to be 56.9 dB (A) & 42.5 dB (A). There are several other sources in the 10 km radius of

study area, which contributes to the local noise level of the area. Traffic activities as well as activities in nearby villages and agricultural fields add to the ambient noise level of the area.

3.7 BIOLOGICAL ENVIRONMENT

3.7.1 Introduction

The ecological study reflects the potential of a regional ecosystem and its biological components. In India, the biological diversity of plants and animals varies from region to region on account of their diversity and density. Producers (plants), consumers (animals), and decomposers (microbes) govern the whole cycle of ecology. Plant and animals both are interdependent on each other.

The biological study is essential to understand the impact of any developmental project on the existing flora and fauna present in the study area. Hence, studies on various aspects of the ecosystem play an important role in identifying sensitive issues for undertaking appropriate action to mitigate the impact if required.

The Environment baseline data generation report in respect of flora-fauna has been prepared to assess the current ecology & biodiversity scenario of the area; and to carry out Environmental Management Plan based on the proposed project activities. The plan will identify and address the environmental and ecological conservation implications of the area. Conservation of biodiversity is essential for sustainable development.

3.7.2 Objective of the Study

The ecological study was carried out to establish the biological importance in the core area (Kanapala Samil Mahulpal Sand Quarry Mine Project, Area 9.96 Ha) and buffer area of 10 km radius from the boundary of the mining lease area. The ecological survey was undertaken in Pre monsoon season. Hot and dry weather was experienced during the survey period with most of the water bodies in the study area was dried up or shallow. The ground flora was mostly arid or only available near the moist areas.

Floral Status

- Floral species identification within the mine lease and area in 10 km radial distances from the mine area,
- Identification of major vegetation types of the study area,

- Identification of impacts to the vegetation in the study area due to proposed expansion of feldspar and quartz mining project,
- Preparation of mitigation measures required, for the identified impacts on flora within the study area due to proposed expansion.

Faunal Status

- Identification of all faunal species within 10 km radial distances from the mine area,
- Classification of these fauna based on their conservation status as per IUCN red-list and Indian Wildlife Protection Act (IWPA), 1972 and its amendments along with their endemic status,
- Identification of impacts to faunal species due to proposed expansion,
- Preparation of mitigation measures required, for the identified impacts on fauna within the study area due to proposed expansion.

3.7.3 Methodology/ Data Collection:

A primary field survey was carried out within a 10 km radius of the proposed project. Both terrestrial and aquatic ecosystems have been studied to understand the biological environment. Secondary data were collected from authentic sources like the Forests Department, Fisheries Department, Agriculture Department of Dhenkanal, and available published literature.

- Survey sites: project site, few identified locations in 10 km radius
- Core zone: Project site and 500 m radius from project site
- Buffer zone: 10 km radius surrounding the project area
- Study period: March to May 2025

Table 3.4: Mode of data collection& parameters considered during the survey

Aspect	Data	Mode of data collection	Parameters monitored
Terrestrial Ecology	Primary data Collection	Field survey	Flora, Fauna
	Secondary data collection	From authentic sources like. Published literature, Government Websites and Published Maps	Flora and Faunal diversity and study of vegetation, importance etc.

River Ecology	Secondary data collection	List of fish fauna obtained from Published literature on fish fauna of River Tons & Government Websites	Fish fauna

3.7.4 Ecosystem Overview of the Area

The area falls under Dhenkanal Forest Division encompassing:

- Dhenkanal Forest Range
- Kamakhya Forest Range
- Hindol Babamba Forest Range

Odisha's forests are broadly classified into two main types:

Tropical Moist Deciduous and Tropical Dry Deciduous. The moist deciduous forests are typically found in the northeastern part of the state, while the dry deciduous forests are dominant in the southwest.

Tropical Moist Deciduous Forests:

These forests are characterized by the presence of Sal (*Shorea robusta*), teak, and bamboo, along with other hardwood trees. They are found in areas with higher rainfall and humidity, often on hills and plateaus.

Tropical Dry Deciduous Forests:

These forests are dominated by Sal, bamboo, and various thorny species. They are found in the drier, western and central parts of Odisha. Tropical dry deciduous forests are a transitional type forest between moist deciduous and thorn forests on the wetter side and thorn forests on the drier side. They thrive in harsh and highly fluctuating climates marked by low annual rainfall, 5-6 dry months per year, and nutrient-depleted soil.

Other Forest Types:

Semi-evergreen Forests: These forests are a mix of evergreen and deciduous species and are found in the coastal areas of Odisha, transitioning between mangrove forests and moist deciduous forests.

Mangrove Forests: Found in the coastal regions, particularly in the Bhitarkanika area, these forests are adapted to saline conditions.

Coastal Tidal Forests: These forests are found along the coast and are adapted to the tidal influence.

Study Area Forest Type

The forest type of the study area is Tropical dry deciduous forests which are vital to rural livelihoods, especially for the poor who rely on them. Tropical dry deciduous forests and woodlands contribute to the direct provision of numerous products, including timber and non-timber forest products, in addition to their roles in maintaining resilient and multi-functional landscapes. These products are shown to help people supplement their incomes and alleviate poverty. A wide range of these products are collected, either for personal consumption or to make a little amount of cash. Drought-prone animals rely on the forest for fodder.

Tropical Dry deciduous forests are among the world's most endangered ecosystems due to extensive anthropogenic disruptions. Vast sections of these forests have been destroyed to make way for agriculture. Overgrazing, fire, and other factors have devastated these forests. They also face biotic disturbances, which can lead to ecosystem fragmentation and conversion, resulting in changes in biomass, productivity, and soil microbial biomass, among other things.

(https://dhenkanal.odisha.gov.in/)

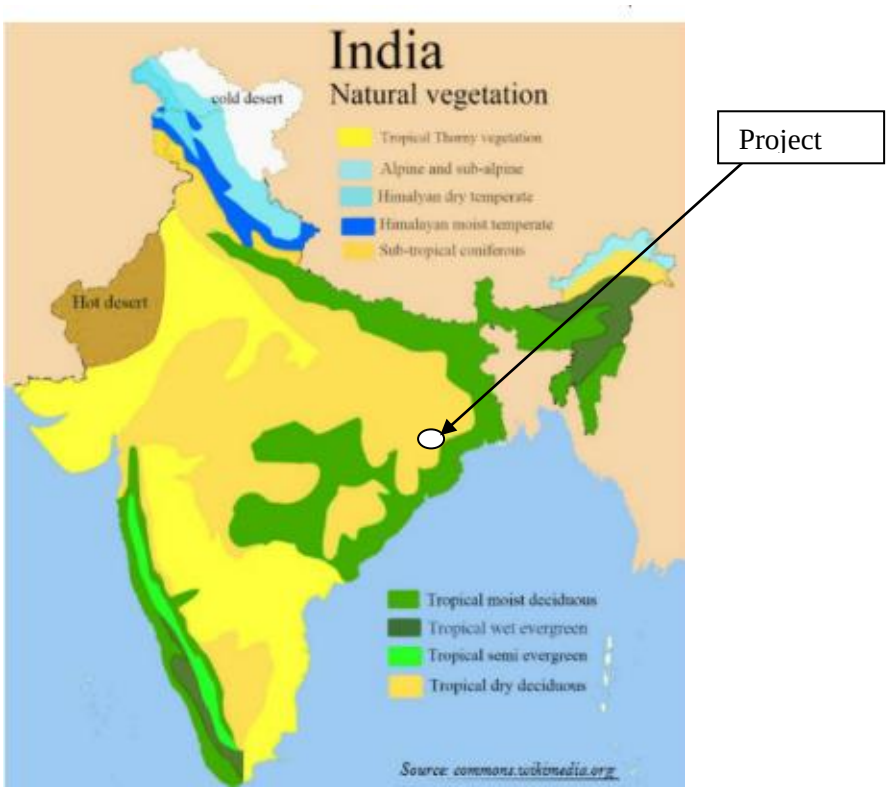


Fig 3.6 (a) Location of Study area on the map of Forest Classification of India

District Forest Type

The Climatic variation influence the floral diversity in the forest. The northern side has tropical moist deciduous forests which tends to become semi evergreen towards south and southeast. The hill ranges stretches over a length of about 32 km constituting mostly of Anantpur and Ranjagarh RF blocks. Out of 4452 sq. km geographical area of the district, 1399 sq. km is covered with forest. The forest cover includes 172 sq. km survey dense forest, 346 sq. km of moderately dense forest and 881 sq. km of open forest which is 31.4% of the geographical area. The total DLC forest area in the district is 1737.62 sq. km. *(https://dhenkanal.odisha.gov.in/)*

Forest Area		
S. No.	**Type of Forests**	**Area as per Notification/Govt.record(in ha.)**
1	Reserve Forest (65 Blocks)	1,16,363.31
2	DPF (47 Nos.)	13,008.17
3	Village Forests (217 Nos.)	1,478.18
4	Protected Forests (4 Nos.)	124.46
5	Debottar Forests	5261
6	Unclassed Forests	4
	Total	**1,39,873.12**

(Source: https://dhenkanal.odisha.gov.in/)

Tree top canopy trees are deciduous and remain leafless for shorter period of time but middle story is evergreen having species like *Shorea robusta, Madhuca indica, saraca indica, magnifera indica,* etc. The forests are confined to the damper pockets in the valley and nalla banks with few exceptions on the hill slopes. Vegetation in the valley comprises of drier type of crop where as higher slopes contain semi evergreen species.

Agriculture - Large area of study area is covered with agricultural land. Major farming systems are: Paddy, Wheat, Moong, Lentil, fallow, Rai, Sugarcane, Potato, vegetables, maize, dairy, poultry, bee keeping, and fishery.

3.7.5. Description of Eco-sensitive zones in the Study Area (Wild life Sanctuary/ National Parks/Animal or Elephant Corridors/ Protected Wetlands etc.)

There are no National parks, Biosphere Reserves, Wildlife corridors, Tiger/Elephant reserves (existing as well as proposed), within 10 km from the present project. Also, areas protected under

international conventions, national or local legislation for their ecological, landscape, cultural or other related value, doesn't exist in the core and buffer zone of the present project.

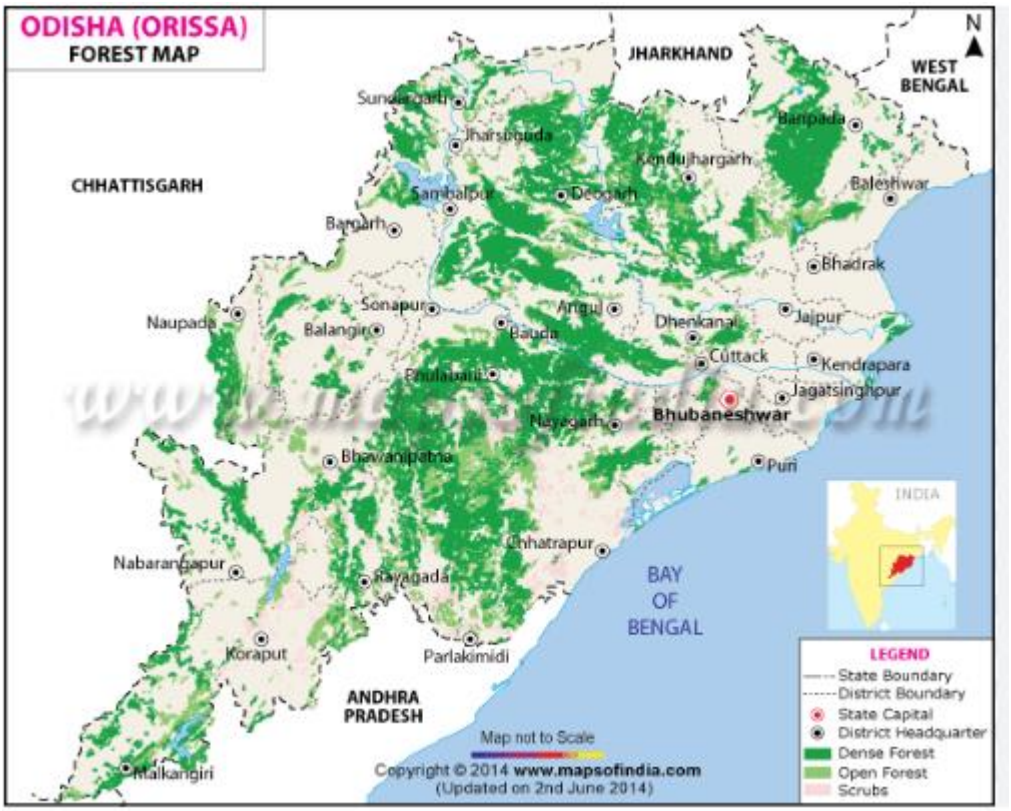


Figure 3.6 (b) Forest Map of Odisha

On the other hand, the proposed is on Brahmani River. Natural hydrology and protection of all forms of biota found there in all the water bodies of the area and it will be maintained by Project executors.

3.7.6 Drainage /Water Bodies of the Study Area

Project lies on the Riverbed of River Brahmani. Apart from these, some seasonal (monsoon-fed) riverine streams and Nallas are also present in the study area. Few ponds are also recorded nearby the different villages mainly used for fish farming, Cattle feeding, Irrigation purpose by the villagers, etc.

A. Brahmani River Source of Origin

The Brahmani is a major seasonal river in the Odisha state of eastern India. The Brahmani is formed by the confluence of the Sankh and South Koel rivers, and flows through the districts of Sundargarh, Deogarh, Angul, Dhenkanal, Cuttack, Jajapur and Kendrapara. Also the South Koel can be

considered as the upper reaches of the Brahmani. Together with the river Baitarani, Brahmani forms a large delta before emptying into the Bay of Bengal at Dhamra. It is the second widest river in Odisha after Mahanadi.

The site of the Brahmani's origin is mythologically reputed to be the place where Sage Parashara fell in love with the fisherman's daughter, Satyavati who later gave birth to Ved Vyasa, the compiler of the Mahabharata. The place is thus called Ved Vyasa.

B. Brahmani River Catchment

At about 480 kilometres (300 mi) long, the Brahmani is the second longest river in Odisha after the Mahanadi. However, if its constituent rivers are included, its length extends to about 799 kilometres (496 mi), of which 541 kilometres (336 mi) are in Odisha. It has a catchment area of about 39,033 square kilometres (15,071 sq mi) in Odisha alone.

3.7.7 Flora of Core zone

A) Terrestrial Flora of Core zone (Natural vegetation etc.).

There is no flora found in the core zone. Core Zone is dry River sand bed.

B) Agricultural Crops/ Commercial Crops of the Core zone and Buffer Zone

Details of the agricultural vegetation and commercial crops were collected from the site of the study area and the details are given below in the table 3.4 (ii).

Table 3.5: List of Crops seasonally planted by respective farmers in the Core and Buffer Zone

S.No	Botanical Name	Local/Trade Name	Family Name
1	*Zey mays*	Makkha/Maize	Poaceae
2	*Triticum aestivum*	Wheat	
3	*Oryza sativa*	Paddy	
4	*Cicer arietinum*	Channa	Fabacea
5	*Coriander sativum*	Dhaniya	Apiaceae
6	*Abelmoschus esculentus*	Bhendi	Amaranthacea
7	*Mamordica charanta*	Karela	Cucurbiataceae
8	*Capsicum annum*	Mirchi	Solanaceae
9	*Lycopersicon lycopersicum*	Tomato	
10	*Solanum melongena*	Brinjal	
11	*Capsicum annuum*	Mirchi	
12	*Solanum tuberosum*	Potato	
13	*Allium cepa*	Onian	Amaryllidaceae
14	*Cajanus cajan*	Pigeon pea	Fabaceae
15	*Carica papaya*	Papaya	Caricaceae

16	*Okra*	Ladyfinger/ Bhindi	Malvaceae
17	*Lagenaria siceraria*	Bottle gourd/ Lauki	Cucurbitaceae

3.7.8 Flora of Buffer zone

A) Terrestrial Flora of Buffer zone (Natural vegetation/Commercial vegetation) The details of vegetation of the buffer zone is given in Table 3.4 (iii) below.

Table 3.6 (i): List of Trees, Shrubs, Herbs and Grasses observed in Buffer Zone

Sl. No.	Local name	Botanical name	Family	
		Tree		
1.	Acacia	*Acacia auriculifonnis*	Mimosaceae	
2.	Akasmali / Akas nim	*Mellingtonia hortensis*	Bignoniaceae	
3.	Amba / Am	*Mangifera indica*	Anacardiaceae	
4.	Ambada / Amda	*Spondias pinnata*	Anacardiaceae	
5.	Ambta	*Bauhinia recemosa*	Fabaceae	
6.	Amthi	*Lasiobema retvsum*	Caesalpiniaceae	
7.	Anchhu	*Morinda tinctoria*	Rubiaceae	
8.	Ankula	*Alangium lamarckii*	Alangiaceae	
9.	Anla / Aunla	*Phyllanthus emblica*	Euphorbiaceae	
10.	Arjuna / Kaha / Kau	*Terminalia arjuna*	Combretaceae	
11.	Asan / Sahaja	*Terminalia tomentosa*	Combretaceae	
12.	Ashok	*Saraca asoca*	Fabaceae	
13.	Aswatha/ Peepal/ Osta	*Ficus religiosa*	Moraceae	
14.	Babul	*Acacia nilotica*	Mimosaceae	
15.	Bahada	*Terminalia belerica*	Combretaceae	
16.	Bana kapasia	*Kydia calycina*	Malvaceae	
17.	Bandhan / Tinsa	*Ougeinia oojeinensis*	Fabaceae	
18.	Bantala	*Ardisia solanacea*	Myrsinaceae	
19.	Bara	*Ficus bengalensis*	Moraceae	
20.	Barabakulia / Dhoben	*Dalbergia paniculata*	Fabaceae	
21.	Barada	*Bauhinia purpurea*	Caesalpiniaceae	
22.	Barkoli	*Ziziphus mauritiana*	Rhamnaceae	
23.	Baruna	*Crateva religiosa*	Capparaceae	
24.	Batra	*Melia dubia*	Meliaceae	
25.	Bela	*Aegle marmelos*	Rutaceae	

26.	Benta	*Naringi crenulata*	Rutaceae	
27.	Bhalia	*Semecarpus anacardium*	Anacardiaceae	
28.	Chakunda	*Cassia siamea*	Ceasalpinaceae	
29.	Champa	*Michelia champaca*	Annonaceae	
30.	Chara	*Buchanania lanzan*	Anacardiaceae	
31.	Sahada	*Streb lus asper*	Sahada	
32.	Sal / Sargi / Rengal	*Shorea robusta*	Sal / Sargi / Rengal	
33.	Salai	*Boswellia serrata*	Burseraceae	
34.	Siju	*Euphorbia neriifolia*	Borroacaceae	
35.	Simal / Simili	*Bombax ceiba*	Mimosaceae	
36.	Siris	*Albizia lebbeck*	Fabaceae	
37.	Sissoo	*Albizzia odoratissimla*	Fabaceae	
38.	Sissoo / Pahadi	*Dalbergia latifolia*	Caesalpinaceae	
39.	Sunari	*Cassia fistula*	Arecaceae	
40.	Tala	*Borassus flabelliformis*	Vetbenaceae	
41.	Teak / Saguan	*Tectona grandis*	Mirmsaceae	
42.	Tentra	*Albizziz procera*	Caesalpinaeeae	
43.	Tentuli / Kania	*Tamarindus indica*	Cycadaceae	
44.	Mohul	*Madhuca indica*	Sapotaceae	
45.	Mokha / Mukha	*Schrebera swietenioides*	Oleaceae	
46.	Morda	*Milletia ariculata*	Fabaceae	
47.	Muchkunda	*Pterospermum acerifolium*	Stereuliaeeae	
48.	Mundi / Mitkania	*Mitragyna parviflora*	Rub iae eae	
49.	Neem/ Limbo	*Azadirachta indica*	Meliaceae	
50.	Nimburumoi	*Bursera serrata*	Burseraceae	
51.	Palas/ Phalas	*Butea monosperma*	Fabaceae	
52.	Panas	*Artocarpus integrifolia*	Moraceae	
53.	Panigambhari/ Tabhar	*Trewia nudiflora*	Euphorbiaceae	
54.	Mahanimba	*Ailanthus excelsa*	Simarubaeeae	
55.	Mohi	*Lannea coromandelica*	Anacardiaceae	
56.	Manda / Gandhaguria	*Macaranga peltata*	Euphorbiaceae	
Shrubs & Herbs				
1	Bana chakunda	*Cassia tora*	Fabaceae	
2	AmiriI / Raipani	*Ipomia carnea*	Convolulaceae	
3	Agnijal / Bana jalangi	*Vernonia cinerea*	Asteraceae	
4	Bantulasi	*Ocimum gratissimuni*	Lamiaceae	

5	Barkoli	*Zizyphus Mauritiana*	Rhamnaceae	
6	Dhatura	*Datura fastuosa*	Solanaceae	
7	Khajuri	*Phoenix dactylifera*	Arecaceae	
8	Lantana/ Bho lupadi/ Nagairi	*Lantana camara*	Verbenaceae	
9	Tulsi	*Ocimum sanctum*	Lamiaceae	
10	Patalgaruda	*Rauwolfia serpentina*	Aoocvnaceae	
11	Mothi dudhi	*Euphorbia hirta*	Evphorbiaceae	
12	Besharam	*Ipomoea carnea*	Convolvulaceae	
Climbers				
1	Latapalas / Bhudel	*Butea superba*	Fabaeeae	
2	Panayiri	*Aristolochia indica*	Aristolochiaceae	
3	Malati	*Aganosma dichotoma*	Apocynaceae	
4	Tankua lai	*Schefflera venulosa*	Araliaceae	
5	Kosa Alu	*Dioscorea puber*	Dioscoraeeae	
6	Bana kunduru	*Trichosanthes cucumerina*	Cucurbitaceae	
7	Bana simba	*Lab lab purpurens*	Fabaceae	
8	Bana kunduri/ Mataka	*Solena amplexicaulis*	Cucurbitaceae	
9	Dantari	*Acacia pennata*	Mimosaceae	
10	Kaincha	*Abrus precatorius*	Fabaceae	
Bamboo				
1	Daba bansa/ kanta bans	*Bambusa arundinacea*	Poaceae	
2	Dungi bans	*Cephalostachyum pergacile*	Poaceae	
3	Balangi bans	*Oxytenanathera nigrocilita*	Poaceae	
4	Salia / Hill bambo	*Dendrocalamus strictus*	Poaceae	
Grasses				
1	Duba	*Cynodom dactylon*	Poaceae	
2	Mutha	*Arundo donax*	Poaceae	
3	Tenda/ Kastandi	*Saccharum spontaneum*	Poaceae	
4	Bounsuni	*Saccharum munja*	Poaceae	
5	Kodua	*Paspalum scrobiculatum*	Poaceae	
6	Chepti	*Evolvulus alsinoides*	Convolvulaceae	
7	Bena	*Vetiveria zizaniodes*	Poaceae	

(Source: https://odishaforest.in/admin/data/documents)

During the present survey, total of 89 species of plant species were observed from the study area. Out of 89 plant species, 56 species of tree, 12 species of shrubs/herbs, 10 species of climbers, 4

species of bamboo and 7 species of Grass species were recorded from the buffer zone of the present study area. The below- mentioned vegetation details have been collected from the Core as well as Buffer zone of the present study area. All the details have been furnished based on the field survey at different locations and data supported by the Department of Forest, Dhenkanal Forest Division.

