**Department of Civil Engineering**

**Indian Institute of Technology hyderabad**

**Environment and Social Impact Assessment of the Bhadrak Mega Drinking Water SUPPLY Project**

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ABBREVATION

|  |  |
| --- | --- |
| AAQ | Ambient Air Quality |
| BIS | Bureau of Indian Standard |
| BMTPC | Building Materials & Technology Promotion Council |
| CGWA | Central Ground Water Authority |
| CGWB | Central Ground Water Board+C26 |
| CTE | Consent to Establish |
| DEM | Digital Elevation Model |
| DG | Diesel Generator |
| EHS | Environmental Health Safety |
| EPC | Engineering Procurement Construction |
| ESMP | Environmental Social Management Plan |
| HSSE | Health Safety Social Environment |
| IFC | International Finance Corporation |
| OSEB | Odisha State Electricity Board |
| OSPCB | Odisha State Pollution Control Board |
| OIDCO | Odisha Urban Infrastructure Development Company Limited |
| KII | Key Informants Interview |
| NH | National Highway |
| OF | Out Fall |
| OP | Operating Procedure |
| PM | Particulate Matter |
| PVC | Polyvinyl Chloride |
| RCC | Reinforced Cement Concrete |
| RoW | Right of Way |
| UDHD | Urban Development and Housing Department |
| ULB | Urban Local Body |
| BMDP | Bhadrak Municipal Development Project |
| OUIDCO | Odisha Urban Infrastructure Development Company Ltd. |
| WB | World Bank |
| ESMF | Environmental and Social Management Framework |
| ESIA | Environment and Social Impact Assessments |
| ToR | Terms of Reference |
| OHT | Over Head Tank |
| WTP | Water Treatment Plant |
| EMP | Environment Management Plant |
| WSS | Water Supply Scheme |
| SES | Socio-Economic Survey |
| PIA | Project Impact Area |
| CoI | Corridor of Impact |
| PAPs | Project Affected Persons |
| RAP | Resettlement Action Plan |
| SIA | Social Impact Assessment |
| OSEB | Odisha State Electricity Board |
| GRC | Grievance and Redressal Committee |

# Introduction

1. Project introduction

The objective of proposed water supply system is to supply potable water in adequate quantity, quality, conveniently and economically to the habitants of 1329 habitations in 526 villages of Basudevpur, Chandabali, Tihidi, Dhamanagar blocks of Bhadrak district. Maximum villages of water supply scheme are having the existing ground water source as hand pumps and Tube Wells. But there is a problem of depleting ground water table due to over exploitation of water for irrigation, as well as for drinking, yield from Tube Wells decreases especially during peak summer. Thus it is essential to supply drinking water from surface based source in order to ensure water supply throughout the year.

An Environmental and Social Impact assessment as part of ESMF has been prepared by Indian Institute of Technology Hyderabad for the Bhadrak Mega Drinking Water Project with the following objectives: to assess and manage the potential environmental and social risks and impacts that may come up during implementation and throughout the project cycle; to ensure the social and environmental sustainability of investments; and to ensure compliance with national environmental and social legislation As per World Bank policy 4.01, an ESMF is an instrument that examines the issues and associated impacts when a project consists of a program and/or series of sub-projects, and the impacts cannot be determined until the program or sub-project details have been identified. The ESMF sets out the principles, rules, guidelines and procedures to assess the environmental and social impacts. It contains measures and plans to reduce, mitigate and/or offset adverse impacts and enhance positive impacts, besides provisions for estimating and budgeting the costs of such measures, and information on the agency or agencies responsible for addressing project impacts. As required by the ESMF, Environment and Social Impact Assessments (ESIAs) are being conducted for the selected priority sub-projects.

The overall goal of this policy is to translate the vision of “Swachh and Sustha gram”, into reality throughout rural Odisha by constructing improved sanitation facilities at household and institutional level, ensuring transportation and safe disposal of waste, promoting recycling of solid and liquid waste, creating awareness about public health and environment, improving hygiene knowledge, and institutionalizing core capacities to ensure effective management along the entire sanitation value chain.

The specific goals are:

* Achieving sustained Open Defecation Free villages
* Achieving Open defecation free villages

All rural HHs, irrespective of their tenurial status, will have access to IHHLs and use safe sanitation and hygiene facilities such that no one defecates in the open. In order to achieve this goal, the following activities shall be undertaken.

Sustain and improve upon the gains made under SBM-G to ensure each household, including the additional households on account of population growth, have access to IHHLs and safe sanitation facilities.

Under exceptional scenarios, where technical difficulties prevent provision of IHHLs in certain settlements/geographies, provision of community/public sanitation facilities will also be supported.

Sustaining Open Defecation free villages

Ensure continuous usage of toilets by every member of the households within the village/GP.

Adequate upkeep and management of public sanitation facilities in all rural areas will be ensured, to free them of open defecation and environmental hazards.

All public sanitation facilities to integrate appropriate design elements, making them accessible and safe to use at all times by women, children, transgender persons, aged, and differently abled.

Achieving sustained open discharge free villages.

Sanitary and safe treatment and disposal Human excreta, domestic solid and liquid waste from all households, institutions, commercial establishments and sanitation facilities including toilets must be treated safely before disposing into the environment.

The vision of this policy is to form a “Swachh and Sustha gram”, where all the rural habitats have access to improved sanitation, where safe hygienic behaviour is a norm, where recycling of solid and liquid waste is widely practiced, where the environment is waste free, clean and unpolluted, leading to an enhanced quality of life with improved health, general well-being, and social equity fostering economic growth. The overall goal of this policy is to translate the vision of “Swachh and Sustha gram”, into reality throughout rural Odisha by constructing improved sanitation facilities at household and institutional level, ensuring transportation and safe disposal of waste, promoting recycling of solid and liquid waste, creating awareness about public health and environment, improving hygiene knowledge, and institutionalizing core capacities to ensure effective management along the entire sanitation value chain

1. Brief Description of Project

The population projections are carried out as per the list of villages, population details and criteria mentioned in the tender document. Population projection has been arrived based on the population details of 2011 provided in the agreement. Population projections have been calculated based on Arithmetical increase method with a decadal growth rate of 14%. The projections were made for the Ultimate design year 2050 with Intermediate design year as 2035 and Base year as 2020. The system is designed for 30 years i.e. year 2050.The abstract of the population projection for 1329 Nos. habitations covered under this water supply system is given in the table below.

**Table 1:** Abstract of Projected Population

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bhadrak** | **Population** | **Projected Population with 14.0% per decade** | | |
| **2011** | **2020** | **2035** | **2050** |
| **Mega PWS Project to 84 GPs in Basudevpur, Chandabali, Tihidi and Dhamanagar locks (1329 habitations)** | 6,16,838 | 6,94,564 | 8,47,257 | 10,29,065 |

1. Objective of the ESIA Study

* dentification of the project activities
* Description of existing environment and social conditions of the area
* Assessment of potential impacts associated with the project activities
* Mitigation and monitoring measures proposed for impacts identified andIncorproation of stakeholder suggestions and feedback
* Preparation of an environment and social management plan which includes implmementation arrnagements for supervision

Approach and Methodology

|  |
| --- |
| Preparatory Activities Reviewed and compiled primay secondary data - Conducted field visit to identify environment and social receptors - Identified primary and secondary stakeholders. |

|  |
| --- |
| Analysis of alternativesCompared feasible alternatives to the proposed project site, technology, design, and operation in terms of their potential environmental impacts. |

|  |
| --- |
| Collection of Environment and Social Baseline Data Monitored data for ambient air quality, water quality, soil quality, ambient noise quality Conducted Socio -Economic Survey (SES)/Census Survey to collect socio -economic data Conducted stakeholder consultation to collect first hand information from the beneficiaries and Project Affected People (PAP) |

|  |
| --- |
| Impact AssessmentCompared feasible alternatives to the proposed project site, technology, design, and operation in terms of their potential environmental impacts |

|  |
| --- |
| Development of ESMP and other mitigation PlansDeveloped ESMP |

1. Preparatory Activities

* Assessing existing environmental conditions Identifying potential environmental and social impacts
* Identifying potential mitigation measure Identifying interested and affected individuals or parties
* Preparation of a strategy for the Process Public Participation (PPP)

1. Analysis of Alternatives

The feasible alternatives to the proposed project site, technology, design, and operation were analysed in terms of their potential environmental and social impacts

1. Collection of Environmental and Social Baseline Data

This section details the methodology adopted for establishing the environmental and social baseline. Environmental Baseline The baseline environmental status is important to understand the existing physical and biological characteristics along with cultural and social status of residing community. The data presented in this section is based on field surveys, monitoring, stakeholders consultations and secondary data collection ( drainage, topography, climate, flora and fauna). The information on the baseline environmental conditions (Water/Air/Noise quality and Soil monitoring), forms the basis to analyse the probable impacts of the proposed project vis-à-vis the present background environmental quality of the core study area. In case of environmental baseline, sampling of air quality, water quality (surface and ground), soil quality, and noise levels was undertaken 2019. The sampling locations for monitoring of air, water, soil, and noise qualitywere identified based on the following:

* Existing topography
* Sensitive environmental areas and receptors
* Location of water bodies
* Wind direction and location of village/towns/sensitive areas
* Accessibility, power availability and security of monitoring equipment

The details of the parameters monitored have been presented below:

**Ambient Air Quality**: Ambient air quality was monitored at Bhadrak locations for parameters including Particulate Matter (PM<10 micron, PM<2.5 micron), SOx and NOx.

**Water Quality**: Information on water quality was generated by collecting and analysing samples Balakoti (GP) surface water bodies and Barunadiah ground water locations.

**Soil Quality**: Soil quality was assessed by collecting six soil samples from Chandbali, Thihidi, Basdevpur, Dhamnagar locations. Further, the collected soil samples were analysed for the physical and chemical parameters.

**Ambient Noise Quality**: Ambient noise quality was monitored for 24 hour at Chandbali, Thihidi, Basdevpur, Dhamnagar locations within the study area.

**Land Environment**: Information regarding topography, geology, seismicity, ecology and land use pattern was collected through various field visits, secondary research and information available with the project proponent.

**Social Baseline**

Several visits to the project sites were made during IEE preparation period in 2019 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. Socio-economic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities

Inventory of affected assets

Categorization and measurements of potential loss

Physical measurements of the affected assets/structures

Identification of trees and crops

Household characteristics, including social, economic and demographic profile

Identification of non-titleholders

Assessment of potential economic impact, including temporary loss

1. Impact Assessment and Management Plan

Primary and secondary data collected for establishing the baseline, were analysed for identification of potential environmental and social impacts that may occur during different phases of the project. For each of the identified impacts, measures to avoid and/or mitigate these have been recommended in the Environment and Social Management Plan (ESMP) and Abbreviated Resettlement Action Plan (ARAP) and Scheduled Tribe Participation Plan(STPP).ARAP & STPP is not related and as there is no trible area and land acquisition is not required for this project. A relevant monitoring plan has been proposed to ensure effectiveness of themanagement measures.The sub-steps followed for conducting impact assessment and developing managementplan are given below:Literature review related to the projectField visits to the project areaConducted stakeholders consultations with PAPs, ULB and other local community members about the projectEstablished environmental and social baseline of the project areaIdentified potential environmental and social impacts, considering the characteristics of the project and the biophysical and socioeconomic characteristics of the areaDeveloped recommendations on mitigation measures to be implemented to mitigatethe negative environmental and social impacts due to the project activity

1. Layout of the Report

The ESIA report has been organized into the following sections:

**Section 1: Introduction** - This section provides a brief introduction to the project, scope of the ESIA and methodology followed for developing the ESIA.

► **Section 2: Project Description**- The project details in terms of location and components have been presented in this section.

► **Section 3: Legal and Regulatory Framework**-This section details out the acts,policies and regulations rolled out by the Government of India at central and state level, which are applicable to the proposed project. Further, this section also reviews the applicability of World Bank's safeguard policies to the project activities.

► **Section 4: Analysis of Alternatives**- This section presents two scenarios, ‘with project’ scenario and ‘no project’ scenario.

► **Section 5: Environmental Baseline Profile**- The findings of baseline studies conducted and secondary information collated have been presented in this section.

► **Section 6: Public Consultations and Disclosure -** This section presents the summary of the public consultations including key informant interviews and in-depth interviews with primary and secondary stakeholders.

► **Section 7: Environmental Impact Assessment -** This section presents the environmental impact assessment and environmental impacts identified during various phases of the project. The mitigation measures for the impacts have also been presented.

► **Section 8: Social Impact Assessment (SIA) and Mitigation Plans** - This section presents the social impacts that may occur due to the project activity and summary of relevant mitigation Plans prepared

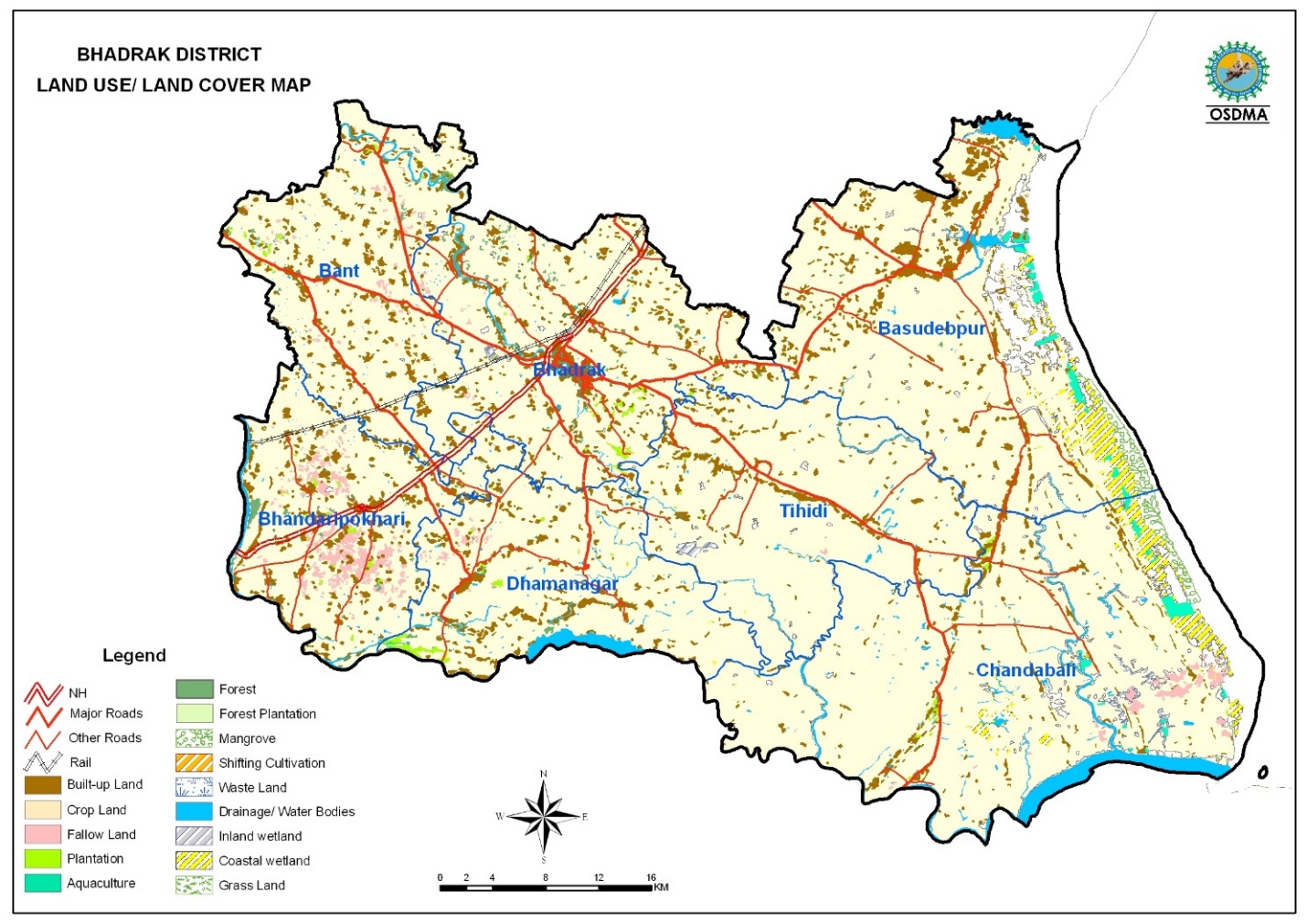
► **Section 9: Environmental And Social Management Plan**- The measures to avoid and mitigate environmental and social impacts across different phases of the project cycle with allocation of responsibilities and monitoring plan for reviewing effectiveness of the measures have been presented in this section. The cost of implementation of EMP has also been presented here.

►**Section 10. Conclusions and recommendations** - This section presents the conclusions and recommendations of the report

# **PROJECT DESCRIPTION**

Bhadrak District is located in the eastern side of the state of Odisha. It is bounded by Baleswar in the north, Keonjhar in the west and Jajpur & Kendrapara districts in the south side. The proposed work of “Execution of Individual Rural Piped water supply projects to pertaining to Bhadrak district including Five Years Operation & Maintenance” aims to provide piped water supply to 33 Villages in Dhamanagar Block, 266 Villages in Chandabali Block, 109 Villages in Tihidi Block & 118 Villages in Basudevpur Block in Bhadrak district.

*Bhadrak district map*



Basudevpur Block

Tihidi Block

Chandabali Block

Dhamnagar Block

# 

# **SCOPE OF WORK**

As per Agreement, Field investigation along with total station survey, then Soil investigation and after that Hydraulic and Structural designs. Topographic survey has been completed and Preliminary concept scheme has been made for finalization for carrying out further detailed hydraulic designs and structural designs.

For Hydraulic and Structural designs

* 1. Intake Arrangement
  2. Raw water rising main
  3. Water Treatment Plant
  4. Clear Water Rising Mains
  5. Electromechanical Works i.e., Pumping machinery
  6. Power substation, transmission lines from the nearest grid point, approvals and further connections
  7. Bulk water flow meters
  8. Civil structures
  9. Intermediate Booster Sump and Pumping Station
  10. Overhead Service Reservoirs
  11. Distribution network from OHTs to Tapping facilities in villages/habitations Preparation of drawings
* Base maps
* L-Sections & General Arrangement Drawings
* Distribution Network drawings
* Structural drawings for Head works i.e., Intake well pump house, WTP, Clear water sump, Pump house, Booster Sump and Pump house, OHTs
* Electromechanical components
* Supervisory Control and Data Acquisition (SCADA)

The project area is located in Odisha State covering one districts namely Bhadrak. The intake well is proposed at Balakati (GP), Baranuadiha (V) intake location - CH:0.4Km of Kharasrota Canal (Pickup Weir) located in Kendrapada District.River KharasrotaSelection of Intake location of Source for RPWS scheme is carried out from the point of view of:Sustainability of water availability Bathymetry data of the river reach Approach to the siteWater Quality analysis of the source Land availabilityThe river survey has been done and detailed water quality analysis has been carried out for sustainability of source.

The water quality feasibility report of source at River Kharasrota at Baruna diha, Kendrapada was approved by Engineer-in-Chief, RWSS vide Lr No. NC-I-31/2019 6334 dated 24.07.2019. The letter is attached as Annexure - 8.The location of the head works is 20°42'13.24" N, 86°40'21.00" E near Barunadiha village in Kendrapara district near SH bridge (Bhadrak - Jagatpur), at a distance of approx. 9 km from the project boundary

# **WATER SOURCE**

River Kharasrota

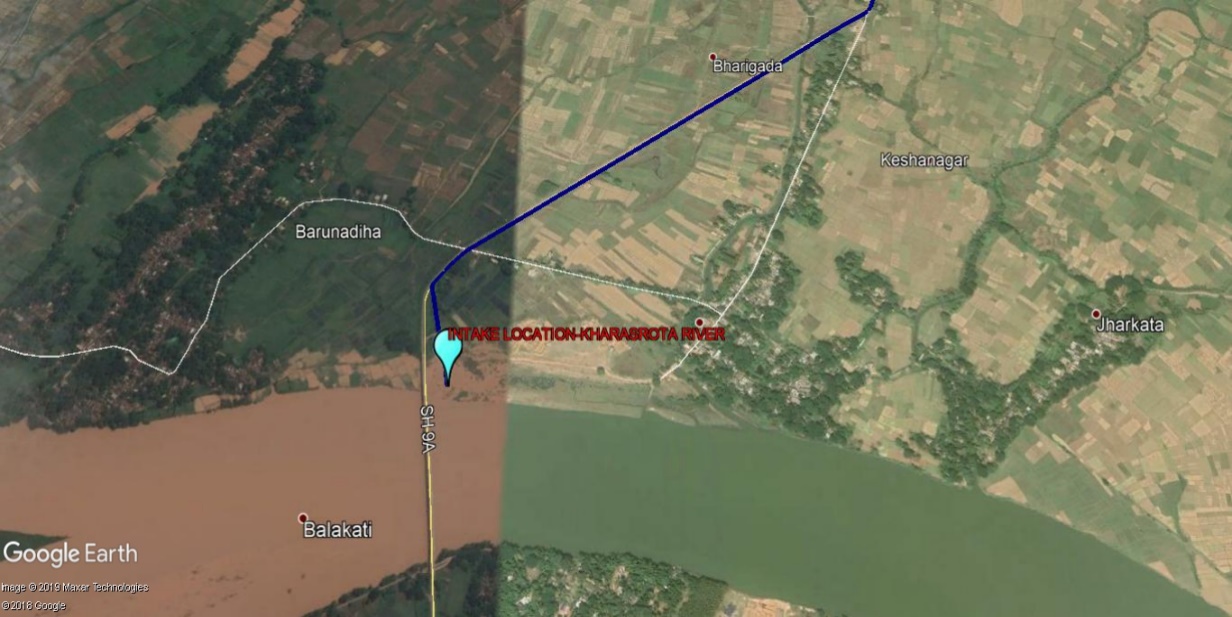
Selection of Intake location of Source for RPWS scheme is carried out from the point of view of:

* Sustainability of water availability
* Bathymetry data of the river reach
* Approach to the site
* Water Quality analysis of the source
* Land availability

The river survey has been done and detailed water quality analysis has been carried out for sustainability of source



*Kharasrota River near Intake location*



Supply source

Raw water transmission

Hours of pumping for raw water : 20 hours/day

Water Treatment Plant

Hours of operation : 20 hours/day

Clear water transmission

* 1. Hours of pumping for clear water : 20 hours/day

Distribution network

* 1. Hours of supply : 8 (Eight) hours/day

The status of various water supply projects under MEGA PWS in Bhadarak division are in below table.

| **Sl. No** | **Name of Block** | **Name of the GPs** | **Name of the PWS Scheme** | **Status** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Basudevpur | Andola | Andola | Running condition |  |
| 2 | Basudevpur | Artung | Artung | Running condition |  |
| 3 | Basudevpur | Jagannathpur | Bachhada | Running condition |  |
| 4 | Basudevpur | Naikanidihi | Balarampur | Running condition |  |
| 5 | Basudevpur | Balimed | Balimed | Running condition |  |
| 6 | Basudevpur | Balimunda | Balimunda | Running condition |  |
| 7 | Basudevpur | Bideipur | Bideipur | Running condition |  |
| 8 | Basudevpur | Biras | Biras | Running condition |  |
| 9 | Basudevpur | Chudamani | Chudamani | Running condition |  |
| 10 | Basudevpur | Jagannathprasad | Dadhibamanpur | Running condition |  |
| 11 | Basudevpur | Eram | Eram | Running condition |  |
| 12 | Basudevpur | Jagannathpur | Jagannathpur | Running condition |  |
| 13 | Basudevpur | Balimed | Kalidaspur (Balimed) | Running condition |  |
| 14 | Basudevpur | Andola | Khantakhoad | Shut down due to pipe damaged |  |
| 15 | Basudevpur | Laxmidaspur | Khempur | Running condition |  |
| 16 | Basudevpur | Kismatkrushnapur | Kismatkrushnapur | Running condition |  |
| 17 | Basudevpur | Kumarpur | Kumarpur | Running condition |  |
| 18 | Basudevpur | Laxmidaspur | Laxmidaspur | Running condition |  |
| 19 | Basudevpur | Naikanidihi | Mallikadeipur | Running condition |  |
| 20 | Basudevpur | Naikanidihi | Naikanidihi | Running condition |  |
| 21 | Basudevpur | Nuagoan | Nuagoan | Running condition |  |
| 22 | Basudevpur | Padhuan | Padhuan | Running condition |  |
| 23 | Basudevpur | Rajgharpokhari | Rajgharpokhari | Running condition |  |
| 24 | Basudevpur | Sanakrushnapur | Sanakrushnapur | Running condition |  |
| 25 | Basudevpur | Rajgharpokhari | Sanakurubatia | Running condition |  |
| 26 | Basudevpur | Sudarsanpur | Sudarsanpur | Running condition |  |
| 27 | Chandbali | Aradi | Aradi | Running condition |  |
| 28 | Chandbali | Badaostia | Badaostia | Running condition |  |
| 29 | Chandbali | Bajarapur | Bajarapur | Running condition |  |
| 30 | Chandbali | Jagula | Balabhadraprasad | Running condition |  |
| 31 | Chandbali | Nandapur | Bankamuha | Running condition |  |
| 32 | Chandbali | Bansada | Bansada | Running condition |  |
| 33 | Chandbali | Jashipur | Barakola | Running condition |  |
| 34 | Chandbali | Aradi | Batol | Running condition |  |
| 35 | Chandbali | Bhatapada | Bhatapada | Running condition |  |
| 36 | Chandbali | Bhuinbruti | Bhuinbruti | Running condition |  |
| 37 | Chandbali | Bijayanagar | Bijayanagar | Running condition |  |
| 38 | Chandbali | Chardia | Chardia | Running condition |  |
| 39 | Chandbali | Dhamara | Dhamara | Running condition |  |
| 40 | Chandbali | Dosinga | Dosinga | Running condition |  |
| 41 | Chandbali | Mousudha | Farsibandha (Goudunipokhari) | Running condition |  |
| 42 | Chandbali | Gopinathpur | Ghanetswar | Running condition |  |
| 43 | Chandbali | Ghatapur | Ghatapur | Running condition |  |
| 44 | Chandbali | Ghatapur | Hengupati | Shut down due to source damaged |  |
| 45 | Chandbali | Jagula | Jagula | Running condition |  |
| 46 | Chandbali | Jaleswarpur | Jaleswarpur | Running condition |  |
| 47 | Chandbali | Nuagaon | Jantuali | Running condition |  |
| 48 | Chandbali | Jashipur | Jashipur | Running condition |  |
| 49 | Chandbali | Kaithakola | Kaithakola | Running condition |  |
| 50 | Chandbali | Karanjamal | Karajamal | Running condition |  |
| 51 | Chandbali | Karanapalli | Karanapalli | Running condition |  |
| 52 | Chandbali | Khadalpokhari | Khadalpokhari | Running condition |  |
| 53 | Chandbali | Nalgunda | Kheranga | Running condition |  |
| 54 | Chandbali | Nalagohira | Kuarikanthi (Jaladharpur) | Running condition |  |
| 55 | Chandbali | Madhapur | Madhapur | Running condition |  |
| 56 | Chandbali | Motto | Malbad | Running condition |  |
| 57 | Chandbali | Motto | Motto | Running condition |  |
| 58 | Chandbali | Mousudha | Mousudha | Running condition |  |
| 59 | Chandbali | Aradi | Muan | Running condition |  |
| 60 | Chandbali | Nalagohira | Nalagohira | Running condition |  |
| 61 | Chandbali | Nalgunda | Nalgunda | Running condition |  |
| 62 | Chandbali | Nandapur | Nandapur | Running condition |  |
| 63 | Chandbali | Bhatapada | Naugarada | Running condition |  |
| 64 | Chandbali | Jaleswarpur | Nuagaon (Ichapur) | Running condition |  |
| 65 | Chandbali | Sundarpur | Olaga | Running condition |  |
| 66 | Chandbali | Orasahi | Orasahi | Running condition |  |
| 67 | Chandbali | Panchutikiri | Panchutikiri | Running condition |  |
| 68 | Chandbali | Karanjamal | Sasikadeipur | Running condition |  |
| 69 | Chandbali | Uttukuda | Singiti | Running condition |  |
| 70 | Chandbali | Sundarpur | Sundarpur | Running condition |  |
| 71 | Chandbali | Tentulidihi | Tentulidihi | Running condition |  |
| 72 | Chandbali | Totapada | Totapada | Running condition |  |
| 73 | Chandbali | Utukuda | Utukuda | Running condition |  |
| 74 | Dhamnagar | Bamkura | Bamkura | Running condition |  |
| 75 | Dhamnagar | Bhattasahi | Bhattasahi | Running condition |  |
| 76 | Dhamnagar | Dhusuri | Dhusuri | Running condition |  |
| 77 | Dhamnagar | Hasnabad | Hasnabad | Running condition |  |
| 78 | Dhamnagar | Kasimpur | Kasimpur | Running condition |  |
| 79 | Dhamnagar | Nadigaon | Nadigaon | Running condition |  |
| 80 | Dhamnagar | Dhusuri | Narasinghpur | Running condition |  |
| 81 | Dhamnagar | Kasimpur | Pachhalo | Running condition |  |
| 82 | Dhamnagar | Palasahi | Palasahi | Running condition |  |
| 83 | Dhamnagar | Raipur | Raipur | Running condition |  |
| 84 | Dhamnagar | Palasahi | Sanalpur | Running condition |  |
| 85 | Tihidi | Bahabalapur | Bahabalapur | Running condition |  |
| 86 | Tihidi | Rajnagar | Baharpal | Running condition |  |
| 87 | Tihidi | Saya | Balichaturi | Running condition |  |
| 88 | Tihidi | Bamanbindha | Bamanbindha | Running condition |  |
| 89 | Tihidi | Rajnagar | Barada (Chhatrapada) | Running condition |  |
| 90 | Tihidi | Barsar | Barsar | Running condition |  |
| 91 | Tihidi | Saya | Birabarpur Madhapur | Running condition |  |
| 92 | Tihidi | Bodak | Bodak | Running condition |  |
| 93 | Tihidi | Narendrapur | Chatrapada | Running condition |  |
| 94 | Tihidi | Jamjodi | Gadi (Rajnagar) | Running condition |  |
| 95 | Tihidi | Gobindapur | Gobindapur | Running condition |  |
| 96 | Tihidi | Sahapur | Haripur (Nalatei) | Running condition |  |
| 97 | Tihidi | S.S Pur | Ishanpur | Running condition |  |
| 98 | Tihidi | Sahapur | Jafarabad | Running condition |  |
| 99 | Tihidi | Jamjodi | Jamjodi | Running condition |  |
| 100 | Tihidi | Kolha | Kamaria (Mangalpur) | Running condition |  |
| 101 | Tihidi | Sindol | Kamaria (Sindol-II) | Running condition |  |
| 102 | Tihidi | Sahapur | Kandaragadia | Running condition |  |
| 103 | Tihidi | Kanpada | Kanpada | Running condition |  |
| 104 | Tihidi | Rajnagar | Khadijanal | Running condition |  |
| 105 | Tihidi | Kolha | Kolha | Running condition |  |
| 106 | Tihidi | Maharampur | Maharampur | Running condition |  |
| 107 | Tihidi | Bhatapada | Mangarajpur | Running condition |  |
| 108 | Tihidi | Bahabalpur | Nandakandarap | Running condition |  |
| 109 | Tihidi | Bodak | Nandore | Running condition |  |
| 110 | Tihidi | Jamjodi | Nuasahi (Diabansoria) | Running condition |  |
| 111 | Tihidi | Daulatpur | Pirahat | Running condition |  |
| 112 | Tihidi | Sahapur | Sahapur | Running condition |  |
| 113 | Tihidi | Maharampur | Satibati | Running condition |  |
| 114 | Tihidi | Saya | Saya | Running condition |  |
| 115 | Tihidi | Sindol | Sindol | Running condition |  |
| 116 | Tihidi | S.S Pur | Taladumuka | Running condition |  |
| 117 | Tihidi | Bhatapada | Tihidi | Running condition |  |

