



**ASSAM INLAND WATER TRANSPORT
DEVELOPMENT SOCIETY
GOVERNMENT OF ASSAM**

**ENVIRONMENTAL AND SOCIAL
ASSESSMENT STUDIES FOR ASSAM
INLAND WATER TRANSPORT
PROJECT, PHASE-II**

IN-IWT-242294-CS-QCBS

**ESIA REPORT FOR UMANANDA
TERMINAL**



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ABBREVIATIONS & ACRONYMS

AIWCL	Assam Inland Waterways Corporation Limited
AIWTDS	Assam Inland Water Transport Development Society
AIWTP	Assam Inland Water Transport Project
Aol	Area of Influence
CITES	Convention on International Trade in Endangered species.
CHMP	Cultural Heritage Management Plan
CPCB	Central Pollution Control Board
CTC	Crew Training Centre
DIWTA	Directorate of Inland Water Transport, Assam
DPR	Detail Project Report
DMP	Disaster Management Plan
EC	Environmental Clearance
EHS	Environment, Health, and Safety
ESIA	Environmental and Social Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EPA	Environmental Protection Act
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GoA	Government of Assam
Gol	Government of India
GLSR	Ground Level Service Reservoir
HFL	High Flood Level
IMD	India Meteorological Department
IUCN	International Union for Conservation of Nature
IWAI	Inland Waterways Authority of India
LWL	Low Water Level
PAPs	Project Affected Persons
PWD	Public Works Department
NGO	Non-Government Organizations
NW	National Waterway
RPF	Resettlement Policy Framework
SPCB	State Pollution Control Board, Assam
SPL	Sound Pressure Level

EXECUTIVE SUMMARY

1. INTRODUCTION

Assam has approximately 1980 km of navigable waterways of which the most important for transport purposes are the Brahmaputra and Barak rivers. The river Brahmaputra is navigable for most of its length in India. The Brahmaputra River with a length of 891 km between the Bangladesh Border and Sadiya, was declared National Waterway No. 2 by the Government of India in 1988.

National waterways are cost efficient and is an environment-friendly mode of transport. The development of National Waterway as a supplementary mode would enable diversion of traffic from over-congested roads and railways. This will ensure enormous gains in terms of economic growth, livelihood generation and prosperity, leading to political and social-cultural stability.

The state Government of Assam (GoA) has taken up a Project titled "Assam Inland Water Transport Project (AIWTP)" to improve the quality of inland water transport services and integrate high quality passenger and vehicle ferry services in river Brahmaputra. The World Bank is financing the GoA to achieve this objective. Assam Inland Water Transport Development Society (AIWTDS) has been formed by the GoA under Transport Department to implement the Assam Inland Water Transport Project (AIWTP) to modernize IWT in Assam.

2. NEED OF THE PROJECT

The facilities built at most of the IWT terminals are not sufficient to meet the growing demand of traffic volume as they lack facilities for berthing, parking, storage areas and other essential facilities such as toilets, drinking water, safety features etc. They usually consist of one pontoon with shore connection for embarking and debarking passenger and cargo.

Thus, there is an urgent need for improvement in passenger ferries and require upgradation of supporting infrastructure.

3. PROJECT FEATURES

The existing Umananda terminal is located at Umananda Island adjacent to the Umananda temple. Umananda Devaloi is a Shiva temple located at Umananda Island in the middle of river Brahmaputra. Every year thousands of devotees from Guwahati city, as well as from all over Assam visit the Umananda Temple on festivals. On an average, about 600-700 devotees per day visit the temple, which increases to about 6000 visitors per day during festival time (Mahashivratri in the month of February and Sawan in the month of July-August every year) for which IWT arranges additional vessels. Umananda temple is reachable only through ferry services from Uzan Bazaar Ghat. At present the capacity and condition of existing terminal is not suitable to handle and provide quality

services to commuters, therefore there is a need to develop this ferry terminal with all basic infrastructure facilities

Due to space constraints at the terminal location, a floating pontoon and ramp connecting sloping access on the riverbank and the pontoon. This involves stepped concrete ramp which is mainly used for areas with inadequate land.

The landside and riverine infrastructure proposed for the ferry terminal are robust structures and provide floating but permanent boarding/de-boarding locations for the passengers and vehicles. The design will also ensure a greater sense of safety amongst the passengers, travelling through these vessels.

The following component have been planned to fulfil operational needs of the proposed terminal.

Landside Facilities:

- Land infrastructure
- Roads
- Terminal building
- Utilities for Electrical, water tanks, sewage management (Bio-digester) etc.

Riverine Facilities:

- Approach ramps
- Sloping linkspans
- Pontoons

The Project would undertake land reclamation and is in a sensitive ecological habitat i.e., dolphins and other aquatic species. Further, the project activities e.g., piling required, would have impacts on this habitat. It is thus considered Category A for the environment.

The social impacts are limited to 4 number of vendors so the project is considered as Category B. ESIA report is made based on the ESMF and RPF documents prepared for the Project.

4. STAKEHOLDERS CONSULTATION

The Focus Group Discussions (FGDs) and stakeholder consultations were organized with key stakeholders to get their views and suggestions on proposed terminal locations. Daily commuters, tourists, nearby shopkeepers/ vendors, ferry operators, members of union/ temple committee, Government officials were purposively selected for the discussions. The team members were trained enough to ensure that all participants were comfortable and engaged with the discussions, and that their opinions were noted down. Widening of approach road, safety and security of passengers, separate entry and exit points, proper displays and announcements ferry, provision of better sanitation facilities, facilities for differently abled & elderly passengers, medical/ first aid facility were the major findings of stakeholder's consultations.

5. BASELINE ENVIRONMENT & SOCIAL STUDY

The information on relevant environmental and social parameters has been collected through primary and secondary sources in order to understand the present environmental and social setting of the proposed project site. The major purpose of describing the environmental and social settings of the study area is:

- To understand the project need and environmental & social characteristics of the area.
- To assess the existing environmental quality, as well as the environmental impacts of the future developments being studied; and
- To identify environmentally significant factors or geographical areas that could preclude any future development.
- Socio-economic and socio-cultural aspects of the proposed site.
- Impacts on land and other assets, likely influx of labour leading to health issues, conflicts with local communities, gender-based violence if any, livelihood impact etc.

The basic parameter on which data has been collected are as follows:

- Physio-chemical aspects (Meteorological Data, Ambient Air Quality, Ambient Noise Quality, Surface Water Quality, Ground Water Quality, Soil Quality);
- Biological aspects (Aquatic Ecology);
- Socio-economic and socio-cultural aspects of the vicinity.

6. ANTICIPATED IMPACTS & MITIGATION MEASURE

It is expected that there will be certain changes in the overall environmental and social matrix of the study area. The baseline data of the existing environment, in the absence of the proposed activity, provides the status of natural environment and with the proposed activity, it further provides a mechanism for prediction of the changes that are likely to occur. In the present study, evaluation of land, water, air, noise, flora, fauna and socio-economic studies were undertaken to understand the baseline environmental status of the area and estimation were made as how this will change with the commencement of the proposed activities. Anticipating the quantum of change, efforts were also made to analyse the degree of alternations and strategies for suitable management to ameliorate the negative impacts of project activities. This exercise has provided a sound basis for formulation of different management plans, which are presented in the ESMP document of the project.

7. ENVIRONMENTAL MONITORING PROGRAM

The overall impact assessment of the proposed project was carried out and monitoring plans have been framed based on the severity of impacts in different areas. During the ESIA study, it has been observed that the Ambient Air Quality and Noise and Water Quality are going to be affected marginally though temporary. The preventive/ curative measures to reduce the ill effects of

construction activities on these parameters have been suggested under various plans. A holistic approach has been adapted for monitoring of air, noise and water related factors under different heads with suitable financial provisions for their implementation.

8. RISK ASSESSMENT AND EMERGENCY PREPAREDNESS PLAN

An important element of mitigation is emergency planning, i.e., recognizing that accidents are possible, assessing the consequences of such accidents and deciding on the emergency procedures, both on-site and offsite, that would need to be implemented in the event of an emergency -

- To prevent or minimize damage of property or the environment.
- To render help to the person at site to provide him relief.
- To restore the affected area as soon as possible.
- To review incident to evaluate and strengthen the emergency

9. ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

A site-specific Environmental & Social Management Plan (ESMP) has been prepared for avoiding, mitigating, checking the adverse impacts envisaged during ESIA studies on various environmental and social components during construction and operational phases of the project.

Preparation of Environmental and Social Management Plan is required for formulation, implementation and monitoring of Environmental and Social protection measures during construction and operation phases of the project. The Environmental and Social Management plan is a site-specific plan developed to ensure that the project is implemented in an environmentally and social sustainable manner where all contractors and sub-contractors, including consultants if any, understand the potential environmental and social risks arising from the project and take appropriate actions to minimize those risks. ESMP also ensures that the project implementation is carried out in accordance with the planned design and by taking appropriate mitigation actions to reduce adverse environmental and social impacts during project's life cycle.

Environmental budget for Umananda Terminal is estimated as approx. Rs. 60.46 lakhs in construction phase and approx. 54.86 Lakh in operation, while the estimated costs for various activities for social management under the sub-project is Rs.45 lakh.

10. IMPLEMENTATION OF ESMP

It is recommended that project authority to establish an Environmental & Social Management Cell (ESMC) at the project site with requisite manpower. The task of the Environmental and Social Management Cell will be to coordinate various environmental and social activities, to carry out

environmental and social monitoring and to evaluate implementation of environmental and social enhancement measures for positive impacts and environmental and social mitigation measures for negative impacts.

The ESMC will closely monitor the environmental and social aspects of the proposed project and identify problems and accordingly, suggest certain measures to mitigate the same. In addition, it will also all the statutory requirements in the area of environmental protection.

The key task of the Environmental & Social Management Cell (ESMC) will be to coordinate specific studies to:

- Monitor implementation of Environmental and Social Mitigatory measures
- Coordinate activities outlined as a part on Environmental and Social Audit
- Coordinate Environmental Monitoring Programme
- Suggestion of additional measures/studies, if any.

AIWTDS will engage an independent consulting firm to conduct external and independent monitoring of the ESMP implementation. The main purpose of the external monitoring will be to ensure that all the key entities including E&S Construction Supervisor, and contractors are effectively and adequately fulfilling their designated role for ESMP implementation and that all the ESMP requirements are being implemented in a timely and effective manner. Monitoring shall be on-going throughout the project life cycle and must be implemented to ensure that environmental & social impacts are within the predicted levels and that specified environmental & social performance targets are being achieved.

It can be concluded that it is likely to entail certain environmental and social impacts due to the proposed intervention at Umananda. These impacts can however be ameliorated to a large extent by implementing appropriate mitigation measures with proper monitoring and reporting mechanism. These anticipated impacts can be mitigated both during the construction and operation of the terminal by implementing the site-specific ESMP by the Contractor with supervision support by TSSC. Further, the independent Third Party Monitoring (TPM) Consultant shall make quarterly site visits and ensure compliance of the ESMP.