List of Ethno-botanical Plants and Their Uses

S. No.	Botanical Name	Family	Local Name	Parts Used	Ethnomedical Uses
1	*Aegle marmelos*	Rutaceae	Bela	Leaf & fruit	Blood purifier and digestive Fruit pulp is used as laxative
2	*Ailanthus excelsa*	Simaroubaceae	Mahal	Bark	Bark ground to paste and administered orally along with curd, twice a day for effective remedy in dysentery.
3	*Asparagus recemosus*	Liliaceae	Satabari	Root	Effective remedy for white discharge, indigestion, colic, stomach pain and spermatorrhea, Root used in nervous disorders, colic, dyspepsia, diarrhea, cough, dysentery, tumours, throat infections, inflammation tuberculosis, etc.
4	*Cassia fistula*	Caesalpiniaceae	Sunari	Fruit	15 gm of Fruit pulp is mixed with 5 ml of Amla juice to cure jaundices.
5	*Mentha piperata*	Lamiaceae	Pudina	Leaf	A volatile oil obtained from the plant is well known in medicine for its antiseptic, stimulant and carminative properties.
6	*Phyllanthus emlica*	Euphorbiaceae	Anla	Fruit	Fruit juice effective against diabetes
7	*Pongamia pinnata*	Fabaceae	Karanja	Shoot, seed	Antibacterial and antirnycobacterial activity. Seed oil is used in skin diseases and rheumatism. Tender twig is used as tooth brush to cure pyorrhoea.
8	*Terminalia*	Combretaceae	Arjuna	Bark	Bark is useful as cardio

	arjuna				tonic, cardio-protective and expectorant. Bark pasteis externally used in different skin diseases, against herpes andleucoderma.
9	*Terminalia chebula*	Combretaceae	Harida	Fruit	Paste prepared from pericarp taken along with curd to cure diarrhoea. The fruits are used as anti inflammatory, carminative and digestive agent
10	*Ficus benghalensis*	Moraceae	Bara	Bark	Infusion of bark is used in diabetes, dysentery and in seminal weakness.

(Source: https://odishaforest.in/admin/data/documents)

3.7.9 Fauna of the Study Area

Proposed alignment passing through the rural and purely in the agricultural field. At some places, it will cross from adjacent to some villages in the study area. The study area is devoid of any natural forest, so, major wildlife animals are rarely found in the area. Only some moving animals were observed. Domesticated animals mainly constitute the faunal population within the project area. The assessment of fauna was done on the bases of secondary data collected from different government offices like the forest department, wildlife department, etc. The presence of wildlife was also confirmed by the local inhabitants depending on the animal sightings and the frequency of their visits in the project area. During the present study period, a large number of local birds are noticed in the buffer zone of the study area. But, there are no bird habitats like nesting, breeding, and foraging patterns are noticed in the core zone.

3.7.10 Fauna of the Core Zone

A) Terrestrial fauna of core zone (Mammals/Reptiles/amphibians/birds/insects etc.).

The domesticated animals like Goat (Capra aegagrus); Buffalo (*Bubalus bubalis*); Cow (*Bos primigenius*); Ass (*Equus hemionus*) and Dog (*Canis lupus familaris*) were observed moving in different parts of the study area (including core and buffer zone), especially nearby town and villages. Mammals & other faunal species found in the study area are listed in Table 3.4 (iv).

Table 3.6 (ii): List Mammals, Reptiles and Amphibians recorded from the Core Zone

S. No.	Common Name	Scientific Name	Family	Schedule status (as per WPA-1972)	IUCN status
Mammals					
1	Indian hare	*Lepus nigricollis ruficaudatus*	Leporidae	V	LC
2	Five striped palm squirrel	*Funambulus pennanti*	Sciuridae	IV	LC
3	Indian Fulvous Fruit-Bat	*Rousettus leschenaultia*	Pteropodidae	V	LC
4	Indian Field Mouse	*Mus booduga*	Muridae	V	LC
5	Common House Rat	*Rattus rattus*	Muridae	V	LC
6	Bandicoot Rat	*Bandicota bengalensis*	Muridae	V	LC
Reptiles & Amphibians					
7.	Garden lizard	*Calotes versicolor*	Agamidae	IV	LC
8	Common skink	*Eutropis carinata*	Scincidae	IV	LC
9	Houselizzard	*Hemidactylus brooki gray*	Gekkonidae	IV	LC
IUCN Status =LC: Least Concern					

Bird Species					
1	*Acridotheres tristis*	Myna	Sturnidae	IV	LC
2	Amandava amandava	Red munia	Estrildidae	IV	LC
3	*Ardea cinerea*	Grey heron	Ardeidae	IV	LC
4	Ardeola grayii	Indian pond heron	Ardeidae	IV	LC
5	Bubulcus ibis	Cattle egret	Ardeidae	IV	LC
6	*Columba livia*	Pigeon	Columbidae	IV	LC
7	*Corvus macrorhynchos*	Jungle crow	Corvidae	IV	LC
8	*Corvus splendens*	Crow	Corvidae	V	LC
9	*Dicrurus adsimilis*	Black drango	Dicruridae	IV	LC
10	*Milvus migrans*	Black Kite	Accipitridae	IV	LC
11	*Passer domesticus*	House sparrow	Passeridae	IV	LC
12	*Pycnonotus cafer*	Red-vented bulbul	Pycnonotidae	IV	LC
13	*Turdoides caudate*	Common babbler	Leiothrichidae	IV	LC

IUCN Status =LC: Least Concern**, NE:** Not Evaluated.

3.7.10 Fauna of Buffer zone

To prepare a detailed report on the status of faunal biodiversity of the present study area (10 km buffer) of Dhenkanal district of Odisha and to assess the impacts due to digging/ leveling of alignment route/ construction of bridge/ operational activity which evolves suitable mitigation measures to protect & conserve biodiversity following components were studied: terrestrial biodiversity, wildlife survey (diversity), habitat study (feeding, breeding, roosting areas), distribution of birds, rare & endangered species of the study area.

The fauna of the study area vary upon the local topography and different types of habitats. Terrestrial Fauna of Buffer zone (Mammals/Reptiles/Amphibians/Birds/ Insects etc.)

The major part of the study area lies under agricultural fields and barren land which restricts the wildlife habitat significantly. There is neither any wildlife sensitive area nor any corridor for the movement of wildlife in the study area. A list of the animals of the study area has been prepared on the basis of the survey and also inquire from the local people. The animals, thus recorded were cross- checked with Wildlife (Protection) Act, 1972 for their schedule status. Faunal details of the study area are given in Tables below.

i) Mammals and Reptiles/ Amphibians

The domesticated animals like Goat (*Capra aegagrus*); Buffalo (*Bubalus bubalis*); Cow (*Bos primigenius*); Ass (*Equus hemionus*) and Dog (*Canis lupus familaris*) were observed moving in different parts of the study area, especially nearby town and villages. Other mammals and reptiles found in the study area are listed in table below.

Table 3.6 (iii): List Mammals, Reptiles and Amphibians recorded from the Buffer Zone

S. No.	Common Name	Scientific Name	Family	Status as per WPA-1972	IUCN status
Mammals					
1	*Bandicota bengalensis*	Bandicoot Rat	Sciuridae	IV	LC
2	*Canis aurius*	Jackal	Pteropodidae	V	LC
3	*Fellis chaus*	Jungle cat	Soricidae	II	LC

4	*Funambulus palmarum*	Three-striped Squirrel	Suidae	III	LC
5	*Funambulus pennanti*	Five striped palm squirrel	Hyaenidae	IV	LC
6	*Herpestes edwardsi*	Indian Grey Mongoose	Canidae	II	LC
7	*Hyaena hyaena*	Stripped hyena	Leporidae	V	LC
8	*Lepus nigricollis*	Indian Hare	Canidae	II	LC
9	*Mus booduga*	Indian Field Mouse	Sciuridae	IV	LC
10	*Presbytis entellus*	Common langur	Cercopithecidae	II	LC
11	*Pteropus giganteus*	Indian Flying Fox	Pteropodidae	V	LC
12	*Rattus rattus*	Common House Rat	Muridae	V	LC
13	*Vulpes bengalensis*	Indian fox	Felidae	II	LC
Reptiles and Amphibians					
1	*Naja naja*	Cobra	Elapidae	II	LC
2	*Bungarus caeruelus*	Krait	Elapidae	IV	NE
3	*Calotes versicolor*	Garden lizard	Agamidae	IV	NE
4	*Crotolus* sp.	Pit viper	Viperadae	II	LC
5	*Enhydris enhydris*	Smooth water Snake	Homalopsidae	IV	LC
6	*Ptyas mucosa*	Rat Snake	Colubridae	II	NE
7	*Euphlyctis hexadactyla*	Common frog	Dicroglossidae	IV	LC
8	*Eutropis carinata*	Common skink	Scincidae	IV	LC
9	Hemidactylus Flaviviridis	House Gecko	Gekkonidae	--	NE
10	*Bufo melanostictus*	Common toad	Bufonidae	IV	LC
11	*Varanus sp.*	Monitor lizzard	Varanidae	II	LC
12	*Rana temporaria*	Common frog	Ranidae	IV	LC
13	*Testudo graeca*	Common Tortoise	Testudinidae	IV	VU
IUCN Status =LC: Least Concern**, VU:** Vulnerable. **NT:** Near Threatened**, NE:** Not Evaluated**,**					

(Source: https://odishaforest.in/admin/data/documents)

ii) Avian Fauna

Table 3.6 (iv): Avian Fauna observed from the study area (10 KM Buffer area)

S.No	Scientific Name	Common Name	Family	Schedule Status (WPA-1972	IUCN Status
1	*Acridotheres tristis*	Myna	Sturnidae	IV	LC

2	*Acridotheres tristis*	Common myna	Sturnidae	IV	LC
3	Alcedo atthis	Small blue kingfisher	Alcedinidae	IV	LC
4	Amandava amandava	Red munia	Estrildidae	IV	LC
5	*Amaurornis phoenicurus*	White-breasted waterhen	Rallidae	IV	LC
6	*Ardea cinerea*	Grey heron	Ardeidae	IV	LC
7	*Ardea purpurea*	Purple heron	Ardeidae	IV	LC
8	Ardeola grayii	Indian pond heron	Ardeidae	IV	LC
9	Athene brama	Spotted Owlet	Strigidae	IV	LC
10	Bubulcus ibis	Cattle egret	Ardeidae	IV	LC
11	*Columba livia*	Pigeon	Columbidae	IV	LC
12	*Corvus macrorhynchos*	Jungle crow	Corvidae	IV	LC
13	*Corvus splendens*	Crow	Corvidae	V	LC
14	*Dendrocygna icolour*	Fulvous whistling duck	Anatidae	IV	LC
15	*Dicrurus adsimilis*	Black drango	Dicruridae	IV	LC
16	Egretta alba	Larger egret	Ardeidae	IV	LC
17	*Egretta garzetta*	Little egret	Ardeidae	IV	LC
18	*Francolinus pondicerianus*	Titar	Phasianidae	IV	LC
19	*Gallinule chloropus*	Common moorhen	Rallidae	IV	LC
20	*Gallus gallus*	Jungle hen	Phasianidae	IV	LC
21	*Passer domesticus*	House sparrow	Passeridae	IV	LC
22	*Pelecanus onocrotalus*	Great white pelican	Pelecanidae	IV	LC
23	*Psittacula krameri*	Rose ringed Parakeet	Psittacidae	IV	LC
24	*Pycnonotus cafer*	Red-vented bulbul	Pycnonotidae	IV	LC
25	*Sarkidiornis melanotos*	Knob-billed duck	Anatidae	IV	LC
26	*Saxicoloides fulicatus*	Indian robin	Psittaculidae	IV	LC
27	*Turdoides caudate*	Common babbler	Leiothrichidae	IV	LC
IUCN Status =LC: Least Concern**, VU:** Vulnerable.					

iii) Butterflies

Table 3.6 (v): Butterflies observed from the Buffer zone of the study area

S. No.	Scientific Name	Common Name	Family	IUCN Status
1	*Catopsilia pomona*	Common emigrant	Pieridae	LC
2	*Chlosyne lacinia*	Sunflower/Bordered Patch	Nymphalidae	LC

3	*Crocothemis erythraea*	Scarlet dragonfly	Libellulidae	LC
4	*Danaus chrysippus*	Plain Tiger	Nymphalidae	LC
5	*Danaus genutia*	Stripped Tiger	Nymphalidae	LC
6	*Euploea core*	Common crow	Nymphalidae	LC
7	*Eurema brigitta*	Small grass yellow	Pieridae	LC
8	*Tirumala limniace*	Blue tiger	Nymphalidae	LC

3.7.11 Aquatic Fauna of Buffer zone

Fish Fauna

The study area of the present Project development project has several lentic and lotic water bodies in which few are perennial and most of the water bodies are seasonal or monsoon fed. Brahmani River is a major lotic system in the study area. Some private ponds are also present in the study area which are mainly used for the culture of fishes. All these water bodies support fish species. Fishes found in the study area are listed in Table.

Table 3.6 (vi): Fish Fauna found in different seasonal & perennial water bodies in the study area

S. No.	Scientific Name	Family Name	IUCN Status	Schedule Status in WPA (1972)
	Notopterus chital	Notopteridae	LC	NA
1	*Catla catla*	Cyprinidae	LC	NA
3	*Channa punctatus*	Chandadae	LC	NA
4	*Labeo bata*	Cyprinidae	LC	NA
5	*Labeo rohita*	Cyprinidae	LC	NA
6	*Chela laubuca*	Cyprinidae	LC	NA
7	*Mystus bleekri*	Bagridae	LC	NA
8	*Mystus cavasius*	Bagridae	LC	NA
9	*Puntius sarana*	Cyprinidae	LC	NA
10	*Puntius sophore*	Cyprinidae	LC	NA
11	*Puntius amphibius*	Cyprinidae	LC	NA
12	*Puntius ticto*	Cyprinidae	LC	NA
13	*Xenentodon cancila*	Belonidae	LC	NA
14	*Labeo Calbasu*	Cyprinidae	LC	NA

Plankton and Benthos

For plankton, 50 litres composite water samples are collected from the river surface about 50-60 cm. depth and are filtered through a 20 µm net and concentrated in a 200 ml bottle and preserved in 4 % formalin solution. Samples are brought for laboratory analysis and further concentrated to 20 ml. The qualitative and quantitative analysis is done using one drop of sample under a light microscope following the APHA et.al. (1998).

$$P = A \times 1/v \times n/N$$

The total number of planktons present in a liter of water sample is calculated using the following formula:

Where, P = Av. no of plankton present /litre

A= average no of organism per drop; V=volume of drop (ml)

N=volume of water filtered (l);

n=total no of concentrated sample (ml).

S. No.	PHYTOPLANKTON	BENTHOS
1	*Cymbella sp.*	Ephemeroptera (Ephemerella)
2	*Navicula radiosa*	Tricoptera (Hydroptilidae)
3	*Gomphonema sp.*	Diptera (Culicoides)
4	*Stigeoclonium sp.*	Coleoptera(Ptilodactylidae)
5	*Compsopogon sp.*	
6	*Mougeotia sp.*	
7	*Oscilatoria sp.*	
8	*Anabaena sp.*	
9	*Microcystis sp.*	
10	*Ulothrix sp.*	
11	*Zygnema sp.*	
12	*Diatoma sp.*	
13	*Nodularia sp*	

Zooplankton

S. No.	ZOOPLANKTON		
	PROTOZOANS	NEMATOD	ATHROPOD
1	*Amoeba sp.*	Cyclindrocorporidae	*Streptocephalus sp.*
2	*Acanthocystis sp.*	Haplodamidae	*Triops sp.*
3	*Arcella sp.*		

4	*Glaucoma sp.*		

Analytical Results

The dominant species of phytoplanktons as observed are *Navicula radiosa, Anabaena sp., Synedra sp., Oscilatoria sp , Stigeoclonium sp., Ulothrix sp.* etc. The dominant species of benthic organisms are Ephemeroptera, Tricoptera, Tricoptera, Diptera, Plecoptera and Odonata.

3.7.12 Conclusion

Flora

Most of the parts of the present study area Dhenkanal district are agricultural fields, village land. The forest of the district comprises tropical deciduous vegetation due to high temperature and humidity. No any rare, endangered and threatened floral species have been observed from the core and buffer zone of the present study.

Fauna

There are no National parks, Sanctuaries, Biosphere Reserves, Wildlife corridors, Tiger/Elephant reserves (existing as well as proposed), within 10 km buffer area of the project area. No endangered and threatened faunal species were observed from the core zone. However, care will be taken during the developmental activities if found any. On the other hand, in the buffer zone there is no Schedule-I fauna was recorded as per the Wildlife (Protection) Act, 1972. 9 species are scheduled in II in WPA, 1972. One species i.e. Common Tortoise listed under IUCN list of vulnerable species is also reported from buffer zone.

3.8 SOCIAL IMPACT ASSESSMENT, REHABILITATION & RESETTLEMENT (R&R) ACTION PLAN

There will be no resettlement or rehabilitation involved in the project being on meandering course of the river. However, a detailed Socio-Economic Assessment has been performed, which is given below:

Introduction

In this section of the report an attempt has been made to measure Socio-economic impact of the proposed river bed mining project on Brahmani River at located Village – Kanapala Samil Mahulpal Tahasil Bhuban District Dhenkanal, and State - Odisha. The various attributes that have been taken

into account are population composition, employment generation, occupational shift, household income, consumption pattern, ethnic issue and law & order problem. The key objective of the study is to assess possible impact of the project on socio-economic life of the people in the neighborhood known as study area.

The objectives of the socio-economic impact assessment are as follows:

a) To collect baseline data of the study area.
b) To know the socio-economic status of the people living in the study area of the proposed mining project.
c) To assess the possible impact of the project on socio-economic aspects in the study area.
d) To measure the impact of the project on Quality of life of the people in the study area.

Approach & Methodology

a) A mixture of both quantitative and qualitative approach has been adopted in the current socio-economic study.
b) The study has been conducted based on primary and secondary data. While primary data has been collected through a sample survey of selected households in the study area, the secondary data has been collected from the administrative records of the Government of Odisha, Census 2011, district hand books and from the Odisha Government portal**.**
c) The details regarding population composition, number of literates, workers, etc have been collected from secondary sources and analyzed. Also, village/city/town wise details regarding amenities available in the study area have been collected from secondary sources like Census 2011, and analyzed.
d) Two stage sampling design has been adopted to select the sampling units. The first stage units are census villages in the rural areas and towns/cities in urban areas. The ultimate stage units are households in the selected villages and towns/cities. Probability sampling has been adopted to select the sampling units.
e) Estimation of various parameters has been made based on sample data and bottom top approach has been adopted.

f) On the basis of a preliminary reconnaissance survey, two questionnaires were developed to make it suitable to fulfill the objectives of the study. The questionnaires contained both open ended and close ended questions

g) The data collected during the above survey was analyzed to evaluate the prevailing socio-economic profile of the area.

h) Based on the above data, impacts due to mining operation on the community have been assessed and recommendations for improvement have been made.

Concept & Definition of Terms Used

a) **Study Area:** The study area, also known as impact area has been defined as the sum total of core area and buffer area with a radius of 10 Kilometers from the periphery of the project site. The study area includes all the land marks both natural and manmade, falling therein.

b) **QoL**: The Quality of Life (QoL) refers to degree to which a person enjoys the important possibilities of his/her life. The 'Possibilities' result from the opportunities and limitations, each person has in his/her life and reflect the interaction of personal and environmental factors. Enjoyment has two components: the experience of satisfaction and the possession or achievement of some characteristic.

c) **Household**: A group of persons who normally live together and take their meals from a common kitchen are called a household. Persons living in a household may be related or unrelated or a mix of both. However, if a group of related or unrelated persons live in a house but do not take their meals from the common kitchen, then they are not part of a common household. Each such person is treated as a separate household. There may be one member households, two member households or multi-member households.

d) **Sex Ratio:** Sex ratio is the ratio of females to males in a given population. It is expressed as 'number of females per 1000 males'.

e) **Literates:** All persons aged 7 years and above who can both read and write with understanding in any language are taken as literate. It is not necessary for a person to have received any formal education or passed any minimum educational standard for being treated as literate. People who are blind but can read in Braille are also treated as literates.

f) **Literacy Rate:** Literacy rate of population is defined as the percentage of literates to the total population aged 7 years and above.

g) **Labour Force:** The labour force is the number of people employed and unemployed in a geographical entity. The size of the labour force is the sum total of persons employed and unemployed. An unemployed person is defined as a person not employed but actively seeking work. Normally, the labour force of a country consists of everyone of working age (commencing from 14 to 16 years) and below retirement (around 65 years) that are participating workers, that is people actively employed or seeking employment. People not counted under labour force are students, retired persons, stay-at home people, people in prisons, permanently disabled persons and discouraged workers.

h) **Work:** Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. The work may be part time or full time or unpaid work in a farm, family enterprise or in any other economic activity.

i) **Worker:** All persons engaged in 'work' are defined as workers. Persons who are engaged in cultivation of land or milk production even solely for domestic consumption are also treated as workers.

j) **Main Workers**: Those workers who had worked for the major part of the reference period (i.e. 6 months or more in the case of a year) are termed as Main Workers.

k) **Marginal Workers:** Those workers who did not work for the major part of the reference period (i.e. less than 6 months) are termed as Marginal Workers**.**

l) **Work participation rate**: The work participation rate is the ratio between the labour force and the overall size of their cohort (national population of the same age range). In the present study the work participation rate is defined as the percentage of total workers (main and marginal) to total population.