# **Water Treatment Plant**

The raw water shall be pumped from Kharasrota river which at about 16.00 km from the WTP. A Water Treatment Plant (WTP) is proposed to meet the acceptable standards of potable water as per IS: 10500 and CPHEEO manual. It is proposed to develop the WTP for meeting the demand for the ultimate design year 106.00 MLD. The location of WTP is near Badastia village in Badastia GP; internal college road left side of SH-9.It is proposed to provide a water treatment plant of capacity 106.00 MLD in a conventional manner having Cascade Aerator, Parshall Flume, Flash mixer, Clarriflocculator, Rapid Gravity Sand Filters with back wash water tank, Clear water sump and disinfection system. Treatment methods include unit operations on raw water to attain the end use quality. These parameters can be attained by organizing the sequential operations of treatment units in a systematic manner. The operation includes:

**Unit operations - Conventional Treatment Process** Water treatment involves removal of undesirable constituents from water and dispose them in easiest and safest manner. To achieve these goals, a variety of treatment operations and process are utilized, which exploit various physical and chemical phenomena to remove or reduce the undeliverable constituents from water. Those operations used in this treatment of water in which change is brought about by means of or through application of physical forces are known as Unit operation (UO). Those processes used for the treatment of water in which change is brought about by means of chemical reaction are known as Unit Processes (UP).There are a number of unit operations for water treatment. The choice of unit operations depends primarily on the substances needed to be removed. Removal of undissolved substances (solids) is effected by mechanical processes. Dissolved substances can be removed by either biological or physical/chemical processes.The process units involved in the conventional treatment process are

* Aeration
* Clariflocculation
* Sedimentation
* Filtration
* Disinfection

**Aeration**Aeration brings water and air in close contact in order to remove dissolved gases (such as carbon dioxide) and oxidizes dissolved metals such as Iron, Hydrogen Sulphide, and volatile organic chemicals (VOCs). Aeration is often the first major process at the treatment plant. During aeration, constituents are removed or modified before they can interfere with the treatment processes.

**Clariflocculation**The clariflocculation is a chemical and physical water treatment process and it mainly consists in the removal of suspended substances. Its application is in the water treatment of surface water, industrial and municipal wastewater treatment, filtration pre-treatment, Reverse Osmosis, both in the municipal and industrial sectors.  
The clariflocculation allows the removal of organic compounds, sedimenting particles and heavy metals. The clariflocculation process is a traditional and consolidated treatment. The sequence of operations sedimentation-precipitation-coagulation-flocculation is the most common technique used in the world for the production of potable water. The process requires low costs for high volumes of purified water. It is a reliable process suitable for automatic control.

**Sedimentation**The microbial quality of water sometimes can be improved by holding or storing it undisturbed and without mixing long enough for larger particles to settle out or sediment by gravity. The settled water can then be carefully removed and recovered by decanting, ladling or other gentle methods that do not disturb the sedimented particles. Sedimentation has been practiced since ancient times using small water storage vessels or larger settling basins, reservoirs and storage tanks. The advantages and disadvantages of plain sedimentation for household treatment of water are summarized.Factors that influence sedimentation are

* Size, shape, density and nature (discrete or flocculent) of the particles;
* Viscosity, density and temperature of water.
* Surface over flow rate;
* Velocity of flow;
* Inlet and outlet arrangements;
* Detention period and
* Effective depth of settling.

**Filtration**Filtration is a process for separating suspended and colloidal impurities from water by passage through a porous medium or porous media. Filtration, with or without pre-treatment, has been employed for treatment of water to effectively remove turbidity (e.g., silt and clay), colour, microorganisms, precipitated hardness from chemically softened waters and precipitated iron and manganese from aerated waters. Filtration of municipal water supplies normally is accomplished using Rapid sand filters.Filtration process in Rapid Sand Filters (RSF)[Rapid sand filtration](http://www.sswm.info/glossary/2/letterr#term1768) is a purely physical [drinking water](http://www.sswm.info/glossary/2/letterd#term1069) purification method. [Rapid sand filters](http://www.sswm.info/glossary/2/letterr#term1768) (RSF) provide rapid and efficient removal of relatively large suspended particles. Two types of RSF are typically used: rapid gravity and rapid pressure sand filters. For the provision of safe [drinking water](http://www.sswm.info/glossary/2/letterd#term1069), Rapid sand filters require adequate [pre-treatment](http://www.sswm.info/glossary/2/letterp#term3365) (usually [coagulation-flocculation](http://www.sswm.info/glossary/2/letterc#term2401)) and [post-treatment](http://www.sswm.info/glossary/2/lettert#term1004) (usually [disinfection](http://www.sswm.info/glossary/2/letterd#term3345) with chlorine). Both construction and operation is cost-intensive. It is a relatively sophisticated process usually requiring power-operated pumps, regular [backwashing](http://www.sswm.info/glossary/2/letterb#term1473) or cleaning, and flow control of the filter outlet. [Rapid sand filtration](http://www.sswm.info/glossary/2/letterr#term1768) is common in developed countries for the treatment of large quantities of water where land is a strongly limiting factor, and where material, skilled labour, and continuous [energy](http://www.sswm.info/glossary/2/lettere#term1370) supply is available. RSF can provide a very efficient method in larger urban water supply systems if preconditions are met.

**Disinfection** The post treatment required after RSF is disinfection with chlorine. The filtered water may normally contain some harmful disease producing bacteria in it. These bacteria must be killed in order to make the water safe for drinking. The process of killing these bacteria is known as Disinfection or Sterilization.The bacterial contamination because of unessential microorganisms present in treated water may be taken care by germicidal action of chlorine as explained by the recent theory of Enzymatic hypothesis, according to which the chlorine enters the cell walls of bacteria and kill the enzymes which are essential for the metabolic processes of living organisms.The major disadvantage of the chlorination is the formation of harmful bi products such as [Bromoform](https://en.wikipedia.org/wiki/Bromoform) and [Dibromo-chloromethane](https://en.wikipedia.org/wiki/Dibromochloromethane) which are mainly responsible for health hazards. Hence, it is essential to maintain the maximum residual chlorine limit of 2 ppm at the consumers tap by maintaining proper control on operations of disinfection process.

**Number of WTPs:** The following are the advantages of adopting 1 WTP over multiple WTPs.

The proposal of single WTP is the most optimized solution considering manpower requirement as deployment of manpower will be directly proportional to no of WTP’s. Also note Clause II - Design Capacity of Water Supply Project states “Suitable Mechanism for monitoring the water supply system so that minimum manpower shall be engaged for O&M”.

The reduction in manpower will be a value addition to the state exchequer as the cost of O&M period is borne by the department.

Single source pumping will avoid synchronization issues owing to change in timings of power availability between various stations with which we can ensure timely water supply.

Reduced cost of power charges for the same quantum of water delivered by adoption of 1 WTP.

Minimal requirement of land for 1 WTP and this will eliminate complex land acquisition / alienation as there is shortage of Government land for multiple WTPs.

Non availability / no feasibility of ROW for laying both Clear Water and Raw Water pumping mains in proximity.

Earlier the source of River Bhaitarani which was center point of the project area and in due course of time the source has been changed to (kharsuan) Kharasrota River. There is no fresh water source either in Basudevpur or Tihidi area for which there is justification of one WTP as per the new alignment.

Mass Balance Reservoir site

Service reservoirs (OHTs) are proposed and designed that minimum residual pressure of 7 m has will be achieved at public stand post/tapping facility of the distribution network of the particular OHT. Service reservoirs are provided with storage of 12.0 hours (i.e., 50% of the water demand per day as per agreement) considering the supply of 8.0 hours.There are a total of 98 OHTs in 84 GPs for serving the project area comprising 10,29,065 souls.

**Table 2:** Summary of OHT Capacities

| **S. No** | **Capacity of OHT (KL)** | **No. of OHTs** |
| --- | --- | --- |
| 1 | 140 | 1 |
| 2 | 180 | 3 |
| 3 | 220 | 1 |
| 4 | 230 | 1 |
| 5 | 240 | 2 |
| 6 | 250 | 1 |
| 7 | 260 | 5 |
| 8 | 280 | 3 |
| 9 | 290 | 2 |
| 10 | 300 | 2 |
| 11 | 310 | 3 |
| 12 | 320 | 3 |
| 13 | 330 | 2 |
| 14 | 340 | 5 |
| 15 | 350 | 7 |
| 16 | 360 | 6 |
| 17 | 370 | 4 |
| 18 | 380 | 3 |
| 19 | 390 | 1 |
| 20 | 400 | 2 |
| 21 | 410 | 5 |
| 22 | 420 | 1 |
| 23 | 430 | 2 |
| 24 | 440 | 1 |
| 25 | 450 | 3 |
| 26 | 460 | 2 |
| 27 | 470 | 2 |
| 28 | 480 | 3 |
| 29 | 490 | 4 |
| 30 | 500 | 4 |
| 31 | 510 | 2 |
| 32 | 540 | 3 |
| 33 | 560 | 1 |
| 34 | 620 | 1 |
| 35 | 630 | 2 |
| 36 | 690 | 1 |
| 37 | 700 | 1 |
| 38 | 740 | 1 |
| 39 | 800 | 1 |
| 40 | 850 | 1 |
| **Total number of OHTs** | | **98** |

1. DISTRIBUTION SYSTEM

Distribution network will be designed from the OHTs covering all the habitations in the agreement with the following concept and design criteria.

**Concept**

* Minimum Residual Pressure of 7m at all ferrule ends.
* 100% population coverage with rate of supply @ 70 LPCD at consumer end
* Eight hours supply

**Design Criteria for distribution network**

* Percapita supply considered for design - 75 LPCD considering wastage/losses.
* Network design considering 8 hours of supply.
* Minimum residual pressure of 7m at all ferrule end considering farthest and elevated points. Storage capacity of service reservoirs - 12 hours retention period / ½ of the daily demand.
* Pipe material - HDPE PE 80 PN 2.5 / 4 and DI K7 as mentioned in Pipe material i.e., Ch 7.7.
* Staging height of tank - as per the required minimum residual pressure at all points.
* Suitable tapping facilities will be provided in all the habitations so as to enable the consumers to collect water from the nearest Tap point. At least 2 stand posts will be provided in each habitation so as to enable the consumer to collect the water.
* Distribution network will be designed in such a manner that no household will be more than 20-30 meters from the nearest stand post.

The tentative abstract of length statement under distribution network is given in table below:

**Table 3:** Tentative abstract of distribution network

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Tentative Abstract of Length Statement under distribution network** | | | | | | |
| **S.No** | **Outer Diameter/ Nominal Diameter  (mm)** | **Internal Diameter  (mm)** | **Type of Material** | **Class** | **Length of  Network in 'M'** | **Length of  Network in 'KM'** |
| 1 | 75 | 68.70 | HDPE | PE 80 PN 4 | 276517.00 | 276.52 |
| 2 | 90 | 84.90 | HDPE | PE 80 PN 4 | 1030784.00 | 1030.78 |
| 3 | 110 | 104.10 | HDPE | PE 80 PN 4 | 178644.00 | 178.64 |
| 4 | 125 | 118.20 | HDPE | PE 80 PN 4 | 60539.00 | 60.54 |
| 5 | 140 | 132.40 | HDPE | PE 80 PN 4 | 169028.00 | 169.03 |
| 6 | 160 | 151.40 | HDPE | PE 80 PN 4 | 58667.00 | 58.67 |
| 7 | 200 | - | DI | K7 | 247182.00 | 247.18 |
| 8 | 250 | - | DI | K7 | 25641.00 | 25.64 |
| 9 | 300 | - | DI | K7 | 2462.00 | 2.46 |
| 10 | 350 | - | DI | K7 | 1846.00 | 1.85 |
| **Total Length of Network** | | | | | **2051310.00** | **2051.31** |

Intake and Pumping Station

Intake at Kharasrota river near SH bridge in Kendrapara district - On detailed assessment, it is established that, a minimum of ~1.60 acre will be required for the intake well-cum-raw water pumping station along with Approach road. Intake well (RCC structure) of required dia is proposed to be located 20 m away from the river bank and will be finalized after electromechanical GA drawing and Site layout at the intake point to lift river water by pumping. The wells are provided with gate arrangement to allow river to flow inside the well corresponding to variation in water levels through the lean and high flow seasons. Intake well cum pump house is proposed to be an integrated structure consisting of:

* Sub-structure of Wells.
* Super- structure of pumps, motors and motor platform, service/maintenance bays
* Civil infrastructure i.e., approach road, staff quarter, Electrical substation comprising of electric panel.

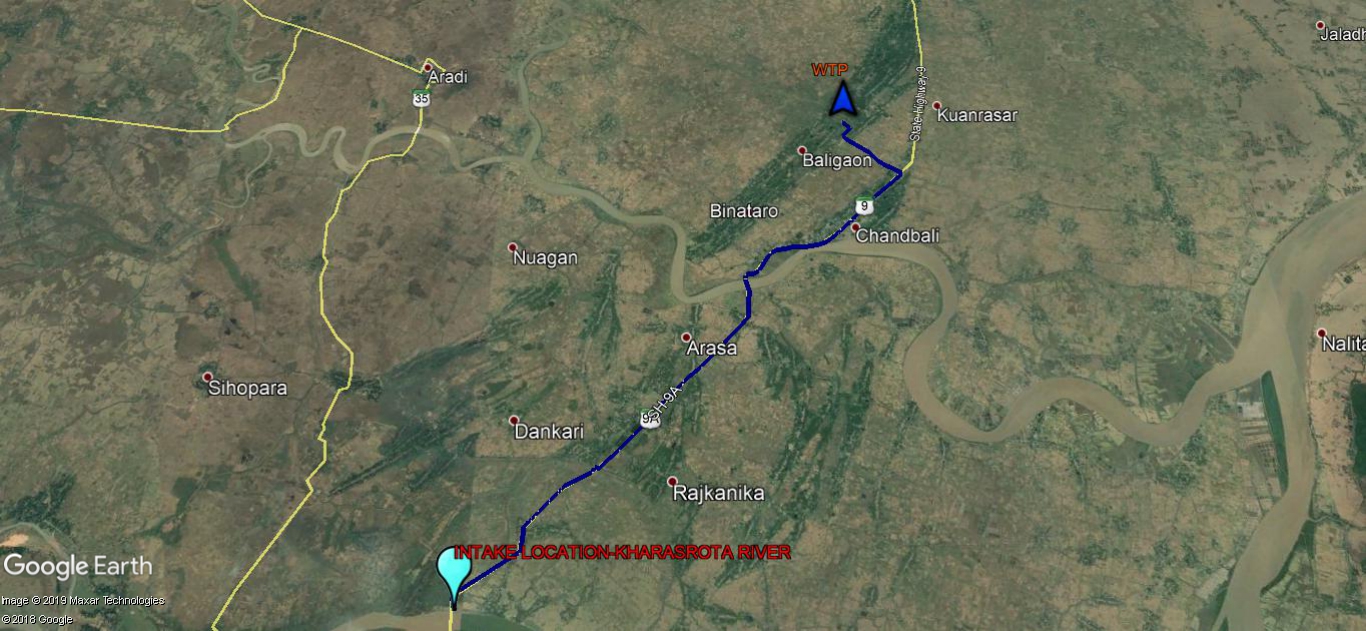
RAW WATER RISING MAIN

Raw water of 106.00 MLD is proposed to be pumped from the Intake well located on the Kharasrota River to WTP through Vertical turbine pumps. The Water Treatment plant is proposed near Badastia village in Badastia GP left side of SH-9. Raw water rising main is of length 16.00 Km. Economic sizing of rising main has been carried out and based on the optimal velocity conditions; 1000 mm dia of DI K9 pipe material is adopted.The salient aspects include

* Diameter of the pumping main is of 1000 mm DI-K9.
* Length of the pumping main is around 16.00 Km (till the WTP location).Alignment is planned along the SH-9 and internal road.
* Bhaitarani River crossing near Chandbali GP; MS pipe 1000 mm diameter of required thickness will be provided at river crossing on pipe carrying bridge.

**Figure 1:** Raw water rising main alignment from Intake to WTPA pipe carrying bridge is to be constructed for crossing the raw water pipe line across Bhaitarani River.Raw water pumping

machinery (VT pumpsets) are proposed to pump water from Intake to water treatment plant for a discharge of 1010.00 lps and pump head of 37.00m.



**INTAKE LOCATION**

**KHARASROTA RIVER**

**WATER TREATMENT PLANT**

Master Balancing Reservoir

*Raw water pipe line crossing Bhaitarani River*

The network from IBPS is serving 32 OHTs in 25 GPs covering 355 habitations serving 3,24,840 souls for the year 2050. The location of IBPS in near Haripur village in Sahapur GP.The pumps from IBPS to network should have a total pumping capacity of 297.16 lps against the pumping head of 65.00 m for the intermediate design year 2035 for the network length of 106.38 Km.

**Table 4:** Details of clear water pumping mains to OHTs from IBPS

| **S. No** | **Pipe line Diameter (mm)** | **Pipe Material** | **Length (Rmt)** |
| --- | --- | --- | --- |
| 1 | 100 | DI-K7 | 6824 |
| 2 | 150 | DI-K7 | 41,653 |
| 3 | 200 | DI-K7 | 11,558 |
| 4 | 250 | DI-K7 | 5348 |
| 5 | 300 | DI-K7 | 6576 |
| 6 | 350 | DI-K7 | 6847 |
| 7 | 400 | DI-K7 | 1665 |
| 8 | 450 | DI-K7 | 8469 |
| 9 | 500 | DI-K7 | 11218 |
| 10 | 600 | DI-K7 | 6219 |
| **Length of Network (Rmt)** | | | **106377** |

The total length of clear water pumping mains network is **380.95Km.**

INTERMEDIATE BOOSTER SUMP AND PUMPING STATION (IBPS)

The capacity of the intermediate booster sump is designed/maintained such that, adequate buffer is made to have a balance between WTP (from source) and pumping to service reservoirs (OHTs). The reservoirs provide a suitable reserve of water with minimum interruptions of supply. The storage will be only for balancing and 60min retention period is adopted as per the agreement. IBPS is considered as Ground level sump with associated pump house for further transmission to GP OHTs by pumping.

**Table 5:** Details of Intermediate booster sump

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S. No** | **Structure** | **Water Demand (MLD)** | **Pumping hours** | **Retention period hours** | **Capacity (KL)** |
| 1 | IBPS | 25.99 | 20 | 1.00 | 1300 |

Land requirement Details

|  |  |  |
| --- | --- | --- |
| **S. No** | **Structure** | **Requirement in Acres** |
| 1 | INTAKE | 2.08 |
| 2 | WTP | 7.26 |
| 3 | IBPS | 1.00 |
| 4 | OHTS EACH ONE | 0.30 |

### Water allocation Electrical and Power requirements

### ELECTRICAL SUB-STATIONS DESIGN

**Intake area**

Incoming supply shall be tapped from nearby 33KV Substation through overhead lines. The installed capacity at intake is 1MVA - 2 nos. at 0.95 power factor. Transformers for meeting LT loads -250KVA - 1 nos. of 33/0.415kV considered. The proposed DG on LT side is 125kVA - 1 nos. of 415V considered for emergency lighting & instrumentation load.

**Water treatment plant (WTP)**

Incoming supply shall be tapped from nearby 33kV substation through overhead lines. The installed capacity at WTP is 3.15mVA - 2 nos. at 0.95 power factor. Transformers for meeting LT loads-250kVA - 1 nos. of 33/0.415kV are considered. The proposed DG on LT side is 125kVA - 1 nos. of 415V considered for emergency lighting & instrumentation load.

**Intermediate booster pump station (IBPS)**

Incoming supply shall be tapped from nearby 33kV substation through overhead lines. The installed capacity at IBPS is 630kVA - 2nos. of 33/0.415kV at 0.95 power factor. The proposed DG on LT side is 125kVA - 1 nos. of 415V considered for emergency lighting & instrumentation load.

### POWER TRANSFORMERS

The transformers will be delta/star type, oil filled with off on-load tap changer. 33 kV transformers will have following protection:

* Over current
* Earth fault
* Differential
* Over temperature (winding and oil)
* Buchholz Earthling impedance will be provided to limit the magnitude of earth fault currents on the secondary side of transformers.

### AUXILIARY TRANSFORMERS

To cater to the auxiliary equipment’s of substations and other loads at Intake and WTP, one number of auxiliary transformers of 33kV / 415 Volts 250kVA rating are provided respectively.

Auxiliary Equipment

All the systems in pumping station will operate at the voltage level of 415V, 3 phase. The power supply to this equipment will be made available from 33kV/415V Auxiliary Transformer. Following are the major equipment considered as part of auxiliary systems envisaged for the pump houses:

* L.T. Panel
* Valve actuator motors
* Ventilation systems
* Air Conditioning unit
* Crane
* Battery Charger cum DCDB
* Illumination system

The equipment / systems covered above will be provided as per the functional requirements and statutory regulations applicable for the pumping station. 415V switchgear panel will have suitable number of MCCB unit of adequate capacity to cater the load requirements. There will be ACB on incoming side with metering and releases. Outgoing feeders will have MCCB and reversible DOL starters for Valve Actuator motors.

To maintain the temperature inside the pump house and panel room, the ventilation system will be provided. This will include suitable number of exhaust fans or blower and ducting arrangements as required. The design of ventilation system will depend on the number of air changes required and the expected temperature inside pump house when all pumps operating. The independent control supply is required for tripping and closing operations of VCBs and Circuit Breakers in switchyard. This is made available by Battery Charger and DCDB. The control voltage envisaged for the system is 220V DC. The safety devices as per statutory requirements will be provided in pump house. This will include, fire buckets with sand, rubber sheets in front of panels, different types of fire extinguishers etc.

### SAFETY EARTHING & LIGHTING PROTECTION SYSTEM

Separate earthling grids will be provided for pump house and substation areas and they will be interconnected. The buried portion of the earth conductor will be of mild steel and exposed earth conductors will be of galvanized steel. Required number of earthling pits will be provided. The earthling grid will be designed to have a system resistance below 1 ohm. A lightning protection system will be provided as per IS - 2309 and Indian Electricity Rules. The protections will consist of roof conductors, air terminals and down conductors and will be provided for Pump House and SS.

### FIRE DETECTION AND ALARM SYSTEM

Control rooms, switchgear rooms, battery rooms etc. shall be provided with Analogue Addressable Microprocessor based fire detection and alarm system. Multi-sensor detectors, Heat detectors, Manual call points, Sounders etc. shall be provided wherever required as per IS - 2189. Sufficient numbers of CO2 cylinders also will be provided at accessible locations.

### BUS BARS

All bus bars and their main current carrying connections shall have the same sectional area throughout their length, Bus bars shall be sized to continuously carry the rated current without exceeding the final temperature of 95°C and the same shall be capable of withstanding the full fault level without any deformation. The continuous current rating of bus bars shall be as per Single Line Diagram. Bus bars shall be of Copper with proper plating at joints. The bus bars shall be provided with cast epoxy sleeving or nylon film of suitable insulation class throughout their lengths and vertical droppers and colour coded. Joints in bus bars shall be provided with shrouds. For long bus bars, suitable expansion joints shall be provided.

The bus bars shall be supported by epoxy resin cast insulators with suitable Creepage distance & capable to withstand the specified fault level. The clearance between live parts and the earth shall be as per the IS.

Bus bars and connections shall be secured in such a manner that the insulators are not subjected to bending forces under short circuit conditions. Dynamic stresses shall be calculated on the basis of peak short circuit current.

Thermal design of the bus bars shall be based on installation of the switchgear in poorly ventilated conditions. The cooling air volume shall take into account only the bus enclosure.

### LV SWITCHGEAR

415V LV switchgear will be of compartmentalized and double front, fixed type except modules containing air circuit breakers. Air circuit breakers will be fully drawn out type and will be rated for the required fault current breaking and making capacity. The 415V switchgear will have modules for motors, auxiliary loads, lighting loads with switch fuse units and contactor relays. These will cater to the LT loads in substation and pump houses. The Auxiliary transformer will be connected to a separate bus section of 415V auxiliary switchgear. The 415V auxiliary switchgear will feed the entire station loads. The switchgear will be equipped with the following.

* ACB controlled incomer feeder.
* MCCB controlled Outgoing feeders to auxiliary boards
* Outgoing feeders to battery chargers / lighting panels with MCCB.
* Motor feeders fitted with MPCB, VFDs, thermal overload relays etc.,
* The switchgear will be provided with the necessary current transformers, indicating instruments, relays, lamps, push buttons etc.,

The main electrical parameters of the switchgear will be:

* Rated Voltage - 415V
* Rated short circuit breaking current 50kA for One Second
* Rated bus bar current –depending on the current output

Power Station Auxiliary Services:

The various services in the power plant will be supplied at the following nominal voltages depending upon their ratings and function:

Motors - 415V, 3 phase AC supply

Lighting and space heaters - 230V, 1 phase AC supply

Power receptacles - 415V, 3 phase AC supply

Control circuits - 230V, 1 phase AC supply for AC control circuits.

- 220V DC supply for control, indication and Instrumentation & Control Systems

### 6.6kV SWITCHGEAR

6.6 KV Switchboard is the critical equipment in pumping station since all pump motors will be controlled from this switchboard. Switchboard will comprise of incoming cubicles to receive power from Transformers, Bus Coupler feeder for interconnection of transformer loads and outgoing feeders for pump motors, auxiliary transformer and capacitors. Switchboard will have in its each cubicle, suitably rated Vacuum Circuit Breaker, metering and protective relays with wiring. All the breakers used are vacuum circuit breaker. Above-mentioned breakers have advantage of good performance with less maintenance. The construction of switchboard will be as per relevant standards and good engineering practices being followed in industry. There will be three types of feeder:

* Incoming feeder
* Bus coupler
* Outgoing feeder
* Motor feeder
* Auxiliary transformer feeder
* Capacitor feeder

The incoming feeders will have VCB, aluminum bus bars, CTs, PTs, meters and relays for transformer protection on secondary side protection. Relay for incomer will cover the following protection:

1. Over current
2. Earth fault
3. Restricted Earth fault
4. under voltage protection

For power measurement on incomer, the following apparatus are provided:

1. Multifunction meter with communicable facility.
2. Ammeter with selector switch

Switchboard will have sufficient numbers of outgoing feeders. For power factor improvement, Bus Capacitor Feeder will be provided with VCB, CTs, ammeter with selector switch.

Protection Relay for Capacitor feeder will cover the following protection:

1. Over Current
2. Earth fault

For pump motor feeder, the switchboard will have VCB, CTs, ammeter with selector switch and Motor Protection Relay. The Motor Protection Relay will cover the following protection:

1. Single Phasing
2. Long Start
3. under voltage
4. Short Circuit Protection
5. Current Unbalance
6. Locked Rotor
7. Thermal Overload
8. Differential Protection

Motor feeder will also have Local / Remote selector switch, push buttons and indication. Auxiliary transformer feeder will be provided with VCB, CTs, ammeter with selector switch. Protection Relay will cover the following protection.