Chapter 1 - INTRODUCTION

1.1 INTRODUCTION

Assam has approximately 1980 km of navigable waterways of which the most important for transport purposes are the Brahmaputra and Barak rivers. The river Brahmaputra is navigable for most of its length in India. The Brahmaputra River with a length of 891 km between the Bangladesh Border and Sadiya, was declared National Waterway no. 2 by the Government of India in 1988 (Refer **Figure-1.1**).

National waterways are cost efficient and is an environment-friendly mode of transport. The development of National Waterway as a supplementary mode would enable diversion of traffic from over-congested roads and railways. This will ensure enormous gains in terms of economic growth, livelihood generation and prosperity, leading to political and social stability.

The Inland Water Transport departments of both the state and central governments of India are very keen to realize NW2's full potential for cargo and passenger transportation. River tourism is another key potential area which can hugely contribute to the economy of the North-eastern states.

The Directorate of Inland Water Transport, Assam (DIWTA), established in 1958 and part of the Assam Transport Department, is responsible for developing, maintaining, and regulating IWT services in the state. It also operates and maintains many of the passenger transport services, ferry terminals and navigation aids on both Brahmaputra and Barak Rivers.

The river Brahmaputra, running through the heart of the state of Assam, provides a vital link for both urban and rural ferry services which are the single most important transport mode for many sections of the population, especially for rural households in Assam. These ferry services are provided by the Directorate of Inland Waterway Transport Assam (DIWTA), and by country boat operators, who are – typically small independent and informal private ventures. In addition to the 106 ferry service routes designated by the Directorate of IWT, there are numerous routes licensed by the local (village) and district councils.

The state Government of Assam (GoA) has taken up a Project titled “Assam Inland Water Transport Project (AIWTP)” to improve the quality of inland water transport services and integrate high quality passenger and vehicle ferry services in river Brahmaputra. The World Bank is financing the GoA to achieve this objective. Assam Inland Water Transport Development Society (AIWTDS) has been formed by the GoA under Transport Department to implement the Assam Inland Water Transport Project (AIWTP) to modernize IWT in Assam.



Figure 1.1: Map showing Brahmaputra River System (NW 2)

1.2 NEED FOR THE PROJECT

The river Brahmaputra is a braided river system characterised by high sediment delivery and low sediment throughput. This is caused due to its very low gradients making it very sensitive to rapid geometry (boundary and channel) changes, channel barring and flooding. The river layout often changes significantly during and after floods. Most of the ferry terminals consist of moorings on the bank of the river, which require relocation with changing river conditions.

The facilities built at these terminals are not sufficient to meet the growing demand of traffic volume as they lack facilities for berthing, parking, storage areas and other essential facilities such as toilets, drinking water, safety features etc. They usually consist of one pontoon with shore connection for embarking and debarking passenger and cargo.

Thus, that there is urgent need for improvement in passenger ferries and require upgradation of supporting infrastructure.

1.3 ESIA STUDY

AIWTDS has appointed WAPCOS Ltd. (A Government of India Undertaking) under aegis of Ministry of Jal Shakti to prepare ESIA the components consist of development of 13 Ferry Terminals, 1 Crew Training Centre (CTC) and 2 Slipway Facilities. The location details of the project terminals are given in **Table-1.1**.

Table 1.1: Location of the Terminals

S No	Proposed Terminal	Location
1	Umananda	26°11'47.73"N, 91°44'42.73"E
2	Uzan Bazar	26°11'35.47"N, 91°45'6.73"E
3	Kurua	26°14'16.08"N, 91°49'23.57"E
4	Guijan	27°34'40.08"N, 95°19'29.16"E
5	Ghagor	27°14'3.72"N, 94°11'14.70"E
6	Kachari (Dhubri)	26° 1'8.08"N, 89°59'43.05"E
7	Goalpara	26°11'3.43"N, 90°37'53.70"E
8	Bahari	26° 14' 49.08", 91° 8' 21.64"
9	North Guwahati	26°11'10.05"N, 91°43'18.18"E
10	Aphalamukh	26°54'57.04"N, 94°17'54.07"E
11	Neamati Ghat	26°51'39.07"N, 94°14'32.16"E
12	Matmora	27° 9'54.90"N, 94°30'55.98"E
13	Disangmukh	27° 2'21.90"N, 94°30'59.90"E
S No	Proposed Slipway	Location
1	Dikhowmukh Slipway	26°59'58.00"N, 94°27'55.00"E
2	Dhubri Slipway	26° 1'23.03"N, 89°59'29.03"E
S No	Proposed CTC	Location
1	CTC at Pandu	26°10'19.05"N, 91°40'57.06"E

As suggested by AIWTDS, ESIA Report is prepared for the priority terminals namely Umananda, North Guwahati, Neamati and Aphalamukh. This report is ESIA of Umananda terminal.

1.4 SCREENING AND SCOPING STUDY

Screening and Scoping exercise has been done for Umananda terminal. The potential impacts on environmental and social attributes were identified based on the reconnaissance survey,

FGDs etc. The identified risks were evaluated qualitatively based on the significance of risks on a scale of 1 to 4 with the help of Scoping Matrix.

As part of environmental and social assessment process, environmental and social safeguards screening exercises have been conducted. The screening exercise has identified the following potential impacts from the project activities:

1.4.1 Positive Impacts

- Improvement in connectivity with Umananda Island
- Improvement in income and living standards due to increase in tourism.
- Improvement in local environmental and social conditions.
- Decrease in public health risk by reducing incidence of water borne and other disaster related diseases, and mental fears after project implementation
- Reduction in poverty through generation of employment opportunities for the locals.

1.4.2 Negative Impacts

- The Umananda ghat zone is one of the highest current areas of the Brahmaputra River so construction activities at this site will have to face this additional risk.
- The proposed terminal area is flooding prone area. The flood period needs to be highlight, as it will affect the construction and operation activities.
- Public health risk by incidence of water borne and other disaster related diseases, and mental fears during construction phase of the project.
- Spillage of construction material into the river.
- Disposal of solid and liquid waste into the river is a major risk for contamination of river water. It may also hamper the aquatic ecosystem.
- There is no possibility of municipal water supply for Umananda island during construction or operation phase.
- Presence of Gangetic Dolphin in and around the project site which is a schedule I species as per Wildlife Act, Endangered species as per IUCN and Appendix I as per CITES. Thus, the construction and operational activities may cause threats to this valuable aquatic species.
- Transportation and storage of construction materials may increase the risk of contamination of river water. Construction materials to be carried on boats to site.
- Labour camps and other utilities cannot be placed at site due to space constraints.
- Umananda is a famous pilgrim place in Guwahati and protected by ASI. The site is significant with the presence of stone sculptures and carvings belonging to the early medieval period. It is built by the Ahom King Gadadhar Singha between 1681 to 1696 AD. Thus, construction and operation activities may cause risk of damage or theft.
- Impact on livelihood of 04 (four) vendors selling fruits, coconut, drinking water etc. near the proposed site.
- Crowd management plan need to be prepared for festival time and tourist season.
- The proposed project site is the only access route for the pilgrimage, tourist and other commuters from the ferry terminal to the Umananda temple. Hence, alternative access route needs to be identified and developed during project construction phase or no construction activities during festival times like Maha Shiv Ratri.
- Noise and vibration due to use of machinery and movement of vessels
- The very fast current near Umananda and the type of construction envisaged present occupational Health safety risk to the workers working in this area.

Based on the identified risks, the impacts could be significant and hence, the ESIA study shall be conducted with emphasis on following aspects:

- Assessment of physico- chemical parameters (Water, Soil, Air and Noise)
- Assessment of aquatic ecology with special emphasis on Dolphin study
- Assessment of loss of livelihood of vendors
- Assessment of impacts on archaeological and historical monuments and Conservation and preservation plan.
- Preparation of Site-Specific Conservation Plan for Dolphins with budgetary provision for construction and operation phases
- Preparation of RAP as per World Bank's OP 4.12 and approved RPF for 4 affected vendors with budget
- Preparation of Environment monitoring Plan of physico- chemical parameters for construction and operation phases with budgetary provision
- Preparation of Environment monitoring Plan of Biological parameters for construction and operation phases with budgetary provision
- Environmental and Social Management Plan (ESMP) for construction and operation phases with budgetary provision.

1.5 OUTLINE OF THE REPORT

Chapter- 1	Presents an overview of the need for the project, objectives and need for ESIA study, Scope of Work, Deliverables, etc.
Chapter- 2	Project description of the terminal
Chapter- 3	Prescribes the legal and policy framework applicable to the project.
Chapter- 4	Describes the stakeholder consultation carried out during the study period
Chapter- 5	Describes the environmental and social baseline status.
Chapter- 6	Describes the impact assessment and mitigation measures.
Chapter- 7	Describes the Risk Assessment & Disaster Management Plan for construction and operation phases
Chapter- 8	Describes the Environmental & Social Management Plan (ESMP) and monitoring schedule.
Chapter- 9	Describes the summary of SEIA study

Chapter 2 - PROJECT DESCRIPTION

2.1 INTRODUCTION

The present chapter gives the details of existing infrastructure facilities, issues at existing facilities, and the new proposed developments at Umananda Terminal.

2.2 DESCRIPTION OF THE TERMINAL

The existing Umananda terminal is located at Umananda Island adjacent to the Umananda temple. Umananda Devaloi is a Shiva temple located at Umananda Island in the middle of river Brahmaputra. This Devaloi was rebuilt after an earthquake in 1897 and it attracts visitors by boats originating from Uzan Bazaar Ghat, Umananda is a famous pilgrim place and archaeological site in Guwahati. The site is significant with the presence of stone sculptures and carvings belonging to the early medieval period.

Every year thousands of devotees from Guwahati city, as well as from all over Assam visit the Umananda Temple on festivals, especially on Maha Shiv Ratri to offer prayers to Lord Shiva. Umananda temple is reachable only through ferry services from Uzan Bazaar Ghat.

The Umananda Ghat is served by IWT vessels i.e., MV Meghna, Ranganadi, Boginodi which make 5-7 round trips per day depending on the day light timing. On an average 600-700 devotees per day visit the temple, which increases to about 6000 visitors per day during festival time (Mahashivratri in the month of February and Sawan in the month of July-August every year) for which IWT arranges additional vessels. There are 07 private cruise vessels plying in this route. The existing ferry terminal is utilised mainly by commuters like temple priests, vendors and tourists travelling from Uzan bazaar Ghat to Umananda Ghat.

At present the capacity and condition of existing terminal is not suitable to handle and provide quality services to commuters, therefore there is a need to develop this ferry terminal with all basic infrastructure facilities. The approach road from ferry debarking point towards temple main gate is approximately 50 meter in length and 2.50m wide. This narrow road needs to be widened to avoid mishaps during festival and rainy seasons. Thus, the existing terminal at Umananda Ghat needs upgradation. The co-ordinates of Umananda terminal are N - 26° 11' 46.12", E - 91° 44' 42.73", and the location map is given in **Figure-2.1**.