Demography of the Dhenkanal District

As per 2011 census, Dhenkanal has a population of 1,192,811 of which male and female are 612,593 and 580,218 respectively. In 2001 census, Dhenkanal had a population of 1,066,878 of which males

were 544,001 and remaining 522,877 were females. Population of Dhenkanal District constitutes 2.84 percent of total Odisha in 2011 against 2.90 in 2001. The population growth in the district in 2011 over 2001 was 11.80 percent as compared to 12.56 percent in 2001.

The 2011 census shows that population density of Dhenkanal district is 268 per sq km against 240 in 2001. Dhenkanal district administers 4,452 square kilometers of areas. With regards to Sex Ratio in Dhenkanal, it stood at 947 per 1000 male compared to 2001 census figure of 961. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 877 girls per 1000 boys compared to figure of 925 girls per 1000 boys of 2001 census data. In regard to child under 0-6 age, there are 139,096 children in the district in 2011 against 145,857 in 2001. Of the total of 139,096, male and female were 74,093 and 65,003 respectively. Child Sex Ratio as per census 2011 was 877 compared to 925 of census 2001. In 2011, Children under 0-6 formed 11.66 percent of Dhenkanal District compared to 13.67 percent of 2001. There was net change' of -2.01 percent in this compared to previous census year.

(*Source: https://dhenkanal.odisha.gov.in/sites/)*

Rural and Urban Characterictics of Population as per 2011 census		
Description	**Rural**	**Urban**
Population %	90.15%	9.85%
Total Population	1,075,305	117,506
Male Population	551,326	61,267
Female population	523,979	56,239
Sex Ratio	950	918
Child Sex Ratio(0-6)	877	883
Child Population (0-6)	127,334	11,726
Male Child (0-6)	67,847	6,246
Female Child (0-6)	59,487	5,516
Child Percentage (0-6)	11.84%	10.01%
Male Child Percentage	12.31%	10.19%
Female Child Percentage	11.35%	9.81%

Literates	735,532	94,387
Male Literates	412,767	51,326
Female Literates	322,756	43,061
Average Literates	77.59%	89.26%
Male Literates%	83.37%	93.28%
Female Literates%	69.49%	84.89%

(*Source: https://dhenkanal.odisha.gov.in/sites/)*

District Development Indicator

In 2011, the average literacy rate of Dhenkanal is 78.76 percent as compared to 69.42 percent in 2001. If things are looked out at gender wise, male and female literacy are 86.18 and 71.00 respectively. For 2001census, same figures stood at 80.57 and 57.89 in Dhenkanal district. Total literate population of Dhenkanal district is 829,910 of which males and females are 464,093 and 365,817 respectively. In 2001, Dhenkanal District literate population was 639,363 in the district. Selected Development indicators of Dhenkanal district are presented in the following table. *(Source: District Environment Plan)*

Comparative Development Indicators of the District with State

SI	Item	Ref. Period	Unit	Dhenkanal	State
1	Geographical Area	Census 2011	Sq.Km.	4452	155707
2	% Share of Geographical area to State area	Census 2011		2.86	100
3	Population Male Female Total	Census 2011	'000No.	613	21212
			'000No.	580	20762
			'000No.	1193	41974
4	% share of Populatin to State Population	Census2011		2.84	100
5	SC Population	Census2011	No	234079	
6	ST Population	Census2011	No	162056	
7	SC Population	Census 2011	%ofTP	19.6	17.1
8	STPopulation	Census 2011	%ofTP	13.6	22.8
9	Overall Sex Ratio(Female per'000population)	Census 2011	No.	947	979
10	Sex Ratio among SC (Female per'000population)	Census2011	No.	971	987

11	Sex Ratio among ST (Female per'000 population)	Census 2011	No.	100	1029
12	Child Sex Ratio (0-6years)	Census 2001	No.	925	953
13	Child Sex Ratio (0-6years)	Census 2011	No.	877	941
14	Density of population per sq.km. area	Census 2011	No.	268	270
15	Decadal population Growth Rate of population	2001-2011	11.8	14	15
16	% of Urban Population	Census 2011	9.9	16.7	16
17	% of SC Population	Census 2011	19.6	17.1	17
18	% of ST Population	Census 2011	13.6	22.8	18
19	% of population in the age group 0-6 to total population Male	Census 2011	12.1	12.8	19
	Female		11.2	12.3	
	Total		11.7	12.6	
20	Literates Male Fe	Census 2011			20
	male		000No. 464	15090	
	Total		'000No. 366	11653	
			'000No. 830	26743	
21	Overall Literacy Rate Male	Census 2011	86.2	81.6	21
	Female		71	64	
	Total		78.8	72.9	
22	% of total workers to total	Census 2011	36.5	41.8	
	population				
23	% of main workers to total	Census 2011	23.2	25.5	
	population				
24	% of marginal workers to total,	Census 2011	8	7.4	
	population				
25	% of non-workers to total	Census 2011	63.5	58.2	
	population				
26	% of main workers to total	Census 2011	63.7	61	
	workers				
27	% of marginal workers to total	Census 2011	28	26.1	
	workers				
28	% of cultivators to total	Census 2011	16.4	23.4	
	workers				

SI	Item	Ref. Period	Unit	Dhenkanal	State
19	% of population in the age group 0-	Census 2011			
	6 to total population Male		12.1	12.8	
	Female		11.2	12.3	
	Total		11.7	12.6	
20	Literates Male Female	Census 2011			
	male		000No. 464	15090	
	Total		'000No. 366	11653	
			'000No. 830	26743	
21	Overall Literacy Rate Male	Census 2011	86.2	81.6	
	Female		71	64	
	Total		78.8	72.9	
22	% of total workers to total	Census 2011	36.5	41.8	
	population				
23	% of main workers to total	Census 2011	23.2	25.5	
	population				
24	% of marginal workers to total,	Census 2011	8	7.4	
	population				
25	% of non-workers to total	Census 2011	63.5	58.2	
	population				
26	% of main workers to total	Census 2011	63.7	61	
	workers				
27	% of marginal workers to total	Census 2011	28	26.1	
	workers				
28	% of cultivators to total	Census 2011	16.4	23.4	
	workers				

(Source: District Planning & Monitoring Unit)

Comparative Development Indicators of the District with State

SI	Item	Ref. Period	Unit	Dhenkanal	State
29	% of Agriculture labourers to total workers	Census2011	37.6	38.4	
30	% of household industry workers to total workers	Census2011	4	4.5	
31	Average size of	1/1/2000	Ha.	0.16	1.25

	operational holding				
32	Yield Rate of Rice	12/1/2011	Kg./Ha.		
	Kharif			2099	1360
	Rabi			2142	1455
	Total			2103	1472
33	Yield Rate of Wheat	12/1/2011	Kg./Ha.	1750	1686
34	Yield Rate of Maize	12/1/2011	Kg./Ha.	1544	2321
35	Yield Rate of Ragi	12/1/2011	Kg./Ha.	592	895
36	Yield Rate of Groundnut	12/1/2011	Kg./Ha.	1741	1707
37	Cropping Intensity	12/1/2011	%	187	166
38	% of net irrigated area to net Area sown	12/1/2011		51.13	57.24
39	Rate of fertilizer consumption	12/1/2011	Kg./Ha.	32.07	62.25
40	% of forest area of geographical area	8/1/2007		39.03	37.34
41	% share of forest area to State Forest area	8/1/2007		2.99	100
42	% of villages electrified	12/1/2011		97.1	82.8

(Source: District Planning & Monitoring Unit)

Table 3.7 Demographic Profile of Bhuban Tahasil of Dhenkanal District as per Census 2011

S. No.	Indicators	Persons	Males	Females
1	Population	101051	51992	49059
2	Child Population	11594	6116	5478
3	Scheduled Castes	20622	10469	10153
4	Scheduled Tribes	9492	4767	4725
5	Literate	71842	40086	31756
6	Illiterate	29209	11906	17303
7	Workers	32432	28337	4095
8	Non Workers	68619	23655	44964

(Source: Census of India 2011)

POSSIBLE IMPACT ASSESSMENT

Impact on population composition

The impact of the proposed mining project on population composition will be marginal as only few skilled and managerial staff will be recruited from outside and the rest will be recruited locally. The

impact will be significant if a large number of people from outside get employed in the proposed project.

In that case not only the population of the study area will go up but also the skewed sex ratio may make permanent social effects like rise in exploitation of women, higher crime rate, increase in sexual diseases and depression among youth.

Impact on employment generation

The proposed sand mining project is expected to provide employment opportunities to 42 persons Skilled & Semi-Skilled/ Unskilled workers. It is understood that all the persons to be deployed for various mining activities will be recruited locally and there is very little scope for migration of people from outside the study area. The employment potentiality of the project is expected to ameliorate the economic condition of the families of those persons who will get employed in the proposed mining project. However, the mining project will provide seasonal employment. Further, the project will provide indirect employment to about 42 people who will be involved in segregation of extracted mining materials, crushing of boulders, petty business and service-oriented industries.

Impact on Health

Extraction of sand, from the river bed poses serious health risks due to dust, quarrying and stone crushing. The effects will vary depending upon the nature of the dust particles, silica content in it and the size of the particles. Pneumoconiosis is an occupational lung disease often caused to miners, due to the inhalation of dust. Silica content in the sand may also lead to Silicosis, which is again an occupational lung disease. Miners may also suffer with occupational respiratory ailments, skin allergies etc, but the same are preventable if exposure is minimized. Further, regular health check-up of the miners is required to prevent any negative impact on their health. In the present mining project, no adverse impact on health is expected if minimum precautions are taken by the miners.

Impact on income

In India poverty is widespread. According to an estimate made by World Bank during 2005, 26 percent of the total Indian population falls below the International poverty Line of US$ 1.25 a day (PPP, in nominal terms ₹ 21.6 a day in urban areas and ₹ 14.3 in rural areas). The impact of the proposed mining activity on household income in the study area is thus positive since it will provide employment to local people, which will result to an increase in household income of those workers

who will be recruited for mining operation. However, this impact will be effective for a period of 250 days in a year.

Impact on consumption pattern

The field survey has revealed that people in the study are poverty ridden. Increased household income may slightly change the consumption pattern of few but majority of the people will continue to be burdened with poverty.

Impact on road development Movement of trucks and other vehicles to and fro the quarry is expected to increase substantially, when mining will start. The existing roads connecting the quarry with the national and state highways are mostly narrow mud roads. There will be mud slide and traffic bottle neck if these roads are not widened and their conditions are not improved by making them paved roads. Hence, there is ample scope for road development in and around the mining areas.

Impact on law & Order

As local people will be employed to run the quarry, no law & order problem is envisaged. It is expected that the workers will attend to their duties from their residence and return to their homes after the day's work is over. There would have been law & order problem if the workers were migrants and lived in shanties closed to the mining area. However, to meet any untoward incident one police post may be set up closed to the project area.

Public Perception about the Project

Visit to project village has revealed that no villager was opposed to the proposed river bed mining project. They whole heartedly welcomed it as they were disgusted with perennial poverty. They hoped that the upcoming mining project will definitely increase their income which in turn will increase their purchasing power. They however, demanded that the beneficiaries should be selected from those who belong to BPL category and registered under SGSY scheme.

The villagers living in the distant villages located within the study area were found either not aware or partially aware of the upcoming mining project and they did not make any comment about its utility. They however demanded that labour intensive projects should be implemented in their villages, to fight poverty.

Suggestions

Provision of First Aid at mining site

Extraction of sand from the river bed poses serious health risks due to dust, quarrying. The effects vary depending on the nature of the dust particles, silica content in it and the size of the particle. To meet any emergency during extraction of the minerals from the river bed and subsequent loading in the transport vehicles, provision for First Aid should be made by the project proponent. Before the affected person is removed to a doctor or health institution for necessary medical aid, the miner should be provided with First Aid.

Tie up with the nearest PHC for medical help

To meet the medical needs of the mine workers it is suggested that tie-ups with nearest hospital or Primary Health Center (PHC) may be made. Few beds may be exclusively reserved for the mine workers in the above health institutions. This will ensure timely medical aid to the affected persons.

Supply of Mask, Gloves and Helmets

The mine workers are subject to respiratory diseases, muscular-skeletal and gastro-intestinal disorders and skin diseases. For protection from dust it may be made compulsory for all mine workers to wear masks and gloves while working in the mines. Further, wearing of helmets will be encouraged while loading and unloading minerals in the trucks in order to avoid impending danger.

Regular health checkups- The miners may be encouraged to undergo health checkups at regular intervals in order to protect themselves from various diseases. The health Department of Odisha Government must Organize Health Camps at regular intervals preferably in every quarter. Further, free medical facilities may be made available to the workers and their family members.

Special telephone number

A special telephone number may be made available to the mine workers. In case of emergency the miners can dial the above number for medical assistance. Vehicle may be provided to the patients in short duration for shifting to the health institution.

Special Group Insurance Scheme

All the mine workers may be covered under a Group Insurance Scheme of LIC or any other Insurance company, if not so far.

Distribution of Blankets and Quilts

During winter season the mine workers may be distributed blankets and quilts free of cost.

Conclusion

The implementation of the Sand mining project will throw opportunities to local people for both direct and indirect employment. Since the quarries have been auctioned and leased out to successful allottees, sand mining operation in the state will get legalized and it will fetch income to the state exchequer. The project will also provide impetus to industrialization of the area. With the implementation of the proposed mining project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities rather in agriculture. Thus, there will be a gradual shifting of population from agriculture to mining and industry. Further, the mining and industrial activities in the area may lead to urbanization. Due to urbanization of the area, employment opportunities will further increase.

The study area is still lacking in education, health, housing, water, electricity etc. It is expected that same will improve to a great extent due to proposed mining project and associated industrial and business activities. It is therefore suggested that extraction of minerals should be taken up on regular basis during the post monsoon period. This will dredge the river bed on regular basis, regulate the course of the river and check flooding of the catchment area.

Proposed activities and expenses on Corporate Environmental Responsibility will be as per CER Mandate of the Government.

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CHAPTER-IV
ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

CHAPTER-IV

ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

INDEX

4.0 GENERAL

Sand have long been used as aggregate for construction of roads and building. Today, the demand for these materials continues to rise day by day. In recent years, rapid development has led to an increased demand for river sand as a source of construction material. It is recommended to remove the sand deposition on the regular basis otherwise the river will raise the height and may pose threats of inundation of unaffected areas. Besides this, the deposited mineral is a constant source of revenue generation to the state government and ensures the constant supply of this building material.

All development projects have an impact on the natural set up of the environment. This impact may be beneficial or adverse, depending on the improvement or the deterioration it brings about in the status of air, water, land, ecology, natural systems, socio-cultural life styles and economics of the population. Depending on the nature of activities and baseline environment status, the impacts are assessed for their importance. On the basis of the impact analysis, the mitigating action and future monitoring requirement are focused in the Environmental Management plan for countering or minimizing the impacts.

Keeping in mind, the environmental baseline scenario as detailed in Section III and the proposed mining activity described in Section II, it is attempted to assess the likely impact and its extent on various environmental parameters and likely mitigation measures to be adopted. This Chapter provides a brief overview of the potential impacts on various environmental components due to the proposed opencast mining activities. The opencast mining operations in general cause environmental degradation and if adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause irreversible damage to the eco- system.

Any human activity in any environment produces impact, modifying it to status which is considered adverse of beneficial according to damage or improvement it brings about in physical, chemical & biological status, the impacts are assessed for their importance. On the basis of impact analysis, the mitigation action is focused in the environmental management plan for counting or minimizing adverse impacts. Effects of this mining project on each of the environmental parameters are detailed below in accordance with the parameters of environment likely to be affected- Climate, Air environment, Land environment, Ecology, Water requirement, Noise levels, Soil, Socio-economic environment, Cultural & Heritage environment. Centrally the environment impacts cab be categorized as either primary or secondary. Primary impacts are those which can be attributed

directly to the projects. On the indirectly or induced typically include the associated investments & change patterns if social & economic by the proposed actions.

IMPACT OF SANDMINING

Impacts of sand mining can be broadly classified as given below:

Physical

The large-scale extraction of streambed materials, mining below the existing stream bed and the alteration of channel-bed form and shape lead to several impacts such as erosion of channel bed and banks, increase in channel slope, and change in channel morphology. These impacts may cause: (1) the undercutting and collapse of river banks, (2) the loss of adjacent land and/or structures, (3) upstream erosion as a result of an increase in channel slope and changes in flow velocity, and (4) downstream erosion due to increased carrying capacity of the stream, downstream changes in patterns of deposition, and changes in channel bed and habitat type.

Mitigation measures

- Sand mining will be restricted up to ~2.0 m below river bed / water table whichever less.
- The RBM will be done in unsaturated zone. Thus minimum loss to habitat.
- Dredging will not be allowed.

Sand Budget

Determining the sand budget for a particular stream reach requires site-specific topographic, hydrologic, and hydraulic information. This information is used to determine the amount of sand that can be removed from the area without causing undue erosion or degradation, either at the site or at a nearby location, upstream or downstream.

In-channel or near-channel sand mining changes the sediment budget, and may result in substantial changes in the channel hydraulics. These interventions can have variable effects on aquatic habitat, depending on the magnitude and frequency of the disturbance, mining methods, particle-size characteristics of the sediment, the characteristics of riparian vegetation, and the magnitude and frequency of hydrologic events following the disturbance.

Temporal and spatial responses of alluvial river systems are a function of geomorphic thresholds, feedbacks, lags, upstream or downstream transmission of disturbances, and geologic/physiographic

controls. Minimization of the negative effects of sand mining requires a detailed understanding of the response of the channel to mining disturbances.

Decisions on where to mine, how much and how often require the definition of a reference state, i.e., a minimally acceptable or agreed-upon physical and biological condition of the channel. Present understanding of alluvial systems is generally not sufficient to enable the prediction of channel responses quantitatively and with confidence; therefore, reference states are difficult to determine. Still, a general knowledge of fluvial processes can provide guidelines to minimize the detrimental effects of mining. Well-documented cases and related field data are required to properly assess physical, biological, and economic tradeoffs.

Mitigation measures

Quantities will be strictly limited so that sand recruitment and accumulation rates are sufficient to avoid extended impacts on channel morphology and in stream habitat. Although conceptually simple, annual sand recruitment to a particular site is highly variable and not well understood.

- Flow and sediment transport for most rivers and streams is highly variable from year-to-year, thus an annual average rate may be meaningless.
- An "annual average deposition rate" could bear little relation to the sediment transport regimes in a river in any given year.
- The site selection was done keeping the following points; minor mineral reserves, site specific problems like flooding, submergence crop lands / fields, need of excavation, rate of sediment deposition etc.
- Sand mining will be restricted up to ~3.0 m below bed / water table whichever less.

Construction Phase- There will be no impacts as no construction phase is involved in this project.

Operation Phase-

Impact on topography & Drainage:

- The mine working will remain confined to river bed only & in no case disturbing any surface area outside which may affect topography or drainage course.
- Due to mining Temporary pits will form & it is replenished in upcoming monsoon season.
- Mining will be done in a planned may i.e collection of mineral/working shall be started from the central dip to rise & then laterally 1.5-meter slice so that river course will not get affected.

- Unwanted material including mineral or spillage (in any) will not be stacked on the bank side as it will hinder the flow of water in monsoon season.
- The mining from river bed will not have any impact on natural drainage of surrounding area as the excavated Sand from river bed is filled with first heavy flow in river during monsoon season.

Impact on Climate:

a) Temperature

The temperature pattern is a regional behavior & is not likely to be affected by river bed mining activity over a small area. Some local and temporary effect may be perceived due to movement of vehicles and equipment used.

b) Rainfall

The trend of rainfall forms part of regional pattern, not dependent on the relatively small area of river bed mining activity. The mining operation, therefore is not likely to have any adverse impact on rainfall pattern.

c) Humidity

The pattern of relative humidity depends mainly on the rainfall, wind temperature & other weather phenomenon that regional in behavior. The mining operation is not likely to have any impact on the relative humidity in the surrounding.

4.1 LAND ENVIRONMENT

No adverse impact is anticipated on land use of buffer zone due to present mining operations. As all the related activities are confined to the core zone.The area likely to be degraded due to quarrying, pitting & roads. The impact on the land form or physiography will be limited to the modification of the slope. The landscape and land use will undergo a radical change due to open cast mining. The impact during next five years is limited as benches will be formed. Besides these benches, roads will also modify the physiography. The impact on land use will also be limited.

Impact on Land use Pattern including change of River course:

- If mining is not carried out in systematic manner by leaving sufficient safety barriers from the bank than it may disturb the river flow/course.
- Stacking of uncoated material including mineral or spillage (if any) on the bank side of river will hinder the flow of water in monsoon season, raise water level upstream, which may lead to bank cutting or flouting.

- Deviation from planned mining procedures can lead to river channel shifting as well as degradation of surrounding land, causing loss of properties & degradation of land scape.

Mitigation measures:

- Mineral will be mined out in central portion of stream & sufficient safety barrier 10% of width will be left towards bank side, so that river flow/course will not get disturbed.
- Mining of mineral will be started towards rise at the centre & also laterally in 1m slice so that river course will not get affected. Unwanted material or spillage (if any) will not be stacked by the side of excavation voids created. This is to be done so. Because it will otherwise hinder flow of water in monsoon period.
- Mining is to be done by leaving safety barrier on both sides & maximum barrier should be do concave side of river preferably the flow channel (excavation void created) should be kept straight to help avoid erosion as side cuttings, Upto next depth of 3.0 m from river bed level.