1. Over current
2. Earth fault

For operating valve actuator motor from switchboard, suitable interlock for operation of valve actuator and main motor is proposed to be provided in the panel.

### POWER FACTOR CORRECTION EQUIPMENT

The motors and other auxiliary loads operate at inductive power factor. The power factor needs to be improved as per statutory requirements of supply authorities and minimize the reactive power to prevent undesirable overloading of electrical system. It is proposed to install the capacitor banks in switchgear room to improve the power factor in the tune of 0.95 and above. Part of capacitors required is connected in parallel with motor and balance on 6.6 KV bus bar through VCB. The selection of capacitor rating will be checked against the magnetizing current of motor so as to avoid creation of resonance during switching of the motor.

Each capacitor unit will be provided with switch fuse unit, CBCT and Earth Fault relay. This earth fault relay will be connected to respective motor controlling VCB through master trip relay circuit to prevent / trip motor starting during failure of capacitor unit. This will be connected in 6.6 KV switchboard. Capacitive power factor correction equipment will be provided at each site to raise the power factor to approximately 0.95.

A combination of correction methods will be employed comprising:

Switchable capacitors in association with each motor, which will be supplied along with Motor. Power factor correction connected to main LV distribution board (415 V) will be carried out if necessary.

### POWER DEMAND

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **POWER REQUIREMENT FOR THE PROJECT** | | | | | | | | | |
| **Pumping Location** | **No. of Pumps Working** | **No. of Pumps Standby** | **Capacity of Each Motor KW** | **VFD Eff @95% in KW** | **Total Motor Loads KW** | **Auxiliary Loads KW** | **Total KW working** | **Power Requirement in KVA @ 0.95 PF** | **Transformer Sizing 33/6.6 (MVA) or 0.433 kV (kVA)** |
| INTAKE  (KHARASR-OTA RIVER) | 2 | 1 | 270 | 256.50 | 513.00 | 150 | 663.00 | 698.00 | 2 X 1 MVA,  1 X 250 KVA |
| WTP (Badastia GP) | 4 | 2 | 250 | 263.16 | 1052.63 | 150 | 1202.63 | 1265.93 | 2 X 3.5 MVA,  1 X 250 KVA |
| IBPS  (KABIRPUR VILLAGE) | 2 | 1 | 145 | 152.63 | 305.26 | 150 | 455.26 | 479.22 | 2 X 630 KVA |

### SUPPLY VOLTAGE REQUIREMENT

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Location** | **Pump Head (m)** | **Type of Pump** | **No of Pumps Working & Standby** | **Discharge for each Pump (LPS)** | **Final Power rating of each Pump set (Kw)** | **Supply**  **Voltage (kV)** |
| Intake (Kharasrota River) | 37 | VT | 2W+1S | 505.00 | 270 | 6.6 |
| WTP  (Badastia GP) | 73 | HSC | 4W+2S | 235.35 | 250 | 6.6 |
| IBPS  (KABIRPUR VILLAGE) | 65 | HSC | 2W+1S | 148.58 | 145 | 415V, 3-Ph |

# ADMINISTRATIVE, REGULATORY FRAMEWORK & PROJECT CATEGORIZATION

This chapter details out the policy, legal and institutional framework under the ambit of which the ESIA was undertaken. It reviews the national and state laws of Odisha relevant to the scope of activities under the sub-project, and, discusses the implications for the subprojectdesign and implementationApplicable National & State Laws and RegulationsTable 18: Applicable Environmental Regulations of GoI and GoO

| **S. No** | **Act/Rules** | **Purpose** | **Applicable Yes/ No** | **Remarks on Applicability/ Non- Applicability** | **Regulatory Authority** |
| --- | --- | --- | --- | --- | --- |
| **Environmental Regulations** | | | | | |
| 1 | Environment Protection Act-1986 The Environment (Protection) Rules, 1986 | To protect and improve the overall environment. | Yes | As most environmental notifications, rules and schedules in India are issued under this Act, an Environmental Statement needs to be submitted annually by the entity to whom. | OSPCB, Government of Odisha |
| 2 | Air(Prevention and Control of Pollution) Act, 1981 and Air (Prevention and Control of Pollution) Rules, 1982 | To control air pollution by controlling emission of air pollutants, as per the prescribed Standards. | Yes | It must be ensured that emissions during construction (e.g., dust emissions) and operation (e.g., DG set at WTP) are within the prescribed standards. Consent to Establish (CoE) and Consent to Operate (CoO) needs to be taken by the Contractor from the Odisha State Pollution Control Board (OSPCB) for establishment and operation of . An Environmental Statement needs to be submitted annually to the OSPCB by the Contractor to whom CoE and CoO is granted | OSPCB, Government of Odisha |
| 3 | Water Prevention and Control of Pollution) Act, 1974 and Water (Prevention and Control of Pollution) Rules, 1975 | To control water pollution by controlling discharge of pollutants as per the prescribed Standards. | Yes | It must be ensured that effluents during construction and operation (e.g., backwash water and sludge from WTP) are within the prescribed standards. | OSPCB, Government of Odisha |
| 4 | The Forest (Conservation) Act,1980 | To check deforestation by restricting conversion of forested areas into nonforested areas. | Yes | There is no diversion of forest land invloved. procedural requirement of the 1980 Act interms of section 4(7), required NOC has been obtained (undersection 3(2) of FRA Act 2006. | Government of Odisha and MoEF&CC, Government of India, Divisional Forest Officer. |
| 5 | Wild Life (Protection) Act, 1972 | To protect and conserve wildlife. | Yes | The sub-project is not located in a protected area. | Forest Department, Government of Odisha and MoEF&CC, Government of India |
| 6 | Environmental Impact Assessment (EIA) Notification 2006 | Sets out the procedure of obtaining Environmental Clearance and conducting EIA for projects and activitiescovered under the Notification. | Yes | Water Supply Projects do not require prior Environmental Clearance under this regulation. | MoEF&CC, Government of India |
| 7 | Solid Waste (Handling and Management) Rules, 2016 | Lays down the methods of handling Municipal Solid Waste (MSW) and its scientific disposal. | Yes | All solid waste generated during construction (e.g., at labour camp) and operation (e.g.,disposal of dry sludge from WTP) of the sub-project has to be handled and disposed as per theprescribed rules. | OSPCB, Government of Odisha |
| 8 | Construction and DemolitionWaste Management Rules, 2016 | Every waste generator isresponsible for collection, segregation, storage of construction and demolition waste. The waste has to be deposited at the collection centre or handed over to authorised processing facilities. | Yes | Construction waste will begenerated during the constructionphase of the sub-project. Emphasis on the roles and accountability for waste management, segregation, recovery, reuse, recycle at source, should be addressed in the management of constructionand demolition waste. | OSPCB, Government of Odisha |
| 9 | Hazardous and Other Wastes (Management and TransboundaryMovement) Rules, 2016. | Stipulates the method of segregating, storing,managing, and disposing hazardous and other wastes regulated under the Rules. | Yes | Applicable to the hazardous waste (waste oil from diesel generator sets, oil soaked cotton, used oil filters) generated during construction and operation phases. | OSPCB, Government of Odisha |
| 10 | The Noise Pollution (Regulation and Control) Rules, 2000 | The standards for noise for day and night have been promulgated for various areas/zones. | Yes | Applicable to all noise generating construction activities and construction equipment deployed at worksite. Also applicable for all noise generating activities duringoperation of sub-project (e.g.,WTP operation). | OSPCB, Government of Odisha |
|  | Occupational Health & Safety | | | | |
| 11 | Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 | It regulates the employment and conditions of service for building and other construction workers and also provides for their safety, health and welfare. | Yes | This is applicable as the construction works will employ 10 or more workers. | District Labour Commissioner and Buildings Inspector, Government of Odisha |
| 12 | Central Motor Vehicles Rules, 1989 | To check vehicular air and noise pollution. | Yes | This rule is applicable for vehicles deployed in constructionactivities. | Department of Transport, Government of Odisha |
| 13 | Explosives Rules Act, 1983 | Safe transportation, storage and use of explosive materials. | Yes | Applicable as the construction activity may require blasting using explosives. | ChiefController of Explosives, Government of India |
|  | Labour Welfare | | | | |
| 14 | Workmen Compensation Act, 1923 | It provides regulation for payment of compensation by employers to their employees for injury by accident i.e. personal injury or occupational disease. | Yes | Construction workers will be involved in the project. | District Labour Commissioner, Government of Odisha |
| 15 | Inter-state Migrant Workers Act, 1979 | It protects workers whose services are requisitioned outside their native states in India Contractor who employs or who employed five or more Inter-State migrant workmen is required to obtain registration under this act | Yes | Interstate migrant workers may be involved in the projects. | District Labour Commissioner |
| 16 | The Child Labour (Prohibition &Regulation) Amendment Act,2016 | It prohibits employment of children in certain specified hazardous occupations,processes and regulates the working conditions in others. | Yes | Construction workers will beinvolved in the project. | District Labour Commissioner |
| 17 | Minimum Wages Act, 1948 | Payment of minimum rate of wages as fixed and periodically revised by the State Government. | Yes | Construction/daily wage workers will be involved in the projects. | District Labour Commissioner |
| 18 | Building and Other Construction Workers Welfare Cess Act, 1996 | An Act to provide for the levy and collection of Cess on the cost of construction incurred by employers. | Yes | Construction workers will be involved in the project. | Commissioner |
|  | Resettlement and Rehabilitation | | | | |
| 19 | Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act-2013 and Odisha Right to Fair Compensation andTransparency in Land Acquisition, Rehabilitation andResettlement Rules-2015 | Fair compensation for acquisition of: (i) Land and other immovable assets; (ii) Resettlement of displaced population due to LA and  (iii) Economic rehabilitation of all those who are affected due to land acquisition. The Act also covers the Lease Holders, Share Croppers and Tenant. | No | No land acquisition will be undertaken for the project. | Revenue Department of respective under the District Collector. |
| 20 | The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 | Grants legal recognition to the rights of traditional forest dwelling communities. For diversion of forest land for “drinking water supply and water pipelines” managed by the Government which involve felling of trees not exceeding 50 trees per ha and diversion of forest area <1 Ha (UNDER SECTION 3(2))- | No | No need for compulsory land acquisition is identified. However, replacement of the existing raw water main of 300mm with 500mm would involve working within the forest area There will be no change in the character of land and does not affect the rights and wefare of the forest rights holders. the forest rights holders along the raw water pipe alignment support the project and and their interests are protected. | Ministry of Tribal Affaires, GoI and Department of Tribal Welfare of various State Government and Panchayati Raj. District Commissioner, Bhadrak |
| 21 | Panchayats (Extension toScheduled Areas) Act, 1996 | Ensuring self-governance through traditional GramSabha for people living in thescheduled areas of India. | No | No land acquisition will be undertaken for the project. Around 1650 m of pipeline will beupgraded and 130.758 km will benewly laid, The newly laid pipewill be within the RoW and thereis no change in the character ofland. | State Government through Gram Sabhas |
| 22 | The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014.Odisha street vendor (Protection of livelihood and regulation of streetvending), Rules 2014. | The Act aims to protect the rights of urban street vendors and to regulate street vending activities. It provides for Survey of street vendors & protection from eviction or relocation;issuance of certificate for vending; provides for rights and obligations of street vendors; development of street vending plans; organizing capacity building programmes to enable the street vendors to exercise the rights contemplated under this Act; | Yes | There is temporary loss of livelihood of 35 street vendors and physical displacement of 2 vendors. | ULBs and State Government. |

1. World Bank Safeguard Policies

The objective of the World Bank's environmental and social safeguard policies is to prevent and mitigate undue harm to people and their environment during the developmentprocess. These policies provide guidelines for bank and borrower staff in identification,preparation, and implementation of programs and projects. Safeguard policies provides aplatform for participation of stakeholders in project design, and are an important instrumentfor building ownership among local populations (World Bank, 2006). The triggered safeguardpolicies are presented in Table below

| **S. No** | **WB Safe Guard Policy** | **Key Features** | **Applicability** |
| --- | --- | --- | --- |
| 1 | OP 4.01 - Environmental Assessment | ► Potential environmental consequences of projects are identified early in the project cycle.  ► Environment Assessment (EAs) and mitigation plans required for projects with significant environmental impacts or involuntary resettlement.  ► EAs to include analysis of alternative designs and sites, or onsideration of "no option”.  ► Requires public participation and information disclosure before board approval. | Applicable  According to OP 4.01 environmental issues have been dentified in the integrated environmental and Social Impact assessment (ESIA) and Environmental Management Plan (ESMP) is prepared. Separate Abbreviated Resettlement Action Plan(ARAP) and Scheduled Tribe Participation Plan (STPP) is not applicable. |
| 2 | OP 4.36 - Forests | ► Requires all relevant types of projects to avoid causing significant, unmitigated harm to natural forests or other natural habitats.  ► Prohibits support for projects that would involve the significant conversion or degradation of critical forests or other types of critical natural habitats  ► Requires recognition of and respect for any legally documented or customary land tenure and use rights aswell as the rights of indigenous peoples and workers. Also the rights and welfare of people affected by project should be assessed and addressed. | Applicable There will be no change in the character of land, no trees will be cut, and the activity does not affect the rights and welfare of the forest rights holders.The project needs to ensure that the forest rights holders along the raw water pipe alignment support the project and their interests are protected. |
| 3 | OP 4.10 Indigenous People | Its purpose is to ensure indigenous peoples benefit from Bank-financed development and to avoid or mitigate adverse effects on indigenous peoples. It applies to projects that might adversely affect indigenous peoples or when they are part of project beneficiaries. it requires the participation of indigenous peoples in design and delivery of unban infrastructure and services. | Applicable  presence of STs are identified in the project influence area of the Project. A separate STPP is not applicable. And consultation is has been carried out to ensure community’s support. |
| 4 | OP 4.12 – Involuntary Resettlement | Implemented in projects which displaces people. ► Requires public participation in resettlement planning as part of Social Assessment (SA) for project. ► Identification of “those who have formal legal rights to land (including customary and traditional rights recognized under the laws of the country. ► Intended to restore or improve income earning capacity of displaced populations in addition to their resettlement. ► Intended to provide compensation for lost assets and other resettlement assistance to “those who have no recognizable legal right or claim to the land they are occupying”. ► Some project interventions are likely to trigger issues such as those related to land acquisition, loss of assets and impact on livelihood sources. Identification of any potential impacts and mitigation measures to address likely impacts is proposed. ► Transfer of Government land under different tenure systems could trigger adverse impacts such as loss of access to natural resources – firewood, fodder, water etc. and loss of sources of income/ livelihood/ shelter/ homestead. | Applicable.  There will be impact on the Squatters and Encroachers (Non-Title Holders) mostly commercial entities. |

IFC EHS GuidelineTable below presents the IFC EHS guideline applicable for the project

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No** | **Safeguard Policies** | **Objective** | **Applicability** | **Safeguard** |
|  | IFC:  General  EHS Guidelines | The (EHS) guidelines contain performance level and measures on environmental, occupational health and safety for construction, community health and safety to be followed during the construction, operation and decommissioning phases. | Applicable, as the sub projects will involve construction, operational and de commissioning activities. | The sub-project will adhere to the performance level and measures provided in the IFC general EHS guidelines,in Annexure V Mitigationmeasures proposed including OHS management plan ( Annex IX) has been prepred using the EHS gudelines, and to provide the contractor withthe guidance in implementing the required measures. |
|  | IFC Industry Sector Guidelines for Water and Sanitation | This industry sector EHS guideline is to be used together with the general EHS guidelines document, which provides guidance on EHS issues potentially applicable to Water and sanitation. Recommendations for the management of EHS issues associated with construction activities as would typically apply to these types of civil works are provided in the general EHS guidelines | The guidelines for water and sanitation include information relevant to the O&M of (i) potable water treatment and distribution systems. | The sub-project had made use of these industry specific guidelines for recommend in mititgation and management measures in O&M phase of the water supply project. |
|  | IFC Industry Sector Guidelines for Waste  Management Facilities Management Facilities | The guideline document provides a summary of the most significant EHS issues associated with waste Management, which occur during the operational and decommissioning phases, along with recommendations for mitigating these impacts. | The guidelines for waste management will cover facilities or projects dedicated to municipal sewage management. | The sub-project had made use of these industry specific guidelines as applicable. |
|  | IFC Workers Accommodation: Processes and Standards: Guidance Note | This Guidance Note addresses the processes and standards that should be applied to the provision of workers’ accommodation | Applicable, as the subprojects will involve setting up of labour camp during onstruction phase. | The plan to be followed for setting up of the labour camp has been provided in Annexure VII. This plan is prepared in reference to the Workers accommodation : processes and standards (A guidance note by IFC and EBRD). The objective of this plan in Annex VII is to provide guidance to the contractor or other agency involved in setting up of the construction and labour camp for keeping the health & Safety of workers and impacts of setting up such camps on the local community in consideration while developing and establishing such camp. |

Project Categorization As per the preliminary screening conducted in Annex 1, the Bhadrak Urban Water Supply Project is categorized as E-1 and S-2 (shown in table 21). As per ESMF catgeorisation, category E-1 corresponds to Bank Category A project. Hence the requirements of Catgeory A project as per OP 4.01 have been followed under the ESIA for Bhadrak water Supply, including OP 4.01 Annex B Contents of ESIA for Category A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No** | **Category** | **Description** | **Type** | **Action** |
|  | Environmental | | | |
| 1 | E1 | Significant adverse environmental impacts over the lifetime of the project; likely need for significant mitigation | Significant adverse impacts that are sensitive, diverse,or unprecedented,or that affect an area broader than the sites or facilities subject to physical works. ► Projects impacting sensitive environmental components .► Projects involving STPs and dam safety due diligence measures ► Projects requiring environmental clearance as per EIA notification of MoEF&CC | There will be no change in the character of land, notrees will be cut, and the necessary precautions in the construction activity have been integrated in the ESMP. The activity does not affect the rights and welfare of the forest rights holders.The project needs to ensure that the forest rights holders along the raw water pipe alignment support the project and their interests are protected. All impacts, environmental and social concerns associated with proposed water supply project have been addressed in the ESIA, and the appropriate mitigation and monitoring measures have been provided in ESMP. ARAP and STPP is not applicable.OUIDCO has engaged an independent agency different from DPR consultant. |
|  | Social | | | |
| 2 | S1 | Moderate with  minimized social impacts | The project activity will not impact of loss of livelihood. |  |

E & S permissions required

Planning Stage

► NOC from WRD for withdrawal of water for water supply scheme(obtained and presented in Annex-XVII). Pre-construction stage

► NOC from the Forest Department ► NOC/ Consent from Urban Local body for designated site for disposal ofconstruction waste (obtained- see annex IV)

► NOC for WTP sludge disposal from urban local body NOC from urban local body for establishment of labour camp near WTP

Construction stage

► CTE & CTO from OSPCB for batching (concrete mix) plant and DG set (> 15 kVA).

► Labour license from Department of Labour.

► Contractor who employs or who employed five or more Inter-State migrant workmenneed to obtain registration of interstate workmen migrant license from labour commissioner.

► Approval from ULB for withdrawal of water for construction purpose from surface water source

► PUC for construction vehicles from Department of Transport, Government of Odisha

# ANALYSIS OF ALTERNATIVES

# The main obstacle to wider implementation of fly ash and slag may be largely due to the risk of construction with new technology that has not been exposed to long field testing. Until a carbon tax is implemented, companies are unwilling to take the chance with new concrete mix recipes even if this reduces carbon emissions. However, there are some examples of “green” concrete and its implementation. One instance is a concrete company called Ceratech that has started manufacturing concrete with 95% fly ash and 5% liquid additives.Another is the [I-35W Saint Anthony Falls Bridge](https://en.wikipedia.org/wiki/I-35W_Saint_Anthony_Falls_Bridge), which was constructed with a novel mixture of concrete that included different compositions of Portland cement, fly ash, and slag depending on the portion of the bridge and its material properties requirements.

# ENVIRONMENTAL BASELINE

Introduction .

In order to predict and evaluate environmental impacts of geothermal development, it is critical to understand the baseline environmental conditions prior to development. This is achieved by carrying out Environmental Baseline Studies (EBS) during geothermal exploration. Understanding the existing Kubo et al. 2 EBS geothermal development environment serves to define the focus of the environmental impact analysis and resources that need protection through mitigation. Early collection of baseline data can help to guide the definition of the proposed geothermal project, including location of facilities. Significant impacts and development costs can be avoided if the location and nature of the sensitive resources are identified early in the geothermal development process. Best environmental management practices have also revealed that avoiding impacts through careful siting and project design is more desirable and cost effective than mitigating adverse environment impacts.

**Land Environment**

This section presents the existing environmental baseline status of the study area, covering an area of 500m radius from the sub-project site.

Land utilization

|  |  |  |  |
| --- | --- | --- | --- |
| **Agriculture** | | | |
| i) Total Area | 2014-15 | hectre | 250 |
| ii) Forest cover | 2014-15 | hectre | 10 |
| iii) Non Agriculture Land | 2014-15 | hectre | 33 |
| iv) Barren & Un-culturable land | 2014-15 | hectre | 01 |
| **Forest** |  |  |  |
| (i) Forest | 2014-15 | hectre | 10 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Livestock & Poultry** | | | |
| Cattle |  |  |  |
| i) Cows (Indigenous & Cross Bred) | 2012 | No | 513017 |
| ii) Buffaloes | 2012 | No | 4932 |
| Other livestock |  |  |  |
| i) Goats | 2012 | No | 144109 |
| ii) Pigs | 2012 | No | 973 |
| iii) Sheep | 2012 | No | 1945 |
| iv) Poultry | 2012 | No | 483522 |
| **Railways** |  |  |  |
| i) Length of rail line | 2014-15 | Km | 36 |
| **V) Roads** |  |  |  |
| (a) National Highway | 2014-15 | Km | 41 |
| (b) Express highway | 2014-15 | Km | - |
| (c) State Highway | 2014-15 | Km | 170 |
| (d) Major District Road | 2014-15 | Km | 67 |
| (e) Other District Road | 2014-15 | Km | 176 |
| (f) Rural road | 2014-15 | Km | 1062 |
| (g) G.P. Road | 2014-15 | Km | 5335 |
| (h) Panchayat Samiti Road | 2014-15 | Km | 226 |
| (f) Forest Road | 2014-15 | Km | 0 |

Existing Status of Industrial Area in the District Bhadrak

Source IDCO, Bhubaneswar

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Name industrial area/Estate** | **Total Area** | **Allotted** | **Allotable Elitication free land** | **Land rate per Acre/ Rs in lakh** | **Total Shed** | **Shed Allotted /used otherwise** | **popularity** |
| 01 | Bhadrak | 20.700 | 10.215 | 1.843 | 20.00 | 10 | 4 | - |
| **Total** | | **20.700** | **10.215** | **1.843** | **20.00** | **10** | **4** | **-** |

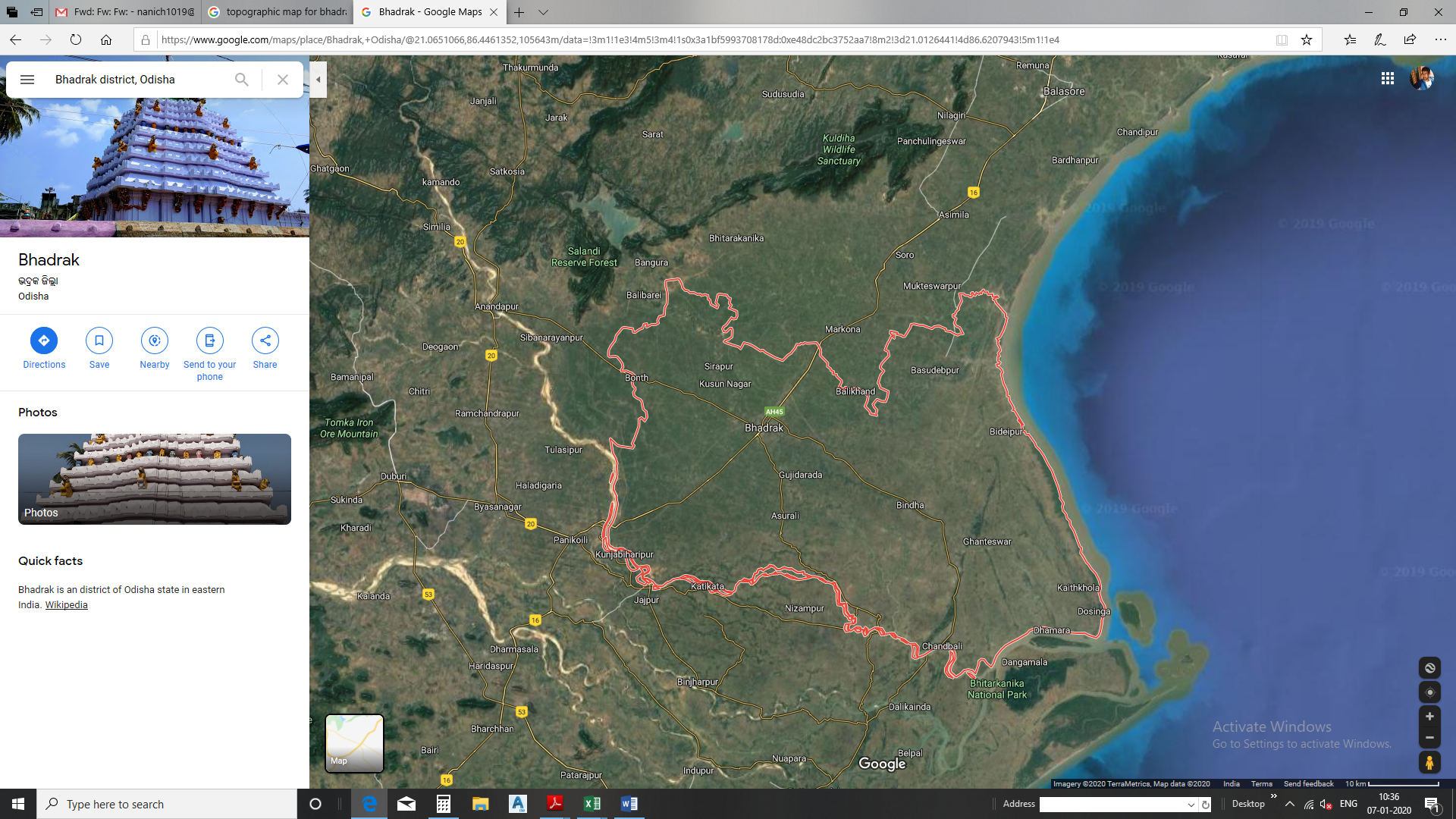
**Topography**

Bhadrak district is divided in to three zones according to its soil condition. 1. Saline Soil, 2. Alluvial Soil 3. Sandy Soil.

Bhadrak district isnaturally divided into two welldesigned tracks.

1. The salt tracks alongthe coasts which is not arable

2.The arable track, which is called thegranary of the state. As per the agro climatic condition of the district theareas may be divided into four zones.

****a) Rain fed Zone, b) Perennialirrigated Zone, c) Flooded Zone d) Saline Zone.

**Forest**

Forest is a large area of land covered with tree or other woody vegetation. Forests are

the dominant terrestrial Ecosystem of the Earth. It is distributed across the globe.

Forestsaccount for 75% of the gross primary productivity of the earth’s biosphere and  contain 80% ofthe earth’s plant biomass.

India belongs to the forests areas from the rainforest of Kerala in the south to the alpine pastures of Ladakh in the north, from the deserts of Rajasthan in the west to the evergreenforests in the northeast. The climate, soil type, topography, and elevation are  the mainfactors that determine the type of forest. Forests are classified according to their nature and composition.

Odisha's forests are vast. Out of the totalgeographical area of 155,707 sq. Kms, the Staterecords 58,136 sq. Kms. (equivalent to 37%) asforest area.



According to the Forest Survey of India, the actual forest cover is less. Aromatic Plants, Rich Medicinal Plants, Orchards, Rosewood,  Sal,Piasal, Bandhan, Kangada, Kasi, Sisu, Asana,Kurum, Dheura, Sanghvan, Haldi and varioustypes of Bamboos etc. are available in the forests of Odisha. The forest's naturally vigorous

growthaccounts for a tremendous wealth of  biodiversity, filling many catalogues of the wild plant and animal species.

Odisha has declared large parcels of land as protected areas with the purpose being to allow animals and plants who are sensitive to sharing with human’s places of relative  freedomfrom interference and habitat loss. These protected areas constitute 10.37% of the total forest area and 4.1% of the total geographical area.

Human society and forests influence each other in both positive as well as negative

ways. Forest provides ecosystem services to humans and serves as tourist spot attractions.

Forest can also impose costs, affects people’s health and interfere with tourist enjoyment. Itplay an important role in environment protection. Forest in mountain areas helps to prevent soilerosion and landslides. Forests help in maintaining the water quality of rivers. Sincethe arrivalof humans in earth, forestry practices continue to cause damage to the environment in the formof soil erosion; water quality deterioration and other adverse effects appeared.

In an era of climate change, protecting our forests is one of the best things we should

prevent dangerous global warming. While policymakers have their role to play, companies toomust enable suppliers to join their efforts to protect forests. The long-term viability ofagricultural production, food security and climate action depend on this.

The Forest Department is to manage, conserve and protect forest as well as wildlife

resources through afforestation of degraded forest lands, forest protection along with theupliftment of rural people in the forest peripheral areas and its sustainable management.