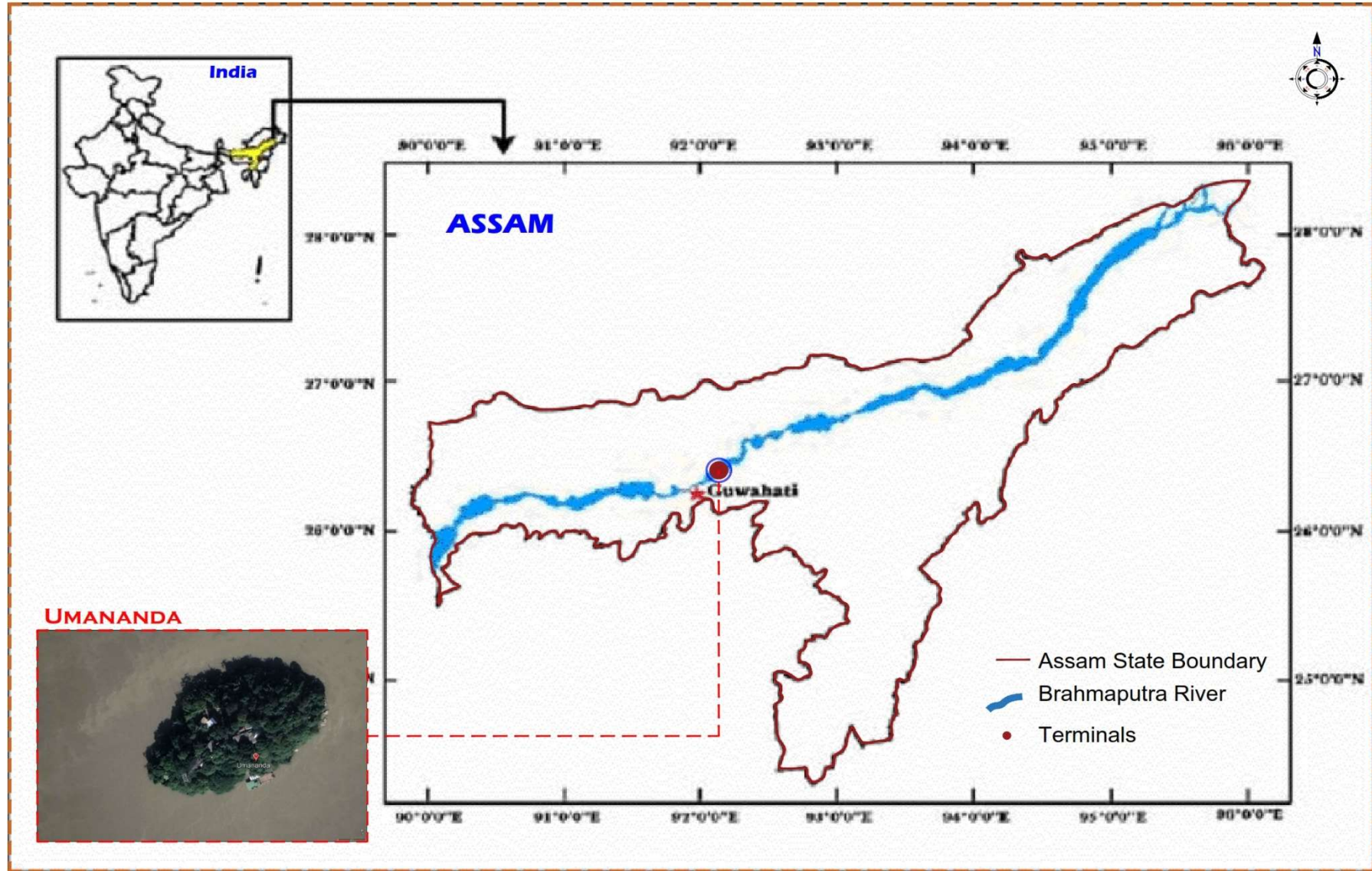


Figure 2.1: Location Map of Umananda Terminal

2.3 EXISTING FACILITY AT UMANANDA GHAT

There are no residential and commercial areas in the island at this moment of time. Most of the commuters are devotees and tourists. The devotees visit the temples by crossing the river through ferry service by parking the vehicle on the opposite bank of the river.

The existing facilities at Umananda Ghat is as follows:

- a) Floating pontoon facility for berthing of vessels and boarding and de-boarding of commuters.
- b) Wooden planks as access structure to reach the pontoon.
- c) Kachcha approach road from terminal to the temple.
- d) At the land side there is no terminal building, dedicated waiting areas and the ticketing counters etc. At this point of time the waiting area and the ticket counter are present in the pontoon itself.

The existing conditions at Umananda Ghat is shown in **Figure 2.2**.



Existing Umananda Ghat

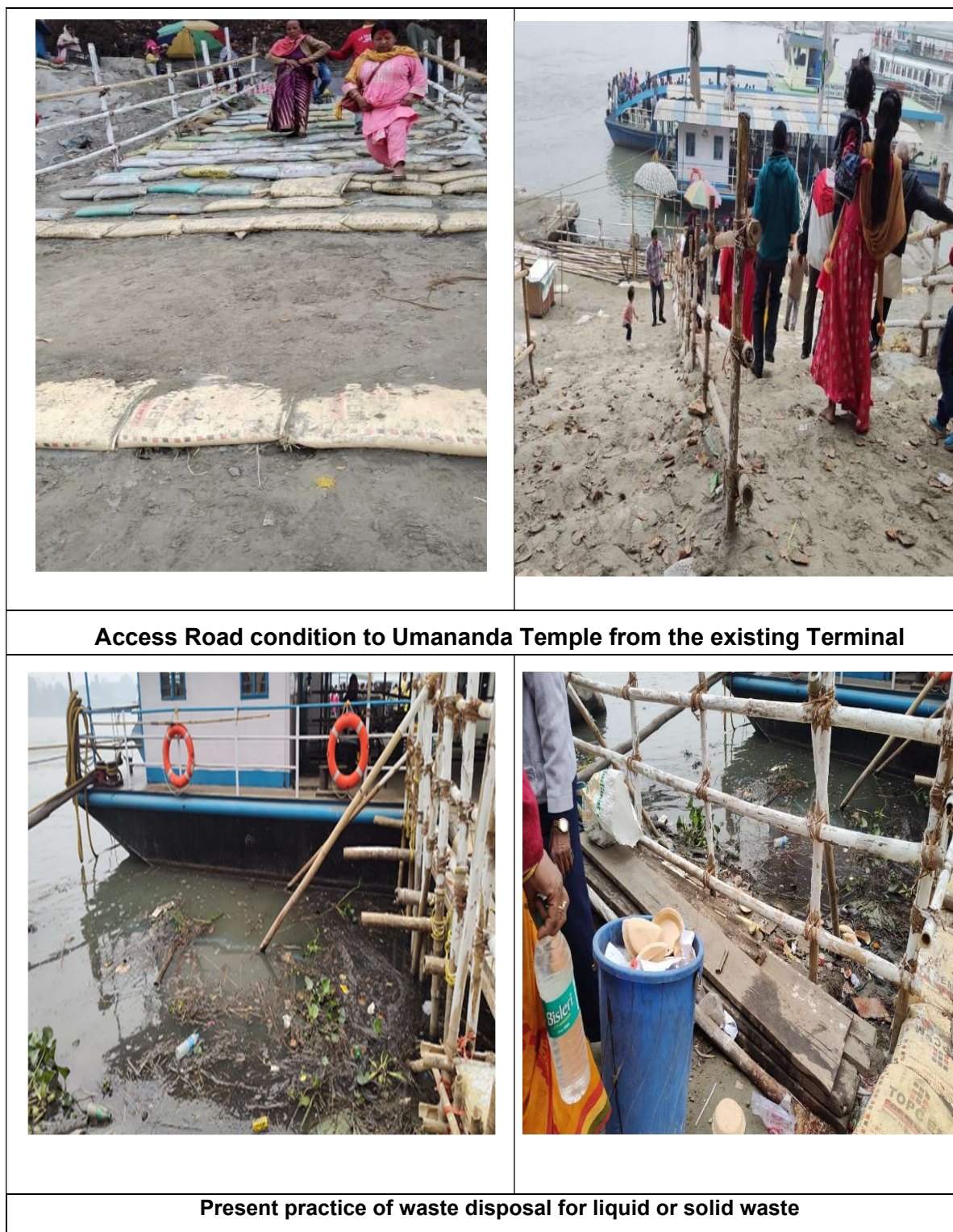


Figure 2.2: Existing conditions at Umananda Ghat

2.4 PROPOSED UP-GRADATION AT THE TERMINAL

There is a need to develop a ferry terminal with all basic infrastructure and facilities. The layout of the proposed Umananda Ghat Terminal is enclosed as **Figure-2.3**. The Umananda Terminal Face a unique problem of High-Water level during the monsoon and floods and receding water

levels and low water levels during the non-monsoon seasons. This presents a unique challenge of temporally varying water levels. To manage this problem a Dog-Legged Sloping Bund¹ and steeped concrete ramp has been planned for Umananda Terminal. The dog legged ramp arrangement is provided to cater to the seasonal water level variation. This is essentially a floating pontoon and ramp connecting sloping access on the riverbank and the pontoon. This concept solution is proposed where the terminal site land mass is made up of rocky out crops at the riverbank. The rock mass will be chipped to attain 1:12 access way slope and concreting will be done over the hard ground to generate a finished access pathway. The sloping access way shall be planned in a staggering manner. Each dead end of sloping access way will be having a landing point where the linkspan will rest. During the seasonal water variation in the river the link span needs to be shifted onto different landing points based on the position and level of the pontoon.

Sloping ramp with the landing at the either side of it, shall be used as landing platform from low water level, intermediate to high water level. At the Low Water Level condition i.e., 41.550 m the Access Ramp 1 (AR1) shall be resting on landing which is at 42.20 m at the same time the Access Ramp 2 (AR2) shall be in lifted position / unserviceable for the safe commute of passengers. The cross-sectional view shown in **Figure-2.4**.

Ramps allow persons in wheelchair or persons with disability or elderly to move from one level to another. For the ramps (hard ramps) that are on the landside, reference is made to “Harmonised Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons (2016)” which is part of “Accessible India Campaign”, program. For the ramps (articulated) specifically for floating platforms, for example linkspan, reference is made to “Guidelines for Floating Jetties/Platforms”, issued by Ministry of Ports, Shipping and Waterways (Sagaramala cell), Govt. Of India (2021). For Umananda considering hilly terrain, a milder gradient of 1:15 with landings at every 9 meters of ramp run is considered. It is anticipated that the disabled person shall always be assisted during their Journey along the ramps, including embarkment and disembarkment from the vessel until they reach the terminal premises.

The entire facility has been divided to two categories.

- Landside Facility
- Riverine Facility

The landside and riverine infrastructure proposed for the ferry terminal are robust structures and provide floating but permanent boarding/de-boarding locations for the passengers and vehicles. The design will also ensure a greater sense of safety amongst the passengers, travelling through these vessels.

Following component have been planned to fulfil operational needs of the proposed terminal.