No waste water will be generated from the mining activities of minor minerals as the project. Only involves lifting of Sand from the river bed.

4.2 WATER ENVIRONMENT

Damage in the water body, depends on its assimilative capacity. To find out assimilative capacity of receiving water body, water samples were collected from different groundwater and surface water sources. The study indicates that assimilative capacity of the River water bodies still exists, but effective measures shall be taken to check water pollution. To find out the effect on ground water an extensive hydro-geological study has been conducted and from the study it can be safely concluded that there is no noticeable effect on surrounding ground water resource due to mining. The mining activity does not require water. The collection of sand is done on the river bed where excessive sedimentation has been noticed.

Mining of sand from within or near a streambed has a direct impact on the stream's physical habitat characteristics. These characteristics include geometry, bed evaluation, substrate composition and stability, in stream roughness elements, depth, velocity, turbidity, sediment transport, stream discharge and temperature. Altering these habitat characteristics can have deleterious impacts on both in stream biota and associated riparian habitat.

The detrimental effects to biota resulting from bed material mining are caused by three main processes:

i. alteration of flow patterns resulting from modification of the river bed
ii. an excess of suspended sediment
iii. damage to riparian vegetation and in stream habitat

As the project activity is carried out in the meandering part of the river bed, none of the project activities affect the water environment or riparian habitats. In the projects, it is not proposed to divert or truncate any stream. No proposal is envisaged for pumping of water either from the river or tapping the ground water. In the lean months, the proposed sand mining will not expose the base flow of the river and hence, there will not be any adverse impact on surface hydrology and ground water regime due to this project. The contractor will adhere all guidelines and rules for proper and scientific method of mining during the period of extracting the ordinary sand. Thus, the project activities shall not have any adverse effect on the physical components of the environment and therefore may not have any effect on the recharge of ground waters or affect the water quality.

Impacts on hydrological Conditions:

- The study area is itself part of river course carries surface as well as ground water (under current). The flow of surface/ground water (sub surface flow is following the trend of topography.
- The area is part of dry river bed for more than nine months in a year except for the rainy season. The Sand mining is up to the depth of 2.0 m will have in significant impact on water regime.
- The general ground water table which will be about 2.0 m below surface of river bed in the mining area during dry seasons will not be disturbed as ultimate working depth 2.0 m.

Impact on Water Quality:

- Mining causes lowering of riverbed level as well as riverbed water level resulting in lowering in ground table due to excessive extraction & drainage out of ground water from the adjacent areas, if general ground water table is higher than the river bed level. In case the general ground water level is lower than riverbed water level, than it will have positive impact on ground water table will recharge vertically as well as laterally. In the former case may cause shortage of water for the vegetation & human settlement in the vicinity, but in later case it will help in improving situations

- River is recharging the ground water, excessive mining will reduce the thickness of the natural filter material (sediments), infiltration through which the ground water recharged, so restriction in depth becomes necessity.

Mitigation Measures:

Mining in the area will be done above the water table as well as river bed water level, therefore much impact on water regime is not anticipated.

4.3 AIR ENVIRONMENT

Anticipated impacts and Evaluation

Information on air quality was studied and various modelling techniques predicted that the mining activity will not affect the air quality in a significant manner. In mining operations, loading, transportation and unloading operations may cause deterioration in air quality due to handling dry materials. In the present case, only wet materials will be handled, thus eliminating problems of fugitive dust. Also, the collection and lifting of minerals will be done Semi-Mechanized without any blasting. Therefore, the dust generated is insignificant as compared to mining process of other hard minerals like the process of drilling, blasting, mechanized loading etc.

The major contribution of air pollution is by river bed mining, such as excavation, loading, transportation, handling operation & handling of mineral viz Sand. This will lead to momentary rise in the particulate matter (PM_{10}). The dust liberated in mining & other relative operations is injurious to health if inhaled in sufficient quantity. As such there will be no notice able impact on air quality.

AIR MODELING

A detailed study on emission sources and quantification of pollutant concentration by means of dispersion modeling is required to access the environmental impact of a mine. On the basis of the predicted increments to air pollutant concentrations, an effective mitigation and environmental plan can be devised for sensitive areas. In case of this mining, as there are no blasting and drilling activities, the impacts may only be caused by material handling and transportation activities. The material is mostly wet, and therefore effect is minimal.

FUGITIVE DUST- MODELING

Air quality modeling was done using line source model as published by USEPA "Emission Factor Documentation for AP-42", in section 13.2.2, for transportation though unpaved roads. Emission factors to be used in Line source dispersion equation is adopted from formula as given below:

E=k * (s/12)a * (W/3)b /(M/0.2c) ……(1)

Where

E = Emission Rate (lb/VMT)

s = Surface material Silt Content (%) = 10%

W=Mean Vehicle Weight (tonnes) = 20 tonnes

M= Surface material moisture content (%) = 2.1%

K, a, b & c are empirical constants with values given as below:

Constant	PM 10
k	2.6
a	0.8
b	0.4
c	0.3

Thus for vehicles of 20 tonners, the Emission Rate using equation **(1)** is**:**

E = 1.41020 lb/VMT

E = 0.000110 g/s/m

Concentration of the fugitive dust was calculated using the formula given in "Workbook of Dispersion Modeling" by Turner. The Concentration of the fugitive Dust is given below:

$C = (2/\pi)^{1/2}$ $(E / \sigma z\, \upsilon)$ Exp- $[(h^2) / (2\, \sigma z^2)]$ x 10^6 ---------- (2)

Where

C = Hourly Concentration in microgram/ m^3

E = Emission Rate = 0.000110 g/s/m

υ = Wind Speed = 5.8 m/s

h = 0 m

Modeling was done for an infinite line source assuming unpaved road. For conservative calculation wind was assumed to blow at a velocity of 5.8 m/s perpendicular to the road. The results for 24 hourly concentration values are given in the **Figure 4.1**

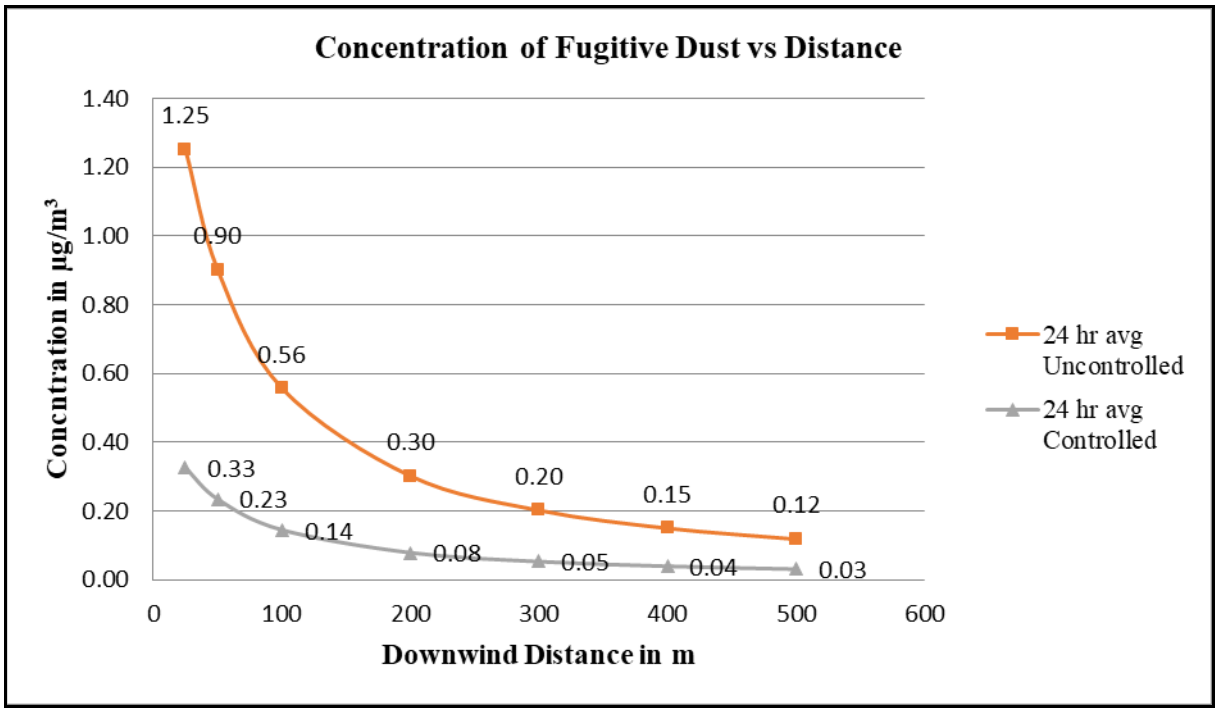

Figure 4.1 Concentration of Fugitive dust vs Distance in 24 hours average unscientific and scientific way

It is observed that the ground level concentration (GLC) decreases from **1.25 µg/m^3** at 25 m **to 0.12 µg/m^3** at 500 m from the centre line of the road. These values have been predicted for a dry unpaved road in an uncontrolled scenario. However, the GLC at 25 m will further reduce down to **0.33 µg/m^3** and **0.03 µg/m^3** at 500 m in a controlled scenario i.e. through water sprinkling.

Mitigation measures

- In control the emission regular preventive maintenance of equipment will be carried out on contractual basis.
- Proper mitigation measures like water sprinkling will be adopted to control dust emission.
- Plantation will be carried out at a place which is authorized by local authority.

- It is being certified that all transportation vehicles will carry a valid PUC certified. The only air pollution sources are the road transport network of the trucks. The dust suppression measures like water spraying will be done on the roads. This will decrease the dust emission by 75%.
- There is no toxic element present in the mineral which may contaminate the soil.

4.4 NOISE ENVIRONMENT

The sand mining projects are mainly not noisy as these are mainly manual in nature. But in this case the methodology adopted for mining is opencast semi mechanized mining method which may generate noise.

Impact on environment

At mines, noise is created by movement of machinery & transportation vehicles, etc. The noise level in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which has been adopted and enforced by the Govt. of India through model rules framed under Factories Act, 1980 and CPCB 2000 norms. The summary of the permissible exposures in cases of continuous noise as per above rules is given below:

Table 4.1 Noise impact

Total time of exposure per day in hour	Sound pressure dB(A)	Remarks
1	2	3
8.0	90	No exposure in excess of 115 dB(A) is permissible
6.0	92	--
4.0	95	For any period of exposure falling in between any figure and lower figure as indicated in column (1), the permissible sound is to be determined by extrapolation or proportionate scale.
3.0	97	
2.0	100	
1 ½	102	
1	105	
¾	107	
½	110	
¼	115	

Noise at lower levels (sound pressure) is quite acceptable and does not have any bad effect on human beings, but when it is abnormally high- it incurs some maleficent effects.

a. Mitigation measures

The off-site receptors are not significantly affected as noise generated by mines is insignificant but for some disturbances due to vehicle movement. The following measures have been envisaged to reduce the impact from the transportation of minerals.

- Periodical monitoring of noise will be done.
- Transportation vehicles will be maintained in good running condition so that noise will be reduced to minimum possible level.
- Noise generated by these Equipment shall be intermittent & does not cause much adverse impact.
- Proper maintenance of all equipment/machines will be carried out which help in reducing noise level during operations.
- In addition, truck drivers will be instructed to make minimum use of horns in the village area and sensitive zones.

4.5 BIOLOGICAL ENVIRONMENT

Impact on Ecology of the Area

Excessive and unscientific Riverbed sand mining causes the degradation of rivers. Mining which leads to the removal of channel substrate, re-suspension of streambed sediment, clearance of vegetation, and stockpiling on the streambed, will have ecological impacts. These impacts may have an effect on the direct loss of stream reserve habitat, disturbances of species attached to streambed deposits, reduced light penetration, reduced primary production, and reduced feeding opportunities.

Riverbed sand mining results in the destruction of aquatic and riparian habitat through large changes in the channel morphology. Impacts include bed degradation, bed coarsening, lowered water tables near the streambed, and channel instability. These physical impacts cause degradation of riparian and aquatic biota and may lead to the undermining of bridges and other structures. Continued extraction may also cause the entire streambed to degrade to the depth of excavation.

Sand mining generates extra vehicle traffic, which negatively impairs the environment. Where access roads cross riparian areas, the local environment may be impacted.

Mitigation measures

As the present mining will be done in a scientific manner as mentioned before, not much significant impact in predicted, however, the following mitigation measure will be taken to further minimize it.

- Re-suspension, turbulence, stream flow, channel substrate and associated species will be disturbed and lost due to proposed mining will disturbed existing pattern but in respect to river area is very minimum / less. The activity will mainly be carried out By semi-Mechanized to minimize associate loss, as stated earlier that the settling pit will be created to minimize the adverse impact downstream.
- No mining will be done near to important structure like bridges, dam and others.
- No mining will be carried out during the rainy season to minimize impact on aquatic life.
- As the mining site has no vegetation, thus clearance of vegetation not required.
- The mining activity will employ many heavy vehicles to transport the sand outside the mine to desired destination that cause the loss to riparian habitat. Safe site / site having less impact will be selected for transportation, all the vehicles will be employed for transportation purpose will be PUC certified. On closure / during the rainy season the eroded bank will be restored / reclaimed to minimize negative impacts.

Flora and Fauna of Riparian Habitat

If sand mining is done in an unscientific way, i.e. beyond the replenishment capacity, riverbed mining can have adverse effects at the mine sites. The fertile streamside land will be lost gradually and the wildlife in the riparian areas may start vanishing. Degraded stream habitats will result in loss of fisheries productivity, biodiversity, and recreational potential. Thus, the severely degraded channels may lower the aesthetic value too.

Anthropogenic activities that artificially lower stream bed elevation cause bed instabilities that result in a net release of sediment in the local vicinity. Unstable sediments simplify and, therefore, degrade stream habitats for many aquatic species.

The most important effects of excessive and unscientific Riverbed sand mining on aquatic habitats are bed degradation and sedimentation, which can have substantial negative effects on aquatic life. The stability of sand-bed streams depends on a delicate balance between stream flow, sediment supplied from the watershed, and channel form. Mining-induced changes in sediment supply and channel form disrupt channel and habitat development processes. Furthermore, movement of unstable substrates results in downstream sedimentation of habitats. The affected distance depends on the intensity of mining, particles sizes, stream flows, and channel morphology. Channel widening causes swallowing of the streambed, producing braided

flow or subsurface intergrades flow in riffle areas, hindering movement of fishes between pools. Channel reaches become more uniformly shallow as deep pools fill with gravel and other sediments, reducing habitat complexity, riffle-pool structure, and numbers of large predatory fishes.

All such impacts can be reduced by following scientific mining practices and mitigation measures as restricted.

Mitigation measures

Sand extraction operations will be managed to avoid or minimize damage to stream/river banks and riparian habitats

- Sand extraction in vegetated riparian areas will be avoided.
- Large woody debris in the riparian zone will be left undisturbed or replaced when moved and not be burnt.
- Sand stockpiles, overburden and/or vegetative debris will not be stored within the riparian zone.
- It is essential that overburden is evenly redistributed over exposed areas as soon as possible after the operation has been completed for faster revegetation.
- Operation and storage of heavy equipment within riparian habitat will be restricted.
- Access roads will not encroach into the riparian zones.

No exotic species will be introduced by the RBM project activity & associated persons at all. As the mining will not be done beyond the stipulated limit, so the chances of river mouth widening, bank widening will be negligible. Thus, mining in a scientific and systematic way will reduce such impending effects.

4.6 SOCIO-ECONOMIC ENVIRONMENT

Impact on Human Settlement

- The villages & their inhabitants in the buffer zone will not be disturbed from their settlement due to mining operations.
- There is no inhabitation with in the area. Therefore, neither villagers nor any part of village or any hamlet will be disturbed during entire life of mining. As the mining operations will not disturb or relocate any village or settlement, no adverse impact is anticipated on any human.

Impact on Employment

- The area is considered as industrially backward. The preparation on general do not have opportunities of easing from employment. The only employment is depend on is agriculture, which is seasonal. In the absence of any high employment potential activities, the people are economically backward. The local people shall be employed for mining activities.
- The various indirect employment opportunities have also been generated. Several persons of neighboring villages would be benefited with contract work, employment through contractors, running on jeeps, trucks, tractors & buses on hire, different bird of shops & transport related business avenues.

Impact on Economic Status

- Some people shall be edged in trading of Sand. Therefore, due to mining of Sand, the per capita income of local people shall be improved. The local people shall be provided with either direct employments or indirect employment such as business, contract works & development work like roads etc. & other welfare amenities such as medical facilities conveyance, free education, and drinking water supply.
- The job/business opportunities shall improve the economic condition of the persons. They are in a position to utilize this money for propose of tractors, trucks, jeeps, etc., which may be put into use for business purpose. Part of the money shall also be utilized in starting of some business as per person's skill.

4.7 TRAFFIC ANALYSIS

Traffic analysis is carried out by understanding the existing carrying capacity of the roads near to the project site and the connecting main roads in the area. Then depending on the capacity of the mine, the number of trucks that will be added to the present scenario will be compared to the carrying capacity.

Traffic Analysis for Brahmani River Sand Mining Ghat

Table 4.2 (i): Existing No. of Day count Vehicles (inventory)

S. No	Traffic Vehicle	No. of vehicles per day count at Vill Rd. Nilakanthapur	No. of vehicles per day count at intersection of Baji Rout MDR Rd. & Vill. Rd.	Factor	Equivalent Passenger Car Unit Vill Rd. Nilakanthapur	Equivalent Passenger Car Unit at intersection of Baji Rout MDR Rd. & Vill. Rd.

1	H.M.V	70	250	3	210	750
2	L.M.V	150	350	1	150	350
3	Two/ three wheelers	120	400	0.5	60	200
4	Others	0	0	-		0
	Total	**340**	**1000**		**420**	**1300**

Table 4.2 (ii): Existing Traffic Scenario & LOS

Road	V	C	Existing V/C Ratio	LOS
Village Road	420	2000	0.21	A
MDR	1300	8000	0.16	A

V= Volume in PCU's/hrs. & C= Capacity in PCU's/ hrs.

The existing Level of Service is "A" i.e. "Excellent" for Village & MDR Road.

V/C	LOS	Performance
0.0 - 0.2	A	Excellent
0.2 - 0.4	B	Very Good
0.4 - 0.6	C	Good / Average / Fair
0.6 - 0.8	D	Poor
0.8 - 1.0	E	Very Poor

Note: Capacity as per IRC: 64-1990 page no 11-12 for arterial road/ Highways

During mine operation

Total capacity of mine : 25000 cum/year

No. of working days : 250 days

Per day capacity of mine : 100 cum per day

Truck capacity : 12 cum

No. of trucks deployed per day : 8.33 ~ 9 Trucks

No. of Trips/day to & fro : 18

Considering both loaded & empty trucks

Increase in PCU/day will be : 54

Table 4.2 (iii): Additional per day load due to proposed mining operation (Modified)

S. No.	Traffic Vehicle	No. of vehicles per day count at Vill Rd. Nilakanthapur	No. of vehicles per day count at intersection of Baji Rout MDR Rd. & Vill. Rd.	Factor	Equivalent Passenger Car Unit Vill Rd. Nilakanthapur	Equivalent Passenger Car Unit at intersection of Baji Rout MDR Rd. &

						Vill. Rd.
1.	H.M.V	70 +18 =88	250 + 18 =268	3	264	804
2.	L.M.V	150	350	1	150	350
3.	Two/ three wheelers	120	400	0.5	60	200
4.	Others	0	0	-		0
	Total	**358**	**1018**		**474**	**1354**

Table 4.2 (iv): Modified Traffic Scenario & LOS

Road	V	C	Modified V/C Ratio	LOS
Village Road	474	2000	0.23	A
MDR	1354	8000	0.169	A

Results

From the above analysis it can be seen that the V/C ratio will change from 0.21 to 0.123 for Nilakanthapur Village Road with LOS remaining the same i.e, "A" that is Very good respectively, and the V/C ratio for MDR will change from 0.160 to 0.169 with LOS remaining the same i.e, "A" that is Very good so the additional load on the carrying capacity will be affected to a very minimum level.

Figure- 4.2 Transportation Route Map of the Study Area

4.8 PUBLIC HEALTH IMPLICATIONS

With the mitigation measures in relation to air pollution, water pollution, soil contamination and noise pollution proposed to be adopted at the mine along with plantation and other SER activities, with green belt plantation along the place which authorized by local authority, it is expected that there will be no impact of mining on the population in the impact zone. However, the following measures shall be adopted:

- Health check of all villagers in the immediate vicinity of the mine shall be carried out periodically.
- Surface water management shall be adopted to ensure that run-off from the mining are does not adversely affect natural water streams or other water bodies.
- All water bodies e.g. wells and surface water sources in the vicinity of the mine, shall be periodically tested for any pollution related to mining operations and remedial action taken, if warranted.
- Operators of all transport vehicles shall be instructed not to honk unnecessarily and not over speed while passing through villages or near schools.

4.9 STATUATORY REQUIREMENTS

It is accepted that effective resource management cannot be done in isolation. The Department therefore pursues approaches towards coordination and integration where possible, which has led to coordinated regulatory systems.

A regulatory system consists of both statutory and non-statutory components. In the Sectoral-specific strategy for prospecting and mining, the Department participates within an integrated environmental management system which is administered in terms of the Acts and Rules. Other Acts dealing with matters relating to the conservation and protection of the environment and which a holder of a mining authorization must also take cognizance of include *inter alia*, the following:

- The Mines Act, 1952
- The Mines and Mineral (Development and Regulation) Act, 1957
- Mines Rules, 1955
- Mineral Concession Rules, 1960
- Mineral Conservation and Development Rules, 1988
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Forest (Conservation) Act, 1980
- The Wildlife (Protection) Act, 1972

CHAPTER-V

ANALYSIS OF ALTERNATIVES

(TECHNOLOGY & SITE)

CHAPTER-V

ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

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5.0 GENERAL

Examination of alternatives of technology and Site are an utmost important part for assuring that the project has long term sustainability, especially large projects, which involves a lot of money, manpower & their safety and nature, value of minerals & environmental hazards. River bank mining is a very simple operation needing extraction of sand from river bank which does not need any mechanization or drilling and blasting.