The forests are significant as the natural capital of a region. They constitute the

ecological and economic resource base. They dynamite the economy of Odisha by contributingto State Income, State Revenue, Industrial Activity as well as the Tribal and RuralDevelopment. Under all dimensions, one may find that in the present accounting frameworkthe contributions are relatively low Incomes from forests are not properly assessed.

***Forest Coverage***

Forest is a natural phenomenon. It is the land straddling more than 0.5 hectares with tree

higher than 5 metres and canopy cover more than 10% or trees to reach this threshold. It doesnot include land that is predominantly under agriculture or Urban land use. Above all, itincludes all actually forest area on the land so closed or administered asforests under legalenactment with forest, it may be State owned or private.

The total forest area in the Bhadrak district is estimated only to be 31. 41sq .kms.

The area is mostly situated in northern and southern part of the bhadrak district. The district is having scatteredmangrove forest, which play veryimportant role in checking the high tide of the sea and maintainingecological balance. Themajor forest produces of the district are timberfirewood, bamboo, etc. the low patch of forest area has been degradeddue to scarcity of fuel of the rural people and most of the trees are cut down for fire wood and fodder purposes.

***Classification of Forest Area***

(Area in Sq.Km)

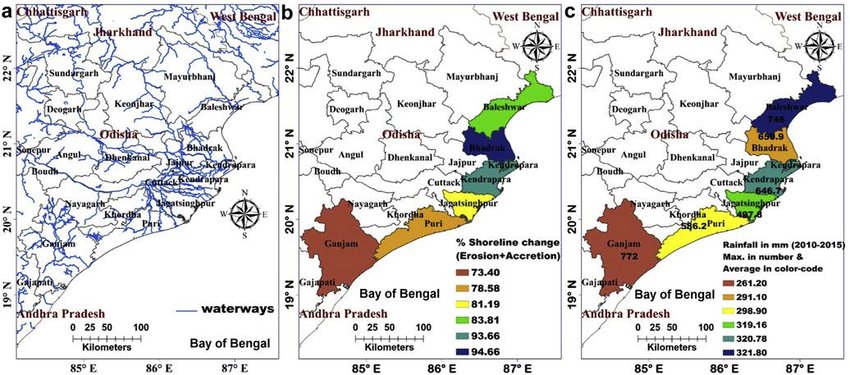
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sl.  No | District | Geogra  phical  Area | Total  Forest  Area | Forest Land under  control of Forest  Department | | Forest Land under Control of Revenue  Deptt. | | |
| Reserve  Forests | Un classi  fied  Forests \* | Demarcated  Protected  Forests  (DPF) | Undemar-  cated  Protected  Forests  (UDPF) | Other  Forests  under  Revenue  Deptt. |
| 1 | Bhadrak | 2505 | 97.07 | 0.00 | 0.01 | 3.96 | 32.98 | 60.12 |

**Geomorphology**

The district is situated between Balasore district in the north, Jajpur & Kendrapara district in the south. It also extends in the west up to keonjhar district and in the east upto the Bay of Bengal. The headquarter Bhadrak town is situated 125km away from the state capital, Bhubaneswar. The geographical area of the district is 2505 sq.km.

**Geographical features**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No.** | **Particular** | **Year** | **Unit** | **Statistics** |
| (A) | Geographical Data |  |  |  |
|  | i) Latitude | 2014-15 | Degree | 21° 4 North |
|  | ii) Longitude | 2014-15 | Degree | 86° 30 East |
|  | iii) Geographical Area | 2014-15 | Sq. Kms | 2505 |

**Geology**

# (a) Coastal geomorphology, (b) Percentage shoreline change, and (c) Average rainfall during 2010e2015.

**Hydrogeology**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Stratum | Depth in m. | Nature of formation | Hydraulic Conductivity in m/day | Remarks |
| 1 | 00.00m to 07.50m | Yellowish Clay | 4.1x10-4 |  |
| 2 | 07.50m to 16.00m | Yellowish Clay with Sand | 4.1x101 |  |
| 3 | 16.00m to 21.00m | Sand mixed with Gravels | 4.51x102 |  |
| 4 | 21.00m to 33.00m | Coarse Sand mixed with Pebbles | 6.56x102 |  |
| 5 | 33.00m to 38.00m | Clay with Sand | 4.1x101 |  |
| 6 | 38.00m to 62.00m | Sticky Black Clay | 4.1x10-2 |  |
| 7 | 62.00m to 69.00m | Medium to Coarse Sand | 4.1x101 | A (Zone) |
| 8 | 69.00m to 72.00m | Clay | 4.1x10-3 |  |
| 9 | 72.00m to 95.00m | Medium to Coarse Sand | 4.1x101 | B (Zone) |
| 10 | 95.00m to 100.00m | Clay mixed with Sand | 4.1x101 |  |

Lithological Section of Borehole of Kantabania, Bhadrak, Orissa

Lithological Section of Borehole of Bankamahal Bank near Sadabrata Nath, Bhadrak, Orissa

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Stratum | Depth in m. | Nature of formation | Hydraulic Conductivity in m/day | Remarks |
| 1 | 00.00m to05.00m | Top Soil | 4.1x10-3 |  |
| 2 | 05.00m to08.00 m | Clay | 4.1x10-3 |  |
| 3 | 08.00m to 34.00m | Sand with Clay | 4.1x101 |  |
| 4 | 34.00m to 45.00m | Sand medium to coarse mixed  with Gravels & Pebbles | 6.56x102 |  |
| 5 | 45.00m to 72.00m | Sticky black Clay | 4.1x10-2 |  |
| 6 | 72.00m to 86.00m | Sand medium to coarse | 4.1x101 | A (Zone) |
| 7 | 86.00 m to 88.00m | Clay | 4.1x10-3 |  |
| 8 | 88.00m to 95.00m | Sand medium to coarse | 4.1x101 | B (Zone) |
| 9 | 95.00m to 101.00m | Clay | 4.1x10-3 |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7 | 44.00 m to 50.00m | Fine Sand | 4.1x100 |  |
| 8 | 50.00m to 55.00m | Clay | 4.1x10-3 |  |
| 9 | 55.00m to 73.00m | Medium to Coarse Sand | 4.1x101 | A (Zone) |
| 10 | 73.00m to83.00m | Clay | 4.1x10-3 |  |
| 11 | 83.00m to 89.00m | Medium to Coarse Sand | 4.1x101 | B (Zone) |
| 12 | 89.00m to 93.00m | Clay mixed with Sand | 4.1x101 |  |
| 13 | 93.00m to 101.00m | Medium to Coarse Sand | 4.1x101 | C (Zone) |
| 14 | 101.00m to106.00m | Clay | 4.1x10-3 |  |

Lithological Section of Borehole of near P.H.Pump House Bhadrak College, Bhadrak, Orissa

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Stratum | Depth in m. | Nature of formation | Hydraulic conductivity  in m/day | Remarks |
| 1 | 00.00m to05.00m | Top Soil | 4.1x10-3 |  |
| 2 | 05.00m to16.00 m | Clay | 4.1x10-3 |  |
| 3 | 16.00m to 19.00m | Yellowish Sand | 4.1x100 |  |
| 4 | 19.00m to 25.00m | Sand with Clay | 4.1x101 |  |
| 5 | 25.00m to 38.00m | Clay | 4.1x10-3 |  |
| 6 | 38.00m to 44.00m | Clay with Sand | 4.1x101 |  |

Filter position 1) 56m to 72m= 16m, 2) 84m to 88m= 4m, 3) 94 to 100m =6m

A (Zone), B (Zone) and C (Zone) are zones for granular sediments saturated with ground water.

RESULTS

Chloride

Chlorides are normally present in water in the form of sodium chloride NaCl. Their concentration above250mg/l produces a noticeable salt taste  in drinking water. High chloride content indicates that the seawater intrusion takes places in these sites.

Iron (+++)

Both physico chemical and microbiological factors control the concentration of the iron in natural water. Inground water, iron generally occurs in two oxidation states i.e., Ferrous and Ferric. The presence of iron is within the tolerance limit as the upper limit setup by the World Health Organization (WHO) is 1.00 mg/l.

According to the Indian Council of Medical Research, the maximum desirable limit is 0.1mg/l (ICMR, 1975).

Iron in irrigation water should not exceed 20 mg/l in neutral or alkaline soils and 5mg/l in acidic soil.

Total Dissolved Solids (TDS)

The permissible limit of TDS in drinking water in ppm is 500ppm. The amount of TDS in Samples no.06, 09and 20 have concentrations of 2496, 870, &774 ppm. From the above, it is obvious that the increase is due tothe saltwater intrusion in the in coastal side. Based on the TDS present, the  water samples were categorised as saline, brackish and fresh water.

Conclution

For prevention and control of saline water intrusion, the following measures are to be implemented

•Collection of river water from upstream and distribution among different sectors after propertreatment.

•Reduction of pumping and rearrangement or redistribution of point of extraction

•Artificial recharge to create a freshwater ridge by injection wells or water spreading are implemented over the whole coastal basin.

•Relocation and redesign of wells and providing scavenger wells

**Ground Water Status**

**Water Environment**

**Ground Water Quality:**

Chemical analysis results of ground water samples indicate that ground water is extremely fresh to saline in shallow as well as in deeper aquifers of the district. The limit of freshness is fixed considering the maximum prescribed limit of dissolved solids concentration (2000 mg/l) for potable water (I.S – 1991).

Water quality in the project area is anaysed and repored as enclosed.

The ground water from both shallow and deeper aquifers is Na-HCO3, NaCl and Ca-HCO3 types and Na-HCO3, Na-Cl types are predominating, which may be due to Base Exchange process and also due to proximity of the sea. Hydrochemistry of shallow and deep aquifers is described below.

**Suitability of Ground Water for Drinking Purpose -**

The concentration of major chemical constituents and also the pollutants like fluoride and nitrate content in fresh ground water of shallow and deeper aquifers are well within permissible limit of drinking water specification (Indian Standard 1991). Hence the fresh ground water may be used as safe drinking water source.

**Availability of drinking water facilities in different blocks of Bhadrak**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name of Block | No of villages having No Source of safe drinking water facilities | Tube wells | | Piped Water | |
| No of working  tube wells | No of villages  covered | No of piped  Water Projects | No of villages  covered |
| Basudevpur | 173 | 980 | 111 | 3 | 8 |
| Bhadrak | 147 | 1119 | 105 | 2 | 3 |
| Bhandaripokhri | 164 | 917 | 130 | - | - |
| Bonth | 195 | 1008 | 158 | 2 | 8 |
| Chandbali | 267 | 1024 | 217 | 4 | 17 |
| Dhamnagar | 138 | 1011 | 84 | 2 | 6 |
| Tihidi | 151 | 954 | 83 | 4 | 14 |

|  |  |  |
| --- | --- | --- |
| **S.NO** | **ITEMS** | **STATISTICS** |
| 1 | NUMBER OF GROUND WATERMONITORING WELLS OF CGWB (as on 31.3.2011)  1. No of Dug Wells  2. Nos of Piezometers | 14  12 |
| 2 | PREDOMINANT GEOLOGICAL FORMATIONS | Alluvium, laterites & Gr.gneiss |
| 3 | HYDROGEOLOGY  • Major Water Bearing Formations  •Pre-Monsoon Depth to Water Level during 2011.  •Post-Monsoon Depth to Water Level during 2011  •Long Term water level trend in 10 yrs (2001-2011) in m/yr | Alluvium,  92-7.20,Average=4.82 mbgl  1.14-4.01,Average=1.97mbgl  Rise and fall within 0.50 m |
| 4 | GROUND WATER EXPLORATION BYCGWB (As on 31.3.2011) No of wellsdrilled (EW, OW,DW, Pz, SH) DepthRange (m) Discharge(lps) Storativity(s) Transmissivity (m ²/day) | EW=37,OW=9,DW=19, Pz=14 ,SH=1) 154 to 600mbgl 4 to 67lps 2.11×10-4 to 8.3×10-4 274 to 1798 m2/day |
| 5 | GROUND WATER QUALITY Presence of Chemical constituents more than permissible limit (e.g. EC, F, AS, Fe) Type of water | All within permissible limit Normal |
| 6 | DYNAMIC GROUND WATER  RESOURCES (2009 in mcm)  1-Annual replenishable Ground Water Resources  2-Net Annual Ground Water Draft  3-Projected demand for domestic and industrial uses up to 2005  4-Stage of Ground Water Development (%) |  |
| 7 | AWARENESS AND TRAINING ACTIVITY  Mass Awareness Programmes organized Date Place No of Participiants | Not Organized |
| 8 | Water Management and Training Programmes Organised Date Place No of Participiants | Not Organized |

|  |  |  |
| --- | --- | --- |
| 9 | EFFORTS OF ARTIFICIAL RECHARGE  & RAIN WATER HARVESTING Projects completed Jointly by Deptt. Of Water Resources, WAPCOS and CGWB  (Nos. & Amount spent ) | Two nos. of Artificial Recharge  project were undertaken  during 9th Plan Period 1- Rs.  544.89 Lakhs 2- Rs. 561.30 Lakhs |
| 10 | GROUND WATER CONTROL AND  REGULATION  No of OE Blocks  No of Critical Block  No of Blocks Notified |  |
| 11 | MAJOR GROUND WATER PROBLEMS  AND ISSUES | 46% of the district is affected -  by Ground Water salinity  problem |

**Surface Water Status**

***Soil***

A detailed soil fertility inventory study was carried out in Bhadrak district of Odisha during 2012-13 using the Global Positioning System (GPS) and Geographical Information System (GIS) tools. Geo-referenced soil samples were collected from the different villages in each blocks of the district. Soil samples were processed and analysed in laboratory for pH, EC, organic carbon, available nitrogen, phosphorus, potassium, sulphur and boron. The results reveal that soils of all the blocks were found to be acidic (4.9 to 5.2) in reaction and medium to high in organic carbon content (6.1 to 9.4 g kg-1)-Available soil nitrogen content was low (148.9 to 190.7 kg N ha-1), available soil phosphorus content was low to medium (3.7 to 17.8 kg P ha-1) whereas, available soil potassium content was medium to high (178.9 to 484.3 kg K ha-1). On the other hand, available sulphur was found to be deficient in some blocks and sufficient in other blocks of the district (8.04 to 32.86 mg S kg-1). Hot water soluble boron content remained above the critical limits (0.57 to 1.03 mg kg-1) in all the blocks. The soil fertility maps of Bhadrak district were prepared by using the Arc GIS software. The generated data and maps are very useful for planning, monitoring and evaluation of soil fertility status for sustainable crop production.

Soil is a natural body comprised of solids(minerals and organic matter),liquid, andgases that occurs on the land surface, occupies space, and is characterized by one or both of thefollowing: horizons, or layers, that are distinguishable from the initial material asresult ofadditions, losses, transfers, and transformations of energy and matter or the ability to supportrooted plants in a natural environment.

The upper limit of soil is the boundary between soil and air, shallow water, live plants,or plant materials that have not begun to decompose. Areas are not considered to have soil ifthe surface is permanently covered by water too deep (typically  more than 2.5 meter) for thegrowth of rooted plants.

The lower boundary that separates soil from the non-soil under neath is most difficultto define. Soil consists of horizons near the Earth's surface that, in contrast to the underlyingparent material, have been altered by the  interactions of climate, relief, and living organismsover time.Commonly, soil grades at its lower boundary to hard rock or to earthy materialsvirtually devoid of animal, roots, or other marks of biological activity.For purposes of classification, the lower boundary of soil is arbitrarily set at 200 cm.

***Importance of Soil***

Soil is a vital part of the natural environment. It is just as important as plants, animals,

rocks, landforms, lochs and rivers.

It influences the distribution of plant species and provides a habitat for a wide range

of organisms.

It controls the flow of water and chemical substances between the atmosphere and

the earth, and acts as both a source and store for gases (like oxygen and carbon dioxide) in the atmosphere.

Soils not only reflect natural processes but also record human activities both at

present and in the past. They are therefore part of our cultural heritage.The

modification of soils for agriculture and the burial of archaeological remains are good

examples of this.

Soil, together with the plant and animal life it supports, the rock on which it develops,its position in the landscape and the climate it experiences, form an amazingly intricate naturalsystem – more powerful and complex than any machine that man has created. Soil may lookstill and lifeless, but this impression couldn’t be further from the truth. It is constantly changingand developing through time. Soil is always responding to changes in environmental factors,along with the influences of man and land use. Some changes in the soil will be of short durationand reversible, others will be a permanent feature of soil development.

***Types of Soil***

Soil is a term that has a very broad definition and refers to a loose layer of earth thatcovers the surface of the planet. Soil is generated when rocks breakup into their constituentparts. A plethora of different forces then workupon the brokenup parts of the soil, such as theimpact of wind and water and the reaction from salts. Soil  has three examples of state: solidsoil, soil with air in the pores and soil with water in the pores. Dueto the number of differentforms of organic and mineral compositions, there are various types of soil that undergoes different environmental pressures.

* *Clay Soil*
* *Silty Soil*
* *Loamy soil*
* *Sandy Soil*
* *Peaty Soil*
* *Chalky Soil*

*Major types of soils in India*

* *Alluvial soil*
* *Laterite and Lateritic soils*
* *Red Soils*
* *Black Soils or Regur soils*
* *Desert Soil*
* *Mountain soil*

*Types of Soil in Odisha*

* *Red Soils*
* *Laterite and lateritic Soils*
* *Red and yellow Soils*
* *Coastal salt affected alluvial Soils*
* *Deltaic alluvial Soils*
* *Black Soils*
* *Mixed red and black Soils*
* *Brown forest Soils*

***Coastal salt affected alluvial Soils***

Alluvial soils with high total soluble salts (Electrical conductivity greater than 4 mmhos/cm) are included under this group. The salinity of soil may be due to littoral deposits or theincursions of brackish tidal water. The salts are mainly composed of chlorides and sulphatesof sodium, magnesium and to a lesser extent of calcium and potassium. Bicarbonates andcarbonates are rarely found. Soils in lacustrine sediments of the lake Chilka also get affectedby salts due to flooding of brackish lake water during monsoon and a buildup of subsoil salinitydue to high ground water table under low-lying situation. These soils found in the deltaic regions of the rivers Bhadrak.

***Deltaic alluvial Soils***

These soils have variable texture ranging from coarse sands to clays, depending uponthe geomorphology of flood plain and the type of alluvium carried by the flowing river. Deltaicalluvial soils are generally fertile but fertility decreases if the soil is not recharged regularly byflood. These types of soil found in the deltaic regions of the rivers such as Mahanadi, Brahamani, Baitarani, Subarnarekha and Rushikullya in the districts of Balasore, Bhadrak**,** Jajpur, Kendrapara, Jagatsinghpur, Cuttack, Puri, Gajapati and Ganjam.

***Land Pollution***

Land pollution is the degradation of earth's landsurfaces often caused byhuman activities and its misuse. Haphazard disposal of urban and industrial wastes, exploitation of minerals, and improper use of soil byinadequate agricult ural practices are a few of the contributing factors. Also, increasing urbanization, industrialization, and other demands on the environment and its resources is of great consequence to many countries

***Causes of land pollution***

There are many different ways of permanently changing the land, from soil contamination (poisoning by chemicals or waste) to general urbanization (the  systematiccreation of cities and other human settlements from green field, virgin land). Some, such ashuge landfills or quarries, are very obvious; others, such as atmospheric deposition (where landbecomes contaminated when air pollution falls onto it) are much less apparent. Let's considerthe main causes and types of land pollution in turn.

*1. Deforestation and soil erosion*

*2. Agricultural activities:*

*3. Mining activities*

*4. Overcrowded landfills*

*5. Industrialization*

*6. Construction activities*

Due to urbanization, large amount of construction activities are taking place which hasresulted in large waste articles like wood, metal, bricks, plastic that can be seen by naked eyesoutside any building or office which is under construction.

*7. Nuclear waste*

*8. Sewage treatment*

*Effects of Land Pollution*

***1. Soil pollution:***

Soil pollution is another form of land pollution, where the upper layer of the soil isdamaged. This is caused by the overuse of chemical fertilizers, soil erosion caused by runningwater and other pest control measures; this leads to loss of fertile land for agriculture, forestcover, fodder patches for grazing etc.

***2. Change in climate patterns***

The effects of land pollution are very hazardous and can lead to the loss of ecosystems.When land is polluted, it directly or indirectly affects the climate patterns.

***3. Environmental Impact***

When deforestation is committed, the tree cover is compromised on. This leads to asteep imbalance in the rain cycle. A disturbed rain cycle affects a lot of factors. To begin with,the green cover is reduced. Trees and plants help balance the atmosphere, without them we aresubjected to various concerns like global warming, the greenhouse effect, irregular rainfall andflash floods among other imbalances.

***4. Effect on human health***

The land when contaminated with toxic chemicals and pesticides lead to problem ofskin cancer and human respiratory system. The toxic chemicals can reach our body throughfoods and vegetables that we eat as they are grown in polluted soil.

***Solutions for Land Pollution***

1. Make people aware about the concept of Reduce, Recycle and Reuse.

2. Reduce the use of pesticides and fertilizers in agricultural activities.

3. Avoid buying packages items as they will lead to garbage and end up in landfill site.

4. Ensure that you do not litter on the ground and do proper disposal of garbage.

5. Buy biodegradable products.

6. Do Organic gardening and eat organic food that will be grown without the use of

pesticides.

7. Create dumping ground away from residential areas.

8. Reduce the amount of plastic you use

Natural hazards

ATMOSPHERIC

Hailstorms  
Hurricanes  
Lightning  
Tornadoes  
Tropical storms

OTHER GEOLOGIC/HYDROLOGIC

Debris avalanches  
Expansive soils  
Landslides  
Rock falls  
Submarine slides  
Subsidence

HYDROLOGIC

Coastal flooding  
Desertification  
Salinization  
Drought  
Erosion and sedimentation  
River flooding  
Storm surges

Seismicity

Fault ruptures  
Ground shaking  
Lateral spreading  
Liquefaction  
Tsunamis  
Seiches

Wind Hazard

• Eliminate the hazards by stopping a work task that poses a hazard due to wind conditions (i.e., roof work, lifting operations).

• Jobs involving aerial lifts, cranes and sheathing materials must be properly evaluated with wind conditions.

• Different or additional PPE may be required (goggles vs. safety glasses against flying dust and debris).

• Park heavy equipment and light duty vehicles so that the wind is not blowing directly against the side used to enter/exit the vehicle.

• Do not react or reach for dropping objects (i.e. losing a hardhat in the wind). This can result in slips, falls and strain/sprains.

• All hoarding must be designed/engineered to sustain loads to which it is likely to be subjected, such as wind, snow loads and falling debris.

• Fencing must be set back an appropriate distance from the edge of an excavation - which varies depending on site conditions.

• Where a scaffold is enclosed by a tarp or other cover, induced loads (i.e. wind) must be considered. Consult with the manufacturer's instructions for the scaffold or seek the direction of a professional engineer

Floods

Days of heavy rain from 05 September, 2018, caused flooding in several districts of Odisha in eastern India, affecting around 90,000 people.

Special Relief Commissioner, Odisha said that at least 41 locations recorded more than 100 mm of rain in 24 hours to 06 September, 2018 and a further 25 locations the next day.

The heavy rain caused the Baitarani river to overflow in several locations. On 07 September the river stood at 18.47 metres in Akhuapada, Bhadrak district, above the danger mark of 17.83 metres. CWC also says that levels of the Hirakud Dam in Sambalpur are extremely high.

As of 09 September, India’s Ministry of Home Affairs Disaster Management Division (DMD) reported that 13,890 people had evacuated their homes and were staying in 80 relief camps in Bhadrak, Jajpur and Kendrapara districts.

Event

Odisha, India, September 2018

Date September 5, 2018

Type River flood

Cause

Extreme rainfall, Long-term rainfall

Magnitude

River level

18.47 metres Baitarani river, Akhuapada, Bhadrak - September 7 to September 7, 2018  
Warning Level (WL): 17.33 Meters (m); Danger Level (DL): 17.83 Meters (m); Highest Flood Level (HFL): 21.95 Meters (m)

Rainfall level

139 mm in 24 hours Chandbali - September 7 to September 8, 2018 Ogimet figures

Rainfall level

282 mm in 24 hours Chandbali - September 6 to September 7, 2018 Ogimet figures

Damages

Evacuated

13890 people September 6 to September 9, 2018 80 relief camps opened to house all displaced

Famrland

4009 hectares September 6 to September 9, 2018 Flooding also caused damages to roads, bridges, culverts, embankments, power supply and telecommunication, according to India's Ministry of Home Affairs Disaster Management Division.

**Air Environment**

Climate and Micro-meteorology of the study area

The climate of the study area is classified as tropical monsoon climate with following four main seasons:

► Winter season: January and February

► Pre-monsoon season: March to May

► Monsoon season: June to September

► Post monsoon Season: October to December

a) IMD Meteorological Data

The secondary data on ambient temperature, atmospheric pressure, relative humidity and wind speed has been analysed based on Indian Meteorological Department (IMD) data.

After a preliminary reconnaissance of the study area and taking into account of major activities in proposed drinking water supply, it is concluded that no major source of air pollution exists in the project area. The other sources identified for air pollution are local traffic, small scale industries and domestic emissions. Ambient air quality in the study area is collected from the regional Pollution Control Board and secondary sources for the assessment of the air quality. The air quality monitored at Science Centre.

**Air Quality in Bhadrak:**

|  |  |
| --- | --- |
| O3 | 11.25 µg/m³, AQI 11   Good |
| PM2.5 | 136.56 µg/m³, AQI 300   Severe |
| SO2 | 33.11 µg/m³, AQI 33   Good |
| CO | 1530.0 µg/m³, AQI 76   Severe |
| Humidity | 69.0 % |
| Barometric Pressure | 1015.0 hPa |
| Wind Speed | 5.55 m/s |
| Wind Direction | 14.0 degrees |

**NOISE**

Noise-emitting construction activities include earthworks, concrete missing, demolition works, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates. The significance of noise impact will be higher in areas where noise-sensitive institutions such as health care and educational facilities are situated. The follow items that Noise levels should not exceed the national standards for noise or WHO noise level guidelines, whichever is more stringent, or result in increase in background noise levels of 3 decibels at the nearest receptor location off-site. [[1]](#footnote-1)

Mitigation measures include:

1. using equipment that emits the least noise, well maintained and with efficient mufflers;
2. restricting noisy activities to day time, and avoiding use of noisy equipment or doing noisy works at night time;
3. limit engine idling to a maximum of one minute;
4. spread out the schedule of material, spoil and waste transport; and
5. minimizing drop heights when loading and unloading coarse aggregates.

**Climate**http://orienvis.nic.in/images/line_black.gif

The state has tropical climate, characterized by high temperature, high humidity, medium to high rainfall and short and mild winters. As per Koppen’s climatic classifications most part of Odisha comes under the AW having a tropical Savannah type of climate. The south-west monsoon normally sets in between 5th June and 10th June in the coastal plain, and by 1st July the whole of the state is under the full sway of the south-west monsoons. By 15th October, the south-west monsoon withdraws completely from Odisha. These are the normal dates which fluctuate from year to year. As per “Thornthwaite’s classification”, Odisha comes under the “Sub humid” category, implying deficient winter rains.

On the basis of climate type, Orissa has been divided into ten agro-climatic zone. The normal rainfall of the state is 1451.2 mm. About 75% to 80% of rainfall is received from June to September. Floods, droughts and cyclones occur almost every year varying intensity.

**Climate Change**

With a 480 km coast line that is prone to climate-mediated cyclones and coastal erosion and water resources dependent on monsoons, Orissa is relatively more vulnerable to climate change. Water-consuming rice is its main crop and therefore its agriculture is vulnerable to the vagaries of climate-induced weather changes. Though 38 percent of the state’s geographical area is recorded as forests, much of these forests are degraded. Vector-borne diseases, particularly malaria, are fairly rampant and climate change may make the prevalence of the disease even more widespread.

Indeed, climate change has the potential to derail the current growth strategy and deepen poverty in Orissa. Continuing climate variation is predicted to alter the sectoral growth, including the ability of the poor to engage in farm and nonfarm sector activities. The direct impacts of extreme climate-induced events could include loss of life, livelihoods, assets and

infrastructure. All of these could affect the state’s economic growth and nullify the effectiveness of macro economic policies and pro poor initiatives.

**Climate Risks in Odisha**

* High variability of rainfall, leaving people with two peak periods of food shortage
* Drought and dry spells at an interval of every two years in Western Orissa with a major drought every 5-6 years
* Flash floods during rainy season
* Heat waves in summer
* Intense coastal flooding and cyclones

**Climate change issues relevant to Orissa**

Climate projections for India suggest that impacts are likely to be varied and heterogeneous, with some regions experiencing more intense rainfall and flood risks, while others will encounter less rainfall and prolonged droughts. Among the more substantial effects is a projected spatial shift in the pattern of rainfall towards the already flood-prone coastal areas, while water-scarce regions become even more drought-prone and unproductive. India will also suffer from higher tides, more intense storms fueled by warmer oceans and further erosion along its coastline due to sea level rise. For India, climate variability and climate change pose huge risks to human life and threaten to endanger the sustainability of the country’s economic growth. India’s immense geographic diversity adds to the complexity of developing and implementing an adaptation strategy. The impacts will vary across States, sectors, locations and populations. Consequently, there can be no one-size-fits-all approach to developing a climate risk management strategy: approaches will need to be tailored to address state and local vulnerabilities and conditions.

Orissa has a 480 km vulnerable coast line, which is a periodic recipient of climate risks such as cyclones and coastal erosion. Orissa is rainfall dependent as its irrigation network does not cover the entire state. With a water-dependent crop, rice, as its main staple, the agriculture sector is vulnerable to the vagaries of climateinduced weather changes. In terms of health, the vector-borne disease - Malaria - is fairly rampant in many parts of the state. Although 38 percent of the state’s geographical areas are forests, much these forests are degraded.