Landside Facilities:

- Land infrastructure
- Roads
- Terminal building
- Utilities for Electrical, water tanks, sewage management (Bio-digester) etc.

¹ The dog-legged stairs consist of two flights connected by a landing, forming a right angle or “dog-leg” shape when viewed from above. The first flight of stairs goes up to the landing, where it changes direction by 180 degrees before continuing with the second flight. The landing provides a resting place for people climbing the stairs and allows the staircase to change direction without taking up too much space.

Riverine Facilities:

- Approach ramps
- Sloping linkspans
- Pontoons

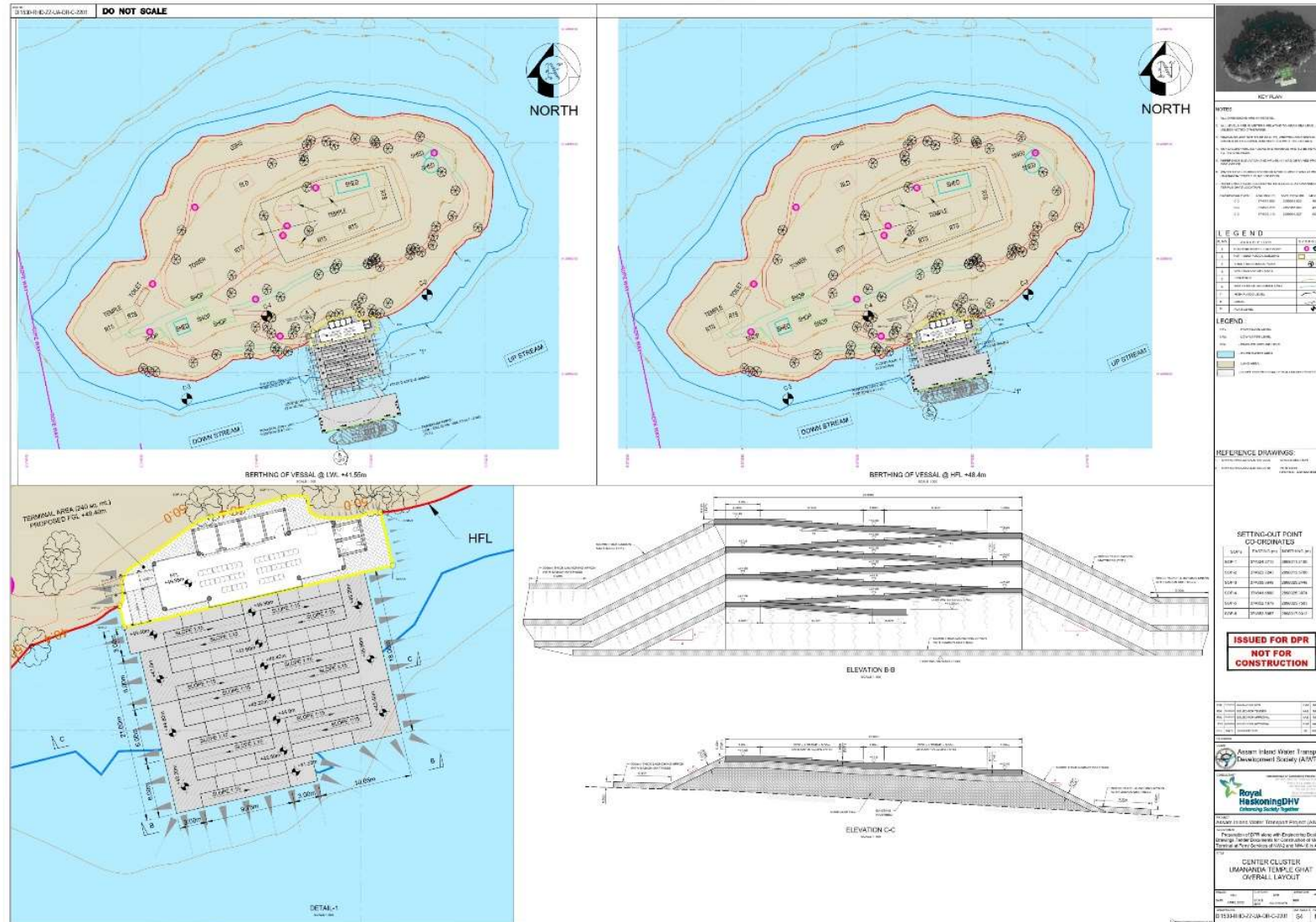


Figure 2.3: Proposed Layout of Umananda Ghat Terminal including Pontoon Linkspan and Sloping Access



The summary of land and river components to be developed as a part of the project are given in **Table-2.1**. The typical arrangement of pontoon, ramp and approach bund is shown in **Figure-2.5**.

Table 2.1: Summary of land and river components for Umananda Ghat Terminal

Components	Nos.	Dimension	Remarks
A. Riverine structures			
I. Type of berthing arrangement	Dog Legged Sloping Access		
II. Floating pontoon	1	45x12 m	Steel pontoon
III. Pontoon Integrated ramp	2	8.0 m x 3.0 m	Mechanical/Hand winch
IV. Approach bund	6.5	26 m length with 1 in 15 slopes with landing at every 9.75 m and 3.0 m Wide	The approach bund is the contact point of pontoon ramp with landside infrastructure. The passengers disembarked from the pontoon shall move through ramp will reach the approach bund. The approach bund in the Umananda is planned in a staggered / doglegged manner due to the availability of less river frontage area. These staggered levels of the approach bund connect the access way from low water level to high water. Further this solution is proposed to the terminal site since land mass is made up of rocky strata. The slope of the access way shall be limited to 1:15. Each dead end of sloping access way will be having a landing point where the pontoon ramp will rest for the movement of the passenger. Adequate passageway is considered, here it is 1.8 Meter. Lane for passengers and physically disabled person
V. Type of slope protection	-	0.5 m thick	Gabion mattress with Aggregate as a filling Material
VI. Type of Bank Protection			Fabric foam mattress solution technology ²
B. Land side facilities			
I. Total land area		240 Sqm	
II. Building area		170 sqm	
• No. of floors		One (Ground floor)	

**Source: DPR, February 2023*

Other amenities and facilities proposed at Umananda Terminal

- Surveillance System (CCTVs)
- Communication System
- Fire alarm and security system (explained in
- Internal HVAC

² On the trimmed surface of riverbank non-woven Geotextile shall be placed. The geotextile shall be needle punched made of polyester staple fibre. Finally, the fabric form mattress shall place over the geotextile surface. The fabric form mattress shall be filled with suitable filler material like cement mortar which shall be laid on geotextile base for river bank protection.

- Power
 - Power requirement: 25kVA

Source of power supply: Project site is typically a river island and thus it is not possible/practical to tap the Electricity from SEB tapping point Hence a suitable rating of DG (Diesel Generator) Set to be considered as a Primary power source for this site. During the operation phase of the Terminal, provision for installation of a Grid Tied Solar Rooftop Photo Voltaic (SPV) power plant and solar exterior lights are suggested in DPR.

Water

- **Demand:** Water demand of 9 KLD is estimated based on the unit demand norms as per average number of passengers (to and from) projected per day for design phases of development up to year 2045 in DPR. The water requirement for vendors and staff at ferry terminal is also considered
- **Source:** PHE Department has provided water treatment plant at Umananda temple, currently river water is pumped to the overhead tank which is used for domestic usage. For the construction phase, potable water shall be utilized from the same tank. During operation, the Ground Level Service Reservoir (GLSR) will have one potable water compartment. The potable water compartment will have storage for 24 hours of demand i.e., 9 KL. From this GLSR, water will be pumped to the overhead tank (OHT) of the building using a submersible pump after requisite treatment.

Sewage Management- The sewage treatment at the site has been recommended via a bio-digester tank. A bio-tank of 4 KL occupying 4 sqm (2m X 2m) is proposed for the site. Biodigester will be used for sewage treatment during the construction phase as well as for the operation phase. The sewage from the terminal building will be conveyed to the bio-tank from the inspection chamber. The Design detail and efficiency of bio-digester is enclosed as **Annexure-1**.

Storm Water Management: Due to site constraints, there is no provision of storm water drainage. The gradient of the site will be maintained to facilitate flow towards river.

Solid Waste Management: The site will have designated waste collection area. All solid waste will be collected, segregated and removed from the building before being disposed in approved waste disposal sites. Currently no proper waste disposal system is followed. Being in the middle of the river, local municipal body also do not provide this service. However, once the terminal starts its operation, NGOs assigned by GMC in North Guwahati or Fancy Bazar area can be contacted for waste collection and disposal at designated sites on payment basis. 2 bin system for separating Wet and Dry waste will also be placed at various locations throughout the riverine locations i.e., approach bund, approach trestle, landing platforms, main pontoons etc. During Construction phase, the contractor shall clear away all debris and excess material accumulated at the site, failing which the same shall be done by Employer/Engineer at the Contractor's risk and the cost of clean-up shall be deducted from the Contractor's pro-rata bill, as per the contract terms and conditions.

Firefighting System

Potable fire-fighting system will be provided for the internal building. At least 04 number of portable dry powder fire extinguishers of 9 litre capacity for all classes of fire will be provided. In addition, 04 numbers of Fire buckets (9 lit. Capacity) and 04 numbers Sand boxes (0.5 m x

0.5 m x 0.3 m) is provisioned. Atleast 02 numbers of Fire Hose with nozzle has been provisioned with fitting on Main Deck and shall be connected from shore supply. 1.5m wide walkways are planned all along the building as well as entry/exit route for easy logistics and also for emergency evacuation in case of fire etc. At Umananda, the design of the building is kept minimalistic due to its unique location. The technical design studies have considered the building as one which is of low-risk with low fire load due to low concentration of flammable materials. Thus, the proposed fire-fighting system shall suffice and shall not require additional sprinkler system in case of Umananda. (Refer **Annexure-24** New Approach to Umananda Temple constructed under Smart City Project)

Emergency exit in case of fire or any other hazard is planned from the back side of the terminal through an exit door as shown in the Fig- 2.5. Passengers or any other persons during the time of emergency shall be evacuated through the emergency exit and guided through the backside of the terminal towards the main temple stair case. People can also use the steel staircase currently being constructed under the Smart City Project during any emergency. Details of emergency evacuation is given in Chapter 7.