Sand bed mining is a site-specific project depending upon the geological set up and mineable portion of the river. Being inside the river meandering course, no objects of economic or ecological importance are disturbed. The area allotted is with abundant mineral reserve and hence auctioned by the state. Hence, there is not much scope for site alternative.

For the mining operation, which is manual in nature, no alternative technology has been adopted. As this leads to high employment potential of local habitants. Thus, it will have more acceptability and help in socio economic upliftment of the area.

Therefore, the opencast manual extraction of sand at the selected site is adopted.

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CHAPTER-VI

ENVIRONMENTAL MONITORING PROGRAMME

CHAPTER-VI

ENVIRONMENTAL MONITORING PROGRAMME

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6.0 INTRODUCTION

The industrial development of any area needs to be intertwined 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 into the environment without affecting the designated use and is governed by dilution, dispersion and removal due to physico-chemical and biological processes.

Regular monitoring of the various environmental parameters is necessary to evaluate the effectiveness of the management programme so that the necessary corrective measures can be taken in case there are some drawbacks in the proposed programme. Since environmental quality parameters at work zone and surrounding areas are important for maintaining sound operating practices of the project in conformity with environmental regulations, the post project monitoring work forms part of Environmental Monitoring Program.

Environmental Monitoring Program will be implemented once the project activity commences. Environmental monitoring program includes

(i) Environmental surveillance,
(ii) Analysis & interpretation of data,
(iii) Preparation of reports to support environmental management system and
(iv) Organizational set up responsible for the implementation of the programme.

The Environment Monitoring Programme is required to ensure sustainable development in the study area (10 km) of the project site, hence it needs to be an all-encompassing plan for which the plant authorities, Government, Regulating agencies like Pollution Control Board etc. working in the region and more importantly the affected population of the study area need to extend their co-operation and contribution.

6.1 ENVIRONMENTAL MONITORING AND REPORTING PROCEDURE

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of

discharges and wastes, for measurement against corporate or statutory standards, consent limits or targets. It may also require measurement of ambient environmental quality in the vicinity of a site using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints. The preventive approach to environment management may also require monitoring of process inputs, for example, type and method used, resource consumption, equipment and pollution control performance etc.

The key aims of environment monitoring are:

1. To ensure that results /conditions are as forecast during the planning stage, and where they are not, to pinpoint the cause and implement action to remedy the situation.
2. To verify the evaluations made during the planning process, in particular with risk and impact assessments and standard & target setting and to measure operational and process efficiency.
3. Monitoring will also be required to meet compliance with statutory and corporate requirements.
4. Finally, monitoring results provide the basis for auditing i.e. to identify unexpected changes.

The said team will be responsible for:

i. Collecting water and air samples from surrounding area and work zone monitoring for pollutants.
ii. Analyzing the water and air samples.
iii. Implementing the control and protective measures.
iv. Co-coordinating the environment related activities within the project as well as with outside agencies.
v. Collecting statistics of health of workers and population of surrounding villages.
vi. Monitoring the progress of implementation of environmental management program.

The laboratory will be suitably equipped for sampling/testing for various environmental pollutants.

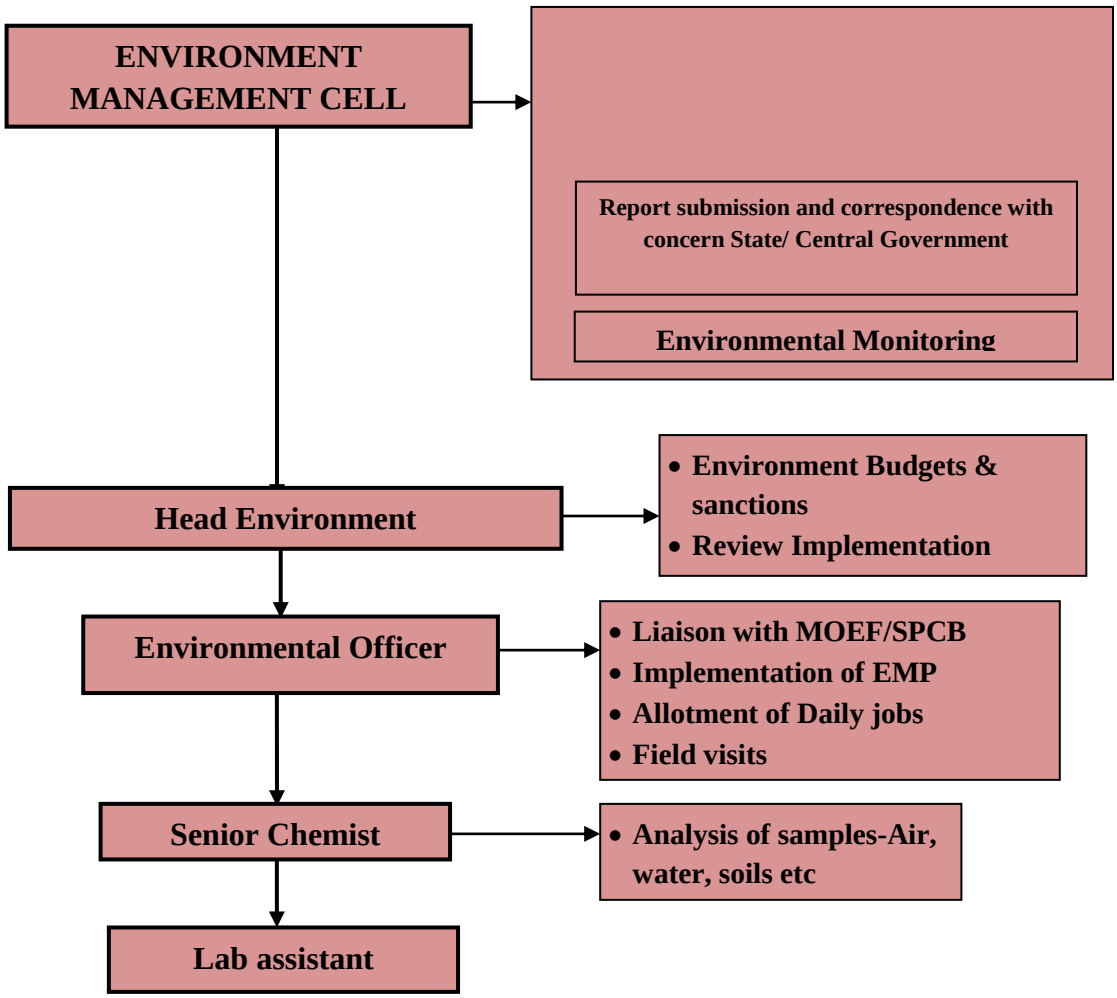

Figure 6.1 Function of Environmental Management Cell

6.2 MONITORING METHODOLOGIES AND PARAMETERS

Air Quality Monitoring

Air Quality monitoring is essential for evaluation of the effectiveness of abatement programme and to develop appropriate control measures. Suspended Particulate Matter (PM_{10} & $PM_{2.5}$), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2) will be monitored at the workplace i.e. core zone. The methodology proposed for is shown below:

Parameters	Technique	Technical Protocol
$PM_{2.5}$	Gravimetric method	**CPCB Guideline Vol. I May' 2011**
PM_{10}	Gravimetric method	**IS 5182 (Part-XXIII)**
Sulphur Dioxide	Improved West and Gaeke	**IS-5182 (Part-II)**
Nitrogen Dioxide	Modified Jacob &Hoch heiser	**IS-5182 (Part-VI)**

Water Quality monitoring

Water quality monitoring involves periodical assessment of quality of surface water and the ground water near the mining project. Surface water samples will be analyzed for all the parameters as per EPA, 1986 ground water samples will be analyzed for all the parameters as per IS-10500.

Phreatic surface levels will be monitored through out the life of the project to study the impact of mining operations on ground water regime. A network of observation wells will be located in the villages around the projects area for monitoring of phreatic surface levels. The water levels will be monitored during pre-monsoon and post-monsoon seasons four times in a year.

Noise Level Monitoring

Noise level monitoring will be done for achieving the following objectives:

a) To compare sound levels with the values specified in noise regulations
b) To determine the need and extent of noises control of various noise generating sources
c) Correlation of noise levels with community response to noise levels

Noise level monitoring will be done at the work zone to assess the occupational noise exposure levels. Noise levels will also be monitored at the noise generating sources like mineral handling arrangements, vehicle movements and also nearby villages for studying the impact due to higher noise levels for taking necessary control measures at the source.

Soil Quality Monitoring

The soil quality monitoring is carried out to assess the soil characteristic. The soil quality will be analysed as per CPCB norms.

Socio-economic Survey

Socio economic condition will be monitored to assess the demographic particulars of the area including the impacts on the social & economical condition on the residents nearby.

Plantation monitoring programme

Plantation monitoring will be done to ensure survival & growth rate of plantations.

6.3 MONITORING SCHEDULE

The schedule has been shown below for the parameters proposed for monitoring.

Table 6.1: Monitoring Schedule and Parameters

S.No.	Description of Parameters	Schedule of Monitoring
1	Air Quality	24 hourly samples twice a week in each season except monsoon
2	Water Quality (Surface & Groundwater)	Twice a year
3	Soil Quality	Once in a year in project area
4	Noise Level	Twice a year for first two years & then once a year
5	Socio-economic Condition	Once in 3 years
6	Plantation monitoring	Once in a season

6.4 MONITORING SCHEDULE IMPLEMENTATION

An implementation programme has been prepared as it serves no purpose if it is not implemented in letter and spirit. The major attributes of environment are not confined to the mining site alone. Implementation of proposed control measures and monitoring programme has an implication on the surrounding area as well as for the region. Therefore, mine management should strengthen the existing control measures as elaborated earlier in this report and monitor the efficacy of the control measures implemented within the mining area relating to the following specific areas:

a) Collection of air and water samples at strategic locations with frequency suggested and by analyzing thereof. If the parameters exceed the permissible tolerance limits, corrective regulation measure will be taken.
b) Collection of soil samples at strategic locations once every two years and analysis thereof with regard to deleterious constituents, if any.

c) Measurement of water level fluctuations in the nearby ponds dug wells and bore wells and to assess if mining has got any impact on it or not.

d) Measurement of noise levels at mine site, stationary and mobile sources, and adjacent villages will be done twice a year for first two years and thereafter once a year.

e) Post plantation, the area will be regularly monitored in every season for evaluation of success rate. For selection of plant species local people should also be involved.

An Environmental Management Cell (EMC) is envisaged which will be responsible for monitoring EMP and its implementation. EMC members should meet periodically to assess the progress and analyze the data collected during the month.

6.5 BUDGET ALLOCATION FOR MONITORING

The EMC will be responsible to carry on the monitoring. Budget allocated has also been proposed for the same:

Table 6.2 Budget allotted for the Environmental Management Plan

S. No	Description	Annually Recurring Cost (INR)
1	Pollution Monitoring i) Air pollution ii) Water pollution iii)Soil iv) Noise Pollution	50,000*2 (Twice in a year) = 1,00,000 (Air- 25,000/-, Water – 10,000 Soil – 10,000, Noise – 5,000)
TOTAL		**1,00,000/-**

6.6 REPORTING SCHEDULES OF THE MONITORING DATA

It is proposed that voluntary reporting of environmental performance with reference to the EMP should be undertaken. The environmental monitoring cell shall co-ordinate all monitoring programmes at site to furnish the data to the State regulatory agencies regularly in respect of the stipulated prior environmental clearance terms and conditions.

The proponent shall prominently advertise in the newspapers indicating that the project has been accorded environmental clearance and also the details of website where it is displayed.

CHAPTER-VII

ADDITIONAL STUDIES

CHAPTER-VII

ADDITIONAL STUDIES

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7.0 PUBLIC CONSULTATION

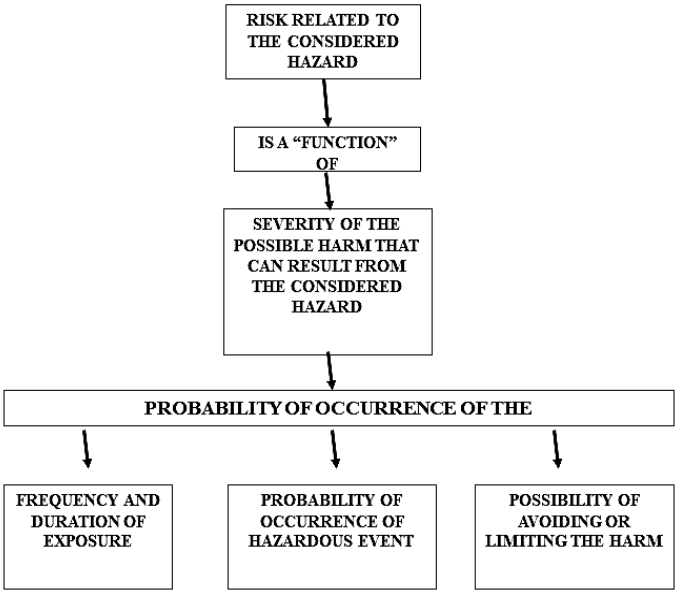
As per EIA notification dated 14th September, 2006 (amended thereof), the committee has suggested various Terms of References (TOR) for the preparation of the Environmental Impact Assessment (EIA) Report and Environmental Management Plan (EMP). The following additional studies is to be carried out as per Terms of References.

1. Public hearing
2. Risk Assessment
3. Disaster Management Plan

7.1 HAZARD IDENTIFICATION AND RISK ASSESSMENT METHODOLOGY

A) RISK

Risk analysis is the systematic study of uncertainties and risks encountered in various areas. Risk analysis is to identify the risks involved in mining operations at various phases. Potential locations and activities around the proposed site are identified and probable risks are estimated on a person, business and Govt. establishment.



Tolerable risk: Risk which is accepted in a given context based on the current values of society

Protective measure: The combination of risk reduction strategies taken to achieve at least the tolerable risk. Protective measures include risk reduction by inherent safety, protective devices, and personal protective equipment, information for use and installation and training.

Severity: Severity is used for the degree of something undesirable.

Risk Analysis: A systematic use of available information to determine how often specified events may occur and the magnitude of their likely consequences.

The different steps of risk assessment procedure are as given below:

Step I: Hazard Identification

The purpose of hazard identification is to identify and develop a list of hazards for each job in the organization that are reasonably likely to expose people to injury, illness or disease if not effectively controlled. Workers can then be informed of these hazards and controls put in place to protect workers prior to them being exposed to the actual hazard.

Step II: Risk Assessment

Risk assessment is the process used to determine the likelihood that people exposed to injury, illness or disease in the workplace arising from any situation identified during the hazard identification process prior to consideration or implementation of control measures. Risk occurs when a person is exposed to a hazard. Risk is the likelihood that exposure to a hazard will lead to injury or health issues. It is a measure of probability and potential severity of harm or loss.

Step III: Risk Control

Risk control is the process used to identify, develop, implement and continually review all practicable measures for eliminating or reducing the likelihood of an injury, illness or diseases in the workplace.

Step IV: Implementation of risk controls

All hazards that have been assessed should be dealt in order of priority in one or more of the following hierarchy of controls

The most effective methods of control are:

i. Elimination of hazards

ii. Substitute something safer

iii. Use engineering/design controls

iv. Use administrative controls such as safe work procedures

v. Protect the workers i.e. By ensuring competence through supervision and training, etc.

Each measure must have a designated person and date assigned for the implementation of controls. This ensures that all required safety measures will be completed.

Step V: Monitor and Review

Hazard identification, risk assessment and control are an on-going process. Therefore regular review of effectiveness of the hazard assessment and control measures is to be done. Make sure that you undertake a hazard and risk assessment when there is change to the workplace including when work systems, tools, machinery or equipment changes. Provide additional supervision when the new employees with reduced skill levels or knowledge are introduced to the workplace.

B) RISK ANALYSIS

The risk assessment portion of the process involves three levels of site evaluation:

a) Initial Site Evaluation,

b) Detailed Site Evaluation,

c) Priority Site Investigations and Recommendations.

The risk assessment criteria used for all levels of site evaluation take into account two basic factors:

- The existing site conditions
- The level of the travelling public's exposure to those conditions.

The Initial Site Evaluation and Detailed Site Evaluation both apply weighted criteria to the existing information and information obtained from one site visit. The Initial Site Evaluation subdivides the initial inventory listing of sites into 5 risk assessment site groups. The Detailed Site Evaluation risk assessment is then performed on each of the three highest risk site groups in order of the group priority level of risk. The result of the Detailed Site Evaluation process is a prioritized

listing of the sites within each of the three highest risk site groups.

Risk analysis is done for:

- Forecasting any unwanted situation
- Estimating damage potential of such situation
- Decision making to control such situation
- Evaluating effectiveness of control measures

C) ACCEPTABLE RISK

Risk that is acceptable to regulatory agency and also to the public is called acceptable risk. There are no formally recognized regulatory criteria for risk to personnel in the mining industry. Individual organizations have developed criteria for employee risk and the concepts originally arising from industries. Because of the uncertainties linked with probabilistic risk analysis used for quantification of the risk levels the general guiding principle is that the risk be reduced to a level considered

As Low as Reasonably Practicable(ALARP). The risk acceptability criteria are given in following Table. It can be seen that there are three tiers:

a) A tolerable region where risk has been shown to be negligible and comparable with everyday risks such as travel to work.

b) A middle level where it is shown the risk has been reduced to As Low As Reasonably Practicable level and that further risk reduction is either impracticable or the cost is grossly disproportionate to the improvement gained. This is referred as the ALARP region.

c) An intolerable region where risk cannot be justified on any grounds. The ALARP region is kept sufficiently extensive to allow for flexibility in decision making and allow for the positive management initiatives which may not be quantifiable in terms of risk reduction.

Table-7.1 The risk acceptability criteria

1	Risk unacceptance and must be reduced. The actions may include equipments and people or procedural measures. If risk cannot be reduced to ALARP level, operating philosophy must be	**Intolerable Region**

	fundamentally reviewed by the management.	
2	Efforts must be made to reduce risk further and to as low as reasonably practicable, without expenditure that is grossly disproportionate to the benefit gained	**ALARP Region (As Low as Reasonably Practicable)**
3	Risk level is so low as to not require actions to reduce its magnitude further.	**Tolerable Region**

A logical systematic process is usually followed during a qualitative risk assessment to identify the key risk events and to assess the consequences of the events occurring and the likelihood of their occurrence.

Table 7.2 Qualitative Risk Assessment

Risk Rank X Likelihood Consequence	L1 Almost certain	L2 Likely	L3 Possible	L4 Unlikely	L5 Rare
C1 Catastrophic	1	2	4	7	11
C2 Major	3	5	8	12	16
C3 Moderate	6	9	13	17	20
C4 Minor	10	14	18	21	23
C5 Insignificant	15	19	22	24	25

RISK RATING:

High Risk: 1-6
Medium Risk: 7-15
Low Risk: 16-25

7.2 POTENTIAL HAZARDS & 'ALARP' CONDITION

Mining and allied activities are associated with several potential hazards and risk to both the employees and the public at large. A worker in a mine should be able to work under "**ALARP**" conditions (as stated above), which are adequately safe and healthy. At the same time the

environmental conditions should be such as not to be impair his working efficiency. This is possible only when there is adequate safety in mines.

7.3 RISK PRIORITISATION BASED ON HAZARDS

There are various factors, which can create unsafe working conditions/hazardsin mining of minor minerals from river bed.

The key risk (hazard x probability) event rating associated with sand bed mining and to assess its consequences of such events occurring and the likelihood based on above Table are as:-

The Risk rating of such hazards is as follows:

a) Inundation / Flooding (C1 xL3=4)
b) Drowning.(C5 xL5=25)
c) Accident due to vehicular movement.(C3 xL3=13)
d) Accident during sand loading, transporting and dumping=14.(i.e., C4 xL2=14)

7.3.1 Accident during sand/mineral loading, transportation

The risk rating assigned to this activity is assigned as “14 i.e. it is likely event with minor consequences”, as frequency of this operation is more but the predicted/assumed intensity(Based on experience) is less like minor cuts, abrasion, fall due to river bank collapse & falling of cattle’s, if not under proper supervision to bring under ALARP ZONE.

a) There is possibility of injury into the workers during excavation &loading of minerals.
b) There is possibility that the workers standing on the other side of loading may get injury due to over thrown sand with pebbles.
c) There is possibility of workers getting injured during opening of side covers to facilitate loading.
d) There is possibility of riverbank collapse.
e) There are chances of falling of cattle/children into pits in river bed by overlooking of fenced area near worksite or improper supervision.

7.3.2 Accident due to vehicular movement

The risk rating assigned to this activity is assigned as 13 i.e., it is possible event with moderate consequences as frequency of this operation is more but the predicted/assumed intensity(Based on experience) is less like minor cuts, bodily injury due to reckless or untrained driver. However, a strict control to be exercised to deploy trained drivers with valid driving license with a helper. A strict supervision/control to be exercised to avoid drunken driving or driving by unauthorized person to bring under ALARP ZONE.

The minerals loaded in trucks are being sent to through public roads.

a) All possibilities of road accidents are possible due to rash driving.
b) Accident may also occur during movement in the haul road, in case pathway is not compacted suitably or movement is at the embankment.
c) There are possibilities that due to overloading. Some pebbles or big boulder may injure the passerby public. In case Traffic & vehicle load bearing licensed capacity is neglected.

7.3.3 Inundation/Flooding

The risk rating assigned to this activity is assigned as 4(C1 xL3=4) i.e., it is only possible, if warnings are neglected and work started without assessment of the river bed condition specially during monsoon season ,the event will be catastrophic with major consequences as frequency of this operation is possible. However the event has to be brought under 'ALARP' Zone by strict supervision based on river water and other metrological data.

a) The possibility of inundation/flooding of the mines are very high during monsoon or during heavy rains as the mine area lies in the riverbed.
b) There is danger to theworkers working in the mines.
c) There is also danger to the trucks and other machineries due to flooding.
d) Inundation or flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

7.3.4 Drowning

The risk rating assigned to this activity is assigned as 25 i.e., it is insignificant due to dry season mining. There are no possibilities of drowning in the river, since mining operations are carried out only in the dry portion of the river and all mining activities will be stopped during the monsoon season.