Orissa also remains one of India’s poorest states. The estimates from the Planning Commission reflected in indices such as the percentage of population below the poverty line both in rural and urban areas, and the overall incidence of poverty in Orissa vis-a-vis rest of India reveal that Orissa remains one of the poorest among all the major states of India. The high poverty in Orissa is closely tied to low productivity in agriculture, which is in turn linked to the prevalence of small and marginal holdings. The GoO has realized that poverty reducing economic growth would need acceleration of progress in both agriculture and non-agricultural sectors. Climate change is predicted to impede poverty alleviation programmes in Orissa both directly and indirectly compromising the current growth strategy. The direct impacts could include loss of life, livelihoods, assets, infrastructure, etc. from climatic extreme events. The indirect effects could be the effect on economic growth. Continuing climate change variation is predicted to alter the sectoral origins of growth, including the ability of the poor to engage in the non-farm sector. This could nullify the pro-poor potential of macroeconomic policies, trade and private sector investment.

Climatic variations could further multiply the vulnerability of poor people by adversely 30 Orissa Climate Change Action Plan affecting their health and livelihoods and jeopardizing growth opportunities vital for poverty reduction. Climate change in Orissa has the potential to tremendously aggravate water stress and enhance food insecurity.

Odisha State Disaster Management Authority (OSDMA) has done a multi-hazard mapping for all the thirty districts of the state. The results are given below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Districts** | **Wind & Cyclone** | **Flood** | **Drought** | **Earthquake** | **Accidents** |
| Bhadrak | 1 | 1 | 3 | 2 | 1 |

**Temperature:**

The mean minimum temperature of the bhadrak area is ranging from 19.1ºC – 27.8ºC during winter season and mean maximum temperature is ranging from 28.8ºC – 40.2ºC in summer season.

**Relative Humidity**

The mean humidity varies from minimum at 32.8% to maximum at 82.4% and the humidity figure shows that Chittoor area belongs to semi-humid region.

**Wind Speed**

At bhadrak, wind speed normally is in the range of 15 Km/hr. The wind speed range is high during October to December due to entry of NE monsoons.

**Wind Direction**

The predominant wind direction prevails from SW, W and NW. Following are the season wise predominant wind directions; during winter – Northwesterly, summer – Westerly, monsoon – Southwesterly and in post monsoon season – Northwesterly.

**Ecology baseline**

The ecological baseline is the [ecological value](https://www.designingbuildings.co.uk/wiki/Ecological_value) of a [site](https://www.designingbuildings.co.uk/wiki/Site) before [construction works](https://www.designingbuildings.co.uk/wiki/Construction_works) are undertaken. It can be compared to the [ecological value](https://www.designingbuildings.co.uk/wiki/Ecological_value) of the [site](https://www.designingbuildings.co.uk/wiki/Site) after [construction works](https://www.designingbuildings.co.uk/wiki/Construction_works) are complete to determine where there have been changes.

In this [context](https://www.designingbuildings.co.uk/wiki/Context), [ecological value](https://www.designingbuildings.co.uk/wiki/Ecological_value) is the importance, worth, or usefulness of a species, [habitat](https://www.designingbuildings.co.uk/wiki/Habitat) or [ecosystem](https://www.designingbuildings.co.uk/wiki/Ecosystem) in terms of its impact on other species and / or [habitats](https://www.designingbuildings.co.uk/wiki/Habitat), as well as other [environmental](https://www.designingbuildings.co.uk/wiki/Environmental), social, cultural and economic [value](https://www.designingbuildings.co.uk/wiki/Value) that can be delivered from species and [habitats](https://www.designingbuildings.co.uk/wiki/Habitat) and their interactions, specific to a geographical [frame](https://www.designingbuildings.co.uk/wiki/Frame) of reference.

**Aquatic ecology**

Fresh water Creek along Baitarani river, New Dhamra, District: Bhadrak, Diagnostic Characters Colour: Dark brownish above, fore femur almost straight and slightly constricted before apex, terminated by two distinct spines. The middle tibia longer than the hind tibia; the hind femur distinctly longer than the middle femur. Abdomen: moderately slender slightly widened in the middle; Connexival spines stout and long, almost reaching abdominal end (Proctiger). Segment 8 large, subcylindrical, with a prominent, triangular tubercle on the ventral surface. Pygophore large, subovate. Parameres connate and setose. Proctiger elongate, ovate with pointed apex.

Socio economic profile

POPULATION

The population projections are carried out as per the list of villages, population details and criteria mentioned in the tender document. Population projection has been arrived based on the population details of 2011 provided in the agreement. Population projections have been calculated based on Arithmetical increase method with a decadal growth rate of 14%. The projections were made for the Ultimate design year 2050 with Intermediate design year as 2035 and Base year as 2020. The system is designed for 30 years i.e. year 2050.

The abstract of the population projection for 1329 Nos. habitations covered under this water supply system is given in the table below.

Abstract of Projected Population

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bhadrak** | **Population** | **Projected Population with 14.0% per decade** | | |
| **2011** | **2020** | **2035** | **2050** |
| **Mega PWS Project to 84 GPs in Basudevpur, Chandabali, Tihidi and Dhamanagar blocks (1329 habitations)** | 6,16,838 | 6,94,564 | 8,47,257 | 10,29,065 |

# PUBLIC CONSULTATIONS AND DISCLOSURE

This section Identification of Stakeholders and Methods for Consultation Consultation during project preparation as an integral part of the environment and social assessment process not only minimizes the risks but involves the public as stakeholders in project preparation process, promotes public understanding of the project leads to timely completion of the project. The ESMP prepared also incorporates the views of the project beneficiaries and Project Affected Persons (PAPs) in the design of the mitigation measures and a management plan.

The specific aims of the consultation process are to:

► Provide clear and accurate information about the project to the beneficiary

community;

► Obtain the main concerns and perceptions of the public and their representatives

regarding the project

► Obtain opinions and suggestions directly from the impacted communities on their

preferred mitigation measures; and

► Identify local leaders with whom further dialogue can be continued in subsequent

stages of the project.

► Improve project design and, thereby, minimize conflicts and delays in implementation

► Increase long term project sustainability and ownership The primary stakeholders that were identified for the Bhadrak mega water supply project are the 84 Panchayat officials, representative of forest, water resource department and other relevant departments, PAPs and the direct beneficiaries. The secondary stakeholders include other individuals and groups, viz., the ULBs, other Governmental/Quasi-governmental departments, etc.

# ENVIRONMENTAL IMPACT ASSESSMENT

This chapter assesses key potential environmental impacts that are expected to occur during the project duration. The significance of the impacts has been assessed based on the methodology defined in Annexure XIII. The expected impacts have been categorized into the following two phases:

► Construction phase

► Operation phase

* 1. Project Area of Influence

In the proposed sub-project, direct and/or indirect impacts are generated which are rather short-term. It is expected that most of the impacts are temporary in nature and will cease once the construction is completed. Table 43 shows the influence area of the proposed sub-project components

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No | Component | Sub-component | Description of construction activity | Description of operation & maintenance activity | Influence area | List of sensitive receptors identified within influence area |
| 1 | Installation of new  pumps | Installation of new  pumps | installation of new  pumps along with noncorrosive painting | Oiling & Greasing,  Non-corrosive  painting | River bed | Aquatic life |
| 2 | Raw water  rising main | Construction of  Coffer Dam | Dewatering, construction  of coffer dam | No operation and  Maintenance  required | 15 m upstream and  15 m downstream  of 25 m of pipeline  to be laid in the river  bed | River bed. There is no  fishing or any water  related activity in  this area. |
| 3 | WTP | Construction WTP | Excavation, foundation,  civil, structural,  mechanical, electrical and  pavement works | Operating Pumps,  electric panels,  disinfection dosing  Maintaining Valves,  Screens, Pumps,  Chambers, Filters,  Aeration Pipe pores,  Dosing | 10 m periphery of  the WTP site | Labours / workmen |
| 4 | Clear water  rising main | Placement of pipeline | Excavation of foundation and Laying of 377.30km of pipeline | Intermediate  Connections  pipelines | 2 m along the pipe  line laying | Workmen |
| 5 | OHTs | OHT | Construction of OHT and boundary wall | Tank Cleaning,  maintenance of EST  Walls, Ladder  including painting | Around OHT | OHT Workmen |
| S. No | Component | Sub-component | Description of construction activity | Description of operation & maintenance activity | Influence area | List of sensitive receptors identified within influence area |
| 6 | Distribution system | Laying of pipeline of  1833.62 km. | Linear excavation for  laying pipes along the  roads, placing pipes in the trench and refilling with the excavated soil. The trenches will be of  maximum 1 m wide and  1.5 m depth | Monitoring for  Unaccounted Water  Loss by leakage/  seepage/pipe breaks | 2 m along the pipe  line | Land and habitation |
| 7 | Labour camp |  | Construction of Labour  Camp within WTP Area,  Labour huts, Drinking  water & sanitation facility  to labours, crèche, first aid  medical room , dismantling  of labour camp | None | WTP Site area | Labour and  contractors staff. |

Impacts due to project activity

Positive Impacts

Construction Phase

Employment opportunities: With the construction of the proposed Project, there will be employment opportunities for both skilled and unskilled workers from Bhadrak. This will be beneficial both from the economic and social point of view. Economically, it means abundant unskilled labour will be used in production. Several workers including casual labourers, plumbers and engineers are expected to work on the sitefor a period of time. Semi-skilled, unskilled and formal employees are expected toobtain gainful employment during the period of construction. With labour intensive construction technologies, the project will provide employment for youths and provide support to the GoO initiatives on creation of jobs.

► Creation of a market for construction: The Project will require materials, some of which will be sourced locally and some internationally. These include plant (pump sets, switch gear, instrumentation) pipes, valves, cement, sand and chemicals. This will provide a ready market for suppliers in and outside the project area

**Operation Phase**

Improved water quality will in turn reduce exposure to water borne diseases to the

consumers.

► General hygiene in the served area could improve through use of acceptable water

quality and enhanced availability (from 65 lpcd to 155 lpcd).

► Savings in time and effort: Piped water availability through household connections

will save time and effort spent earlier in fetching water, especially for women.

► Household water connections and metering will help to reduce water wastage –

currently estimated at 20 percent.

► Use of SCADA will reduce water wastage due to overflows at the OHTs, enhance

equity and timeliness in water supply.

► Availability of potable drinking water will contribute to improved living standards

within the sub-project area.

► Discontinuation of groundwater use and creating a new water supply system based

on nearest surface water sources

► Recovering backwash water from treatment process

Improve water use efficiency and reduce water wastage at household level by

recording and monitoring the water usage, and charging the consumers as per

usage. Minimize unaccounted for water (UFW) losses using leak detection, and

identifying unauthorized connections

► Using low-noise and energy efficient pumping systems

|  | **Impacts** |  |  | **Impact** | **Explanation of impact** | | |  |  | **Mitigation Measures** | | | |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **Significance** |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Impact utilities, | On | | Minor | ► | The proposed interventions will necessitate | | | | ► | . | | | | | | |
|  | movement | Traffi  c | |  | ► | road cuttings, excavations of trenches, and in some cases the relocation of existing public utilities resulting in the interruption of the services for a period of time | | | |  | Consult with the utility departments to demarcate the locations and alignments of electrical cables, water mains and communication cables | | | | | | |
|  |  |  |  |  | ► | The construction activities may necessitate partial traffic interruption, and temporary road cuts and vehicle and pedestrian traffic deviations. These could result in traffic congestion and increase risk of | | | | ►Prepare a | | | detailed | planning | | and construction | |
|  |  |  |  |  | ► | accidents Also, the materials supply and disposal will generate circulation of trucks increasing the traffic load on the various roads/ National highway Accidental damages to existing services (cables) might occur during excavation | | | |  | phasing schedule, and coordinate service interruption with public utilities and public administrations. (Works phasing shall be | | | | | | |
|  | Loss  of  Vegetation | | | Negligible |  | Land clearance for laying pipeline in forest land will not lead to felling of trees. No pipeline length of the current alignment passes through forest land and will For relaying pipeline in forest area, there will be no felling of trees and as per condition of NOC received from the Divisional Forest Officer. | | | |  |  | | | | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Impacts** |  | | **Impact** | **Explanation of impact** | | | |  | **Mitigation Measures** | | |  | | |
|  |  |  | | **Significance** |  | | | |  |  | |  |  |  | |
|  |  |  | |  | Site for clearance. | | | |  |  | | observed in order to confine land clearance with the RoW of the pipeline extent possible within the urban area The contractor will stockpile topsoil for reinstating flora along the road or in the areas which have been cleared vegetation The contractor will not fell/cut trees without a written consent from the competent authority and permission obtained from the respective officer for cutting of trees, along with a justification on the need for tree cutting | | | |  |
|  | **Construction Phase** | | | |  | | | |  |  | |  |  | |  |
|  | Traffic |  | |  | ► Traffic congestion and temporary | | | |  | ► | | The contractor will prepare and implement Traffic |  | | |
|  | interruption | and | |  | road closures (for sections where pipeline is | | | | |  | | Management Plan and traffic arrangements in | | | |  |
|  | vehicle, |  | |  | crossing key arterial roads) | | | |  |  | | consultations with the ULB, PIU staff and the traffic police. |  | | |
|  | pedestrian |  | |  | ► Increased movement of trucks for | | | | materials |  | |  |  | | |
|  | traffic deviations | | |  | supply and disposal will generate traffic | | | | | ► | | Trucks carrying materials should be restricted to |  | | |
|  |  |  | |  | congestion and risk of accidents. | | | |  |  | | hours for delivery of material and pick up of waste |  | | |
|  |  |  | |  | ► Traffic flow may also be impacted by | | | | |  | | material. (delivery hours must be set a part of | | | |  |
|  |  |  | |  | temporary road cuts. | | | |  |  | | planning) |  | | |
|  |  |  | |  |  | | | |  | ► | | Provide citizens advanced warning about |  | | |
|  |  |  | |  |  | | | |  |  | | partial/temporary road closures and rerouting of vehicle and pedestrian traffic, especially where |  | | |
|  |  |  | |  |  | | | |  |  | | schools/ colleges concerned. |  | | |
|  |  |  | |  |  | | | |  | ► | | Phasing of open work fronts should be scheduled |  | | |
|  |  |  | |  |  | | | |  |  | | so that multiple sites are not affected at the same time |  | | |
|  |  |  | |  |  | | | |  | ► | | At night time, all barriers and signs will remain at sites, with lighting and / or fluorescent signs |  | | |
|  |  |  | |  |  | | | |  |  | | Placed as required to warn both vehicular and pedestrian traffic, especially where trenches are left open |  | | |
|  |  |  | |  |  | | | |  | state to which it was or better, prior to construction. | | | | | |  |
| Impact | | | on |  | ► |  | Excavations to replace old pipelines and place | | | | ► Prior Information and consultation with hospitals, | | | | |
| accessibility | | | to |  |  |  | transmission lines may create temporary | | | | schools, institutions and local authorities wherever | | | | |
| buildings | | |  |  |  |  | difficulties of access to the adjacent buildings | | | | any sensitive receptor is concerned, such that | | | | |
| (houses, | | |  |  |  |  | and some disturbance of the neighbouring residents and users. | | | | access should not be disturbed or affected. | | | | |
| Businesses schools) | | | and |  |  |  |  | | | | ► Where areas are excavated, temporary fencing, bridges, and access routes should be provided | | | | |
|  | | |  |  | ► |  | Minor, temporary disruptions mostly related to temporary disruption of entrances. | | | |  | | | | |
|  | | |  |  |  |  | |  | | | ► Signage should clearly mark the dedicated | | | | |
|  | | |  |  |  |  | |  | | | pedestrian route, to facilitate access and avoid | | | | |
|  | | |  |  |  |  | |  | | | accidental falls into these areas | | | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Impacts** |  | **Impact** | **Explanation of impact** | | | **Mitigation Measures** |
|  |  | **Significance** |  |  |  |  |
| Impact | on |  | ► |  | Excavations to replace old pipelines and place | ► Prior Information and consultation with hospitals, |
| accessibility | to |  |  |  | transmission lines may create temporary | schools, institutions and local authorities wherever |
| buildings |  |  |  |  | difficulties of access to the adjacent buildings | any sensitive receptor is concerned, such that |
| (houses, |  |  |  |  | and some disturbance of the neighbouring | access should not be disturbed or affected. |
| businesses | and |  |  |  | residents and users. | ► Where areas are excavated, temporary fencing, |
| schools) |  |  | ► |  | Minor, temporary disruptions mostly related to temporary disruption of entrances. | bridges, and access routes should be provided |
|  |  |  |  |  |  | ► Signage should clearly mark the dedicated |
|  |  |  |  |  |  | pedestrian route, to facilitate access and avoid |
|  |  |  |  |  |  | accidental falls into these areas |
| Land |  | Minor | ► |  | There is a risk of water and soil contamination | ► All wastes/debris will be disposed as per the |
| Contamination | |  |  |  | in case of spills or leaks of oil, grease and | construction debris and waste management plan in |
|  |  |  |  |  | hazardous substances | Annex VIII |
|  |  |  | ► |  | Cross-contamination of previously non- | ► All storage containers containing fuel, oil, lubricant |
|  |  |  |  |  | contaminated soils from any pollutants/grease | should be adequately sealed and labelled. |
|  |  |  |  |  | or sediments from contaminated soils | ► The contractor will utilize BHADRAK official landfill at |
|  |  |  | ► | | Increased fire risk and the resulting | belahatti for waste generated on the construction |
|  |  |  |  |  | mobilization of hazardous smoke or air borne materials | site which has been approved by the ULB. |
|  |  |  |  |  |  | ► All waste and wastewater generated from the labour |
|  |  |  | ► |  | Poor or improper management of the stored | camp will be managed as per the specifications in |
|  |  |  |  |  | materials and wastes can result in dispersion | VII such that there is no significant impact on camp |
|  |  |  |  |  | of materials in the nearby canals, streets and | residents, the biophysical environment or |
|  |  |  |  |  | adjacent properties. | surrounding communities. |
|  |  |  | ► The estimated amount of waste is as follows: | | | ► The contractor shall maintain Maintain the MSDS |
|  |  |  |  | i. Construction waste: Nil | | Sheets incase of any hazardous materials on site. |
|  |  |  |  | ii. Domestic waste (labour camp):10 kg per day | | ► Adopt the provisions in the Emergency Response |
|  |  |  |  |  |  | Plan in case of any leakage or hazardous material spill. |
|  |  |  | iii. Hazardous waste: Nil | | |  |
|  |  |  | iv. | | Other wastes: Nil | ► Construction contractor will ensure daily collection, |
|  |  |  |  |  | (packaging waste ) | a designated storage area, segregation and periodic |
|  |  |  |  | v. Concrete waste – 1 tons per annum | | (monthly) disposal of construction waste generated |
|  |  |  |  | |  | as per the ULB and OSPCB regulations. |
|  |  |  |  |  |  | ► Littering and burning of waste at the labour camp |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Impacts** | **Impact** | **Explanation of impact** | | |  |  | **Mitigation Measures** | |
|  | **Significance** |  |  |  |  |  |  |  |
|  |  | vii. | Bituminous | Waste-190.4175 | cu | m |  | will be strictly prohibited. |
|  |  |  | Domestic waste generated from labour | | | | ► | Segregated Domestic waste generated at the labour |
|  |  |  | camp can cause contamination of land. | | |  |  | camp will be stored onsite and handed over to ULB |
|  |  | ► | A small proportion of waste generated will | | | |  | for proper disposal by contractor |
|  |  |  | include used oil, hydraulic fluids, waste fuel, | | | | ► | Construction contractor will ensure that there is no |
|  |  |  | and grease and waste oil soaked rags. | | |  |  | unauthorized dumping of used oil and other |
|  |  |  |  |  |  |  |  | hazardous wastes. Such wastes will be stored |
|  |  |  |  |  |  |  |  | safely onsite and disposed periodically through |
|  |  |  |  |  |  |  |  | OSPCB/CPCB approved recyclers and records of |
|  |  |  |  |  |  |  |  | the same will be maintained. |
|  |  |  |  |  |  |  | ► Transport vehicles and equipment will undergo | |
|  |  |  |  |  |  |  |  | regular maintenance to avoid any oil leakages. |
|  |  |  |  |  |  |  | ► Unloading and loading protocols will be prepared for | |
|  |  |  |  |  |  |  |  | diesel, oil and used oil respectively and workers will |
|  |  |  |  |  |  |  |  | be trained to prevent/contain spills and leaks. |
| Soil Erosion | Minor | ► | Excavation and allied construction activities | | | | ► | Top soil will be managed as per the guidelines in |
|  |  |  | will make the top soil susceptible to erosion. | | |  |  | Annex VI |
|  |  |  |  |  |  |  | ► Construction activities (especially excavation work) | |
|  |  |  |  |  |  |  |  | will be undertaken in the dry season. |
|  |  |  |  |  |  |  | ► The contractor shall contain excavated materials in | |
|  |  |  |  |  |  |  |  | the vicinity of the worksite to prevent dispersion and |
|  |  |  |  |  |  |  |  | sedimentation of drains, creeks, streets and |
|  |  |  |  |  |  |  |  | adjacent properties |
|  |  |  |  |  |  |  | ► | Stripping of topsoil shall not be conducted earlier |
|  |  |  |  |  |  |  |  | than required to prevent the erosion (wind and |
|  |  |  |  |  |  |  |  | water) of soil. Excess topsoil will be used for |
|  |  |  |  |  |  |  |  | landscaping purposes. |
|  |  |  |  |  |  |  | ► The disturbed areas and soil stock piles will be kept | |
|  |  |  |  |  |  |  |  | moist to avoid wind erosion of soil. |
|  |  |  |  |  |  |  | ► | Topography will be restored and re-vegetated for |
|  |  |  |  |  |  |  |  | slope stabilization immediately after the completion |
|  |  |  |  |  |  |  |  | of construction at each location. |
|  |  |  |  |  |  |  | ► | In case of areas in the proximity of water bodies, |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  | **Impacts** |  | **Impact** | **Explanation of impact** | | | | | **Mitigation Measures** | | |  |  |
|  |  |  | **Significance** |  |  |  |  |  |  |  |  |  | |  |
|  |  |  |  |  |  |  |  |  |  | small bunds will be created and silt traps will be | |  |  |
|  |  |  |  |  |  |  |  |  |  | provided to prevent washing of the soil into these | |  |  |
|  |  |  |  |  |  |  |  |  |  | water bodies. | |  |  |
|  |  |  |  |  |  |  |  |  | ► ‘Muck Disposal is not required for this project. | | |  | |  |
|  |  |  |  |  |  |  |  |  |  | Plan’ will be prepared in consultation with the Forest | |  | |  |
|  |  |  |  |  |  |  |  |  |  | Department and will include measures for soil | |  | |  |
|  |  |  |  |  |  |  |  |  |  | erosion control in the forest area. | |  | |  |
|  | Impact | on | Moderate | ► | Around 5000 kl of water will be required for | | | | ► The contractor will ensure sourcing of water through | | |  | |  |
|  | Water |  |  |  | civil works during the construction process, | | | |  | tanks will be done after proper verification of the | |  | |  |
|  | Availability |  |  |  | sprinkling for dust supression and for | | | |  | source of water | |  | |  |
|  |  |  |  |  | consumption and use by workers. | | |  | ► | Construction labour will be sensitized about water | |  | |  |
|  |  |  |  | ► The duration of the impact is assessed to be | | | | |  | conservation. | |  | |  |
|  |  |  |  |  | short-term, *i.e.* during construction and will be | | | | ► Optimum use of water will be done during sprinkling | | |  | |  |
|  |  |  |  |  | fluctuating with peak and low phases. | | | |  | on roads for dust settlement, washing of vehicles, | |  | |  |
|  |  |  |  | ► Extraction of water from nearby surface water | | | | |  | etc. | |  |  |
|  |  |  |  |  | sourced, will lead to local shortage of water | | | | ► | Wastewater generated from the washing/cleaning | |  | |  |
|  |  |  |  |  | that may cause hardship to nearby | | | |  | area in camp site, after passing through oil & grease | |  | |  |
|  |  |  |  |  | communities. | |  |  |  | trap and curing area can be re-used for water | |  | |  |
|  |  |  |  | ► | Replacement of the rising main will involve | | | |  | sprinkling and wheel washing. | |  | |  |
|  |  |  |  |  | construction of cofferdam near the intake | | | | ► | Total 2-3 days will be required for replacing the | |  | |  |
|  |  |  |  |  | using temporary barriers. Water will be | | | |  | rising main line. Adequate communication regarding | |  | |  |
|  |  |  |  |  | pumped out to make the area dry for | | | |  | this will be made to local communities through print | |  | |  |
|  |  |  |  |  | construction. During the replacement of rising | | | |  | media and notices minimum 7 days prior to | |  | |  |
|  |  |  |  |  | main pipeline, there will be no supply of water, | | | |  | construction activity. | |  | |  |
|  |  |  |  |  | which | will | create | temporary |  |  | |  | |  |
|  | Impact | on | Moderate | ► | Pumping and discharging of storm water off- | | | | ► Wastewater from construction site should not be | | |  | |  |
|  | Water Quality |  |  |  | site from the excavated trenches | | |  |  |  | |  | |  |
|  |  |  |  | ► | Chances of contamination of surface and | | | |  | lead to breeding of mosquitoes. Septic tanks/soak | |  |  |
|  |  |  |  |  | groundwater resources may occur due to | | | |  | pits should be provided for its disposal (as per | |  |  |
|  |  |  |  |  | improper | management of | | wastewater |  | specifications given in IS 2470 1995 Part I and Part | |  | |  |
|  |  |  |  |  |  |  |  |  |  |  | |  |

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| **Impacts** | **Impact** | **Explanation of impact** | | | | | | | | **Mitigation Measures** | |  |
|  | **Significance** |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | (sewage, grey water) at project labour camp | | | | | | |  | II) onsite and at labour camp. |  |
|  |  |  | or other accidental spills/leaks at the storage areas. | | | | | | |  | Proper cover and stacking of loose construction |  |
|  |  |  |  | |  |  |  |  |  | ► |  |
|  |  | ► | Surface | | runoff | carrying the | | excavated loose | |  | material and excavated loose soil will be ensured to |  |
|  |  |  | top soil will lead to increased sedimentation in the receiving water bodies | | | | | | |  | prevent surface runoff and contamination of |  |
|  |  |  |  | | | | | | |  | receiving water bodies. |  |
|  |  | ► Replacement of the rising main/pumps would | | | | | | | | ► Dumping of debris in or nearby water bodies will be | |  |
|  |  |  | lead to an impaxct water quality due to | | | | | | |  | strictly avoided. All the waste generated |  |
|  |  |  | increase | | in | turbidity | | and | chemical |  | (construction waste, labour camp waste) will be |  |
|  |  |  | contamination from paints in the construction | | | | | | |  | collected, segregated, stored and disposed in an |  |
|  |  |  | work. Increase in silt content and water | | | | | | |  | environmentally suitable manner. |  |
|  |  |  | turbidity. | |  |  |  |  |  | ► Silt curtain will be deployed to completely enclose | |  |
|  |  | ► | The | Contractor | | may need to extract storm | | | |  | the cofferdam installation and removal works. |  |
|  |  |  | waters from the trenches and other | | | | | | | ► | Sheet piling will be cut off at elevations approved in |  |
|  |  |  | construction works to ensure effective working | | | | | | |  | advance byOUDICO–Engineer in order to minimize |  |
|  |  |  | conditions; the discharge of the pumped water | | | | | | |  | damage to foundation soils adjacent to the |  |
|  |  |  | can impact surface waters and drainage | | | | | | |  | structures , and the cut off portions will be removed |  |
|  |  |  | systems and cause erosion. | | | | |  |  |  | from the site |  |
|  |  |  | Replacement of the rising main will involve | | | | | | |  |  |  |
|  |  |  | construction of cofferdam at the selected site | | | | | | |  |  |  |
|  |  |  | using temporary barriers. Water would be | | | | | | |  |  |  |
|  |  |  | pumped out to make the area dry for | | | | | | |  |  |  |
|  |  |  | construction. Removal of temporary barriers | | | | | | |  |  |  |
|  |  |  | once the work is over, may damage the | | | | | | |  |  |  |
|  |  |  | foundation soils adjacent to the structure and | | | | | | |  |  |  |
|  |  |  | may have temporary impacts. | | | | | |  |  |  |  |
| Impact on Air | Moderate | ► | Air quality in and around the project site would | | | | | | | ► | The batching plant will conform to CPCB general |  |
| Quality |  |  | be | impacted | | to | some | extent | due to |  | emission and noise standards for noise. The |  |
|  |  |  | construction | | | and | construction | | related |  | contractor will obtain a consent from Pollutin control |  |
|  |  |  | activities. The main impacts will be from site | | | | | | |  | board before the plant is operational. |  |
|  |  |  | levelling, earthworks, excavation, construction | | | | | | | ► | The emissions from diesel generators (meant for |  |
|  |  |  | material handling, dismantling of existing | | | | | | |  | emergency power requirement) will be controlled to |  |
|  |  |  | structures, wind-generated dust from exposed | | | | | | |  | minimise impacts of air emissions by optimised |  |

| **Impacts** | **Impact** | **Explanation of impact** | **Mitigation Measures** | | |
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|  | **Significance** |  |  |  |  |
|  |  | areas of soil and mounds of stored soil and |  | operations, orientation at the site and providing | |
|  |  | use of DG sets, etc. |  | stack height as per stack height criteria of Central | |
|  |  | ► A batching plant would be set up at WTP site would have air quality impacs |  | Pollution Control Board) from ground level for wider dispersion of gaseous emissions. Proper | |
|  |  | ► Dust generated from vehicle movements |  | maintenance of engines and use of vehicles with | |
|  |  | emissions from construction traffic and onsite machinery |  | ‘Pollution under Control Certificate’ will be ensured. | |
|  |  | Dust and air pollutants emitted could affect the community residing in the nearby areas 13 depending upon prevailing wind directions and speed, causing minor respiratory impacts on site workers, nearby residents and pedestrians | ► | Fugitive dust emissions will be suppressed by spraying water and wetting of the stockpiles. | |
|  |  | ► Proper location of material stockpiles will be | | |
|  |  |  | ensured (especially sand and soil). All such loose | |
|  |  |  | screens to prevent erosion and generation of | |
|  |  |  | fugitive dust. When not in use, all stockpiles of the loose construction material will be covered with tarpaulin sheets | |
|  |  |  | ► Trucks transporting soil and material will be covered with tarpaulin sheets | | |
|  |  |  | ► Dust masks and eye protection against dust, | | |
|  |  |  |  | splinters, debris etc. should be provided to | |
|  |  |  |  | construction workers where required. | |
| Noise | Moderate | ► The major sources of noise will be use of | ► All vehicles and machinery will conform to Central | | |
| Environment |  | heavy machinery, vehicles, and operation of |  | Motor and Vehicle Act 1988, EP Act 1986 Noise | |
|  |  | DG sets, batching plant, and demolition of |  | Rules 2002 |  |
|  |  | existing structures such as the existing WTP | ► Hammering | | and vibration compaction will be |
|  |  | and OHT |  | minimised when in close proximity to structures, | |
|  |  | ► Construction activities will increase noise |  | buildings or property boundary where applicable, | |
|  |  | levels and impact nearby communities, |  | residential class mufflers and engine shrouds | |
|  |  | especially the sensitive receptors (hospitals, |  | (acoustic lining) will be used on all equipment. | |
|  |  | schools, etc.). | ► | Normal working hours of the contractor will be | |
|  |  |  |  | between 06:00 and 18:00 hours. Contractor should | |

1. nearest resident located approximately 30m from proposed site

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| **Impacts** | **Impact** |  | **Explanation of impact** |  | **Mitigation Measures** |
|  | **Significance** |  |  |  |  |

ensure that the ambient noise level near the project site is within the day time noise standard (refer Annexure V for applicable standards).