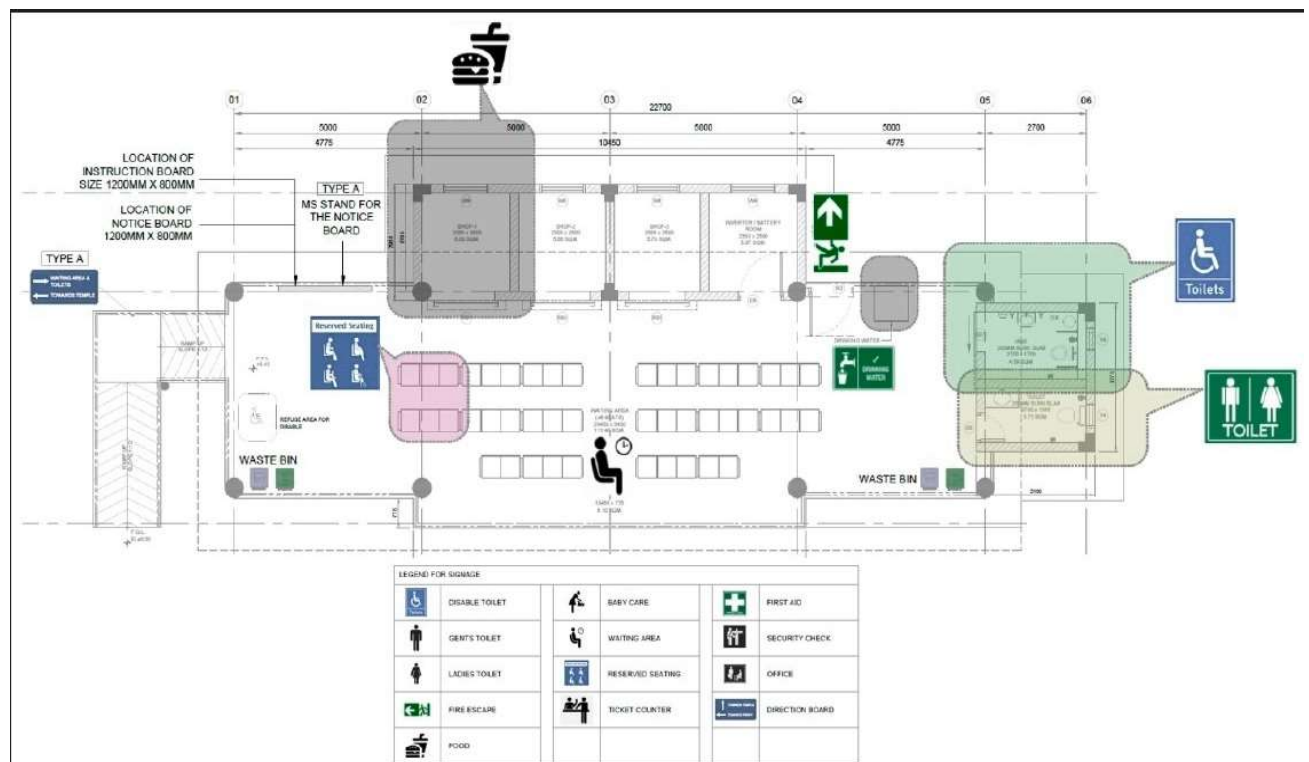


Fig: 2.5 Signage Lay-out of terminal building

Barrier Free Design for Differently-abled

As part of Accessible India Campaign, all designs will be given great emphasis on encouraging the less fortunate members of the society, who, for the reasons of certain physical handicaps are not at par with their counterparts. To create circumstances, environment, and conditions

of work, suitable for those who are physically handicapped, certain basic requirements shall have to be designed, augmented, or executed in all terminal buildings.

All Barrier free facility designs will be designed in compliance with:

- CPWD Guidelines– Handbook on barrier free and accessibility 2019
- Harmonised Guidelines and Space standards for Barrier Free Environment for Persons with Disabilities and Elderly Persons, February 2016
- Nation Building Code 2016
- IS 4963-1987 (2020)- Recommendations for Buildings and Facilities for the Physically Handicapped
- Local State and Municipal requirements

The intent is to make buildings and facilities accessible to and usable by all people including those living with disabilities and may include those with inability to walk or difficulty in walking, reliance on walking/ mobility aids, blindness and visual impairments, speech and hearing impairments, limited coordination of motor movements, reaching and manipulation, lack of stamina, difficulty in interpretation and reacting to sensory information and extremities of physical size.

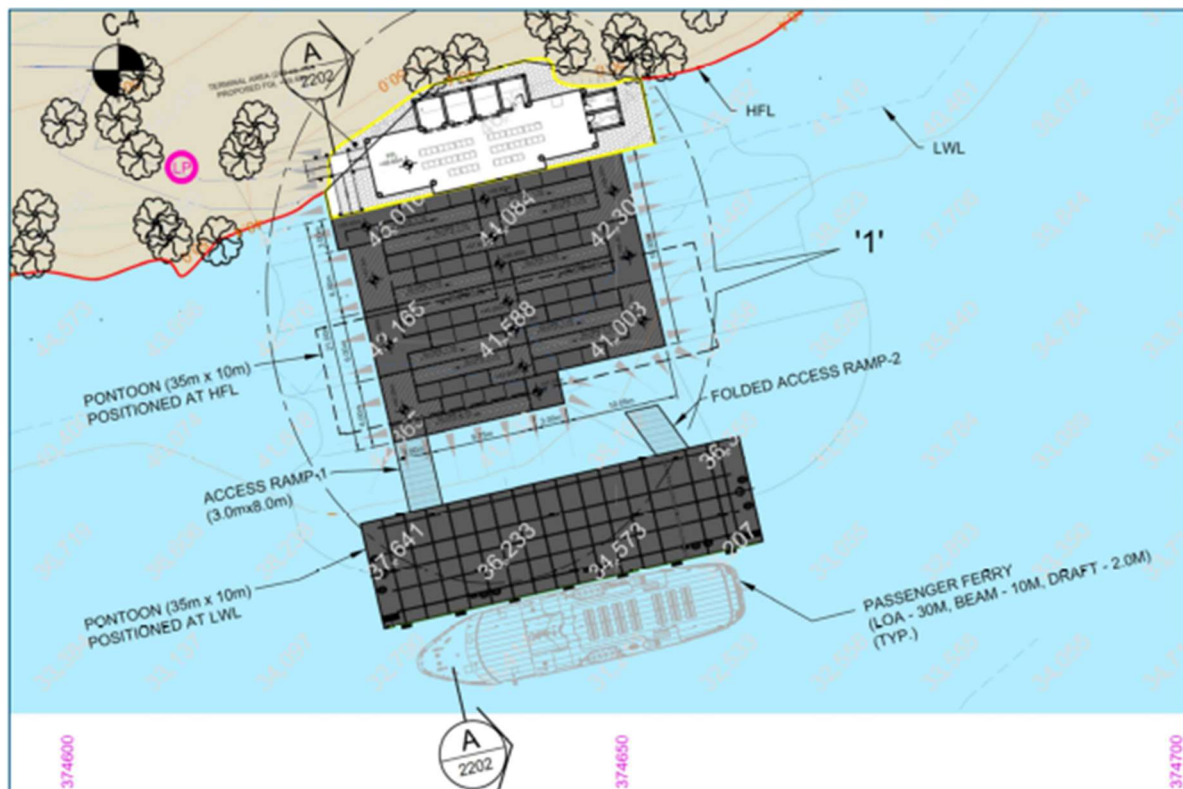


Figure 2.6: Typical Arrangement of Pontoon, Ramp and Approach Bund

2.5 RIVER BANK PROTECTION

Morphology of the river bank at Umananda site is considered stable as per the technical studies conducted during the preparation of DPR. The terminal site is stable over the years due to presence of the rocky strata in the island. The entire terminal facilities development

shall take place on the reclaimed land and slope protection shall be of Gabion mattress. The side slopes of approach ramp is placed at 1 Vertical (V : 2 Horizontal (H) stable slopes by placing granular fill. However, to address the scour and slope protection due to river flow, approach ramp slopes on all over three sides shall be protected by Gabion mattress filled with aggregate. This layer will act as slope protection element for drag and lift caused by river flow. On preliminary basis it is understood that ~ 0.5m thick gabion mattress shall be sufficient for slope protection. These gabion mattresses shall be filled with suitable aggregate material. River bank stability calculation was done considering all the site conditions and appropriate size of the gabion mattress were decided. Thickness of 0.5 m gabion mattress was found to be suitable for the Umananda location, hence forth the entire geotechnical part which also constitute the soil stability section was duly vetted by IIT, Guwahati and they found the design satisfactory, Refer **Annexure-23: Slope Stability Report by IIT-G & Gabion Mattress design calculation.**

2.6 LAND REQUIREMENT AND OWNERSHIP STATUS

The land requirement for the four terminals as per DPR is given in Table-2.2.

Table 2.2: Land requirement for the four terminals

S. No	Name of Terminal	Land Requirement (sqm)	Ownership
1	Umananda	850	Unsurveyed Government land belongs to District Revenue Department

The proposed Umananda terminal is archaeological site. The NOC for the construction of terminal has been received from Director of Archaeology, Assam. Copy enclosed as **Annexure-2** and Land documents at **Annexure -22**

2.7 CONSTRUCTION PERIOD

The duration of construction phase is about 12 months including pre-tender activities.

2.8 COST ESTIMATE

The cost for Umananda terminal is given in **Table-2.3.**

Table 2.3: Cost of the project

S. No	Name of Terminal	Cost (Rs. Cr.)
1	Umananda	11.8

**Source: DPR, April 2023*

Chapter 3 – LEGAL AND POLICY FRAMEWORK

3.1 GENERAL

The Environmental and Social Impacts Assessment (ESIA) studies for the proposed AIWTP-Ph-2 have been carried out in accordance with applicable WB, National and requirements of GoA on environmental, health and safety management. The present chapter gives a brief review of the applicable legal and policy framework.

3.2 NATIONAL LEGAL AND POLICY FRAMEWORK

The national environmental legislations are broadly discussed here. The MoEF&CC, Central Pollution Control Board (CPCB), Dept. of Env't. & Forest, GoA and State Pollution Control Board, Assam (SPCB) together form the regulatory authorities for implementation of provisions of environmental legislations. Other Ministries/Statutory Bodies/Departments responsible for ensuring environmental compliance and granting various clearances includes State Dept. of Environment, Regional offices of MoEF&CC and State Forests/Wildlife Departments.

Under the Environmental Protection Act (EPA), 1986, various rules/notifications/acts have been promulgated to control pollution and mitigate adverse impacts on the environment. The EIA Notification, 2006 and its subsequent amendments imposes certain restrictions and prohibitions on new projects or activities, or on the expansion or modernization of existing projects or activities based on their potential environmental impacts. These project categories are listed in the notification and clearance process defined based on their capacities to obtain prior environmental clearance.

Based on the preliminary review of documents, and scope of works within purview of this project, activities encapsulated under this project are mainly for transportation and navigation purposes. As per the OM dated 21st December 2017, Ministry of Environment, Forest and Climate Change, the proposed project does not require Environmental Clearance. However, NOC/Permissions are required to be obtained for specific activities like setting up Batch Mix Plant, Hot Mix Plant, Operation of DG sets, from respective agencies as indicated under legal and administrative framework. All permissions will have associated conditions that will be complied with by contractor/AIWTDS. None of these permissions required a detailed Environmental Impacts Assessment study. However, findings of the ESIA and proposed mitigation measures as a part of ESMP would be useful in obtaining permissions and for environmentally friendly construction and operation of the project. ESMP will be prepared separately for all components, and it will be part of contractor's agreement for implementation during the construction and operation stages.

A list of National and State level legislations and regulations that could have a bearing on the project during its pre-construction, construction, implementation, and monitoring stages is provided **Table-3.1**.