7.4 OCCUPATIONAL HEALTHHAZARDS

Dry- pit mining by open cast method involves dust generation by excavation, loading and transportation of mineral. At site, during excavation and loading activity, dust is main pollutant which affects the health of workers whereas environmental and climatic conditions also generate the health problems.Addressing the occupational health hazard means gaining an understanding of the source (its location and magnitude or concentration), identifying an exposure pathway (e.g. a means to get it in contact with someone), and determination of likely a receptor (someone receiving the stuff that is migrating).

Occupational hazard due to mining mainly comes under the physical hazards. Possible physical hazards are as below mention:-

Physical hazards due to mining operations

Following health related hazards were identified mining operations to the workers:-

1. **Light: -** The workers may be exposed to the risk of poor illumination or excessive brightness. The effects are eye strain, headache, eye pain and lachrymation, congestion around the cornea and eyefatigue.
2. **Heat and Humidity: -** The most common physical hazard is heat. The direct effects of heat exposure are burns, heat exhaustion, heat stroke and heat cramps; the indirect effects are decreased efficiency, increased fatigue and enhanced accident rates. Heat and humidity are encountered in hot and humid condition when temperatures and air temperatures increasein summer time up to 48°C or above miningarea.
3. **Eye Irritation: -** During the high windy days in summer the dust could be the problems for eyes like itching and watering ofeyes.

4. **Respiratory Problems: -** Large amounts of dust in air can be a health hazard,exacerbating respiratory disorders such as asthma and irritating the lungs and bronchialpassages.
5. **Noise Induced Hearing Loss: -** Machinery is the main source of noise pollution at the mine site. Too much noise from the machines can induce loss of hearing.

Table-7.3 Management of Health Hazards

Particulars	Control Measures
Heat & Light	The mine site will have adequate drinking water supply so that workers do not getdehydration. Awareness will be created to wear lightweight and loose-fitting clothes having light colors.
Noise	Vehicles will be maintained properly. Greasing oiling will be done regularly. The personal protective equipment will be provided for eachmine workers. Supervisor will be instructed for reporting any problems withhearing protectors or noise controlequipment. Haul road will be leveled and maintained daily.
Respiratory	Pack cabin will be given to the excavator operator with the sun glass and mask. PPE like face mask etc. will be provided during miningactivity. Periodic medical examinations will be provided for allworkers. Awareness program will be organized forworkers. Control of dust through water spraying.

Occupational health and Safety programme of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures if required.

7.5 ADDITIONAL MITIGATION MAJORS TO BRING HAZARDS UNDER "ALARP" ZONE

7.5.1 Measures to Prevent Accidents during Loading

- The truck should be brought to a lower level so that the loading operation suits to the ergonomic condition of the workers.
- The loading should be done from one side of the truck only.
- The workers should be provided with gloves and safety shoes during loading.
- Opening of the side covers (pattas) should be done carefully and with warning to prevent injury to the loaders.

- Operations during daylight only.
- No foreign material should be allowed to remain/spill in river bed and catchment area, or no pits/pockets are allowed to be filled with such material.
- Stockpiling of minerals on the river bank should be avoided.

7.5.2 Measures to prevent accidents during transportation

- All transportation within the main working will be carried out directly under the supervision and control of the management.
- The vehicles will be maintained in good repairs and checked thoroughly at regular intervals by the competent person authorized for the purpose by the Management.
- To avoid danger while reversing the vehicles especially at the embankment and tipping points, the areas for reversing of lorries will be made man free as far as possible.
- The truck will be covered and maintained to prevent any spillage and no overloading will be permitted.
- The maximum permissible speed limit will be ensured.
- The truck drivers will have proper driving license.
- A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.

7.5.3 Measures to prevent Dangerous Incidents during Inundation/Flooding

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

- During monsoon months and heavy rains the mining operations will be ceased.
- There would be mechanism/warning system of heavy rains and discharges from the upstream dams to make the workers alert.

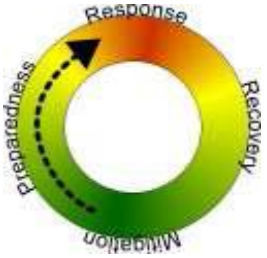
7.5.4 Measure to Prevent Drowning

- The mining should be done under strict supervision and only during the dry season.
- Deep water areas must be identified.

- No go zones should be clearly marked and made aware to the mine workers.
- Signages will be erected if there is any steep slopes or existing pits, so that there is no movement in that area.

7.6 DISASTER MANAGEMENTPLAN

This should deal with action plan for high risk accidents like landslides, subsidence, flood, in underground mines, fire, seismic activities, tailing dam failures etc. and emergency plan proposed for quick evacuation, ameliorative measures to be taken etc. The capability of lessee to meet such eventualities and the assistance to be required from the local authorities should be described.



- Communication plans with easily understandable terminology and methods.
- Proper maintenance and training of emergency services, including mass human resources such as community emergency response teams.
- Development and exercise of emergency population warning methods combined with emergency shelters and evacuation plans
- Develop organizations of trained volunteers among civilian populations.

7.6.1 Natural Hazards Floods:

Flood events are a part of nature. They mostly occur in the monsoon season at times of heavy rainfall. No Mining Shall be done in Rainy Season.

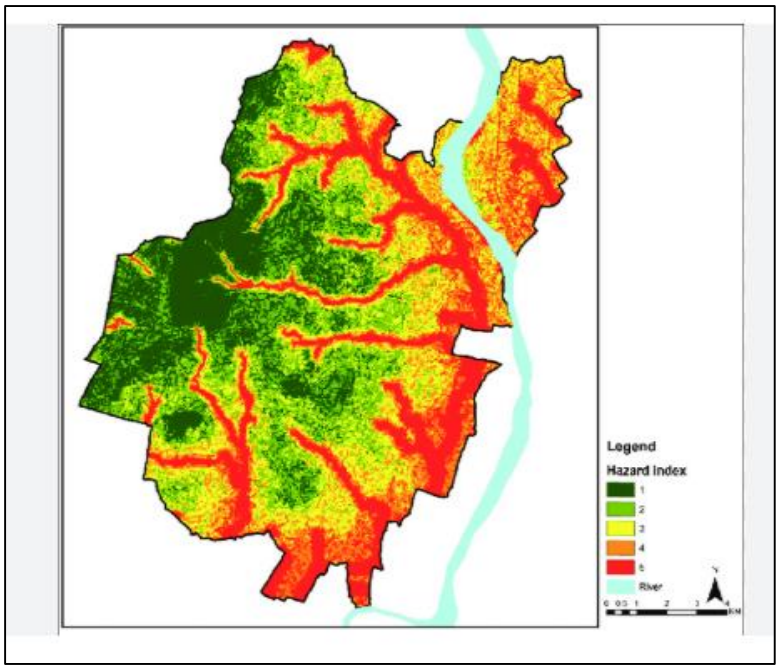


Figure 7.1 - Flood Hazard Map of Odisha

The region experiences heavy rainfall and due to water collection of the catchment area of various rivers, the proposed site maybe prone to flood hazards during monsoon. As floods during rainy season are common and the district has minor flood risk, there are some chances of flood. A DMP will be in place to deal with any such occurrences.

Following Precautionary Measures will be undertaken:

- Storm water system will be checked and cleaned periodically
- Storm water network will be meticulously cleaned before the onset of monsoon

Earthquakes: An Earthquake is a sudden, rapid shaking of the earth caused by the breaking andshifting of rocks beneath the earth surface.

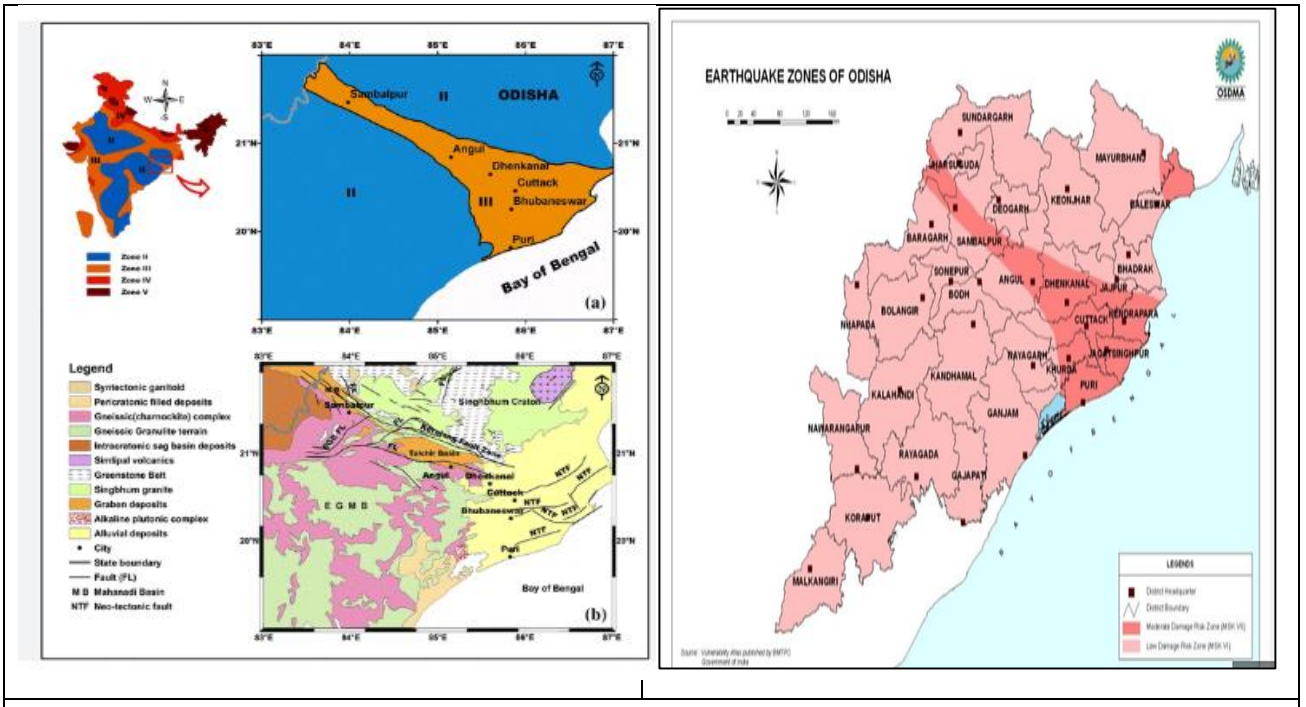
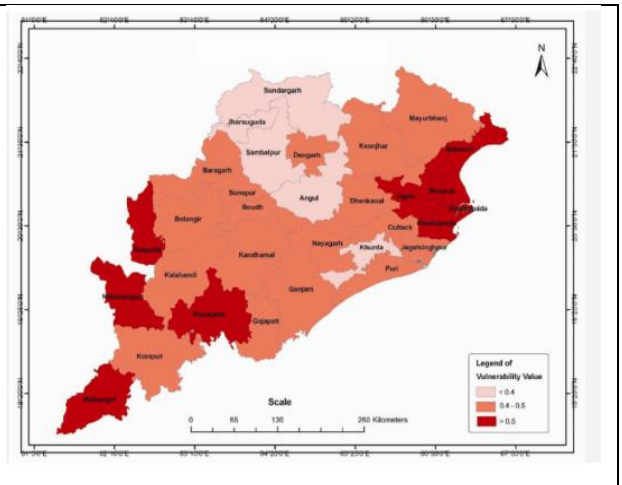


Figure 7.2- Earthquakes Map of Odisha

Based on the above figure, it is observed that proposed project lies in moderate damage risk zone. Dhenkanal district has experienced earthquakes rarely and with less intensity. Since the district lies in Seismic Zone III – Moderate Damage Risk Zone, hence earthquakes are not major risks for the proposed project.

Cyclone: Cyclones are huge revolving storms caused by winds blowing around a central area of low atmospheric pressure. Cyclone is a storm accompanied by the high-speed wind. It brings torrential rains and creates several dangers for people living around tropical areas. These winds are strong enough to easily topple fences, sheds, trees, power poles and caravans, while hurling helpless people through the air.

It is observed that Dhenkanal district lies under very high-speed windszone.The probability of the cyclonic depression is high in the study area. Hence, the structures will be designed keeping in mind the cyclonic risks.



Wind & Cyclone Map of Odisha **Vulnerability Map of Odisha**

Figure 7.3 Wind & Cyclone and Vulnerability Map of Odisha

Precautionary Measures to be undertaken:

- The complete mining operation will be carried out under the Management and control of experienced and qualified Mines Manager having Certificate of Competency to manage the mines granted by DGMS.
- All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955 and other laws applicable to mine will strictly be complied with.
- During heavy rainfall the mining activities will be ceased.
- All persons in supervisory capacity will be provided with proper communication facilities.
- Periodic drills and training will be provided to the workers and supervisors to react at the time of disaster.
- Detailed warning system, implementation procedure, emergency control center would be maintained at the mine with names of trained persons.
- Details and availability of heavy machinery, fire-fighting equipment would be available at the site.
- Proper arrangements would be made for treatment of injured person with first aid, if any.

- All the safety equipment will be made available at the mine.

7.7 NATURAL RESOURCE CONSERVATION

Mining at the concave side of the river channel should be avoided to prevent bank erosion. Similarly meandering segment of a river should be selected for mining in such a way as to avoid natural eroding banks and to promote mining on naturally building (aggrading) meander components.

CHAPTER-VIII

PROJECT BENEFITS

CHAPTER-VIII

PROJECT BENEFITS

INDEX

8.0 GENERAL

The operation of the project will protect against widening of river channel and flooding of adjoining areas due to non-removal of sediments which have been accumulating over years, naturally. It will bring overall improvement in the locality, neighborhood and the state by bringing industry, roads, water supply, electricity, employment, living standard and economic growth.

8.1 PHYSICAL BENEFITS

The opening of the proposed project will enhance the following physical infrastructure facilities in the adjoining areas.

a. **Road Transport:** There will be improved road communication due to the proposed project and maintenance will also be done time to time.

b. **Market:** Generating useful economic resource for construction. Excavated mineral will provide a good market opportunity.

c. **Enhancement of green cover:** As a part of reclamation plan, plantation will be carried along the place in consultation with local authority.

   Providence of free saplings of fruit and other trees, etc. to local during rainy season for plantation will be taken up by project proponent. This will increase the consciousness in workers and near-by villagers for greenery. Fruit trees can contribute towards their financial gains.

d. **Creation of community assets:** (infrastructure) like provision for drinking water, construction of school buildings, village roads/ linked roads, dispensary & health center, community center, market place etc, as a part of corporate social responsibility.

The impact on the civic amenities will be substantial after the commencement of mining activities. The basic requirement of the community needs will be strengthened by extending health care, educational facilities developed in the township to the community, providing drinking water to the villages, building/strengthening of existing roads in the area. The proponent will initiate the above amenities either by providing or by improving the facilities in the area, which will help in uplifting the living standards of local communities. Medical facilities will be provided in the form of first-aid facility at the mine. These medical facilities will also be available to local people in the surrounding in case of emergencies.

8.2 SOCIAL BENEFITS

- Generation of employment and improved standard of living;
- Increased revenue to the State by way of royalty, taxes and duties; and

- Superior communication and transport facilities etc.
- There will be significant change in the socio-economic scenario of the area.
- The proposed project will enhance the prospects of employment. Recruitment for the unskilled and semiskilled workers for the proposed project will be from the nearby villages.
- The development of the basic amenities viz. roads, transportation, electricity, drinking water, proper sanitation, educational institutions, medical facilities, entertainment, etc. will be developed as far as possible.
- Overall, the proposed project will change living standards of the people and improve the socio-economic conditions of the area.

A) Employment Potential- The employment of local people in primary and secondary sectors of project will upgrade the prosperity of the region. These will in-turn improves the socio-economic conditions of the area. The total manpower required for the proposed mining project under various categories is 42 persons and persons will be mainly sourced from local community in and around mining project and few technical persons will be employed during operational phase from local and also from outside area. In addition to the above, contractual labour and indirect employment opportunities will also be getting benefited after installation of mining project.

Table 8.1 Employment detail

S. No.	Category	Post	Numbers
1.	Skilled	Loading supervisor	2
2.	Semi-skilled	Assistant Loading Supervisor	2
3.	Un-skilled	Labourers	38
Total			**42**

B) Contribution to the Exchequer as the saleable minerals will be given royalty. Since the quarries will be leased out to successful allot tees, mining operation in the state will get legalized and it will fetch income to the state exchequer.

C) Increased Health related activities: Healthcare promotional activities will be undertaken. Pre-placement & and Periodic medical checkups will be done, which will lift the general health status of the residents of the area. Health camps, medical aids, family welfare programs, immunization camp sports will be arranged.

D) Educational attainments: Educational activities will be promoted by the lessee. Awareness program will be arranged covering basic issues related to primary level education, environment, health and hygiene etc.

E) Strengthening of existing community facilities through the Community Development Programme.

Table 8.2 Budget for Public Health

S.No.	Activity	Tentative Cost
1.	Awareness campaigns regarding health issues in the nearby villages.	1,00,000
2.	Provide free health checkups & medicines to the nearby villagers of the project site	1,00,000
3.	Assistance to set up a temporary health center during the lease tenure	1,00,000
	Total	**3,00,000**

Table 8.3 Budget for Occupational Health

S.No.	Activity	Tentative Cost
1.	For Routine Checkup	1,00,000
2.	Medical aid as per ESI Scheme	2,00,000
3.	Training	1,00,000
	Total	**4,00,000**

8.3 ENVIRONMENTAL BENEFITS

a. Protection of banks
b. Reducing submergence of adjoining agricultural lands due to flooding
c. Reducing aggradations of river levels
d. Protection of crops being cultivated along the bank
e. A check on illegal mining activity

8.4 CORPORATE ENVIRONMENTAL RESPONSIBILITY

2 % of capital cost of the project cost will be allotted for the Corporate Environmental Responsibility as per OM dated 1st May 2018.

CER cost will be 2% of the total project cost. This amount will be used for social welfare.CER cost is Rs. 1,20,000/-.

Table: 8.1Budget for Corporate Environment Responsibility for One Time (Annual)

S. No.	Activity	Capital Cost (in Rs.)
1	Financial aid for medical camp in nearby village @ Rs. 20,000/ camp (2 camp in a year)	40,000/
2	Distribution of educational kits like books and note books for the students of primary schools of Village Brahmapur and Purastampur	40,000/
3	Skill development Programme like computer training and sewing machines @ Rs. 20,000 per trainer for above two programmes (As per the Requirement of Local People)	40,000/-
TOTAL		**1,20,000**

For each activity the funds to be earmarked by the proponent will be decided after discussion with the local authority/people and the beneficiaries during public hearing. It has been planned to undertake a concurrent evaluation of the activities to be taken up under the CER programme.

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CHAPTER- IX

ENVIRONMENT COST BENEFIT ANALYSIS

CHAPTER IX

ENVIRONMENT COST BENEFIT ANALYSIS

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9.0 INTRODUCTION

It is essential to have a cost benefit impact analysis of a project. It is more compressive in scope. It takes long view of the project (further as well as nearer future) and a wide view (in the sense of allowing for side effect). It is the comparison of any positive or negative changes in the value of mine environment amenities with costs (or benefits) of implementing the proposed change.

a) Project Cost

After comprehensive study of the proposed project, it can be concise that the project is desirable and it can be implemented. The total project cost for the Sand Mining Project Kanapala Samil Mahulpal Sand Quarry on Brahmani River, Khata No.452, Plot No. 4265, 4266 & 4267 Village- Kanapala Samil Mahulpal, Tahasil-Bhuban, District-Dhenkanal, State-Odisha, Area-9.967 Ha is estimated to be Rs.60 lakhs, which includes all Project expenditures comprising the required operational expenses necessary for the successful execution of the project and the Environmental Management Budget for environment protection during project implementation and mine execution stage.

9.1 ENVIRONMENTAL COST ANALYSIS

The Environment cost for this proposed mining includes Environmental Management Plan, CER and cost that to be abided by proponent for Occupational health and safety, which is Rs. **9,20,000/-**The detailed cost for Environmental Expenses is given below in the Table.

Table 9.1 Cost Benefit Analysis

S.No	Major Heads	Environmental Cost Expenditure
1	Environmental Management Plan	4,00,000
2	CER	1,20,000/-
3	Occupational health and safety	4,00,000
	Total	**9,20,000/-**

9.2 CONCLUSION

The estimated capital cost and financial viability of the Sand Mining Project have been assessed, indicating that the project is both financially and technically viable. The project operations incurs higher environmental benefits in and around the mining lease area.

CHAPTER-X

ENVIRONMENTAL MANAGEMENT PLAN

CHAPTER-X

ENVIRONMENTAL MANAGEMENT PLAN

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10.0 INTRODUCTION

The environmental management plan consists of the set of mitigation, management, monitoring and institutional measures to be taken during the implementation and operation of the project, to eliminate adverse environmental impacts or reduce them to acceptable levels. The present environmental management plan addresses the components of environment, which are likely to be affected by the different operations in a mine area. To mitigate the adverse impact which may be caused due to the mining operations and overall scientific development of local habitat, environmental management plan (EMP) has been formulated and integrated with the mine planning. The details of the anticipated impacts and mitigate measures have been discussed in Section IV of this report, based on the results of present environmental conditions and environmental impact assessment. The EMP has therefore been made considering implementation and monitoring of environmental protection measures during and after mining operations.

The mitigation measures which reduce the impact have already been identified earlier in this report. To minimize the adverse impact, certain additional EMP is enumerated below for implementation.

The aims of EMP are:

- Overall conservation of environment.
- Minimization of waste generation and pollution.
- Judicious use of natural resources and water.
- Safety, welfare and good health of the work force and population.
- Ensure effective operation of all control measures.
- Vigilance against probable disasters and accidents.
- Monitoring of cumulative and long time impacts.
- Ensure effective operation of all control measures.

10.1 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Proper environmental management plan is proposed for sand mining project to mitigate the impact during the mining operation.