► Only well-maintained equipment will be operated

on-site, and, regular maintenance of equipment

such as lubricating moving parts, tightening loose

parts and replacing worn out components will be

conducted. Machineryand equipment that maybein intermittent use will be shutdown or throttled down during non-work periods.

► Low noise equipment will be used as far as

practicable, and the number of equipment operating simultaneously will be reduced as far as practicable

► Equipment known to emit noise strongly in one

direction will be oriented so that the noise is

directed away from nearby sensitive receptors as

far as practicable.

►Earplugs should be provided to workers involved in unloading operations

► Timely maintenance and servicing of transportation vehicles and the machinery/pumps to be used during construction phase to reduce the noise generation due to friction and abrasion

► In cases where contractor will perform night time

work, prior notice and consent will be taken from

nearby residents.DG sets shall be provided with acoustic enclosure and comply with CPCB norms

► Monitoring of Noise levels shall be carried out on monthly basis to check the level of pollutants and effectiveness of the proposed ESMP

► Minimal use of vehicle horns in the project area will be encouraged Equipment noise will be 85 Db(A) at 1 m from

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| **Impacts** |  |  | **Impact** | **Explanation of impact** | | **Mitigation Measures** | |
|  |  |  | **Significance** |  |  |  |  |
| Increased |  |  |  | ► | The construction activities will necessitate temporary on-site storage of construction materials and excavated materials; poor  management of the stored materials and wastes can result in dispersion of materials in the nearby drainage systems, streets and adjacent properties. Appropriate disposal of construction wastes could minimize similar issues at the final disposal site | ► | The contractor shall handle construction materials |
| generation |  | of |  |  |  | and waste in accordance with approved procedures in Annex VIII and Annex VII. |
| Waste fromConstruction | |  |  |  | ► Sites for temporary piles should be agreed with PIU and local authorities. | |
| materials |  |  |  |  | ► The community should be made aware of constraints imposed on the contractor for waste collection, storage and disposal In case of accidental waste dispersion, CSQC/PIU shall be informed and restoration measures shall be applied. Waste materials are to be disposed as per the consent given by the ULB provided in Annex III. | |
|  |  |  |  | ► | Wastes would be generated from discarded construction materials, cement bags, wood, steel, oils, fuels and other similar items. | ► |  |
|  |  |  |  |  |  | Waste concrete will be reused and recycled to the extent possible to help in pollution prevention and conservation of natural resources. |
|  |  |  |  | ► Domestic solid wastes may also be generated from the workers’ camp. Improper waste management could cause odour and rodent problem. | |  |  |
| Occupational | |  | Moderate | ► | Construction site personnel (including | ► | The contractor will follow the provisions for OHS |
| Health & Safety | | |  |  | workers) will be exposed to risk of accidents |  | management plan in Annex VIII. In addition, all |
| Risk |  |  |  |  | from handling of heavy equipment, working at heights in OHTs, working in excavated pits electrical work, etc., |  | Workers will be trained on Environment Health & |
|  |  |  |  |  |  | Safety with an aim of improving awareness.this |
|  |  |  |  |  |  | cludes use of PPE, HIV prevention, maintainence of campsite hygiene. |
|  |  |  |  | ► | Increased air pollution and noise levels will |  | Provision of all workers with requisite personal |
|  |  |  |  |  | directly impact construction workers and site | ► |
|  |  |  |  |  | personnel. |  | protective equipment. |
|  |  |  |  | ► | The excavation trenches for placement of | ► | Provision of onsite drinking water and sanitation |
|  |  |  |  |  | risks to vehicles and workers; long pipe |  | facilities. |
|  |  |  |  |  | alignments can create health and safety risks for both workers and pedestrians |  | Provision of signage’s at all construction sites enforcing/ reminding use of PPE and safety |
|  |  |  |  |  |  |  | practices. |

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|  |  | ► |  |  |  |  | ► | Safety conditions in the trenches during | | |
|  |  |  |  |  |  |  |  | construction phase shall be ensured using | | |
|  |  |  |  |  |  |  |  | appropriate shoring systems and dewatering | | |
|  |  |  |  |  |  |  |  | mechanisms. |  |  |
|  |  |  |  |  |  |  | ► Safe access and thoroughfare must be provided | | | |
|  |  |  |  |  |  |  |  | on construction site always. Dangerous areas shall | | |
|  |  |  |  |  |  |  |  | be clearly identified with appropriate signs, lights and | | |
|  |  |  |  |  |  |  |  | flagmen. |  |  |
|  |  |  |  |  |  |  | ► | Excavated areas shall be clearly marked to avoid | | |
|  |  |  |  |  |  |  |  | accidental falls into these areas, and clearly lit at | | |
|  |  |  |  |  |  |  |  | night. |  |  |
|  |  |  |  |  |  |  | ► | Regular monitoring by supervising engineers of | | |
|  |  |  |  |  |  |  |  | contractors’ compliance with safety procedures. | | |
|  |  |  |  |  |  |  | ► Use of de-watering, side-walls support, and slope | | | |
|  |  |  |  |  |  |  | ► gradient adjustments that eliminate or minimize the | | | |
|  |  |  |  |  |  |  |  | risk of collapse, entrapment, or drowning in | | |
|  |  |  |  |  |  |  |  | excavated areas | |  |
|  |  |  |  |  |  |  | ► Providing safe means of access and egress from | | | |
|  |  |  |  |  |  |  | ► excavations, such as graded slopes, graded access | | | |
|  |  |  |  |  |  |  |  | route, or stairs and ladders | |  |
|  |  |  |  |  |  |  | ► Job rotations | | should be practised | for people, |
|  |  |  |  |  |  |  |  | working in high noise level areas | |  |
|  |  |  |  |  |  |  | ► Risk of free fall of materials should be minimized | | | |
|  |  |  |  |  |  |  |  | by installing telescoping arm loaders and conveyors | | |
|  |  |  |  |  |  |  | ► Firefighting facility should be provided at the camp | | | |
|  |  |  |  |  |  |  |  | site and trained personnel should be available at | | |
|  |  |  |  |  |  |  |  | site who can operate the fire extinguishers and | | |
|  |  |  |  |  |  |  |  | other fire-fighting equipment. | |  |
|  |  |  |  |  |  |  |  |  |  |  |

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|  | **Impacts** | **Impact** | **Explanation of impact** | **Mitigation Measures** | | |  |
|  |  | **Significance** |  |  |  |  |  |
|  | Community Health & Safety |  | During peak time of construction approximately 350 labours would be required, |  |  | |  |
|  | Risk |  | of which 55 would be migrant labour (skilled |  |  | |  |
|  |  |  | and unskilled). Labour requirements will also | ► | Vaccinating workers against common and locally | |  |
|  |  |  | be met from local populations, but |  | prevalent diseases; and establishment of health | |  |
|  |  |  | approximately 15 % would need to be sourced |  | centres at camp and construction site for routine | |  |
|  |  |  | from outside Bhadrak district to meet the |  | health screening. | |  |
|  |  |  | requirement. | ► | Mandatory and regular training for workers on | |  |
|  |  |  | ► Arriving migrant workers will require housing, |  | required code of conduct and and consequences for | |  |
|  |  |  | food supply, merchandize, transport, health |  | failure to comply with law | |  |
|  |  |  | care, entertainment, social interaction, etc. | ► Measures described earlier for controlling impact on | | |  |
|  |  |  | ► If not managed appropriately this influx of |  | air quality, noise levels and improper wastewater | |  |
|  |  |  | workers (and followers) can lead to adverse |  | discharges will also help to mitigate the community | |  |
|  |  |  | social and environmental impacts on local |  | impacts. | |  |
|  |  |  | communities. | ► A traffic management plan will be prepared by the | | |  |
|  |  |  | ► Laying of pipes may necessitate the re-routing |  | contractor, approved by the ULB, and implemented | |  |
|  |  |  | of vehicular and pedestrian traffic and |  | throughout the construction period, to ensure | |  |
|  |  |  | introduce traffic delays, thereby increasing |  | smooth traffic flow and minimize disruption. | |  |
|  |  |  | travel time, cost, and risk of accidents to | ► Public information notices with work start and | | |  |
|  |  |  | pedestrians, and young students, especially at |  | completion dates, contact details of ULB officials, | |  |
|  |  |  | areas which are excavated, and access to |  | traffic diversion details, etc., will be put up in local | |  |
|  |  |  | important buildings, campuses may be |  | newspapers and distributed as pamphlets (including | |  |
|  |  |  | affected. |  | in the local language). | |  |
|  |  |  | ► Access to construction sites by unauthorized | ► | The contractor will follow the specifications in the | |  |
|  |  |  | persons (including children) may cause |  | labour camp plan Annex VII | |  |
|  |  |  | accidents. | ► OUDICOwill issue the directives to Contractor and | | |  |
|  |  |  |  |  | Contractor will accordingly prepare code of conduct | |  |
|  |  |  |  |  | for all labour and staff. | |  |
|  |  |  |  | ► Necessary directives will be given to Contractor for | | |  |
|  |  |  |  |  | hiring the local work force. | |  |
|  |  |  |  | ► | Details of project will be displayed at prominent | |  |
|  |  |  |  |  | places such as ULB's office and Deputy | |  |
|  |  |  |  |  | Commissioner's office | |  |
|  |  |  |  | ► Responsibilities for managing these impacts will be | | |  |
|  |  |  |  |  |  |  |  |
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|  | **Impacts** | **Impact** |  | **Explanation of impact** |  | **Mitigation Measures** |
|  |  | **Significance** |  |  |  |  |
|  |  |  |  |  |  | reflected as a contractual obligation, with |
|  |  |  |  |  |  | appropriate mechanisms for addressing non- |
|  |  |  |  |  |  | compliance. |

► Caution boards, barricades, etc., will be used to

warn the public about unauthorized access and

danger. Additional monitoring on these aspects will

be undertaken at locations close to sensitive

receptors such as schools and playgrounds.

► Deploy temporary security guards in critical areas

such as labour camp, construction camp, to prevent

unauthorized access.

► Install lighting devices and safety signal devices in

the temporary access areas and construction sites.

►

**Operation Phase**

|  |  |  |  |
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| Impacts on Air | Minor | ► Gaseous pollutants will be generated may be | ► BIS guidelines for safety in chlorination plants (IS |
| Quality |  | from accidental release of chlorine gas in | 10553 – Part 1) will be followed (see Annexure XII). |
|  |  | WTP. | ► Emergency scrubbing arrangement will be provided |
|  |  | ► Emissions from diesel fuel combustion in | in the WTP to prevent accidental emission of |
|  |  | diesel generators14 at WTP, and from | chlorine gas. |
|  |  | operation of transportation vehicles. | ► Diesel generators will be operated only for |
|  |  |  | emergency power backup. The emission source of |
|  |  | ► | diesel generators will have adequate stack height |

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| **Impacts** |  | **Impact** | **Explanation of impact** | | |  |  | **Mitigation Measures** |  |
|  |  | **Significance** |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | will conform to the set norms of CPCB. Also regular | |
|  |  |  |  |  |  |  |  | maintenance of diesel engines will be ensured. | |
|  |  |  |  |  |  |  |  | ► Only vehicles holding valid Pollution under Control | |
|  |  |  |  |  |  |  |  | Certificates will be used for transportation. |  |
|  |  |  |  |  |  |  |  | ► There will be peripheral plantation of trees around | |
|  |  |  |  |  |  |  |  | the WTP to filter any dust emissions and reduce | |
|  |  |  |  |  |  |  |  | impacts n surrounding areas. |  |
| Impacts | on | Moderate | ► | The major noise generating equipment during | | | | ► The DG sets will have inbuilt acoustic enclosure, | |
| Noise |  |  |  | operational phase are the pump sets at the | | | | silencers, air release valve, essential hoods, etc., | |
| Environment |  |  |  | intake well, and, air blowers, ventilation fans, | | | | and will meet the CPCB noise standards of 75 dB | |
|  |  |  |  | water pumps and DG Sets at the WTP. | | | | (A) at 1 meter from the enclosure surface. |  |
|  |  |  | ► All these are expected to result in increase in | | | | | The motors and pumps within enclosed chamber | |
|  |  |  |  | existing noise levels at the intake well and | | | | ► Ear plugs and ear muffs will be provided for the | |
|  |  |  |  | WTP premises. | |  |  | workers near noise generating sources at the intake | |
|  |  |  | ► | Settlements presents within 100 m of the | | | | and WTP. |  |
|  |  |  |  | WTP, can be affected during the operation | | | | Thick canopied trees will be planted around the | |
|  |  |  |  | phase. |  |  |  | WTP site to attenuate noise, if any, arising from the | |
|  |  |  |  |  |  |  |  | WTP in line with the guidelines of CPCB for green | |
|  |  |  |  |  |  |  |  | belt development15. |  |
|  |  |  |  |  | | | |  |  |
| Waste |  | Moderate | ► | The water treatment process will generate | | | | ► RCC sedimentation tanks will allow the | flow of |
| Generation |  |  |  | waste from rinsing and back washing of filter | | | | waste water to accumulate in the waste water tanks | |
|  |  |  |  | media | containing | debris, | chemical | so as to allow sufficient time for the sludge to settle | |
|  |  |  |  | precipitates, straining of organic debris and | | | | down Backwash water will be reused by directing it | |
|  |  |  |  | plankton. It is estimated that the backwash | | | | to the channel of raw water to flash mixer | via a |
|  |  |  |  | water will be about 5% of the WTP capacity. | | | | small pump |  |
|  |  |  | ► | The water treatment process will generate | | | | ► Any excess waste water that needs to be disposed | |
|  |  |  |  | sludge from sedimentation of particulate | | | | will be first tested for ensuring compliance with the | |
|  |  |  |  | matter in raw water, flocculated and | | | | CPCB’s ‘general standards for discharge of | |
|  |  |  |  | precipitated material resulting from chemical | | | | environmental pollutants’ and disposed at a location | |
|  |  |  |  | coagulation, residuals | | of excess | chemical | authorized by OSPCB. |  |

1. http://cpcbenvis.nic.in/scanned%20reports/PROBES-75%20Guidelines%20For%20Developing%20Greenbelts.pdf

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Impacts** |  | **Impact** | **Explanation of impact** | | | **Mitigation Measures** | |
|  |  | **Significance** |  |  |  |  |  |
|  |  |  |  | dosage, plankton etc. It is estimated that 0.52 | | ► | Accumulated sludge from clari-flocculators, filter |
|  |  |  |  | MLD of sludge will be generated. | |  | backwash, etc., will be channelled to the sludge |
|  |  |  | ► Improper disposal of sludge at any site may | | |  | drying beds for natural drying. The BHADRAK has |
|  |  |  |  | result in contamination of soil. | |  | identified Belahatti as the landfill site for disposal of |
|  |  |  |  |  |  |  | the sludge. A NOC has been obtained from BHADRAK for |
|  |  |  |  |  |  |  | disposal of sludge in the Belahatii land fill. |
|  |  |  |  |  |  | ► Hazardous waste like spent oil from generators | |
|  |  |  |  |  |  |  | and used oils generated from maintenance activity will be sent to authorised vendor of OSPCB/CPCB. |
| Reduced |  | Minor | ► The downstream flow is likely to be affected in | | | ► The sub-project will adhere to the limits in the water | |
| Downstream |  |  |  | case of abstraction over the permissible | |  | use permit issued by the WRD; |
| Flows |  |  |  | withdrawal limit as prescribed by Water | | ► | The Proponent shall monitor the hydrology to |
|  |  |  |  | Resources Department The prescribed limits | |  | determine whether there is reduced downstream |
|  |  |  |  | as per NOC received from WRD for water | |  | flow that may affect community residing |
|  |  |  |  | withdrawal are | 7.88 MLD in 2018 , 10.35 |  | downstream of the river |
|  |  |  |  | MLD in 2035- & 14 MLD in 2048. | |  |  |
| Increased |  | Moderate | ► As a result of the increase of water supply, it is expected that wastewater will increase | | | The ULB andOUDICOwill develop and implement a | |
| Waste water | in |  |  |  | | ULB, with the support of ongoing state and national | |
| BHADRAK area |  |  |  | proportionally with the implementation of the | | programmes, will implement sewerage network and | |
|  |  |  |  | sub-project, the net wastewater generation is | | treatment infrastructure system in the next 3-5 years. | |
|  |  |  |  | estimated to be 7.82 MLD16 by 2033 and is | |  | |
|  |  |  |  | expected to rise to 10.2 MLD by 2048.As 66% | |  |  |
|  |  |  |  | of BHADRAK has no drainage system at present, | |  |  |
|  |  |  |  | and no sanitary sewerage network this | |  |  |
|  |  |  |  | additional generation of waste water (sullage) | |  |  |
|  |  |  |  | is likely to flow into open drains and natural | |  |  |
|  |  |  |  | drainage system. | |  |  |
| Occupational |  | Moderate | ► | The WTP plant operation requires use of | | ► Handrails and guards will be installed around tanks, | |
| Health & Safety | |  |  | various chemicals in different stages of the | |  | trenches, pits, stairwells, and other accident-prone |
|  |  |  |  | process. |  |  | areas. |
|  |  |  | ► | The following | chemicals used during the | ► Flooring at the plant will be of non-skid type. | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Impacts** | **Impact** | **Explanation of impact** | **Mitigation Measures** | |
|  | **Significance** |  |  |  |
|  |  | operation phase might be hazardous in case | ► | Storage and handling of chemicals will be as per |
|  |  | of improper storage or handling: Chlorine, and |  | the applicable code of safety (SDS –Safety Data |
|  |  | diesel. |  | Sheet) issued for the chemicals. |
|  |  |  | ► | Adherence to safety procedures for chlorination |
|  |  |  |  | detailed in IS 10553 will be ensured through training |
|  |  |  |  | for personnel and monitoring for compliance. |
|  |  |  | ► | A plan for emergency response to accidental |
|  |  |  |  | releases will be prepared and implemented as |
|  |  |  |  | required. |
|  |  |  | ► Provision will be made for the necessary PPE and | |
|  |  |  |  | first-aid kit. |
|  |  |  | ► Periodic training on EHS aspects will be provided to | |
|  |  |  |  | the personnel by the operator. |
| Public Health | Moderate | ► Improper treatment, disinfection dosage and |  | Daily water quality testing to ensure compliance to |
|  |  | chlorination will result in public health impacts. |  | IS: 10500:2012 will be undertaken at the WTP |
|  |  |  |  | through a fully functional govt. approved laboratory. |
|  |  |  | ► Monthly water quality monitoring at end user points | |
|  |  |  |  | will be conducted to ensure that water being |
|  |  |  |  | circulated through distribution lines is meeting the |
|  |  |  |  | necessary standard. |

# SOCIAL IMPACT ASSESSMENT (SIA) Mitigation plan

**SIA Methodology**

The chapter deals with the approach and methodology adopted for collection of material and non-material socio-economic and cultural data and its analysis for understanding the various types of impact the project would bring about in the local social, cultural and economic fabric of the society. It also discusses the methods, tools and techniques used for screening and identifying the areas of concern for preparation of Resettlement Action Plan (RAP). With a view to comply with the applicable national and state laws, acts and guidelines and the World Bank OP 4.12, a conjunctive approach integrating the social, environmental and design aspects as well as intensive stakeholder consultations was adopted.

The project thus involves an integrated approach towards planning and design, incorporating close cooperation of the engineering, environment and social sector teams. The social assessment for impact analysis of the project was carried out through a series of complementary processes. Data for SIA was collected through various primary and secondary sources.

Primary data was collected through intensive survey to comprehend the broad baseline status and socio-economic profile of the local community and to establish the legal entitlement of the project affected families/people. Secondary data/information was collected from various agencies so as to ascertain/verify the ground realities and bring out the socio-economic characteristics, physical features and cultural set-up of the project area. Other secondary data was obtained from documents collected from OUIDCO, published articles and census publications.

Promoting maximum adoption of mechanical solutions for cleaning of on–site sanitation installations with exceptions for use of innovative and partly mechanical solutions adhering to safety practices as mentioned above.

 Encouraging participation of women and transgender persons in sanitation value chains and procurement cycles – as entrepreneurs, door-to-door waste collectors, handling & Treatment Plant operators, plumbers, masons – capitalising on the pivotal role played by women and transgender persons led Self Help Groups (SHGs) of Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM), Mission Shakti, Ama Gaon Ama Bikash programme etc.

 Ensuring proper functioning of network-based sewerage systems, if available in the Census towns and/or large dense villages and ensuring connections of households to them wherever possible;

Formulation and adherence to appropriate standards for handling and treating faecal waste

 State government shall issue appropriate standards, wherever needed, for safe management of solid and liquid waste including faecal waste, so as to ensure safety of all stakeholders involved across the sanitation value chain.

 Further, the treated products shall be discharged based on existing national standards. For integrated solid and liquid waste management systems, treatment and disposal mechanisms shall be formulated based on international best practices such as ISO, wherever needed, to address environmental concerns.

 Specifications for PPE and other components for safe operations will be clearly prescribed and mandated to ensure safety and dignity of all sanitation workers, with a special focus and attention on women sanitation workers.

Recycling and reuse of treated products

 Creating enabling environment and mechanisms for recycling and reuse of treated solid and liquid waste;  Strengthening capacity of GPs and other service providers to adopt innovative solutions for productive reuse of treated solid and liquid waste;

Once they meet the prescribed standards;

 Encouraging partnerships with industries and bulk users that may purchase the end products from solid and liquid waste treatment.

Inclusive sanitation and community participation

Re-Orienting Institutions and Mainstreaming Sanitation

 Mainstream sanitation planning and implementation in all sectors and departmental domains as a cross-cutting issue, especially in all rural management endeavours;

 Strengthening state, village and local institutions (public, private and community) to accord priority to sanitation provision, including planning, implementation and O&M;

 Extending access to entire sanitation value chain for poor communities and other un-served or under-served settlements with a special focus on women, transgender persons and the vulnerable.

 Ensuring equal representation of women and socially excluded groups in all decision-making bodies and institutions related to sanitation, from national to local level, to increase their agency

**9.2 Findings of Social Impact Assessment**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Table 45: Summary Project Impacts** |  |  |
| **Sl. No.** | **Impacts** |  | **Number** |
|  |  |  |  |
| 1 | Total land acquisition requirements (in Ha) |  | 16.00 |
|  |  |  | |
| 2 | Total private land acquisition requirements (in Ha) | 0.70 | |
|  |  |  |  |
| 3 | Total Govt. land acquisition requirements (in Ha) |  | 15.30 |
|  |  |  | |
| 4 | Total Number of land units/plots affected | 101 | |
|  |  |  | |
| 5 | Total Number of private land units/plots affected | 01 | |
|  |  |  |  |
| 6 | Total Number of private Residential structures of TH |  | Nil |
|  |  |  |  |
| 7 | Total Number of private Commercial structures of TH |  | Nil |
|  |  |  | |
| 8 | Total Number of private structures of NTH affected within the RoW | Nil | |
|  |  |  | |
| 9 | Total Number of Affected Families | Nil | |
|  |  |  | |
| 10 | Total Number of Vulnerable households affected | Nil | |
|  |  |  | |
| 11 | Total Number of Mobile vendors affected Temporarily | Nil | |
|  |  |  |  |
| 12 | Total Number of CPRs affected (Community and Religious) |  | Nil |
|  |  |  |  |

**OUIDCO-PMU**: OUIDCO is the primary implementing agency for the OMDP underwhich the Bhadrak-WSS sub-project is being implemented. OUIDCO has established a Project Management Unit (PMU) for JMDP, which has a dedicated environment and social specialist. The OUIDCO-PMU will have ultimate responsibility and obligation to ensure ESMP implmentation and compliance. This role will include on-going identification and management of environmental impacts, monitoring social and environmental performance, ensuring availability of committed human resources and budget for ESMP implementation, periodic monitoring and reporting on ESMP performance. OUIDCO PMU will also carry out regular training on ESHS aspects especially for construction stage, orientation and experience sharing programs to enhance the knowledge and capacity of the project staff.

The PMU will also put in place training programmes as per the ESMF for contractors staff on environment and social impacts in construction stage which include OHS management, maintainence of labour camp code of conduct and hygene,use of PPE, HIV prevention, gender, and maintaining hazard free work spaces OUIDCO-PMU will coordinate with Project Implementing Unit (PIU) at ULB level and Project Management Consultant (PMC) for effective monitoring of the ESMP. The OUIDCO PMU will draw support from safeguards specialists from the project management consultant’s team if needed.

1. **OUIDCO-PIU:** The PIU located at the ULB level, this will be established and have adedicated environment and social specialist to supervise and monitor the contractor’s performance in implementing the ESMP. The PIU will assume direct responsibility for day-to-day project management, coordination and implementation of the sub project. The PIU will also supervise implementation of ESMP, and submit monthly progress reports to the PMU; and, will monitor the financial and physical progress of ESMP, adequacy of public consultation and compliant handling, and grievance redressal. It will also facilitate smooth coordination between the contractor, CSQC and the relevant government departments (ultilities, forest, traffic management etc.) for ESMP implementation. The PIU will also form the formal link between he ULB and OUIDCO, obtaining various clearances and approvals required and essential for project implementation, and reporting ESMP non compliance to the PMU.

**Contractor:** The contractor will be responsible for implementation and adherence toall the mitigation measures, monitoring and inspection arrangements outlined in this ESMP associated with their respective activities. The contractor will be required to comply with the mitigation provisions, specifications, and drawings of the ESMP and with any related codes of conduct required by OUIDCO. The contractor selection process will include consideration of the capacities of the entities to ensure compliance to legal environmental and social requirements as well as adherence to the ESMP. The contract conditions will emphasize the obligations of the contractor on both these aspects. The contractor will put in place experienced specialist in the roles of Environmental Health and Safety; and Social as a part of the implementation team**.**

**State Pollution Control Board** The state pollution control board (OSPCB) will provideApprovals for the WTP before start of Operation and Maintenance and conduct Monitoring of the effluent quality and ensure that it is according to the Standards laid down by CPCB/

CPHEEO.

**Bhadark ULB:** The ULB officers, engineers will form an integral part of the PIU. However, theULB will also support the sub project implmentation in conducting information education and communication activities, addressing compliants, assistance in obtaining necessary government approvals for waste management, water withdrawal, and raw material requirements.

**Revisions to the ESMP**

In case of any future changes in the sub-project design the ESMP will need to be updated to reflect the new scope of the activities. The environmental specialist in CSQC firm, and JUIDCO- PIU will identify any safeguard issues relating to the new design elements, and mitigation measures for the same. In case of substantial revisions, this will be finalised in consultation with the PMU.

**Environmental and Social Management Plan**

The ESMP presents a listing of the mitigation measures to be taken for each potential impact along with details on the responsible person, means of verification, timing and frequency of monitoring, supervision responsibility and reporting requirements. Before the start of construction work, the Project Engineer, contractor’s team will carry out joint field verification of the EMP. The efficacy of the mitigation measures suggested in the EMP will be checked and if required, the Engineer will modify the EMP and BoQs associated with the mitigation measures. Additionally, JUIDCO shall organize orientation sessions for all contractor staff of and field level implementation staff of Contractor and all consultants on environment and social management

# ENVIRONMENT & SOCIAL MANAGEMENT PLAN

This section describes the management plan to be implemented to avoid or mitigate the anticipated negative environmental impacts and enhance the positive impacts of the sub-project activities.