Table 3.1: Relevance of national and state level legislations to the project

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
1	National Environment Policy 2005	National Environment Policy deals with the issues related to the control and regulation of environmental degradation and underline the needs for water conservation for different use and appropriate management, including integrated water management considering ecological use as a means.	ESIA and ESMP to examine the provisions of this policy, examine the clauses that are attracted and suggest remedial measures.
2	<ul style="list-style-type: none"> • Environmental (Protection) Act, 1986, • Environmental Impact Assessment Notification, 2006 its amendments 	<ul style="list-style-type: none"> • This Act empowers the Central Government to take necessary action to protect the environment and in the prevention of environmental pollution. • Construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to the notification under the Act will only be undertaken after the prior environmental clearance from the Central/State Government as applicable. 	Environmental Clearance (EC) is not required for the proposed project.
3	The Biological Diversity Act, 2002	<ul style="list-style-type: none"> • This Act aims to integrate conservation, promotion and sustainable use of biological diversity into projects. The State Government can declare areas rich in biological diversity, or when biological resources are threatened by overuse, abuse or neglect, as areas of biological importance for preservation. 	Not Applicable There is no such area in the vicinity of the project.
4	Water Prevention and Control of Pollution) Act, 1974, Amendment thereof	To prevent and control water pollution.	Applicable. Effluents are expected to be generated during construction and operation phase of the project
5	Noise Pollution (Regulation and Control) Rules, 2000	A level of noise permitted in different areas, including those of vehicular traffic, generators, and construction activities is defined under these rules. During operation phase noise	The standards shall be included in the bid documents for civil works Contracts for compliance. It will be instructed to cruise operator not to play loud music.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		can be created during cruise operation.	
6	Air (Prevention and Control of Pollution) Act, 1981, its Rules and amendments	Prevention and control of air pollution. State PCBs have been set up to monitor and manage activities that would lead to air pollution in and around the project area. Under the Act air quality standards are to be maintained in residential, ecologically sensitive areas.	During construction phase, likely use of diesel generators, movement of heavy transport on unpaved or semi-paved roads may cause air pollution. The bid documents for civil works contracts shall include the standards to be maintained for compliance. Necessary permits to be taken by the contractor for DG set and Batching plant if applicable.
7	Hazardous & Other Wastes Management and Trans boundary Movement) Rules, 2016	Proper handling storage and disposal of hazardous waste.	Project has potential to generate hazardous waste (Used Oil) during both construction and operation phases. The same shall be handled as per the applicable rules of the Act. The measures shall also be included in the bid document for contractor involved in construction.
8	E- Waste Management Rules 2016	The e-waste especially unused cables, electrical switches may be generated during construction and unused computers, laptops, cables etc. during operation of terminal.	Provisions in the bid document be made for disposal of e-waste by contractor. During implementation project proponent will implement the provision of this Act for disposal of e-waste.
9	Plastic Waste Management 2016	The plastic waste like polythene, plastic bags, plastic bottles etc. during project construction and operation phases.	Provisions in the bid document be made for disposal of plastic waste by contractor. In operation phase, project proponent will implement the provision of this Act for disposal of Plastic waste.
10	Battery management and handling rule 2010	The shipping boat needs different type of batteries for their operation.	Project proponent and boat operators must follow this Act/Rules for disposal of batteries.
11	Assam, Fire Safety Rules, 1989	Applicable for Fire NOC for construction as well as for operation of terminal	Contractor shall apply Fire NOC for construction period. AIWCL/DIWT shall apply/renew Fire NOC for operation of terminal.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
12	Labour laws	All legislations governing the labour including child and women labour, wages, and compensation, working condition and worker welfare will have a bearing on the project	The bid documents for civil works need to include adequate provisions to ensure strict compliance with India's labour laws and regulations
13	National Policy on Safety, Health, and Environment at Workplace	The policy aims to secure health of strength of employees and ensure humane conditions of work, including maternity relief to women	The provisions will apply to ensure that labour camps and working conditions are safe and humane.
14	Solid Waste Management Rules, 2016	The provisions of the Act prevent littering and mandate proper segregation, collection, storage and disposal of municipal solid waste.	The project will have provisions to manage and dispose solid wastes generated during project construction and operation phases.
15	Construction and Demolition Waste Management Rules, 2016	Rules and regulation for construction & Demolition Waste	The project shall generate construction and demolition waste, which shall be handled as per applicable rules. The same shall be mandatorily included in the bid document for construction works.
16	Minimum Wages Act, 1948	The Act makes it mandatory for the employer to pay every employee in a scheduled employment under him wages at the rate not less than the minimum rates of wages fixed under the Act.	The project involves labour employment; the project will document and monitor paid wages and as far as possible discourage cash payments
17	Child Labour (Prohibition and Regulation) Act, 1986	The Act prohibits the engagement of children in certain employments and to regulate the conditions of work or children in certain other employments.	To prevent contractor from employing child labour who shall come under the purview of the Act; the project will include relevant provisions in the bid document for complying with this Act.
18	Right to Information (RTI) Act, 2005.	The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, to promote transparency and accountability in the working of every public authority. Under the provisions of the Act, any India citizen may request information from a "public authority" (a body of Government) which is	The provisions of this act are bearing on AIWTDS/ contractor etc. For providing the information to the public on their demand.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
		required to reply expeditiously or within thirty days.	
19	RFCTLARR ACT, 2013	<p>This Act may be called the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. It extends to the pan India.</p> <p>The provisions of this Act relating to land acquisition, compensation, rehabilitation, and resettlement, shall apply, when the appropriate Government acquires land for its own use, hold and control, including for Public Sector Undertakings and for public purpose.</p> <p>Independent SIA (Social Impact Assessment) study needs to be conducted</p>	Not Applicable, as the project land is unsurveyed government land.
20	Assam LAAR Rules 2015	<p>This Act may be called the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules 2015. It extends to the whole state of Assam.</p> <p>Similar provisions for SIA (Social Impact Assessment) study also exist in this act.</p>	Not Applicable as the project land is unsurveyed government land
21	Sexual Harassment at the workplace (Prevention, Prohibition and Redressal), 2013	Sexual harassment at the workplace is prohibited by law and can lead to disciplinary, civil, and criminal action. This means that an employer can act for a misconduct against an employee and can impose any penalty, including fines and dismissal, on any employee found guilty of sexual harassment.	AIWTDS has established an Internal Complaints Committee (ICC) on 16th September'2020 for redressal of sexual harassment complaints as per the requirements of this act.

3.2.1 Other Relevant Acts

There are certain acts which are applicable to this project directly or indirectly are listed below:

- The Employees' Provident Funds and Miscellaneous Provisions act, 1952: The record

of Provident Fund deduction along with wages of labour given by contractor to be kept in record by the WRD. (As per Appendix A, 18 B);

- Equal Remuneration Act, 1976- Record of equal remuneration to men and women workers for similar nature of work needs to be maintained by contractor. (As per Clause no. 4 & 8 of Act)
- Inter-State Migrant Workmen's (Regulation of Employment and condition of services) Act, 1979-Record of registration of inter-State migrant workmen needs to be maintained by contractor. (As per Clause no. 4 & 23 of Act)
- Central Motor Vehicle Act, 1988 and Central Motor Vehicle Rules, 1989: Record of Vehicles used in project to be maintained like date of registration, insurance papers, fitness certificate, PUC etc. (As per Clause no. 115 & 139 of Act)
- Public Liability Insurance Act and Rules, 1991- Contractors shall undertake the public liability Insurance for their work for a value commensurate with work involved. (For immediate relief in case of any untoward incidence)
- The building and others construction workers (Regulation of Employment and conditions of services) Act, 1996: The record of welfare measures for labours, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace needs to be maintained by Contractors. (As per Clause no. 30 of Act)

3.2.2 Legislation Framed for Vessels Playing in Inland Waterways

There are certain legislations framed for vessels playing in Inland Waterways by IWA and Ministry of Ports, Shipping and Waterways, GoI are given in Table-3.2.

Table 3.2: Regulations Applicable on Vessels Plying in Inland Waterways

Name	Key Requirements	Applicability
Prevention of Collision on National Waterways Regulations, 2002	Precautions required for vessels and crew members	Applicable for all the vessels plying in IWT
National Waterways, Safety of Navigation and Shipping Regulations, 2002	Ensuring safety during navigation on the national waterways	Applicable for all the vessels plying in IWT
The National Waterway Act, 1982	Regulation and development of rivers for navigation	Applicable for all the rivers under IWT
New Inland Vessel Act, 2015 & Rules Under IV Act	Economical and safe transportation through inland waters	Applicable for all the vessel plying in IWT
National Disaster Management Guidelines, Boat Safety, September 2017	NDMA prepared National Guidelines on Boat Safety. The guidelines include action points towards drawing procedures and regulatory elements by states to streamline the passenger boat navigation in the established waterways in the regions	Most of the boat tragedies were on account of overloading and various other factors. Project proponent and all boat operators needs to follow these guidelines.

3.3 WORLD BANK POLICIES AND REQUIREMENTS

The Project is being implemented through AIWTDS, Assam financed by World Bank and AIWTDS would comply with the Environmental and Social Framework of WB.

The WB environmental and social safeguards frameworks for this project include the following:

The World Bank's Operational Policy 4.12 is applicable to the project and accordingly Environment Management Framework, Social Management Framework (SMF), RPF & Gender Development Framework, Environment Codes of Practices has been prepared and approved by the Bank and disclosed. The gap analysis is included in the SMF, RPF and Gender Development Framework. The ESIA and ESMP has been prepared on the basis of this framework.

The Project will be subject to the provisions of the Access to Information Policy and other related World Bank requirements concerning the disclosure of environmental and social information. The proposed project is also subject to World Bank review and clearance prior to disclosure. The consultant will provide all required assistance to AIWTDS to meet these disclosure requirements. Key documents will be made available in both English and local language.

The World Bank has published a number of Safeguard Policies and Guidelines to ensure that all possible impacts are taken care of by implementing mitigation measures in the proposed project.

Project involves augmentation of navigation capacity of existing IWT by developing various facilities like terminals, jetties, navigation aids etc. The project is likely to occur impacts on quality of life, livelihood, social status, economy, terrestrial and aquatic ecology, air quality, water quality, noise levels etc. The anticipated impacts are both positive and negative but will be significant.

The Project would undertake land reclamation and is in a sensitive ecological habitat i.e., dolphins and other aquatic species. Further, the project activities e.g., piling required, would have impacts on this habitat. It is thus considered Category A for the environment.

The social impacts are limited to 4 number of vendors so the project is considered as Category B. ESIA report is made based on the ESMF and RPF documents prepared for the Project.

Chapter 4 - STAKEHOLDERS CONSULTATION AND DISCLOSURE

4.1 INTRODUCTION

The stakeholder consultation process helps in positive support of general public and due to involvement of locals in the decision-making process. These consultations help to acknowledge the Project Affected Persons (PAPs), if any, about the project. The relevant information is exchanged, observations, suggestions given by the people are documented.