- No overburden or loose sediments will be kept in the vicinity of the working benches.
- The possibility of the project activity contributing to the pollution of watercourses of the region or to the ground water regime is so less that this does not significantly constitute an area of concern.
- Construction of well-compacted roads.
- Regular water spraying on haul roads by tankers.
- Personal Protective Equipment (PPE) like earmuffs/earplugs, dust masks, helmets, safety boots will be provided to all operators and employees working near mining machineries or at higher noise zone.
- Proper and regular maintenance of vehicles and other equipment.
- Provision of supplying earplugs for workers and operators.
- Care being taken that noise produced during vehicles movement for carrying Sand is within the permissible noise level.
- Provision of Green Belt (thick foliage) in the places where required would be done in consultation with local authorities.
- Strict observance of the provisions of Acts, Rules and Regulations in respect of safety both by management and the workers.
- Proper planning and designing of work in order to reduce the risk of hazards.
- Specific instructions and supervisions of working where danger due to fall of side (overhanging, undercutting of bench, fall of objects from higher benches/places is apprehended).
- Training of work persons and the officials.
- Since the haul road will be of considerable length, due importance will be given in the construction of road. The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.

- A code of practices for tipping in stock piles/dumping of overburden at dump yard and loading point will be implemented.
- In respect of contract work, safety code for contractors and workers will be implemented.
- They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centers. All personal protective equipment will be supplied to them.
- A code of practice for fighting fire will be implemented.
- Competent persons like fitters, mechanics will be imparted with special attention to project impact.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness amongst employees.
- Pre joining medical checkup shall be done and regular health check-up in 6 monthly intervals is planned for the employees.
- Care will be taken that no cooking, or burning of woods will be allowed in the adjoining area.
- If some causality or injury to animal occurs, it should be informed to forest department and proper treatment should be given.
- Corridor movement of wild mammals (If exists) would be avoided.
- Provision of temporary rest shelters for mine workers with amenities like drinking water etc.
- Periodical Medical Examination (PME) of all workers by a medical Officer
- First Aid facility is provided at the mine site.
- Close surveillance of the factors in working environment and work practices which may affect environment and worker's health.
- Working of mine as per approved mining plan and environmental plans.

10.2 ENVIRONMENTAL MANAGEMENT PLAN IMPLEMENTATION

Environmental Management Plan serves no purpose if it is not implemented with true spirit. Some loopholes in the EMP can also be detected afterwards when it is implemented and monitored.

Thus, an implementation and monitoring programme shall be done. The major attributes of environment are not confined to the mining site alone. Implementation of proposed control measures and monitoring programme has an implication on the surrounding area as well as for the region. Therefore, mine management would strengthen the existing control measures as elaborated earlier in this report and monitor the efficacy of the control measures implemented within the mining area relating to the following specific areas:

a) Collection of air and water samples at strategic locations with frequency suggested and by analyzing thereof. If the parameters exceed the permissible tolerance limits, corrective regulation measure will be taken.
b) Collection of soil samples at strategic locations once in every year and analysis thereof with regard to deleterious constituents, if any.
c) The effectiveness of drainage system depends upon proper cleaning of all drains provided in the surrounding of mine area. Any blockage due to siltation or loose material will be checked at least once in a month.
d) Measurement of water level fluctuations in the nearby ponds, dug wells and bore wells.
e) Regular visual examination will be carried out to look for erosion of river banks. Any abnormal condition, if observed will be taken care of.
f) Measurement of noise levels at mine site, stationary and mobile sources, and adjacent villages will be done in every quarter of the year.
g) Plantation/afforestation would be done as per program i.e along the road sides and near civic amenities, which will be allotted by local authority as it is not feasible to plant trees near the mine lease area. Post plantation, the area will be regularly monitored in every season for evaluation of success rate. For selection of plant species local people would also be involved.

Mine management will be in regular touch with local surrounding villages to update the various developmental schemes made by them. They will also consider any immediate requirement, which could be taken care of in near future. Mine management will be in regular touch with State Pollution Control Board and Indian Bureau of Mines and send them annual progress report. Any

new regulations considered by State/Central Pollution Control Board for the industry will be taken care of.

Green Belt Development Plan

Green belt is plantation of trees for reducing the pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belt has been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution.

These plantations will be done in the places in consultation local authority. About 500 Plants will be planted in first year and will be maintained in all the 5 years. List of species is recommended for plantation are Mango, Neem, Kadamb, Kathal, Peepal, Gulmohar, and other local species will selected in suitable combination, so that can grow fast and also have good leaf cover.

- The species to be grown in the areas will be dust tolerant and fast-growing so that a permanent greenbelt is created. Plantation in the barrier zone and roads is necessary as these areas will contain fine particulates resulting from mining operation and vehicle movement. Mining activities will not cause any harm to riparian vegetation because mining will not outspread beyond the buffer zone left against the banks in the river.
- Plantation on both sides of the roads as greenbelt is proposed as it will provide cover against dust propagation. Riverbanks will be fortified by way of plantation on the banks.
- Plantation will also be carried out as social forestry programme in village, school and the areas allocated by the Panchayat/State authorities.

List of Species for Greenbelt Development is given in Table

Table: 10.1 Greenbelt Development Plan

Year	Saplings to be Planted	Species to be Planted	Location of Plantation
1st Year	500	Mango, Neem, Kadamb, Kathal,	Approach/Haul Road- 250 nos.i.e. along both sides of 1.0 km approach/haul road

2nd Year 3rd Year 4th Year 5th Year	Maintenance of the Planted Saplings	Jamun, Peepal, Teak, Guava	Village area- 250 nos. i.e area allotted by Panchayat/Local State authority such as school premises, Aangawadi, bhavan
Total	**500**		

The basic objectives of plantations are as follows:

- Soil quality should be improved
- Vegetative cover can check soil erosion and increase water holding capacity of the soil
- River bank stability should be improved
- Conservation of biological diversity
- Habitation for wild life.

10.3 ENVIRONMENTAL MANAGEMENT CELL (EMC)

To implement the EMP, a structured Environment Management Cell (EMC) which includes plant manager and representative of consultants interwoven with the existing management system is there. Occupational safety and health is very closely related to productivity and good employer-employee relationship. The factors of occupational health in the proposed Sand mine are mainly dust and land degradation. Safety of employees during operation and maintenance etc. shall be as per Mines rules and regulations. To avoid any adverse effect on the health of workers due to various pollutants, sufficient measures relating to safety and health will also be practiced.

A comprehensive environmental monitoring program as laid down by State Pollution Control Board is followed. All the above observations will be complied and documented by the EMC to serve the following purposes:

- Identification of any environmental problems that are occurring in the area.
- Initiating or providing solution to those problems through designed channels and verification of the implementation status.

- Controlling activities inside the project, until the environmental problem has been corrected.
- Suitably responding to emergency situations.

10.4 BUDEGT ALLOCATION FOR EMP IMPLEMENTATION

Annual budget for EMP is very essential for successful implementation of EMP. The fund allocated will not be diverted for any other purposes and the top management will be responsible for this. The budget will take into consideration the following capital and operating expenses:

a) Capital cost for installing pollution control systems.
b) Field cost for monitoring of parameters.
c) Cost of any defined outsourcing

It is necessary to include the environmental cost as a part of the budgetary cost component. The project authorities propose to undertake the following environmental works to achieve the environmental quality as desired. The budget for environmental protection has been formulated and given in Table.

The total cost of project would be around Rs 60,00,000/- (60 lakh).

EMP Capital Cost is 2,00,000/- & EMP Recurring Cost is 2,00,000/-

Table 10.2 Budget allotted for Environmental Management Plan

Sl. No	Description	Capital Cost (lakh)	Recurring Cost(lakh)
1	Pollution Control & Dust Suppression	Nil	0.50
2	Pollution Monitoring i) Air pollution ii) Water pollution iii)Soil Pollution iv) Noise Pollution	--	0.50

3	Plantation for 500 saplings @Rs.200 per sapling	1.0	0.50
4	Haul road Maintenance Cost	1.0	0.50
TOTAL		**2.0**	**2.0**

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CHAPTER-XI

SUMMARY & CONCLUSION

CHAPTER-XI

SUMMARY & CONCLUSION

11.0 INTRODUCTION OF PROJECT&PROPONENT

Environment Impact Assessment (EIA) is a process used to identify the environmental, social & economic impacts of a project prior to decision making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for proposed projects. It aims predicting environmental impacts at an early stage of project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision makers. By using EIA, both environmental & economic benefits can be achieved. By considering environmental effects prediction & mitigation, early benefits in project planning, protection of environment, optimum utilization of resources, thus saving overall time & cost of the project.

The project is being proposed by Proponent Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha. Proposed project has been allotted to the proponent through LOI granted in favour of Shri Ratikanta Rout. Kanapala Samil Mahulpal Sand Quarry, Tahasil Bhuban, District Dhenkanal has been allotted to Sri Ratikanta Rout, the lessee through long term quarry lease basis for quarrying of sand (minor mineral) by the Tahasildar Bhuban on behalf of Government of Odisha in accordance with the provision of the Odisha Minor Mineral Concession Rules, 2016 through long term quarry lease for the purpose of excavation of sand Form F vide letter no. 3710 dated 22.12.2020 attached as Annexure II. The EIA-EMP report has been prepared as per the TOR granted under the EIA Notification of September 14th 2006. In order to assess the impact on environment due to proposed mining, it is necessary to ascertain the present status of environment prevailing at the project site and identification and assessment of impacts on the environment of the proposed operations.

As per NGT Order Dated 13-09-2018 and MOEF & CC OM No L-11011/175/2018-IA-II (M) Dated 12-12-2018 the project comes under B1 Category as the area is more than 5 Ha. Environmental Impact Assessment report is prepared to comply with the Terms of Reference (TOR) received from SEIAA, Odisha

11.1 LOCATION

Name of the Project-Sand Mining Project: Kanapala Samil Mahulpal Sand Quarry, Khata No.452, Plot No. 4265, 4266 & 4267 Village- Kanapala Samil Mahulpal, Tahasil-Bhuban, District-Dhenkanal, State-Odisha; Production-25000 Cum/Year Area: 9.967 Hectares or 24.63 Acres

Village	Tahasil	District	State	AreainHa.
Kanapala Samil Mahulpal	Bhuban	Dhenkanal,	Odisha	9.967

Table11.1- Detail of site & surrounding around Lease Area

Nearest Settlements	Brahmapur Villageisabout 145 minNWdirection. Purastampur Village is about 330 m in W direction.
Nearest Road	NH 53 at a distance of 5.70 km in NW SH 20 at a distance of 18.60 km in NE Major District Road is Bentashalia at a distance of 1.90 km in NE
Nearest Airport	Bhubaneshwar Airport approx. at 67 km in S direction.
Nearest Railway Station	Jenapur Railway Station at distance of approx. 19 km in SE direction.
Nearest National Park/wildlife sanctuary within 10 km	NoNationalPark/WildlifeSanctuarywithintheperipheryof 10 Km Radius. NearestKapilasa Wildlife Sanctuary at distance of 18.0 km in SW.
Water body	ProjectliesonBrahmani River
Nearest School/ college	Mahulpal Nodal School 1.76 km NE
Reserve/ Protected Forest	Reserve/ProtectedForest,within 10 km buffer area
Nearest Hospital	CHC Mahulpal Medical Centre at 3.50 km in NE Primary Health Centre at Bhuban at approx. 5 km in NW
Temple	Maa ghata Tarini Temple 1.17 km W Maa Mangla Temple 1.5 km NW Sri Baladev Jew Temple 4.02 km SE

Table 11.2-Project Salient Features

On-line proposal No.	SIA/OR/MIN/62730/2021
Name of Proponent	ShriRatikant Rout
Full correspondence address of Proponent	Shri Ratikanta Rout At- Patala, Ps- Balaram Prasad, District-Dhenkanal, State- Odisha.
Name of Project	Sand Mining Project Kanapala Samil Mahulpal Sand Quarry on Brahmani River
Name of River	Brahmani River

Name of Village	Kanapala Samil Mahulpal	
Name of Tehsil/Anchal	Bhuban	
District	Dhenkanal	
Name of Minor Mineral	Sand	
Sanctioned Lease Area (in Ha.)	9.967 ha/24.63 Acres	
Category of the project	"B1"	
Total Geological Reserves	398710Cum.	
Total Mineable Reserves	357840 Cum.	
Proposed Production/year	25000 Cum. Per Annum	
Sanctioned Period of Mine lease	5 years	
Method of Mining	Open Cast Manual Method	
No. of working days	250 days	
Working hours/day	8hrs	
No. of workers	42	
Type of Land	Government land	
Water Requirement	**Purpose**	**Requirement (KLD)**
	Drinking & Domestic	0.84
	Dust Suppression	12.0
	Green Belt Development	1.0
	Total	**13.84**
Any litigation pending against the project or land in any court	No	
Proposed Project cost (INR)	Thetotalcost ofproject wouldbe aroundRs.60, 00,000/- (60 lakh).	
Proposed EMP budget (INR)	RecurringCost- Rs.2,00,000/- CapitalCost –Rs.2,00,000/-	
Proposed CER (2% of Project Cost)(INR)	Rs. 1,20,000/-	
Length and breadth of Haul Road	Length:1000m,width:6 m	
No. of Trees to be Planted	500plants	

11.2 RESERVES

The reserve has been estimated by considering the following parameters.

i. Surface area method has been adopted for estimation of reserve of sand in Cu.m.

ii. The reserve has been calculated under proved category only

iii. Recovery factor is established as per the actual field practice as follows.

Parameters **Quantity**

Recovery Factor: - 100%

iv. Out of total volume 100% of sand is assumed to be replenished in the absence of monitored database within the quarry lease area for the lease period of five years. Based on the above consideration & chosen local parameter, the reserve has been calculated for sand as per the present scenario. Depending upon the pattern of deposit, position and quantity of the river sand at present, it is impossible to estimate for the ensuing period. Inorder to overcome this, total area has been considered as potential zone for sand deposition of sand after excluding the area under water cover (if located any within the lease area, ref PLATE-IV). The geological reserve has been calculated by surface area method by multiplying total effective area multiplied with average thickness of sand in lease area to attain the volume and there by multiplying recovery factor to attain the geological reserves. The thickness of the sand varies from 1.75 m to 2.25 mtr and the average thickness will be 2 m. Total geological reserve has been calculated by doubling the above calculated reserve.

v. The resource of river sand has been categorized as probable reserve.

vi. It is assumed that the mineable reserve has been estimated in same manner as geological reserve after allowing for loss due to mining, and safety of mine working including 7.5m safety zone all along the boundary and 10m barrieraround the water channel area. Thus, the mineable reserve for Sand bed works out to 178920cu.m/annum. This quantity is existing quantity and the same quantity will be replenished during subsequent flood/rainy season. Besides this 60%of the calculated mineable reserve has been taken as extractable mineable reserve during plan period of the area as per the MoEF Notification dated 25.07.2018.

The total area is 9.967 ha out of which the effective surface after excluding safety zone area and the area covered under water, the surface area considered for mineable reserve is 8.00ha. The geological reserve & mineable reserve of sand quarry calculated under various categories are given in table no. 1 & 2 respectively as follows:

Geological Reserve of Sand Bed (Existing at Present)

Category	Surface area in Sq.mt	Thickness of sand in mtr	Volume of ore in Cu.m	Recovery Factor	Reserve in Cu.m

				(100%)	
Proved	**99676**	**2**	**199352**	**2**	**398710**
Total					**398710**

Category wise Mineable Reserve of Sand Bed

Category	Potential Surface area excluding safety zone in Sq.mt	Thickness of sand in mtr	Replenishment Factor (100%)	Mineable reserve of sand in Cu.m	Extractable mineable reserve
A	**B**	**C**	**D**	**E= BXCXD**	**F= EX0.6**
Probable	**89460**	**2**	**1**	**357840**	**214704**
Total					**214704**

Geological Reserve = 398710 cum.

Mineable Reserve of Sand = 357840cum.

11.3 MINING METHOD

The mode of the deposits, geomorphology of the area and its hydrological condition are some of the factors that favours the open cast method of mining. In this deposit, the mining is done by manual dry-pit mining method The sands are extracted, loaded and transferred from pits to the users through trucks. The mining is done on single shift basis. The local man power has been engaged in the mine.

No machineries shall be used as it is a river bed mining project except tippers/tractors for the haulage/transportation of sand from the lease area to the consumer.

The number, type and capacity of machines to be used are described in the table below;

Type of Machines	Capacity	No. of Machines
Tipper/Tractor	6 Cu.m/2.5 Cu.m	2 tippers/6 tractors
Safety equipment such as helmets, safety shoes, googles & hand gloves	--	As required

1. Abandoned stream channels on terrace and inactive floodplains has been preferred rather than active channels and their deltas and floodplains. Replenishment of ground water has to be ensured if excessive pumping out of water is required during mining.
2. Stream will not be diverted to form inactive channel,
3. Mining below subterranean water level will be avoided as a safeguard against environmental contamination and over exploitation of resources,
4. Scraping of sediment bars above the water flow level in the lean period have been preferred for sustainable mining,
5. Mining of sand from the riverbed has been restricted to a maximum depth of 3m from the surface. For surface mining operations beyond this depth of 3m, it is imperative to adopt quarrying in a systematic bench like disposition, which is generally not feasible in riverbed mining.

   Hence, for safety and sustainability restriction of mining of riverbed material to maximum depth of 3m. has been recommended,
6. Quarry Floor Level (RL) at the end of the year or period of the concession:

   During plan period one pit will be developed. The average production for these years will be around 25000 cu.m. The quarry floor will be 27 mRL. The proposed pit lay out have been shown in the development plan and also in environment management plan (ref Plate V & Plate - VI).
7. Quantity of mineral to be won (Annual Level of Production):

   Based on the present market demand, the year wise production schedule for ensuring five years has been formulated at a steady and uniform rate of 25000 cu.m/annum for sand. As the sand sized particles will be produced the production has been calculated and represented in cubic meter irrespective of the tonnage factor, to facilitate to get the correct quantity of sand. Based on the past experience, the geo-mining parameters taken into consideration for mine planning are as follows:

Geo- Mining Parameters	Quantitative description
Sand Recovery Factor	100%
Bench Height	Benching pattern is not feasible in case of sand

	mining. The maximum depth of mining is 2m
Sand to Waste/rejects	Nil

On the basis of the above data, year wise production of sand is estimated as per the following formula: M = CLI

Where,

M = Quantity of sand in cu.m

C = Surface area in square meters

L = Length of influence in meters

I = Recovery factor of sand deposits

The year wise production of sand during plan period are given in table no, as follows:

Table 11.3 Year Wise Production of sand during plan period

Year	Production of sand in cu.m/annum
1ST	25000
2ND	25000
3RD	25000
4TH	25000
5TH	25000
Total	**1,25,000**

The average production/excavation sand is 25000 cu.m/annum. If the reserve of sand is not sufficient and to meet the production quantity, the lessee may modify the plan within the lease period after seeking permission from the competent authority just after the monsoon of substantial year.

11.4 WATER DEMAND

In the river bed mining projects, there is as such no need of water to carry out operations, except for dust suppression& drinking. The number of working people is **42** & the total water requirement will be around **13.84 KLD.** This water will be supplied from the nearby area.

Table 11.4- Water Demand

S. No.	Purpose	Water Demand KLD
1.	Drinking & Domestic	0.84
2.	Plantation	1.0
3.	Dust Suppression	12.0
Total		**13.84**

11.5 BASE LINE DATA

This section contains the description of baseline studies of the 10km radius of the area surrounding Village- Kanapala Samil Mahulpal, Tahasil-Bhuban, District-Dhenkanal, State-OdishaThe data collected has been used to understand the existing environment scenario around the proposed mining project against which the potential impacts of the project can be assessed.

Environmental data has been collected in relation to proposed mining for:-

(a) Air
(b) Noise
(c) Water
(d) Soil
(e) Ecology and Biodiversity
(f) Socio-economy

Table 11.5 Baseline Environmental Status

Attribute	Baseline status
Ambient Air Quality Ambient air quality was monitored at 5 locations within a 5 km radius of	Ambient Air Quality Monitoring (AAQM) has been carried out at eight locations during pre- monsoon season from March 2025 to May 2025. The minimum and maximum level of PM2.5 recorded within the study area was in the range of 25.12 µg/m^3 to 59.05µg/m^3 with the 98th percentile 39.90 µg/m^3 to 59.13 µg/m^3 at. The minimum and maximum level of PM10 recorded within the study area was in the range of 43.51µg/m^3 to 93.20 µg/m^3 with the 98th percentile 75.12 µg/m^3 to 92.92 µg/m^3. The minimum and maximum concentration of SO_2 recorded within the study area was in the range of was 4.12 µg/m^3 to 15.5µg/m^3 with the 98th percentile 7.15µg/m^3 to 14.63µg/m^3. The minimum and maximum level of NO_2 recorded within the study area was in the range of was 5.2 µg/m3 to 18.9 µg/m^3 with the 98th percentile 12.02 µg/m3 to 18.85 µg/m^3. The results thus obtained indicate that the concentrations of PM10, PM2.5, SO2 and NO2 in the Ambient Air are well within the National Ambient Air Quality (NAAQ) standards for Industrial, Residential, Rural and other areas.

Noise Levels	Noise monitoring was carried out at five locations. The results of the monitoring program indicated that both the daytime and night time levels of noise were well within the prescribed limits of NAAQS, at all the four locations monitored.
Water Quality	4Groundwater samples and 2 surface water samples were analyzed and concluded that: The ground water from all sources remains suitable for drinking purposes as all the constituents are within the limits prescribed by drinking water standards promulgated by Indian Standards IS: 10500. From the Surface water analysis, it is evident that most of the parameters of the samples comply with 'Category 'A' standards of CPCB indicating their suitability for Drinking water source after conventional treatment and disinfection.
Soil Quality	Samples collected from identified locations indicate the soil is sandy loam type and the pH value ranging from 6.32 – 6.70, which shows that the soil is acidic in nature. Iron is found to be from518 mg/kg to 563 mg/kg. The water holding capacity is found in between 40.87% to 44.15%.
Ecology and Biodiversity	There are no Ecologically Sensitive Areas present in the study area, but many reserved forests regions surround the project area. No forest land is also present within the mine area.
Socio-economy	The implementation of the Sandmining project on river Brahmani will throw opportunities to local people for both direct and indirect employment. The study area is still lacking in education, health, housing, water, electricity etc. It is expected that same will improve to a great extent due to proposed mining project and associated industrial and business activities.