Objectives of the ESMP

The objectives of the Environment and Social Management Plan (ESMP) are to:

* + Provide a comprehensive listing of the various mitigation and monitoring measures that are to be implemented to avoid or reduce negative impacts and enhance postive impacts.
  + Ensure compliance with the applicable National, and State Environment and Social laws and regulations as well as the World Bank’s safeguard policies.
  + Institutional arrangements that are and will be put in place by JMDP for the environmental and social compliance.
  + Detail the plan for periodic monitoring of the effectiveness of the mitigation measures and residual impacts.
  + Outline the capacity building plan for enhancing the capacities of the key stakeholders on environmental and social management.

Detail the budget requirements for implementation of the ESMP.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Level** | **Implementing institutions** | | **External institutions servicing the sub-project** | | |  |
|  |  |  | |  | |  |  |
|  | State | **OUIDCO – Project** | | **OUIDCO’s Project Management Consultant** | | |  |
|  |  | **Management Unit (PMU)** | | **(PMC)** | |  |  |
|  |  | [already in place] | | ► | Environmental Specialist | |  |
|  |  | ► | Environmental | ► | Social Specialist |  |  |
|  |  |  | Specialist |  |  |  |  |
|  |  | ► | Social Specialist |  |  |  |  |
|  | Bhadrak | **OUIDCO – Project** | | **Contractor** | | **OUIDCO’s** |  |
|  | ULB | **Implementation Unit (PIU)** | | ► | Environmental | **Construction** |  |
|  | level | ► | Environmental |  | Health and Safety | **Supervision and** |  |
|  |  |  | Specialist |  | Specialist | **Quality Control** |  |
|  |  | ► | Social Specialist | ► | Social Specialist | **Consultant (CSQC** |  |
|  |  |  |  |  |  | **Consultant)** |  |
|  |  |  |  |  |  | ► Environment, |  |
|  |  |  |  |  |  | Social Health |  |
|  |  |  |  |  |  | and Safety |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **S.No** | **Impacts** | **Mitigation Measures** | **Monitoring/Action** | **Responsibility** | **Frequency of** |  |
|  |  |  |  |  |  | **Monitoring/** |  |
|  |  |  |  |  |  | **Reporting** |  |

* Pre-Construction Phase

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1.1 | Site clearing, | ► Vegetation clearance should be limited to only | Site inspection by PIU | Contractor, | During | |
|  |  | leading erosion, | areas where construction is meant to be carriedo ut, and restored/revegetated after construction works |  | (Primary responsibility) | mobilization, | |
|  |  | Sedimentation and vegetation loss | Sediment control measures should put in place before clearing vegetation in areas where the potential for sedimentation exist |  |  |  | |
|  |  |  | ► Non-mechanical construction to be undertaken in the forest area. Heavy construction equipment will be completely avoided in forest area as per the conditions of the NOC, to prevent any damage to existing trees, and ground vegetation. |  | CSQC /PIU/PMU  (secondary responsibility) |  | |
|  |  |  |  | Site preparation and construction |  |
|  |  |  |  | Activities. |  |
|  |  |  | ► No trees will be cut or damaged within the |  |  |  |  |
|  |  |  | forest area as per the conditions of the NOC. |  |  |  |  |
|  |  |  | ► In order to avoid loss of ground vegetation |  |  |  |  |
|  |  |  | urban area close supervision of earthworks will |  |  |  |  |
|  |  |  | be observed in order to confine land clearance |  |  |  |  |
|  |  |  | within the RoW of the pipeline |  |  |  |  |
|  |  |  | ► Removal of vegetation (bushes) will be limited |  |  |  |  |
|  |  |  | to the extent possible within the urban area |  |  |  |  |
|  |  |  | ► The contractor will stockpile topsoil for |  |  |  |  |
|  |  |  | reinstating flora along the road or in the areas which have been cleared vegetation. |  |  |  |  |
|  |  |  | ► The contractor will not fell/cut trees without a |  |  |  |  |
|  |  |  | written consent from the competent authority |  |  |  |  |
|  |  |  | and permission obtained from the respective officer for cutting of trees, along with a justification on the need for tree cutting. |  |  |  |  |
|  |  |  |  |  |  |  | |
|  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **S. No** | **Impacts** |  |  | **Mitigation Measures** | | |  |  |  | **Monitoring/Action** | **Responsibility** | **Frequency of** | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  | **Monitoring/** | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  | **Reporting** | | | |
|  | 1.2 | Interference with | A work plan with clear responsibilities for each party | | | | | | | |  |  | Daily | monitoring | | |
|  |  | existing utilities | should be developed to ensure smooth execution of the construction. | | | | | | | |  |  | by | Contractor, | | |
|  |  |  |  | | |  |  |  |  |  |  |  | CSQC and | |  |  |
|  |  |  | ► Consult with the utility departments to | | | | | | | |  |  | PIU | and | traffic | |
|  |  |  |  | demarcate the locations and alignments of electrical cables, water mains and communication cables construction | | | | | | |  |  | police. | |  |  |
|  |  |  | ► | Prepare a detailed planning and | | | | n | | |  |  |  |  |  |  |
|  |  |  |  | phasing schedule, and coordinate service | | | | | | |  |  |  |  |  |  |
|  |  |  |  | interruption with public utilities and public | | | | | | |  |  |  |  |  |  |
|  |  |  |  | administrations. (Works phasing shall be | | | | | | |  |  |  |  |  |  |
|  |  |  |  | established in a way to reduce the disruption | | | | | | |  |  |  |  |  |  |
|  |  |  |  | time) |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ► | Advise citizens | | in | advance | concerning | | |  |  |  |  |  |  |
|  |  |  |  | programmed interruptions in water, and other | | | | | | |  |  |  |  |  |  |
|  | 2 | Construction phase |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 2.1 | Traffic | ► Trucks carrying materials should be restricted | | | | | | |  | ► On site inspection | Contractor, | Daily  monitoring  by  Contractor, | | | |
|  |  | Management |  | to hours for delivery of material and | | | | pick up | of |  | monitoring of | (Primary |
|  |  |  |  | waste material. (delivery hours must be set a part of planning) | | | | | |  | agreed mitigation | responsibility) | CSQC and  PIU. | | | |
|  |  |  |  |  | |  |  |  |  |  | measures | CSQC / |
|  |  |  | ► Provide citizens advanced warning about  partial/temporary road closures and rerouting of | | | | | | |  |  | PIU/PMU | Quarterly  monitoring  by | | | |
|  |  |  |  |  | (secondary |
|  |  |  |  | vehicle and pedestrian traffic, especially where | | | | | |  |  | responsibility), | PMU | | | |
|  |  |  |  | schools/ colleges concerned. | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Impacts** | |  | **Mitigation Measures** | **Monitoring/ Action** | | **Responsibility** | | **Frequency of**  **Monitorin/ Reporting** | | |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  | ► Phasing of open work fronts should be |  |  |  |  |  |  |  |
|  |  |  |  | Scheduled so that multiple sites are not affected at the same time |  |  |  |  |  |  |  |
|  |  |  |  | ► At night time, all barriers and signs will remain |  |  |  |  |  |  |  |
|  |  |  |  | at sites, with lighting and / or fluorescent signs |  |  |  |  |  |  |  |
|  |  |  |  | placed as required to warn both vehicular and |  |  |  |  |  |  |  |
|  |  |  |  | pedestrian traffic, especially where trenches are left open |  |  |  |  |  |  |  |
|  |  |  |  | ► The Contractor shall restore the project sites |  |  |  |  |  |  |  |
|  |  |  |  | to the state to which it was or better, prior to |  |  |  |  |  |  |  |
|  |  |  |  | construction. |  |  |  |  |  |  |  |
| 2.2 | Accessibility to properties | | | ► Prior nformation and consultation with | ► | Daily inspection on | Contractor, |  | Daily | monitoring | |
|  | hospitals, Schools, institutions and local authorities wherever any sensitive receptor is concerned, and access should not be disturbed or affected. |  | all open work | (Primary |  | by | Contractor, | |
|  |  |  |  |  | fronts | responsibility) |  | CSQC and | |  |
|  |  |  |  | ► Where areas are excavated, temporary fencing, bridges, and access routes should be provided. | ► | Consultations with | CSQC | / | PIU. |  |  |
|  |  |  |  |  | public and ULB | PIU/PMU |  | Quarterly | |  |
|  |  |  |  | ► Signage should clearly mark the dedicated  pedestrian route, to facilitate access and avoid  accidental falls into these areas Prior consultation and notification to the impacted and interested. | ► | GRM mechanism |  |  |  | |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | (secondary |  | monitoring | by |  |
|  |  |  |  |  |  | responsibility. |  | PMU |  |  |
| 2.3 | Land Contamination  Due to improper  Disposal of hazardous and | | | ► The contractor shall handle construction  materials | ► | Periodic inspection  of ‘construction | Contractor,  (Primary |  | Daily by  monitoring  Contractor, | | |
|  |  |  |
|  |  |  | waste management | responsibility) |  | CSQC and | |  |
|  | ► Sites for temporary piles should be agreed with |  | register’ including | CSQC | / | PIU. |  |  |
|  |  | details on | PIU/PMU |  | Quarterly | |  |
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|  | **S. No** | **Impacts** |  |  | **Mitigation Measures** | | |  |  |  | **Monitoring/ Action** |  | **Responsibility** | **Frequency of** | |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Monitoring/** |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | **Reporting** |  |  |
|  |  | construction |  | PIU and local authorities. | | |  |  |  | ►  ► | generation and  disposal of any  ‘hazardous waste’.  . observation of  labour camp for  waste management  issues  Memorandum of  Understanding with approved recycler  of OSPCB/CPCB for disposal of hazardous waste, if generated. |  | (secondary | monitoring | by |  |
|  |  | wastes | ► | The community should be made aware of | | | | |  |  | responsibility. | PMU. |  |  |
|  |  |  |  | constraints imposed on the contractor for waste collection, storage and disposal accident In case of al waste dispersion, CSQC/PIU shall be informed and restoration measures shall be applied. | | | | |  |  |  |  |  |  |
|  |  |  | ► Waste materials are to be disposed at  Belahatti landfill as per the consent given by the ULB provided in Annex III Waste concrete will be reused and recycled to the extent possible to help in pollution prevention and conservation of natural resources.  ► All storage containers containing fuel, oil,lubricant should be adequately sealed and labelled. | | | | | |  |  |  |  |  |  |
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* The contractor will utilize BHADRAK official landfill at Belahatti for waste generated on the construction site which has been approved by the ULB.
* All waste and wastewater generated from the labour camp will be managed as per the specifications in VII such that there is no significant impact on camp residents, the biophysical environment or surrounding site.

|  |  |  |  |  |  |  |  |  |  |  |
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| **S. No** |  | **Impacts** |  | **Mitigation Measures** | | | | **Monitoring/ Action** | **Responsibility** | **Frequency of** |
|  |  |  |  |  |  |  |  |  |  | **Monitoring/** |
|  |  |  |  |  |  |  |  |  |  | **Reporting** |
|  |  |  | ► Adopt the | | provisions | in | the Emergency |  |  |  |
|  |  |  |  | Response Plan in case of any leakage or | | | |  |  |  |
|  |  |  |  | hazardous material spill. | |  |  |  |  |  |
|  |  |  | ► Construction contractor will ensure daily  collection, a designated storage area,  segregation and periodic (monthly) disposal of | | | | |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  | construction waste geneated as per the ULB | | | |  |  |  |
|  |  |  |  | and OSPCB regulations. | | | |  |  |  |
|  |  |  | ► Littering and burning of waste at the labour | | | | |  |  |  |
|  |  |  |  | camp will be strictly prohibited. | | | |  |  |  |
|  |  |  | ► | Segregated Domestic waste generated at the | | | |  |  |  |
|  |  |  |  | labour camp will be stored onsite and handed | | | |  |  |  |
|  |  |  |  | over to ULB for proper disposal by contractor | | | |  |  |  |
|  |  |  | ► Construction contractor will ensure that there | | | | |  |  |  |
|  |  |  |  | is no unauthorized dumping of used oil and | | | |  |  |  |
|  |  |  |  | other hazardous wastes. Such wastes will be | | | |  |  |  |
|  |  |  |  | stored safely onsite and disposed periodically | | | |  |  |  |
|  |  |  |  | through OSPCB/CPCB approved recyclers of | | | |  |  |  |
|  |  |  |  | and records the same will be maintained. | | |  |  |  |  |
|  |  |  | ► | Transport vehicles and equipment will undergo | | | |  |  |  |
|  |  |  |  | regular maintenance to avoid any oil leakages. | | | |  |  |  |
|  |  |  | ► Unloading and loading protocols will be | | | | |  |  |  |
|  |  |  |  | prepared for diesel, oil and used oil | | | |  |  |  |
|  |  |  |  | respectively and workers will be trained to prevent/contain spills and leaks. | | | |  |  |  |
|  | Land | | ► | Littering and burning of waste at the labour camp will be strictly prohibited. | | | | ► |  | Daily monitoring |

|  |  |  |  |  |  |  |  |  |  |
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|  | **S. No** |  | **Impacts** | **Mitigation Measures** | **Monitoring/ Action** | **Responsibility** | **Frequency of**  **Monitoring/**  **Reporting** | | |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  | Contamination due | |  |  |  | by Contractor, | | |
|  |  | to | improper | ► Domestic waste generated at the labour camp |  |  | CSQC and | |  |
|  |  | disposal of waste | | will be segregated onsite and collected by the |  |  | PIU. | |  |
|  |  | at labour camp | | ULB for management. |  |  | Quarterly | |  |
|  |  |  |  | ► Concrete flooring and oil interceptors should |  |  | monitoring | | by |
|  |  |  |  | be provided for workshops, vehicle washing and |  |  | PMU | |  |
|  |  |  |  | fuel handling area. |  |  |  |  |  |
|  |  |  |  | ► Used lead batteries, if any, should be disposed |  |  |  |  |  |
|  |  |  |  | as per the Batteries (Management and  Handling) Rules 2001. |  |  |  |  |  |
|  |  |  |  | ► Water separated and collected from oil |  |  |  |  |  |
|  |  |  |  | interceptor should be reused for dust |  |  |  |  |  |
|  |  |  |  | suppression. |  |  |  |  |  |
|  |  |  |  | ► All arrangements for transportation during |  |  |  |  |  |
|  |  |  |  | dismantling and clearing debris, considered |  |  |  |  |  |
|  |  |  |  | incidental to the work, will be implemented by |  |  |  |  |  |
|  |  |  |  | contractor in a planned manner as approved and |  |  |  |  |  |
|  |  |  |  | directed by OUIDCO. |  |  |  |  |  |
|  |  |  |  | ► Discarded plastic bags, paper and paper |  |  |  |  |  |
|  |  |  |  | products, bottles, packaging material, gunny |  |  |  |  |  |
|  |  |  |  | bags, hessian, metal containers, strips and |  |  |  |  |  |
|  |  |  |  | scraps of metal, PVC pipes, rubber and poly |  |  |  |  |  |
|  |  |  |  | urethane foam, auto mobile spares, tubes, tires, |  |  |  |  |  |
|  |  |  |  | belts, filters, waste oil, drums and other such |  |  |  |  |  |
|  |  |  |  | materials shall be either reused or will be sold |  |  |  |  |  |
|  |  |  |  | /given out for recycling. |  |  |  |  |  |
|  |  |  |  | ► Septic tank must be provided for toilets and the |  |  |  |  |  |
|  |  |  |  |  |  |  |  | |  |
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| **S. No** | **Impacts** |  | **Mitigation Measures** | **Monitoring/ Action** | | | **Responsibility** | | **Frequency of**  **Monitoring/**  **Reporting** | | |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  | sludge should be cleared by municipal |  |  |  |  |  |  |  |  |
|  |  |  | exhausters. |  |  |  |  |  |  |  |  |
|  |  | ► | The municipal waste from the labour camp will |  |  |  |  |  |  |  |  |
|  |  |  | only be routed through proper collection and |  |  |  |  |  |  |  |  |
|  |  |  | handover to local municipal body for further |  |  |  |  |  |  |  |  |
|  |  |  | disposal. |  |  |  |  |  |  |  |  |
| 3.4 | Soil Erosion | ► | Top soil will be managed as per the guidelines in Annex VI | Review | of Contractor’s | | Contractor, (Primary | | Daily monitoring  By Contractor,  CSQC and  PIU.  Quarterly | | |
|  |  |  | work plan. | |  |
|  |  | ► Construction activities (especially excavation | | Periodic Inspection of worksites. | | | responsibility | ) |
|  |  |  | work) will be undertaken in the dry season. | the CSQC | / |
|  |  | ► The contractor shall contain excavated | | Review  implementation of | | |  |  |
|  |  |  | materials in the vicinity of the worksite to prevent dispersion and sedimentation of drains, creeks, streets and adjacent properties |  |  |  | | |
|  |  | ► Stripping of topsoil shall not be conducted earlierthan required to prevent the erosion (wind and water) of soil. Excess topsoil will be used for landscaping purposes. | | for  forest area. | | | (secondary |  | Monitoring by PMU | | |
|  |  | ► The disturbed areas and soil stock piles will be kept moist to avoid wind erosion of soil. | |  | | |  |  |  |  |  |
|  |  | ► Topography will be restored and re-vegetated | | Muck  Disposal/  Management Plan’ | | |  |  |  |  |  |
|  |  |  | for slope stabilization immediately after |  |  |  |  |  |
|  |  |  | the completion of construction at each location. |  |  |  |  |  |
|  |  | ► In case of areas in the proximity of water | |  |  |  |  |  |
|  |  |  | small bunds will be created and silt traps will |  |  |  |  |  |  |  |  |
|  |  |  | be bodies,provided to prevent washing of the soil into these water bodies |  |  |  |  |  |  |  |  |
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|  | **S. No** | **Impacts** |  | **Mitigation Measures** | | | |  |  | **Monitoring/ Action** |  | **Responsibility** | **Frequency of** | |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  | **Reporting** | |  |
|  |  |  | ► OUIDCO will ensure a ‘Muck Disposal | | | | |  |  |  |  |  |  |  |  |
|  |  |  |  | Management Plan’ will be prepared in  consultation with the Forest Department and | | | | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | will include measures for soil erosion control in  the forest area. | | | | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
|  | 3.5 | Impact on Water ► | | The contractor will ensure sourcing of water | | | | |  | Proper legal permit for |  | Contractor,(Pri | Daily | monitoring |  |
|  |  | availability | | through tanks will be done after proper | | | | |  | sourcing of water |  | mary | by | Contractor, |  |
|  |  |  |  | verification of the source of water Construction labour will be sensitized aboutwater conservation. | | | |  |  | Periodic inspection of |  | responsibility ) | CSQC and  monitoring by | |  |
|  |  |  | ► | Wastewater | generated | | from | the |  | Supply of tanker water |  | (secondary |  |
|  |  |  |  | washing/cleaning area in camp site, after | | | | |  | to all wards |  |  |  |  |  |
|  |  |  |  | passing through oil & grease trap and curing | | | | |  |  |  |  |  |  |  |
|  |  |  |  | area can be re-used for water sprinkling and wheel washing. | | | | |  |  |  |  |  |  |  |

* Total 2-3 days will be required for replacing the rising main line. Adequate communication regarding this will be made to local communities through print media and notices minimum 7 days prior to construction activity. The existing OHT will be filled up before the replacement of pipeline , to minimize water scarcity and in addition ,alternate supply of water through tankers will be undertaken during this period*.*

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|  | **S. No** | **Impacts** |  | **Mitigation Measures** | **Monitoring/ Action** | **Responsibility** | **Frequency of**  **Monitoring/**  **Reporting** | | | |
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|  |  |  |  |  |  |  |
|  | 3.6 | Impact on Water | ► | Wastewater from construction site should not | Periodic inspection of | Contractor, | Daily | monitoring | | |
|  |  | Quality |  | be allowed to accumulate at site as standing | worksites. | (Primary | by | Contractor, | | |
|  |  |  |  | water may lead to breeding of mosquitoes. | Review of | responsibility ) | CSQC and | | |  |
|  |  |  |  | Septic tanks/soak pits should be provided | implementation of the | CSQC / | PIU. |  |  |  |
|  |  |  |  | for its disposal (as per specifications given in | ‘Muck Disposal/ | PIU/PMU | Quarterly | | |  |
|  |  |  |  | IS 24701995 Part I and Part II) onsite and at labour camp | Management Plan’ for | (secondary | monitoring | | | by |
|  |  |  | ► Proper cover and stacking of loose | |  |  |  |  |  |  |
|  |  |  |  | construction material and excavated loose soil |  |  |  |  |  |  |
|  |  |  |  | will be ensured to prevent surface runoff and contamination of receiving water bodies. |  |  |  |  |  |  |
|  |  |  | ► Dumping of debris in or nearby water bodies | |  |  |  |  |  |  |
|  |  |  |  | will be strictly avoided. All the waste |  |  |  |  |  |  |
|  |  |  |  | generated (construction waste, labour camp |  |  |  |  |  |  |
|  |  |  |  | waste) will be collected, segregated, stored and disposed in and environmentally suitable manner. |  |  |  |  |  |  |
|  |  |  | ► | The contractor will ensure that the activities |  |  |  |  |  |  |
|  |  |  |  | undertaken at the intake does not degrade the |  |  |  |  |  |  |
|  |  |  |  | using techniques to control the movement and |  |  |  |  |  |  |
|  |  |  |  | deposition of silt, e.g., silt curtains or barriers |  |  |  |  |  |  |
|  |  |  |  | to completely enclose the cofferdam installation. |  |  |  |  |  |  |
|  |  |  | ► Sheet piling will be cut off at elevations | |  |  |  |  |  |  |
|  |  |  |  | approved in advance by OUIDCO –Engineer in |  |  |  |  |  |  |
|  |  |  |  | order to minimize damage to foundation soils |  |  |  |  |  |  |
|  |  |  |  | adjacent o the structures , and the cut off portions will be removed from the site |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
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|  | **S. No** | **Impacts** |  | **Mitigation Measures** | **Monitoring/ Action** | **Responsibility** | **Frequency of**  **Monitoring/**  **Reporting** | | | |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | 3.7 | Air Pollution | ► | The batching plant will conform to CPCB general | Periodic inspection of | Contractor,(Pri | Daily | monitoring | | |
|  |  |  |  | emission and noise standards for noise. The | worksites. | mary | by | Contractor, | | |
|  |  |  |  | contractor will obtain a consent from Pollutin | Air Quality Monitoring | responsibility ) | CSQC and | | |  |
|  |  |  |  | control board before the plant is operational. | by NABL/MoEF&CC | CSQC / | PIU. |  |  |  |
|  |  |  | ► The emissions from diesel generators (meant | | accredited laboratory. | PIU/PMU | Quarterly | | |  |
|  |  |  |  | for emergency power requirement) will be  controlled to minimise impacts of air  emissions by optimised operations, orientation at the site and | Monthly statement of | (secondary | monitoring | | | by |
|  |  |  |  | Ambient Air Quality | responsibility), | PMU. |  |  |  |
|  |  |  |  | Monitoring to be |  |  |  |  |  |
|  |  |  |  | providing stack height as per stack height | submitted to OUIDCO |  |  |  |  |  |
|  |  |  |  | criteria of Central Pollution Control Board) from |  |  |  |  |  |  |
|  |  |  |  | ground level for wider dispersion of gaseous emissions. |  |  |  |  |  |  |
|  |  |  |  | Proper maintenance of engines and use of |  |  |  |  |  |  |
|  |  |  |  | vehicles with ‘Pollution under Control Certificate’ will be ensured. |  |  |  |  |  |  |
|  |  |  | ► | Fugitive dust emissions will be suppressed by |  |  |  |  |  |  |
|  |  |  |  | spraying water and wetting of the stockpiles. |  |  |  |  |  |  |
|  |  |  | ► | Proper location of material stockpiles will be |  |  |  |  |  |  |
|  |  |  |  | ensured (especially sand and soil). All such |  |  |  |  |  |  |
|  |  |  |  | loose material will be provided with temporary |  |  |  |  |  |  |
|  |  |  |  | bunds of and screens to prevent erosion and |  |  |  |  |  |  |
|  |  |  |  | generation fugitive dust. When not in use, all |  |  |  |  |  |  |
|  |  |  |  | stockpiles of the loose construction material will be covered with tarpaulin sheets. |  |  |  |  |  |  |
|  |  |  | ► | Trucks transporting soil and material will be |  |  |  |  |  |  |
|  |  |  |  | covered with tarpaulin sheets. |  |  |  |  |  |  |
|  |  |  |  | Dust masks and eye protection against dust, |  |  |  |  |  |  |
|  |  |  |  | construction workers where required. |  |  |  |  |  |  |
|  |  |  |  | (according to OHS management in Annex IX. |  |  |  | | |  |

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|  | **S. No** | **Impacts** |  | **Mitigation Measures** | **Monitoring/ Action** | **Responsibility** | | **Frequency of**  **Monitoring/**  **Reporting** | | | |
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|  |  |  |  |  |  |  |  |
|  | 3.8 | Noise Pollution | ► | All vehicles and machinery will conform to | Periodic inspection of | Contractor, (Pri  mary responsibility)/ CSQC | | Daily | monitoring | | |
|  |  |  |  | Central Motor and Vehicle Act 1988, EP Act | worksites. | by | Contractor, | | |
|  |  |  |  | 1986 Noise Rules 2002 | Noise Monitoring by | CSQC and | | |  |
|  |  |  | ► | Hammering and vibration compaction will be | NABL/MoEF&CC | PIU. |  |  |  |
|  |  |  |  | minimised when in close proximity to | accredited laboratory. | PIU/PMU |  | Quarterly | | |  |
|  |  |  |  | structures, buildings or property boundary where applicable, | Monthly statement of | (secondary |  | monitoring | | | by |
|  |  |  |  | residential class mufflers and engine shrouds | Noise Monitoring to be | responsibility), |  | PMU. |  |  |  |
|  |  |  |  | (acoustic lining) will be used on all equipment. | submitted to OUIDCO |  |  |  |  |  |  |
|  |  |  | ► | Normal working hours of the contractor will be |  |  |  |  |  |  |  |
|  |  |  |  | between 06:00 and 18:00 hours. Contractor |  |  |  |  |  |  |  |
|  |  |  |  | should ensure that the ambient noise level |  |  |  |  |  |  |  |
|  |  |  |  | near the project site is within the day time noise |  |  |  |  |  |  |  |
|  |  |  |  | standard (refer Annexure V for applicable |  |  |  |  |  |  |  |
|  |  |  |  | standards). |  |  |  |  |  |  |  |
|  |  |  | ► Only well-maintained equipment will be | |  |  |  |  |  |  |  |
|  |  |  |  | operated on-site, and, regular maintenance of |  |  |  |  |  |  |  |
|  |  |  |  | equipment such as lubricating moving parts, |  |  |  |  |  |  |  |
|  |  |  |  | tightening loose parts and replacing worn out components will be conducted. |  |  |  |  |  |  |  |
|  |  |  | ► Machinery and equipment that may be in | |  |  |  |  |  |  |  |
|  |  |  |  | intermittent use will be shut down or throttled |  |  |  |  |  |  |  |
|  |  |  |  | down during non-work periods. |  |  |  |  |  |  |  |
|  |  |  | ► | Low noise equipment will be used as far as |  |  |  |  |  |  |  |
|  |  |  |  | practicable, and the number of equipment |  |  |  |  |  |  |  |
|  |  |  |  | operating simultaneously will be reduced as far as practicable. |  |  |  |  |  |  |  |
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| **S. No** | **Impacts** | **Mitigation Measures** | | | | | **Monitoring/Action** | | | **Responsibility** | | **Frequency of**  **Monitoring/**  **Reporting** | |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | ► Equipment known to emit noise strongly in one | | | | |  |  |  |  |  |  |  |
|  |  | direction will be oriented so that the noise is | | | | |  |  |  |  |  |  |  |
|  |  | directed away from nearby sensitive receptors as | | | | |  |  |  |  |  |  |  |
|  |  | far as practicable. in unloading operations | | | | |  |  |  |  |  |  |  |
|  |  | ► Timely | maintenance | and | servicing | of |  |  |  |  |  |  |  |
|  |  | transportation vehicles and the machinery/pumps | | | | |  |  |  |  |  |  |  |
|  |  | to be used during construction phase to reduce | | | | |  |  |  |  |  |  |  |
|  |  | the noise generation due to friction and abrasion | | | | |  |  |  |  |  |  |  |
|  |  | ► In cases where contractor will perform night | | | | |  |  |  |  |  |  |  |
|  |  | time work, prior notice and consent will be taken from nearby residents. | | | | |  |  |  |  |  |  |  |
|  |  | ► DG sets shall be provided with acoustic | | | | |  |  |  |  |  |  |  |
|  |  | enclosure and comply with CPCB norms | | | |  |  |  |  |  |  |  |  |
|  |  | ► Monitoring of Noise levels shall be carried out | | | | |  |  |  |  |  |  |  |
|  |  | on monthly basis to check the level of pollutants | | | | |  |  |  |  |  |  |  |
|  |  | and effectiveness of proposed EMP | | | | |  |  |  |  |  |  |  |
|  |  | ► Minimal use of vehicle horns in the project area | | | | |  |  |  |  |  |  |  |
|  |  | will be encouraged. | |  |  |  |  |  |  |  |  |  |  |
|  |  | ► Equipment noise will be 85 dB(A) at 1 m from | | | | |  |  |  |  |  |  |  |
|  |  | the source in line with WB EHS guidelines | | | |  |  |  |  |  |  |  |  |
| 3.9 | Occupational | ► The contractor will follow the provisions for OHS | | | | | ► Periodic checking of | | | Contractor, (Pri  mary  responsibility)  CSQC/ PIU/PMU (secondary responsibility) | | Daily monitoring  By Contractor,  CSQC and  PIU. Quarterly monitoring by PMU | |
|  | Health & Safety | management plan in Annex VIII. In addition, all | | | | | Accident Register | | |
|  | Risk | Workers will be trained on Environment Health | | | | | (for | record | of |
|  |  | this includes use of PPE, HIV prevention, maintainence of campsite hygiene. | | | | | accidents at intake, WTP, OHTs).  Review of bid documents for use of any ACM. | | |
|  |  | ► IFC EHS guidelines should be refered and used by the implementing agency OUIDCO  ► Provision for all workers with requisite personal protective equipment. | | | | |