4.2 STAKEHOLDER MAPPING

Stakeholder could be an individual, group or organization those are likely to be impacted by the proposed project. Stakeholder mapping has been done to list the key stakeholders and classified under categories as detailed below:

Table 4.1: Stakeholder Mapping

Stakeholder	Rationale	Relevance to the project	Strategy for engaging the Stakeholder
Category-1- Ferry Operators			
Ferry operators (Government & Private Operators) Association	Livelihood & Service Delivery	Better quality of Service	FGDs
Category -2- Project Impacted Groups			
Squatters/ encroachers on the affected land	Loss of assets/livelihood	Project impacted/ displaced person	SIA
Vulnerable categories Gender Groups Indigenous People	Better access	Vulnerable beneficiary	SIA
Category -3- Community leaders/ Village level officers			
Gaon Panchayat Leaders	Facilitation Support	Opinion leaders	Questionnaire/ Interviews
Category -4-Government Offices			
Revenue Department	Details of land ownership/ transfer/ LA	Land details and transfer	Official communication
Public Works Department (PWD)	Valuation of Structures	Impacted structures to be valued as per PWD rates	Official communication

Stakeholder	Rationale	Relevance to the project	Strategy for engaging the Stakeholder
Forest Department	Wherever forest land impacted	Land transfer	Official communication
Water Resource Department	Convergent functions	Supportive intervention	Consultations
State Disaster management authority	Convergent functions	Supportive intervention	Consultations
Police Department	Convergent functions	Supportive intervention	Consultations
Fisheries Department	To understand whether fishing activities are undertaken near proposed terminal locations	Mitigate supports/ suggestions	Consultations
Tourism department	Convergent functions	Supportive intervention	Consultations
Labour Welfare Department	Convergent functions	Supportive intervention	Consultations
Archaeology Department	Convergent functions	Supportive intervention	Consultations
State Pollution Control Board	Primary Support	Project facilitation	Consultations
Category-5- Civil society organizations, Academics and Media			
Non-Government Organizations (NGOs)	Project supports	Supportive interventions	Consultations
Media	Media Supports	IEC supports	Consultation/ contract
Category-6- Commuter and users			
Passengers/ Small Traders/ Business categories/ tourists	Primary stakeholder	Beneficiaries of the project	FGDs

4.3 MODE OF COMMUNICATION WITH STAKEHOLDERS

The stakeholder consultations were conducted in following order:

- **Formal consultations**-Formal consultations were taken up with formal communications and identified stakeholders.
- **Stakeholder Meeting** – These are the major stakeholder meetings inviting all important stakeholders.

4.4 FOCUS GROUP DISCUSSIONS (FGDs)

In addition to the Stakeholders Consultation Meeting a series of Focus Group Discussions (FGDs) were also organized at terminal site with Commuters, Traders, Ferry Operators and members of influential Bodies.

4.4.1 Approach and Methodology

The Focus Group Discussions (FGDs) were organized with key stakeholders to get their views and suggestions on proposed terminal locations. Daily commuters, tourist, nearby shopkeepers/ vendors, ferry operators, members of union/ temple committee were purposively selected for the discussions. The team members were trained enough to ensure that all participants are comfortable and engaged with the discussions, and that their opinions were noted down.

4.4.2 Tools Used

A semi structured schedule (**Annexure- 3**) was used to collect the first-hand information from the selected groups. A team comprising both male and female including the personnel well versed in local vernacular language and culture were engaged in organizing the FGDs at nearby and proposed terminal locations.

4.4.3 Focus Group Discussions (FGDs) at Priority Terminals

Focus Group Discussions (FGDs) with different groups of people were conducted in the month of May'2022 (05.05.2022 & 06.05.2022) to ascertain views of the participants on the proposed project. The Concerns raised in the Focus Group Discussions (FGDs) are presented below:

Table 4.2: Focus Group Discussions (FGDs) Details

Focused Group	Concerns Raised	Response & mitigation Measures
Regular Commuters (Temple priest, vendors)	<ul style="list-style-type: none"> Approach road needs to be widened Separate corridor for elderly and physically challenged Proper signboards and announcement Electronic Display systems at terminals Washroom facility at terminals/ pontoon Drinking water facility 	<ul style="list-style-type: none"> New structure to have wider approach road and corridor Special design to cater the elderly and physically challenged people Digital display system proposed at terminal sites Drinking water facility are also proposed. Universal access to all kinds of commuters including elderly, differently abled, patients, etc. Construction of new and proper washrooms specially for male, female, differently abled in adequate numbers and drinking water facility are also proposed.
Occasional Commuters (Tourist and Devotees of all age groups including youth, women, aged persons and children)	<ul style="list-style-type: none"> Proper signboards regarding the route of the ferry System for audio/ visual announcement Washroom facility at ferry/ terminals/ pontoon 	<ul style="list-style-type: none"> Digital display system proposed at terminal sites Construction of new and proper washrooms for male, female, differently abled in adequate numbers and

Focused Group	Concerns Raised	Response & mitigation Measures
		drinking water facility are also proposed.
Shopkeepers	<ul style="list-style-type: none"> If the facilities at terminals sites are upgraded it will be better place for them to run business as it will attract more commuters. 	<ul style="list-style-type: none"> Facilities will also be upgraded
Ferry Operators	<ul style="list-style-type: none"> Regular shifting of the existing Ghats during rainy seasons/dry season. Lack of proper operating space Limitations of the existing facilities and expressed need for better facilities and services. Deployment of security personnel at the Ghats as the passengers sometimes become unruly and difficult to manage especially in times of operational delay due to unavoidable circumstances. 	<ul style="list-style-type: none"> Up gradation will be beneficial to ferry operators as well as commuters During the operational stage, the issues will be addressed by DIWT / AIWCL
Members of Umananda Temple committee	<ul style="list-style-type: none"> They suggested that they were in need of a "Snan Ghat" which will allow them to complete a few rituals quite comfortably. They also stressed the need of toilets and drinking water facility as well as proper lighting at the ghat and temple premises. They do have facilities of toilets but most of the time they struggle to provide water which is pumped through DG set incurring huge expenses for flushing and cleaning. Need of Toilets for ladies and disabled persons. The temple priests also complained about the lack of concrete posts to tie the pontoon at the ghat, instead the ghat officials had tied the pontoon to the temple gate and trees which is unsafe many a times. 	<ul style="list-style-type: none"> Every possible arrangement will be done

4.5 CONSULTATION MEETINGS

The several consultation meetings with different stakeholders and officials of line departments were done during site visits. Specific details of the meetings are presented in section below:

4.5.1 Vessel Operators

Inland Water Transport Officials (Date: on 7th May 2022)

The vessels mainly operated by IWT, is responsible for the vessel operation, vessel maintenance, managing the ticketing system and the daily commuters.

Terminal is also operated and maintain by the IWT department and is responsible for operation of the terminal as a whole. This includes cleanliness of the area around the terminal, managing the crowd, handling the crisis situations, and also looking after the safety and security of the travellers.

Consultation meeting with Operators (IWT) on 7th May 2022

During the consultation officials pointed out some difficulties they faced while operating are as follows:

- Vessels get overcrowded during the peak hours.
- Handling of commuters those are habitual of boarding and de-boarding from moving vessels could be a cause of accidents and also unsafe for the fellow commuters.
- During peak hours, it becomes almost impossible to cross check tickets of all commuters.
- Shifting of the existing Ghats during rainy seasons/dry season.
- Lack of proper operating space
- Limitations of the existing facilities and expressed need for better facilities and services.
- Modified pontoon with space for office & ticket counter
- Mandatory to wear safety jackets to all before boarding
- Creche/ baby care facilities
- Deployment of additional security personnel on the boat to look after the passenger's safety and security.

Private ferry Operators

The vessels operated by private ferry operators often works on odd hours due to frequent changes of ramp position from one place to another especially during arrival and departure of boats. In the year 2021 the operation of private boats was suspended due to a major accident in Neamati ghat on 8th September 2021. The boat collision occurred due to striking of one boat on another boat already parked at berthing.

Consultation meeting with Private Operators on 6th May 2022

Concern Raised

- The proposed project will be beneficial as it will attract more tourists.
- Space for ticket counters
- Ticket rates for Government ferries are very low hence they are losing the commuters. Subsidies are requested to keep the ticket rates at par with Government rates.
- Mandatory to wear safety jackets to all before boarding
- Lack of operating space and basic facilities
- Operators spoke about the need of a search and rescue team.
- The private boat operators expressed a need for a siren in the pontoon to alert the passengers about arrival and departure of boats from berths.

They expressed the need of keeping the records of passengers before boarding and de-boarding, besides need to provide proper covered seating arrangements for the personnel deputed for this work.

4.5.2 Relevant Department Officials on 7th May 2022

Consultation meetings were also done with officials of other relevant departments to get their views and concerns over the proposed development project.

Consultation Meetings with Relevant Department Officials on 7th May 2022

Concern Raised

- Terminals should be modified in the way that urban as well as rural commuters can avail the services with ease

- Oil spillage
- Waste management
- Safety norms for passengers and staff
- Online and offline ticket availability
- Separate entry and exit for women commuters
- River Bank protection done by Brahmaputra Board with Geobags.

4.5.3 Terminal Site Vendors

Interaction and formal meetings with the vendors sited in the proposed project were also done, with the support of Divisional IWT officials at terminal site on 5th May 2022 and 23rd June 2023. The access/ approach road to terminal sites has 04 (four) vendors who are earning their livelihood through temporary shops will be affected. However, they may be relocated at alternate terminal site during project construction period. Hence, the impact would be insignificant.

4.5.4 Institutional Stakeholders Consultation on 7th May 2022

Stakeholders' consultations were carried out as an integral part of the social and environmental assessment process of the project with an objective to inform and educate stakeholders about the proposed actions and to receive and record perceptions about the project. It assisted in identification of the likely issues and problems associated with the project as well as the needs and concerns of the population likely to be impacted. This participatory process helped in reducing the concerns in general and enabling participation of the line departments in particular in development process. The summary of interaction with institutional stakeholders and participants list are enclosed as **Annexure- 4** and photographs of FGDs and site condition are given in **Annexure- 5**.

Stakeholder meetings were held at different venues and time:

- **Conference hall of Hotel Lily, Guwahati on May 7, 2022.**

A stakeholders consultation meeting was organized on 07.05.2022 at conference hall, hotel Lily Guwahati, Assam by AIWTDS. The details about the project were presented by AIWTDS and safeguards consultants explained about the different kind of studies and safeguard measure planned for proposed project.

4.5.5 Conference hall of AIWTDS, Guwahati on February 6, 2023

A stakeholder's consultation to present DPR and draft ESIA study for North Guwahati and Umananda Ghat was organized by AIWTDS at conference hall, AIWTDS on 06.02.2023 under the Chairmanship of State Project Director, AIWTDS and Commodore Honorary Advisor, AIWTDS. The official of AIWTDS, invitees from line departments, temple committee members, were attended the meeting.