11.6BIOLOGICAL ENVIRONMENT

Impact on Ecology of the Area

Excessive and unscientific Riverbed sand mining causes the degradation of rivers. Miningwhich leads to the removal of channel substrate, re-suspension of streambed sediment, clearance of vegetation, and stockpiling on the streambed, will have ecological impacts. These impacts may have an effect on the direct loss of stream reserve habitat, disturbances of species attached to streambed deposits, reduced light penetration, reduced primary production, and reduced feeding opportunities.

Riverbed sand mining results in the destruction of aquatic and riparian habitat through large changes in the channel morphology. Impacts include bed degradation, bed coarsening, lowered water tables near the streambed, and channel instability. These physical impacts cause degradation

of riparian and aquatic biota and may lead to the undermining of bridges and other structures. Continued extraction may also cause the entire streambed to degrade to the depth of excavation.

Sand mining generates extra vehicle traffic, which negatively impairs the environment. Were access roads cross riparian areas, the local environment may be impacted.

Mitigation measures

As the present mining will be done in a scientific manner as mentioned before, not much significant impact in predicted, however, the following mitigation measure will be taken to further minimize it.

- Re-suspension, turbulence, stream flow, channel substrate and associated species will be disturbed and lost due to proposed mining will disturbed existing pattern but in respect to river area is very minimum / less. The activity will mainly be carried out by semi-Mechanized to minimize associate loss, as stated earlier that the settling pit will be created to minimize the adverse impact downstream.
- No mining will be done near to important structure like bridges, dam and others.
- No mining will be carried out during the rainy season to minimize impact on aquatic life.
- As the mining site has no vegetation, thus clearance of vegetation not required.
- The mining activity will employ many heavy vehicles to transport the sand outside the mine to desired destination that cause the loss to riparian habitat. Safe site / site having less impact will be selected for transportation, all the vehicles will be employed for transportation purpose will be PUC certified. On closure/during the rainy season the eroded bank will be restored/reclaimed to minimize negative impacts.

Flora and Fauna of Riparian Habitat

If sand mining is done in an unscientific way, i.e. beyond the replenishment capacity, riverbed mining can have adverse effects at the mine sites. The fertile streamside land will be lost gradually and the wildlife in the riparian areas may start vanishing. Degraded stream habitats will result in loss of fisheries productivity, biodiversity, and recreational potential. Thus, the severely degraded channels may lower the aesthetic value too.

Anthropogenic activities that artificially lower stream bed elevation cause bed instabilities that result in a net release of sediment in the local vicinity. Unstable sediments simplify and, therefore, degrade stream habitats for many aquatic species.

The most important effects of excessive and unscientific Riverbed sand mining on aquatic habitats are bed degradation and sedimentation, which can have substantial negative effects on aquatic life. The stability of sand-bed streams depends on a delicate balance between stream flow, sediment supplied from the watershed, and channel form. Mining-induced changes in sediment supply and channel form disrupt channel and habitat development processes. Furthermore, movement of unstable substrates results in downstream sedimentation of habitats. The affected distance depends on the intensity of mining, particles sizes, stream flows, and channel morphology. Channel widening causes swallowing of the streambed, producing braided flow or subsurface intergrades flow in riffle areas, hindering movement of fishes between pools. Channel reaches become more uniformly shallow as deep pools fill with gravel and other sediments, reducing habitat complexity, riffle-pool structure, and numbers of large predatory fishes.

All such impacts can be reduced by following scientific mining practices and mitigation measures as restricted.

Mitigation measures

Sand extraction operations will be managed to avoid or minimize damage to stream/river banks and riparian habitats

- Sand extraction in vegetated riparian areas will be avoided.
- Large woody debris in the riparian zone will be left undisturbed or replaced when moved and not be burnt.
- Sand stockpiles, overburden and/or vegetative debris will not be stored within the riparian zone.
- It is essential that overburden is evenly redistributed over exposed areas as soon as possible after the operation has been completed for faster vegetation.
- Operation and storage of heavy equipment within riparian habitat will be restricted.
- Access roads will not encroach into the riparian zones.

No exotic species will be introduced by the RBM project activity & associated persons at all.

As the mining will not be done beyond the stipulated limit, so the chances of river mouth widening, bank widening will be negligible. Thus, mining in a scientific and systematic way will reduce such impending effects.

11.7 LAND ENVIRONMENT

No adverse impact is anticipated on land use of buffer zone due to present mining operations. As all the related activities are confined to the core zone.

The area likely to be degraded due to quarrying, pitting & roads. The impact on the land form or physiography will be limited to the modification of the slope. The landscape and land use will undergo a radical change due to open cast mining. The impact during next five years is limited as benches will be formed. Besides these benches, roads will also modify the physiography. The impact on land use will also be limited.

Impact on Land use Pattern including change of River course:

- If mining is not carried out in systematic manner by leaving sufficient safety barriers from the bank than it may disturb the river flow/course.
- Stacking of uncoated material including mineral or spillage (if any) on the bank side of river will hinder the flow of water in monsoon season, raise water level upstream, which may lead to bank cutting or flouting.
- Deviation from planned mining procedures can lead to river channel shifting as well as degradation of surrounding land, causing loss of properties & degradation of land scape.

Mitigation measures:

- Mineral will be mined out in central portion of stream & sufficient safety barrier 10% of width will be left towards bank side, so that river flow/course will not get disturbed.
- Mining of mineral will be started towards rise at the centre & also laterally in 1m slice so that river course will not get affected. Unwanted material or spillage (if any) will not be stacked by the side of excavation voids created. This is to be done so, because it will otherwise hinder flow of water in monsoon period.
- Mining is to be done by leaving safety barrier on both sides & maximum barrier should be do concave side of river preferably the flow channel (excavation void created) should be kept straight so as to help avoid erosion as side cuttings, Upto next depth of 3.0m from river bed level.

- No waste water will be generated from the mining activities of minor minerals as the project. Only involves lifting of Sand from the river bed.

11.8 AIR ENVIRONMENT

Anticipated impacts and evaluation

Information on air quality was studied and various modelling techniques predicted that the mining activity will not affect the air quality in a significant manner. In mining operations, loading, transportation and unloading operations may cause deterioration in air quality due to handling dry materials. In the present case, only wet materials will be handled, thus eliminating problems of fugitive dust. Also, the collection and lifting of minerals will be done Semi- Mechanized without any blasting. Therefore, the dust generated is insignificant as compared to mining process of other hard minerals like the process of drilling, blasting, mechanized loading etc.

Mitigation measures- In control the emission regular preventive maintenance of equipment will be carried out on contractual basis.

- Proper mitigation measures like water sprinkling will be adopted to control dust emission.
- Plantation will be carried out at a place which is authorized by local authority.
- It is being certified that all transportation vehicles will carry a valid PUC certified. The only air pollution sources are the road transport network of the trucks. The dust suppression measures like water spraying will be done on the roads. This will decrease the dust emission by 75%.
- There is no toxic element present in the mineral which may contaminate the soil.

11.9 WATER ENVIRONMENT

Damage in the water body, depends on its assimilative capacity. To find out assimilative capacity of receiving water body, water samples were collected from different groundwater and surface water sources. The study indicates that assimilative capacity of the river bodies still exists, but effective measures shall be taken to check water pollution. To find out the effect on ground water an extensive hydro-geological study has been conducted and from the study it can be safely concluded that there is no noticeable effect on surrounding ground water resources due to mining. The mining activity does not require water. The collection of sand is done on the river bed where excessive sedimentation has been noticed.

Mining of sand from within or near a streambed has a direct impact on the stream's physical habitat characteristics. These characteristics include geometry, bed evaluation, substrate composition and stability, in stream roughness elements, depth, velocity, turbidity, sediment transport, stream discharge and temperature. Altering these habitat characteristics can have deleterious impacts on both in stream biota and associated riparian habitat.

The detrimental effects to biota resulting from bed material mining are caused by three main processes

i. alteration of flow patterns resulting from modification of the river bed
ii. an excess of suspended sediment
iii. damage to riparian vegetation and in stream habitat

As the project activity is carried out in the meandering part of the river bed, none of the project activities affect the water environment or riparian habitats. In the projects, it is not proposed to divert or truncate any stream. No proposal is envisaged for pumping of water either from the river or tapping the ground water. In the lean months, the proposed sand mining will not expose the base flow of the river and hence, there will not be any adverse impact on surface hydrology and ground water regime due to this project. The contractor will adhere all guidelines and rules for proper and scientific method of mining during the period of extracting the ordinary sand. Thus, the project activities shall not have any adverse effect on the physical components of the environment and therefore may not have any effect on the recharge of ground waters or affect the water quality.

Impacts on hydrological Conditions:

- The study area is itself part of river course carries surface as well as ground water (under current). The flow of surface/ground water (sub surface flow is following the trend of topography.
- The area is part of dry river bed for more than nine months in a year except for the rainy season. The Sand mining is up to the depth of 2.0m will have in significant impact on water regime.
- The general ground water table which will be about 2.0m below surface of river bed in the mining area during dry seasons will not be disturbed as ultimate working depth will be 2.0m.

Impact on Water Quality:

- Mining causes lowering of riverbed level as well as riverbed water level resulting in lowering in ground table due to excessive extraction & drainage out of ground water from the adjacent areas, if general ground water table is higher than the river bed level. In case the general ground water level is lower than riverbed water level, than it will have positive impact on ground water table will recharge vertically as well as laterally. In the former case may cause shortage of water for the vegetation & human settlement in the vicinity, but in later case it will help improve situations
- River is recharging the ground water, excessive mining will reduce the thickness of the natural filter material (sediments), infiltration through which the ground water recharged, so restriction in depth becomes necessity.

Mitigation Measures:

Mining in the area will be done above the water table as well as river bed water level, therefore much impact on water regime is not anticipated.

11.10 NOISE ENVIRONMENT

The sand mining projects are mainly not noisy as these are mainly manual in nature. But in this case the methodology adopted for mining is opencast semi mechanized mining method which may generate noise.

Impact on environment

At mines, noise is created by movement of machinery & transportation vehicles, etc. The noise level in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which has been adopted and enforced by the Govt. of India through model rules framed under Factories Act, 1980 and CPCB 2000 norms. The summary of the permissible exposures in cases of continuous noise as per above rules is given below:

Table 11.6 Noise impact

Total time of exposure per day in hour	Sound pressure dB(A)	Remarks
1	2	3
8.0	90	No exposure in excess of 115 dB(A) is permissible
6.0	92	--
4.0	95	For any period of exposure falling

3.0	97	in between any figure and lower figure as indicated in column (1), the permissible sound is to be determined by extrapolation or proportionate scale.
2.0	100	
1 ½	102	
1	105	
¾	107	
½	110	
¼	115	

Noise at lower levels (sound pressure) is quite acceptable and does not have any bad effect on human beings, but when it is abnormally high- it incurs some maleficent effects.

Mitigation measures

The off-site receptors are not significantly affected as noise generated by mines is insignificant but for some disturbances due to vehicle movement. The following measures have been envisaged to reduce the impact from the transportation of minerals.

- Periodical monitoring of noise will be done.
- Transportation vehicles will be maintained in good running condition so that noise will be reduced to minimum possible level.
- Noise generated by these Equipment shall be intermittent & does not cause much adverse impact.
- Proper maintenance of all equipment/machines will be carried out which help in reducing noise level during operations.
- In addition, truck drivers will be instructed to make minimum use of horns in the village area and sensitive zones.

11.11 TRAFFIC ANALYSIS

From the Traffic analysis it can be revealed that the V/C ratio will change from 0.21 to 0.123 for Nilakanthapur Village Road with LOS remaining the same i.e, “A” that is Very good respectively, and the V/C ratio for MDR will change from 0.160 to 0.169 with LOS remaining the same i.e, “A” that is Very good so the additional load on the carrying capacity will be affected to a very minimum level.

11.12 SOCIO- ECONOMIC ENVIRONMENT

The implementation of the Sand mining project will throw opportunities to local people for both direct and indirect employment. Since the quarries have been auctioned and leased out to successful allottees, sandmining operation in the state will get legalized and it will fetch income to the state exchequer. The project will also provide impetus to industrialization of the area. With the implementation of the proposed mining project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities rather in agriculture. Thus, there will be a gradual shifting of population from agriculture to mining and industry. Further, the mining and industrial activities in the area may lead to urbanization. Due to urbanization of the area, employment opportunities will further increase.

11.13 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Proper environmental management plan are proposed for "Sand" mining project to mitigate the impact during the mining operation.

- Care will be taken that no labour camps will be allowed on river bed.
- Care will be taken that no cooking, or burning of woods will be allowed in the adjoining area.
- Prior to mining, short awareness program will be conducted for labors to make them aware to way of working.
- If some causality or injury to animal occurs, it will be informed to forest department and proper treatment will be given.
- No tree cutting, chopping, lumbering, uprooting of shrubs and herbs will be allowed.
- Corridor movement of wild mammals (If exists) willbe avoided
- Care will be taken that noise produced during vehicles movement for carrying sandare within the permissible noise level.
- No pilling of material will be in adjoining area.
- If wild animals are noticed crossing the river bed, it will not be disturbed or chased away, instead the labors will move away from their path.

11.14 ENVIRONMENTAL MANAGEMENT PLAN IMPLEMENTATION

Environmental Management Plan serves no purpose if it is not implemented with true spirit. Some loopholes in the EMP can also be detected afterwards when it is implanted and monitored. Thus, an implementation and monitoring programme has to be prepared.

The major attributes of environment are not confined to the mining site alone. Implementation of proposed control measures and monitoring programme has an implication on the surrounding area as well as for the region. Therefore, mine management will strengthen the existing control measures as elaborated earlier in this report and monitor the efficacy of the control measures implemented within the mining area relating to the following specific areas for eco-friendly mining:

a. Collection of air and water samples at strategic locations with frequency suggested and by analyzing thereof. If the parameters exceed the permissible tolerance limits, corrective regulation measure will be taken.
b. Collection of soil samples at strategic locations once in every year and analysis thereof with regard to deleterious constituents, if any.
c. The effectiveness of drainage system depends upon proper cleaning of all drains provided in the surrounding of mine area. Any blockage due to siltation or loose material will be checked at least once in a month.
d. Measurement of water level fluctuations in the nearby ponds, dug wells and bore wells.
e. Regular visual examination will be carried out to look for erosion of river banks. Any abnormal condition, if observed will be taken care of.
f. Measurement of noise levels at mine site, stationary and mobile sources, and adjacent villages will be done in every quarter of the year.
g. Plantation/afforestation as will be done planted at place which authorized by Local Authority. Post plantation, the area will be regularly monitored in every season for evaluation of success rate. For selection of plant species local people will also be involved.

Table 11.7 Budget allotted for Environmental Management Plan

Sl.No	Description	CapitalCost(lakh)	RecurringCost (lakh)

1	PollutionControl&DustSuppression	Nil	0.50
2	PollutionMonitoring i) Airpollution ii) Waterpollution iv)NoisePollution	--	0.50
3	Plantationfor 500 saplings @Rs.200 per sapling	1.0	0.50
4	Haul roadMaintenance Cost	1.0	0.50
TOTAL		**2.0**	**2.0**

11.15 MONITORING SCHEDULE AND PARAMETERS

Table 11.8 Monitoring Schedule and Parameters

S.No.	Description of Parameters	Schedule of Monitoring
1	Air Quality	24 hourly samples twice a week in each season except monsoon
2	Water Quality (Surface &Groundwater)	Twice a year
3	Soil Quality	Once in a year in project area
4	Noise Level	Twice a year for first two years & then once a year
5	Socio-economic Condition	Once in 3 years
6	Plantation monitoring	Once in a season

11.16 BENEFIT OF MINING

- **PHYSICAL BENIFITS**

Improvement in the Physical Infrastructure

The opening of the proposed project will enhance the following physical infrastructure facilities in the adjoining areas.

a. **Road Transport:** There will be improved road communication due to the proposed project and maintenance will also be done time to time.

b. **Market:** Generating useful economic resource for construction. Excavated mineral will provide a good market opportunity.

c. **Enhancement of green cover:** As a part of reclamation plan, plantation will be carried along the place which authorized by local authority.

a. **Creation of community assets** (infrastructure) like provision for drinking water, construction of school buildings, village roads/ linked roads, dispensary & health center, community center, market place etc. as a part of corporate social responsibility.

The impact on the civic amenities will be substantial after the commencement of mining activities. The basic requirement of the community needs will be strengthened by extending health care, educational facilities developed in the township to the community, providing drinking water to the villages, building/strengthening of existing roads in the area. The proponent will initiate the above amenities either by providing or by improving the facilities in the area, which will help in uplifting the living standards of local communities. Medical facilities will be provided in the form of first-aid facility at the mine. These medical facilities will also be available to local people in the surrounding in case of emergencies.

- **SOCIAL BENEFITS**

- Generation of employment and improved standard of living;
- Increased revenue to the State by way of royalty, taxes and duties; and
- Superior communication and transport facilities etc.
- There will be significant change in the socio-economic scenario of the area.
- The proposed project will enhance the prospects of employment. Recruitment for the unskilled and semiskilled workers for the proposed project will be from the nearby villages.
- The development of the basic amenities viz. roads, transportation, electricity, drinking water, proper sanitation, educational institutions, medical facilities, entertainment, etc. will be developed as far as possible.
- Overall, the proposed project will change living standards of the people and improve the socio-economic conditions of the area.

a) **Increase in Employment** Potential due to the project activity. Employment opportunities will increase both directly as well indirectly.

b) **Contribution to the Exchequer** as the saleable minerals will be given royalty. Since the quarries will be leased out to successful allot tees, mining operation in the state will get legalized and it will fetch income to the state exchequer.

c) **Increased Health related activities**: Healthcare promotional activities will be undertaken. Pre-placement& and Periodic medical check-up will be done, which will lift the general health status of the residents of the area. Health camps, medical aids, family welfare programs, immunization camp sports will be arranged.

d) **Educational attainments**: educational activities will be promoted by the lessee. Awareness program will be arranged covering basic issues related to primary level education, environment, health and hygiene etc.

e) **Strengthening of existing community** facilities through the Community Development Programme.

ENVIRONMENTAL BENEFITS

- **Enhancement Of Green Cover**

Plantation/afforestation will be done as per program 500 plants will be planted along the place which would be authorized by local authority within 5 km from lease boundary along with provision for maintenance for 5 years. Post plantation, the area will be regularly monitored in every season for evaluation of success rate. For selection of plant species local people will also be involved. The management will provide free saplings of fruit and other trees, etc. to local during rain for plantation. This will increase the consciousness in workers and near-by villagers for greenery. Fruit trees can contribute towards their financial gains.

11.17 CORPORATE ENVIRONMENTAL RESPONSIBILITY

2 % of capital cost of the project cost will be allotted for the Corporate Environmental Responsibility as per OM dated 1st May 2018.

CER cost will be 2% of the total project cost. This amount will be used for social welfare.CER cost is Rs. 1,20,000/-

For each activity the funds to be earmarked by the proponent will be decided after discussion with the local authority/people and the beneficiaries during public hearing. It has been planned to undertake a concurrent evaluation of the activities to be taken up under the CER programme.

11.18 CONCLUSIONS

- The mining operations will meet the compliance requirements of MoEF & CC;
- Community impacts will be beneficial, as the project will generate significant economic benefits for the region;
- Adoption of Best Available Technology and Best Management Practices with more environmentally friendly process
- With the effective implementation of the Environment Management Plan (EMP) during the mining activities, the proposed project can proceed without any significant negative impact on environment.

CHAPTER-XII

DISCLOSURE OF CONSULTANTS ENGAGED

CHAPTER-12

DISCLOSURE OF CONSULTANTS ENGAGED

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CONSULTANTS ENGAGED

The consultant engaged for the preparation and Validation of the EIA/EMP of the project is M/s Aegis Environment Research Private Ltd. The information about the company with address is as follows:

Basic Information about the Consultant Engaged is as follows stated below:

Name of the Consultant	Aegis Environment Research Private Ltd.
Address	Suite- B 04 H-61Sector –63, Noida - 201301, U.P
Credentials	Accredited by QCI/NABET

Personnel involved in the preparation of EIA/EMP report are stated below:

Sr. No.	Name	EC/FAE	Details
01	Mr. Ankur Sharma Team Member – Mr. Partha Pratim Maji	EC	EIA Coordinator (Mining of minerals opencast).
02	Mr. NimishSinghwi- Ms. Jaya Joshi	FAE	AP, HG, SHW & GEOLOGY
03	Ms. Sonal Sristi Singh Team Member – Ms. Jaya Joshi	FAE	EB, WP
04	Mr. A. Shekar Shannighrahi	FAE	AQ
05	Mr.Ankur Sharma	FAE	WP, SE
06	Mr. P M Jain	FAE	RH, NV
07	Mr. Jay Deep Singh	FAE	LU
09	Vijay Sharma, Team Member – Ms. Nisha Yadav	FAE	AP, SC

Accreditation Certificate of the Consultant Engaged:

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National Accreditation Board for Education and Training

Certificate of Accreditation

Aegis Environment Research Pvt. Ltd., Noida

B-04, H-61, Sector-63, Noida, Uttar Pradesh- 201301

*The organization is accredited as **Category-A** under the QCI-NABET **Scheme for Accreditation of EIA Consultant Organization, Version 3**: for preparing EIA/EMP reports in the following Sectors-*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals including opencast / underground mining	1	1 (a) (i)	A
2.	Mineral beneficiation	7	2 (b)	A
3.	Highways,	34	7 (f)	A
4.	Building and construction projects	38	8 (a)	B
5.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in IAAC minutes dated March 11, 2025, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/25/3572 dated March 25, 2025. The accreditation needs to be renewed before the expiry date by Aegis Environment Research Pvt. Ltd., Noida following due process of assessment.

Valid up to
January 29, 2028

Issue Date
March 25, 2025

Certificate No.
NABET/EIA/25-28/IA 0153

Varinder Kanwar
Prof (Dr) Varinder S Kanwar
(CEO NABET)

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

Ratikanta Rout