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| **S. No** | **Impacts** |  | **Mitigation Measures** |  | **Monitoring/ Action** | | | | **Responsibility** | **Frequency of**  **Monitoring/**  **Reporting** | |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  | ► Provision of onsite drinking water and sanitation | |  |  | | | |  |  |  |
|  |  | facilities. |  |  |  |  |  |
|  |  | ► Provision of signage’s at all construction sites, enforcing/ reminding use of PPE and safety practices. | | ► | Inspection of PPE  Use by workers, first-aid kit | | | |  |  |  |
|  |  | ► Safety conditions in the trenches during  construction phase shall be ensured using  appropriate shoring systems and dewatering mechanisms. | | ► | Periodic checking of records on  training/awareness  programs organized | | | |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  | ► Safe access and thoroughfare must be provided | |  | for workers on EHS | | | |  |  |  |
|  |  | on construction site always. Dangerous areas | |  | aspects. | |  |  |  |  |  |
|  |  | shall be clearly identified with appropriate signs, lights and flagmen. | |  |  |  |  |  |  |  |  |
|  |  |  | |  |  |  |  |  |  |  |  |
|  |  | ► Excavated areas shall be clearly marked to | |  |  |  |  |  |  |  |  |
|  |  | avoid accidental falls into these areas, and | |  |  |  |  |  |  |  |  |
|  |  | clearly lit at night. | |  |  |  |  |  |  |  |  |
|  |  | ► Regular monitoring by supervising engineers of | |  |  |  |  |  |  |  |  |
|  |  | contractors’ compliance with safety procedures.  ► Use of de-watering, side-walls support, and  slope gradient adjustments that eliminate  or minimize the risk of collapse, entrapment  drowning in excavated area working in high noise level areas | |  |  |  |  |  |  |  |  |
|  |  | ► | |  |  |  |  |  |  |  |  |
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|  | **S. No** | **Impacts** |  | **Mitigation Measures** | | | |  |  |  | **Monitoring/ Action** | | **Responsibility** | | **Frequency of**  **Monitoring/**  **Reporting** | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | working in high noise level areas | | | |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ► Risk of free fall of materials should be minimized | | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | by installing telescoping arm loaders and | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | conveyors |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ► Firefighting | | facility should be | | provided at | | the |  |  |  |  |  |  |  |  |  |
|  |  |  |  | camp site and trained personnel should be | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | available at site who can operate the fire | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | extinguishers and other fire-fighting equipment. | | | | | |  |  |  |  |  |  |  |  |  |
|  | 310 | Community Health | ► | Contractor to hire workers through recruitment | | | | | | ► | Periodic checking of | | Contractor, |  | Daily | monitoring | | |
|  |  | and Safety Risk |  | offices and avoid hiring “at the gate” to | | | | | |  | Accident Register. | | (Primary |  | by | Contractor, | | |
|  |  |  |  | discourage spontaneous influx of job seekers. | | | | | | ► | Periodic | visual | responsibility) |  | CSQC and | | |  |
|  |  |  | ► Vaccinating | | workers | against | common | | and |  | assessment | of risk | CSQC | / | PIU. |  |  |  |
|  |  |  |  | locally prevalent diseases; and establishment of | | | | | |  | at accident-prone | | PIU/PMU |  | Quarterly | | |  |
|  |  |  |  | health centres at camp and construction site for | | | | | |  | areas. |  | (secondary |  | monitoring | | | by |
|  |  |  |  | routine health screening. | | |  |  |  |  |  |  | responsibility), |  | PMU |  |  |  |
|  |  |  | ► | Mandatory and regular training for workers on | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | required code of conduct and and | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | consequences for failure to comply with law | | | | |  |  |  |  |  |  |  |  |  |  |
|  |  |  | ► Measures | | described | earlier | for | controlling | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | impact on air quality, noise levels and improper | | | | | |  |  |  |  |  |  |  |  |  |
|  |  |  |  | wastewater discharges will also help to mitigate the community impacts. | | | | | |  |  |  |  |  |  |  |  |  |
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|  | **S. No** | **Impacts** |  | **Mitigation Measures** | **Monitoring/ Action** | **Responsibility** | **Frequency of** | |  |
|  |  |  |  |  |  |  | **Monitoring/** | |  |
|  |  |  |  |  |  |  | **Reporting** | |  |
|  |  |  | ► A traffic management plan will be prepared | |  |  |  |  |  |
|  |  |  |  | by the contractor, approved by the ULB, |  |  |  |  |  |
|  |  |  |  | and implemented throughout the construction |  |  |  |  |  |
|  |  |  |  | period,to ensure smooth traffic flow and |  |  |  |  |  |
|  |  |  |  | minimize disruption. |  |  |  |  |  |
|  |  |  | ► | Public information notices with work start and |  |  |  |  |  |
|  |  |  |  | completion dates, contact details of ULB |  |  |  |  |  |
|  |  |  |  | officials, traffic diversion details, etc., will be |  |  |  |  |  |
|  |  |  |  | put up in local newspapers and distributed |  |  |  |  |  |
|  |  |  |  | as pamphlets (including in the local language). |  |  |  |  |  |
|  |  |  | ► | The contractor will follow the specifications in |  |  |  |  |  |
|  |  |  |  | the labour camp plan Annex VII |  |  |  |  |  |
|  |  |  | ► | OUIDCO will issue the directives to Contractor |  |  |  |  |  |
|  |  |  |  | and Contractor will accordingly prepare code |  |  |  |  |  |
|  |  |  |  | of conduct for all labour and staff. |  |  |  |  |  |
|  |  |  | ► Necessary directives will be given to | |  |  |  |  |  |
|  |  |  |  | Contractor for hiring the local work force. |  |  |  |  |  |
|  |  |  | ► Details of project will be displayed at | |  |  |  |  |  |
|  |  |  |  | prominent places such as ULB's office and |  |  |  |  |  |
|  |  |  |  | Deputy Commissioner's office |  |  |  |  |  |
|  |  |  | ► Responsibilities for managing these impacts | |  |  |  |  |  |
|  |  |  |  | will be reflected as a contractual obligation, |  |  |  |  |  |
|  |  |  |  | with appropriate mechanisms for addressing |  |  |  |  |  |
|  |  |  |  | non-compliance. |  |  |  |  |  |
|  |  |  | ► Caution boards, barricades, etc., will be used | |  |  |  |  |  |
|  |  |  |  | to warn the public about unauthorized access and danger. Additional monitoring on these aspects will be undertaken at locations close to sensitive |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

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| **S. No** | **Impacts** |  | **Mitigation Measures** |  | **Monitoring/ Action** | **Responsibility** | | **Frequency of**  **Monitoring/**  **Reporting** | |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  | receptors such as schools and playgrounds. |  |  |  |  |  |  |
|  |  | ► | Deploy temporary security guards in critical | |  |  |  |  |  |
|  |  |  | areas such as labour camp, construction | |  |  |  |  |  |
|  |  |  | camp,to prevent unauthorized access. |  |  |  |  |  |  |
|  |  | ► Install lighting devices and safety signal | | |  |  |  |  |  |
|  |  |  | devices in the temporary access areas and construction sites. | |  |  |  |  |  |
|  |  | ► A transportation plan of materials will | | be |  |  |  |  |  |
|  |  |  | prepared by the contractor, approved by the | |  |  |  |  |  |
|  |  |  | ULB, and implemented to avoid their delivery | |  |  |  |  |  |
|  |  |  | at peak traffic hours. |  |  |  |  |  |  |
|  |  | ► Warning signs and other protective barriers | | |  |  |  |  |  |
|  |  |  | shall be erected to prevent accidents to due | |  |  |  |  |  |
|  |  |  | citizens to open ditches, heavy machinery | |  |  |  |  |  |
|  |  |  | and construction |  |  |  |  |  |  |
|  |  | ► | vehicles etc. |  |  |  |  |  |  |
| 3.11 | Site restoration | ► | On completion of the works, all temporary |  | Site inspection. | Contractor, (Primary  responsibility )  CSQC  /PIU/PMU  (secondary  responsibility), | | Prior to handing  over of work site  by Contractor.-  by CSQC and  PIU. | |
|  |  |  | structures and construction equipment will  be removed, all waste cleared, waste  disposal pits/trenches filled in and off and  effectively sealed the site left clean and tidy. |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  | ► All waste will be disposed in accordance with | | |  | Quarterly  monitoring  by PMU | |
|  |  |  | the Construction Waste Management Rules, 2016 in consultation with the ULB and OSPCB. | |  |
|  |  |  | The site will be properly levelled and re- vegetated. |  |  |  |  |

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| **S. No** | **Impacts** | **Mitigation Measures** | **Monitoring/ Action** | | | | **Responsibility** | **Frequency of**  **Monitoring/**  **Reporting** | |
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|  |  |  |  |  |  |  |  |
| 4.0 | Operation Phase |  |  |  |  |  |  |  |  |
| 4.1 | Air Pollution | ► BIS guidelines for safety in chlorination plants | Periodic observation  and document check  (e.g., maintenance  record of DG set, PUC  of vehicles, etc.)  Air Quality Monitoring  by NABL/MoEF&CC  accredited laboratory.  Quarterly statement of  Ambient Air Quality Monitoring to be submitted to OUIDCO. | | | | Operator, ULB | Periodic |  |
|  |  | (IS 10553 – Part 1) will be followed (see |  | monitoring | by |
|  |  | Annexure XII). |  | Operator | and |
|  |  | ► Emergency scrubbing arrangement will be provided in the WTP to prevent accidental emission of chlorine gas. |  | ULB |  |
|  |  | ► Diesel generators will be operated only for |  |  |  |
|  |  | source emergency power backup. The |  |  |  |
|  |  | emission of diesel generators will have |  |  |  |
|  |  | adequate stack height will conform to the set |  |  |  |
|  |  | norms of CPCB.Also regular maintenance of |  |  |  |
|  |  | diesel engines will be ensured. |  |  |  |
|  |  | ► Only vehicles holding valid Pollution under |  |  |  |
|  |  | Control Certificates will be used for |  |  |  |
|  |  | transportation. |  |  |  |
|  |  | ► There will be peripheral plantation of trees |  |  |  |
|  |  | around the WTP to filter any dust emissions |  |  |  |
|  |  | and reduce impacts n surrounding areas. |  |  |  |
| 4.2 | Noise Pollution | ► The DG sets will have inbuilt acoustic  enclosure,silencers, air release valve,.,  essential hoods, etc and will meet the CPCB noise standards of 75  dB (A) at 1 meter from the enclosure surface.  ► The motors and pumps to be procured will be selected in such a way that the noise levels will be in the range of 40 – 55 dB  ► Ear plugs and ear muffs will be provided for the workers near noise generating sources at the intake and WTP. | Periodic observation  (noise levels, use of  Protective gear by workers, survival of tree plantation in premises). Document check (eg. Specifications of DG motor sets and pumps: tree plantation records. Noise Monitoring by  NABL/MoEF&CC | | | | Operator, ULB | Periodic |  |
|  |  |  | monitoring | by |
|  |  |  | Operator | and |
|  |  |  | ULB |  |
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| **S. No** | **Impacts** | **Mitigation Measures** | **Monitoring/ Action** | | | | | | **Responsibility** | **Frequency of** | |
|  |  |  |  |  |  |  |  |  |  | **Monitoring/** | |
|  |  |  |  |  |  |  |  |  |  | **Reporting** | |
|  |  | ► Thick canopied trees will be planted to  attenuate noise, if any, arising from the WTP in  line with the guidelines of CPCB. | accredited laboratory.  Quarterly statement of  Noise Monitoring to be  submitted to OUIDCO. | | | | | |  |  | |
| 4.3 | Impact due to | ► Backwash from filter beds will be sent to a  storage tank, and after allowing adequate time  for settlement of solids, clarified water will be  pumped to WTP inlet  ► Any excess waste water that needs to be  disposed will be first tested for ensuring  compliance with the CPCB’s ‘general  standards for discharge of environmental  pollutants’ and disposed at a location authorized by OSPCB.  ► Accumulated sludge from clari-flocculators,  filter backwash, etc., will be channelled to the  sludge drying beds for natural drying.  ► Dried sludge will be disposed at the designated Belahatti landfill site only. | Periodic inspection Of working of backwash  recirculation facility and sludge drying beds. Periodic checking of waste  water quality testing results and their conformity to CPCB standards for disposal. Periodic checking of  sludge transport  and disposal register. | | | | | | Operator, ULB | Periodic |  |
|  | waste generation |  | monitoring | by |
|  |  |  | Operator | and |
|  |  |  | ULB |  |
|  |  |  |  |  |
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| 4.4 | Reduced  downstream flow | ► The sub-project will adhere to the limits in the  water use permit issued by the WRD;  ► Periodic monitoring of the downstream flow will be undertaken by the WRD. | Periodic inspection  Of the records at the Intake and WTP on water intake and supply Monitoring of downstream flow | | | | | | Operator, ULB | Periodic monitoring by Operator and ULB | |

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| **S. No** | **Impacts** | |  | **Mitigation Measures** | **Monitoring/ Action** | | | | | | **Responsibility** | **Frequency of** | |  |
|  |  |  |  |  |  |  |  |  |  |  |  | **Monitoring/** | |  |
|  |  |  |  |  |  |  |  |  |  |  |  | **Reporting** | |  |
| 4.5 | Increased | Waste |  | The ULB and OUIDCO will develop and | Periodic observation of | | | | | | Operator, ULB | Periodic |  |  |
|  | water in BHADRAK area | |  | implement a long-term plan for sewerage | any water | | | stagnation, | | |  | monitoring | by |  |
|  |  |  |  | management in BHADRAK. The ULB, with the support | inspection of soak-pits | | | | | |  | Operator | and |  |
|  |  |  |  | of ongoing state and national programmes, will |  |  |  |  |  |  |  | ULB |  |  |
|  |  |  |  | implement sewerage network and treatment |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | infrastructure system in the next 3-5 years.. |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | |  | | |  |  |  |  |  |
| 4.6 | Occupational  Health &  Safety  Risk | | ► | Handrails and guards will be installed around  tanks, trenches, pits, stairwells, and other  accident-prone areas. | Periodic | | checking | | | Of | Operator, ULB | Periodic  Monitoring by  Operator and  ULB | |  |
|  |  | Accident Register  (for record of accidents  at intake, WTP, OHTs)  Periodic visual assessment of risk  at accident-prone areas Inspection of PPE use by workers, first-aid kit Periodic checking of records on training/awareness  programs organized for workers on EHS  aspects. | | | | | |  |  |
|  |  |  |  |
|  | ► Flooring will be of non-skid type. | |  |  |
|  | ► Storage and handling of chemicals will be as | |  |  |
|  |  | per the applicable code of safety (MSDS – |  |  |
|  |  | Material Safety Data Sheet) issued for the chemicals. |  |  |
|  | ► Adherence to safety procedures for | |  |  |
|  |  |  |
|  |  | chlorination detailed in IS 10553 will be |  |  |
|  |  | ensured through training for personnel and |  |  |
|  |  | monitoring for compliance. |  |  |
|  | ► | A plan for emergency response to accidental |  |  |
|  |  | releases will be prepared and implemented as |  |  |
|  |  | required. |  |  |
|  | ► Provision will be made for the necessary PPE | |  |  |
|  |  | and first-aid kit. |  |  |  |  |  |  |  |  |
|  | ► Periodic training on EHS aspects will be provided to the personnel by the operator. | |  |  |  |  |  |  |  |  |

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| **S. No** | **Impacts** | **Mitigation Measures** | **Monitoring/ Action** | **Responsibility** | **Frequency of** | |
|  |  |  |  |  | **Monitoring/** | |
|  |  |  |  |  | **Reporting** | |
| 4.7 | Public Health | ► Daily water quality testing to ensure compliance | Periodic checking of | Operator, ULB | Periodic |  |
|  |  | to IS 10500:2012 will be undertaken at the WTP | Water Quality Testing |  | monitoring | by |
|  |  | through a fully functional approved govt. | register. |  | Operator | and |
|  |  | laboratory. |  |  | ULB |  |
|  |  | ► Checking water System leaks and loss of |  |  |  |  |
|  |  | Pressure (Water system leaks does not only |  |  |  |  |
|  |  | reduce the pressure of the water, it also |  |  |  |  |
|  |  | compromises the quality of the water by allowing |  |  |  |  |
|  |  | contaminated water to leak into the system) |  |  |  |  |
|  |  | Monthly water quality monitoring at end user |  |  |  |  |
|  |  | points will be conducted to ensure that water |  |  |  |  |
|  |  | being circulated through distribution lines is |  |  |  |  |
|  |  | meeting the necessary standard. |  |  |  |  |

**Environmental Monitoring**

Monitoring will be required to ensure effectiveness of implementation of suggested mitigation measures by assessing the changes in environmental conditions. The monitoring scheduled for the construction and operation phases of the sub-project are presented in table below

|  | | **Type of**  **Monitoring** | | **Parameters for Monitoring** | **Frequency** | **Method** | **Responsibility**  **& Verification** | |  | | | **Monitoring Locations** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | |
| 1 | | Tree Cutting | | If tree cutting is required, then | Before | Visual / Site Inspection | R: Site In-  charge/  Contractor  V: CSQC and PIU | |  | | At respective project Sites | | | |
|  | |  | | tree felling can be undertaken | construction | Maintaining log book |  | |  | | | |
|  | |  | | after necessary approval from |  | of all inspection |  | |  | | | |
|  | |  | | regulatory authority. |  | checklists |  | |  | | | |
|  | |  | |  |  |  |  | |  | | | |
| 2 | | Debris/ | | According to Construction | During construction | Visual / Site Inspection | R: Site In-  charge/  Contractor  V: CSQC and  PIU | |  | | i. WTP construction site. | | | |
|  | | Construction | | debris and waste | – at least once a | Maintaining log book |  | | ii. OHT construction sites | | | |
|  | | materials | | management plan | week | of all inspection |  | | iii. Distribution network | | | |
|  | | disposal | |  |  | checklists |  | | where sensitive area | | | |
|  | |  | | Re-use of Concrete and |  |  |  | | comes like Hospital | | | |
|  | |  | | bituminous wastes |  |  |  | | /school | | | |
|  | |  | |  |  |  |  | | iv. Intake well | | | |
| 3 | | Ambient air | | PM10, PM2.5, SO2, NOX, CO, | Quarterly | Fine Particulate | R: Site In-  charge/  Contractor with  approved  agency for  environmental  quality testing  V: CSQC and PIU | | |  | i. WTP construction site/ | | | | |
|  | | quality | | HC |  | Samplers for PM2.5 |  | AAQ 1 | | | | |
|  | | monitoring | |  |  | Respirable Dust Sampler for PM10 |  | ii. Near Batching Plant | | | | |
|  | |  | |  |  | fitted with Gaseous |  | iii. Baseline Monitoring | | | | |
|  | |  | |  |  | sampling |  | locations /sensitive | | | | |
|  | |  | |  |  | arrangements for SO2 and NOx, |  | receptors (minimum 3 samples | | | | |
| 4 | | Dust Control | | No. of tankers for water | Weekly | Visual / Site Inspection |  | R: Site In- |  | | i. WTP construction site | | | |
|  | |  | | sprinkling, |  | Maintaining log book |  | charge/ |  | | ii. Near Batching Plant | | | |
|  | |  | | Timing of sprinkling, covering |  | of all inspection |  | Contractor |  | | iii. All Open work fronts | | | |
|  | |  | | of all stored materials |  | checklists |  |  |  | | iv. Construction camp | | | |
|  | |  | |  |  |  |  |  |  | |  | | | |
|  | 5 | | Noise | Day time and night time noise | Once a month | Noise meter | R: Site In- | | i.At WTP site/  Construction labour  camp, construction site.  ii. All OHT construction sites  iii.Baseline Monitoring  locations /sensitive  receptors (minimum 3samples) | | | | | |
|  |  | |  | level (max, min & Leq levels) |  |  | charge/ | |
|  |  | |  |  |  |  | Contractor | |
|  |  | |  |  |  |  | V: CSQC and | |
|  |  | |  |  |  |  |
|  |  | |  |  |  |  | PIU | |
|  |  | |  |  |  |  |  | |
|  | 6 | | Surface Water | Relevant physical, chemical | Once a month | Grab sampling and | R: Site In- | | i. | | | | At source | |
|  |  | | Quality | and biological parameters |  | analysis by using | charge/ | |  | | | | intake well) | |
|  |  | |  |  |  | standard methods | Contractor V: CSQC and PIU | | ii. At WTP | | | | | |
|  |  | |  |  |  |  |  | |
|  | 7 | | Drinking | Drinking water quality (as per | Once a month | Grab sampling and | R: Site In- | | Sources of drinking water at | | | | | |
|  |  | | Water Quality | IS:10500-2012) |  | analysis by using | charge/ | | labour camp and mobile | | | | | |
|  |  | | at labour |  |  | standard methods | Contractor | | water tanks if established. | | | | | |
|  |  | | camp and all |  |  |  |  | |  | | | |  | |
|  |  | | worker sites |  |  |  | V: CSQC and PIU | |  | | | |  | |
|  |  | |  |  |  |  |  | |  | | | |  | |
|  | 8 | | Material and | Storage and Handling | Weekly | Inspections, |  | | Contractor’s yard/camp | | | | | |
|  |  | | fuel storage | practices of oils, paints, |  | Observations |  | | sites | | | | | |
|  |  | | areas | lubricants and fuels |  |  |  | |  | | | |  | |
|  |  | |  | Condition of storage facilities |  |  |  | |  | | | |  | |
|  |  | |  | Spillage and drainage |  |  |  | |  | | | |  | |
|  |  | |  | conditions |  |  |  | |  | | | |  | |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 9 | Waste | Record of waste generation, | Weekly | Visual / Site Inspection | R: Site In- | iv. | Labour camp |  |
|  |  | Management | handling and disposal |  | Maintaining log book | charge/ | v. | Construction sites |  |
|  |  | at labour | methods (including |  | of all inspection | Contractor |  |  |  |
|  |  | camp and all | construction waste and |  | checklists |  |  |  |  |
|  |  | worker sites | domestic waste from labour |  |  | V: CSQC and |  |  |  |
|  |  |  | camp). |  |  | PIU |  |  |  |
|  | 10 | Soil Erosion | Extent and degree of erosion | Throughout | Survey and | R: Site In- | River bank near intake, and | |  |
|  |  |  |  | construction | observation | charge/ | Structures for controlling | |  |
|  |  |  |  |  |  | Contractor | soil erosion | |  |
|  |  |  |  |  |  | V: CSQC and |  |  |  |
|  |  |  |  |  |  | PIU |  |  |  |
|  |  |  |  |  |  |  |  | |  |
| 11 | Occupational | Record of accidents, injuries, | Throughout | Visual / Site Inspection | R: Site In- | At all construction sites | |  |
|  |  | health and | Disabilities and fatalities and | construction | Maintaining log book | charge/ |  |  |  |
|  |  | safety | action taken. |  | of all inspection | Contractor |  |  |  |
|  |  |  |  |  | checklists | V: CSQC and |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | PIU |  |  |  |
|  |  |  |  |  |  |  |  | |  |
| 12 | Site | Clearance and restoration of | Post | Visual inspection of all | R: Site In- | Labour camp | |  |
|  |  | restoration | site, removal of all temporary | construction | locations | charge/ | WTP site | |  |
|  |  |  | structures, closing of any |  |  | Contractor | Construction camp site | |  |
|  |  |  | septic waste pits etc. disposal |  |  |  | OHT sites | |  |
|  |  |  | of all debris |  |  | V: CSQC and | Intake well site | |  |
|  |  |  |  |  |  | PIU |  |  |  |
| *NOx – Oxides of Nitrogen, SOx – Sulphur Dioxide, PM – Particulate Matter* | | | | |  |  |  |  |  |

**Table 52: Environment monitoring schedule in operation phase**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of Monitoring** | **Parameters for Monitoring** | **Frequency** | |  |  |  | **Responsibility** | **Monitoring Locations** |  |
| Water Quality | pH, Nitrite, Nitrate, Turbidity, | Daily Sampling | | | -Residual | | WTP operator | Residual Chlorine at |  |
| supplied to | Total | Chlorie | at | WTP | | when | Verfification to be | WTP |  |
| consumers | Alkalinity, Fluoride, Iron, Total | system | begins, | | at | least | undertaken by ULB |  |  |
|  | coliform and Faecal coliform etc. | forthnightly | | under |  | normal |  |  |  |
|  | (IS:10500-2012) | operating conditions. Should | | | | |  |  |  |
|  |  | be done daily over next 10 | | | | |  |  |  |
|  |  | days if the dose of chlorine is | | | | |  | End user points at |  |
|  |  | altered in the system | | | |  |  |  |  |
|  |  | Monthly one | |  |  |  |  |  |
|  |  | water samples | | |  | randomly chosen end- |  |
|  |  | at end user points | | |  |  |  | user points) |  |
|  |  |  |  |  |  |  |  |  |  |
| Water Quality (at | pH,Cl,F,NO3,TC,FC, Hardness, | Monthly |  |  |  |  | WTP operator | At intake, well |  |
| Source) | Turbidity BOD,COD,DO,Total |  |  |  |  |  |  |  |  |
|  | Alkalinity heavy metals & |  |  |  |  |  |  |  |  |
|  | pesticides |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Waste and sludge | Record of waste generation, and | Weekly |  |  |  |  | DBO Contractor | WTP |  |
| management | disposal methods, sludge |  |  |  |  |  | Verfification to be |  |  |
|  | treatment and disposal and any |  |  |  |  |  | undertaken by ULB |  |  |
|  | wastewater that cannot be |  |  |  |  |  |  |  |  |
|  | recirculated; quality to meet |  |  |  |  |  |  |  |  |
|  | CPCB general standards. |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Worker Health | Biological Monitoring, | Regular check up for workers | WTP operator | WTP/ Staff quarters |  |
|  | audiometric testing, fitness-to- | as per Factories Act. |  |  |  |
|  | work examinations, and general |  |  |  |  |
|  | worker well- being. |  |  |  |  |
|  |  |  |  |  |  |
| Worker Safety | Record of accidents, injuries, | Continous monitoring and | WTP operator | Intake and WTP |  |
|  | disabilities and response ; | maintainence of records. |  |  |  |
|  | availability of First Aid Kit and |  |  |  |  |
|  | PPE for all workers. |  |  |  |  |
|  |  |  |  |  |  |
| Green Belt | No. of plants, survival status as | Six-monthly | WTP operator | Within WTP premises |  |
| Development around | per CPCB Guidelines for green |  |  |  |  |
| WTP | belts. |  |  |  |  |
|  |  |  |  |  |  |
| Leak | Checking water System | Regular field visits | Contractor, jointly | Throughout distribution |  |
| Detection; | leaks and loss of |  | with ULBOperator | network |  |
| maintenance and | pressure |  |  |  |  |
| repair | Acting on any complaints by |  |  |  |  |
|  |  |  |  |  |
|  | consumers on loss in pressure, |  |  |  |  |
|  | localised flooding due to |  |  |  |  |
|  | leakage. |  |  |  |  |

1. Conclusions and recommendations

To improve the Water quantity, quality, reliability, conveniently and economically to the habitants of 1329 habitations in 526 villages of Basudevpur, Chandabali, Tihidi, Dhamanagar blocks of Bhadrak district and the Bhadrak Rural Water Supply project is proposed. The system is designed for 30 years i.e. year 2050.

As per WB ESMF Project Categorization, the Bhadrak Urban Water Supply Project is categorized as E-1 and S-2 accordingly ESIA has been carried out and as part of ESIA, IFC performance standards were evaluated in the report

As part of ESIA guidelines, a detailed basesline environmental and social analysis has been carried. As part of it, primary & secondary data was collected n the project study/ affected area and reviewed. From the analysis, it was observed that there no concerns of the baseline environmental and social profile of the project area.

Based on project activities, the possible adverse environmental, social and cultural imparts due to proposed project throughout lifecycle were studied. From the impact identification, assessment/evaluation it is concluded that there are no major/ significant negative or residual impacts from the proposed water supply project. In fact the project will improve and provide sustainable water supply in the region, there by the socio economic profile/living standards of the region will be improved.

A detailed environmental management plan is proposed to mitigate the residual impacts from the project. Similarly an environmental monitoring plan was suggested in construction and operation phase of the project to improve/sustain exiting socio and environmental conditions of the region.

1. [↑](#footnote-ref-1)