Consultation with Police and Disaster Management Department on February 06, 2023:

Consultations were also conducted with Police and DM Department at Guwahati on February 05, 2023, on various issues and risks arises during festival and common days. It was explained by the department that during the time of festival, role and responsibility of each Officers are clearly defined. Meetings with Temple Management, IWT, Priest, Govt. and Pvt. Ferry Operators are conducted in advance and suggested to maintain law and order. Emergency contact number are displaced for any help/support related to theft, pickpocketing, molestation, indecency, stampede etc. People are made aware not to belief on rumours. All emergency service provider departments like medical, fire service, disaster management, special ferry is

deployed near the temple. Further the Panbazar Women Police Station which is within the vicinity of 500 mtrs was also consulted to address GBV issues during any emergencies.

4.5.6 Stakeholder Suggestions and Design Considerations

The project proponents assured that the feasible suggestions given by stakeholders will be incorporated into the design/planning and implementation of the project. Details of the stakeholder suggestions and its considerations are presented in **Table-4.3**.

Table 4.3: Stakeholder Suggestions and Design Considerations

S No.	Key Findings/ Project Considerations	Design/ Implementation Inclusions
1	Need for widening of approach road.	Standard Ramp with protective handrail for barrier free entry- design consideration (ramp configuration, width, slope and landings, handrail, surface and tactile markings) for access to wheelchair users and people with mobility problems
2	Separate entry and exit points.	Segregation of departure and arrival points and split between pedestrian movement and vehicular movement
3	Proper displays and announcements at the jet locations is essential	Provision of signage of appropriate visibility and provision for audio announcements
4	Provision of better facilities	Appropriate waiting areas and entrance lobbies, shops, room, restaurants, storage area, nursing rooms, security & toilets. Provision of at least one water drinking tap suitable for people with disabilities.
5	Facilities for disabled and elderly passengers	Barrier free environment for differently abled and elderly
6	Medical/ First aid	Provision of first aid Services
7	Toilets	Provision of clean, gender segregated, well-lit wheelchair accessible toilets.

4.6 PLANNED INFORMATION DISCLOSURE

The PMU will ensure that relevant information about environmental and social safeguard issues are made available in a timely manner, in an accessible place, and in a form and language(s) understandable to the public and other stakeholders. The purpose of such disclosure is that the public can provide meaningful inputs into project/subproject design and implementation.

This ESIA/ESMP will be disclosed at the state level in the project website. Printed copies will be made available upon request at the AIWTDS. Further, the executive summary of this ESIA will be available in English and translated to the local language, Assamese. This will also be available as an easy-to-download document in the project website. The website disclosure will be kept up to date throughout project implementation. In addition, the ESIA/ESMP (in hard copy) will be made available for public access at the Panchayat office, Block office, local body offices and District administration and also at the existing/ temporary terminal location. The documents will also be circulated to all stakeholder departments.

Chapter 5 - ENVIRONMENTAL AND SOCIAL BASELINE STATUS

5.1 GENERAL

Before the start of any Environmental and Social Impact Assessment (ESIA) study, it is necessary to identify the baseline levels of relevant environmental parameters which are likely to be affected because of the construction and operation of the proposed project.

5.2 STUDY AREA

Based upon the area likely to be affected either directly or indirectly by project component, including ancillaries and linked activities, as well as unplanned induced developments. The Area of Influence (AoI) is the area within 500m radius considered for collection of baseline data. Whereas the area within 10 km radius from the proposed terminal is considered as study area. The primary and secondary data has been collected for various environmental components of the study area to establish the baseline environmental status. The study area maps of Umananda are shown in **Figures- 5.1**.

The baseline status has been categorized as follows:

- Physico-Chemical Aspects
- Ecological Aspects
- Socio-economic Aspects

5.2.1 Monitoring Period

Most of the environmental monitoring was carried out during summer season (March to May) 2022, how study of aquatic ecology was carried out in November 2022 and air quality monitoring was carried out in August 2022, depending on availability of non-rainy days. Monitoring for various aspects was done as per the details given below:

- Physico-Chemical Aspects
 - Soil quality - 30th March 2022
 - Water quality - 30th March 2022
 - Air quality - 2nd August to 29th August 2022
 - Noise - 4th August 2022
- Ecological Aspects
 - Terrestrial Ecology - 8th March 2022
 - Aquatic Ecology - 5th September 2022
- Socio-economic Aspects
 - Social Aspects - 8-11th May 2022

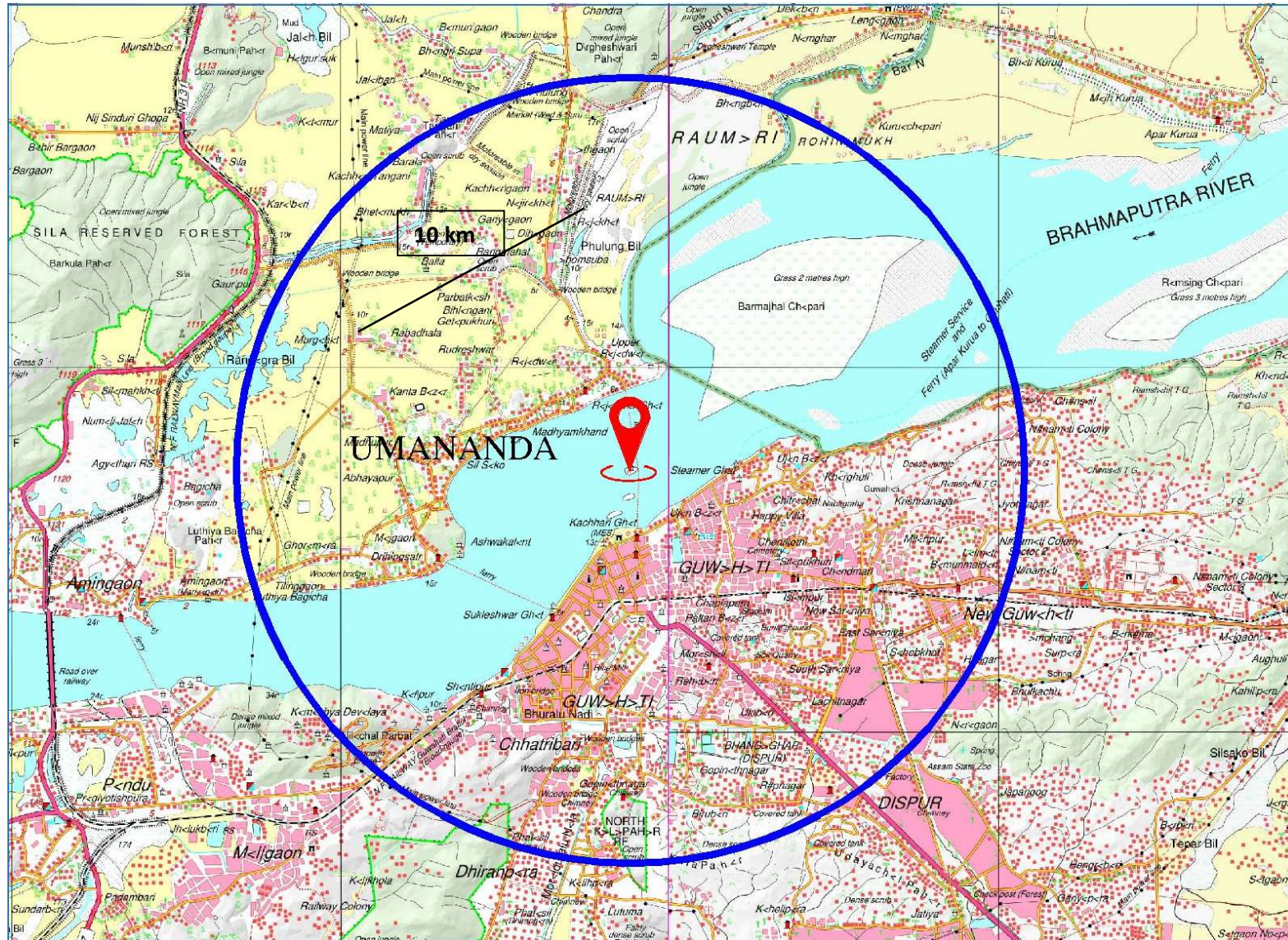


Figure 5.1: Study area map of Umananda terminal

5.3 PHYSICO-CHEMICAL ASPECTS

5.3.1 Meteorology

The project area is within sub-tropical humid climatic zone. It is characterized by hot and wet summer and dry and cool winter. The annual rainfall is reported as 1751.8 mm. The mean monthly temperature ranged from 19.8°C to 29.5°C, and the relative humidity is generally high throughout the year, with highest during south-west monsoon months. With the retreat of south-west monsoons, there is a marginal decrease in humidity. The lowest humidity is observed for the period from February to April.

5.3.2 Geology

In the surroundings of Guwahati, several hillocks arise from the flat alluvial plain. Umananda is also hillock rather consists of old gneissic rocks. Series of similar hillocks and hills that rise from the Brahmaputra plain can be found on several places along the plain on either side of the river. They all are continuations of the Shillong plateau which mainly consists of gneissic rocks from the Precambrian eon that have inhomogeneous appearance and colour variation and that sometimes expose minerals in form of bands or spots. Rocks of this type were developed by a metamorphic process under high temperature and pressure conditions when the originally igneous or sedimentary rocks are deeply covered under other layers of rocks. The layers of original rocks are reflected by foliation called “gneissic banding”. Later on, gneissic rocks can appear at the surface when the covering layers are all eroded away, and the low layers are lifted by tectonic forces.

Umananda project site falls into central cluster as per geological location. The soil/ rock deposits encountered have been grouped into different soil/ rock units as given in **Tables- 5.1 and 5.2**.

Table 5.1: Summary of soil layers w.r.t. land borehole

Unit	Description	Depth below GL m
Soil Unit 1	Not encountered	-
Soil Unit 2	Loose silty SAND	0 – 1.5
Rock Unit 1	Completely weathered Granite ROCK	1.5 – 15.5

**Source: DPR- 2023*

Table 5.2: Summary of soil layers w.r.t. river borehole

Unit	Description	Depth below GL m
Soil Unit 1	Not encountered	-
Soil Unit 2	Loose silty SAND	0 – 1
Rock Unit 1	Completely weathered Granite ROCK	1.5 – 21

**Source: DPR-2023*

5.3.3 Seismicity

- Assam is among the most seismically active parts of India. Geomorphologically, northeast India is located in an earthquake prone zone (zone V) of the Indian subcontinent as per Seismic Zoning Map of the country given in IS 1983 (part I): 2002. It is necessary to take into consideration in the design so that the structure can withstand earthquake of moderate to high intensity.

5.3.4 Land use Pattern

The land use pattern of the study area has been studied through digital satellite imagery data. Sentinel data has been used to describe the present Land Use pattern of the Area. The category wise details of Land use pattern of Umananda are given in **Table-5.3** and **Figure-5.2**.

Table 5.3: Land use Pattern of Umananda Terminal

S. No	Category	Area (m ²)	Percentage (%)
	Umananda Ghat		
1.	Vegetation	19772.41	2.58
2	Open Areas	120	0.015
3	Waterbodies	766030.12	97.47

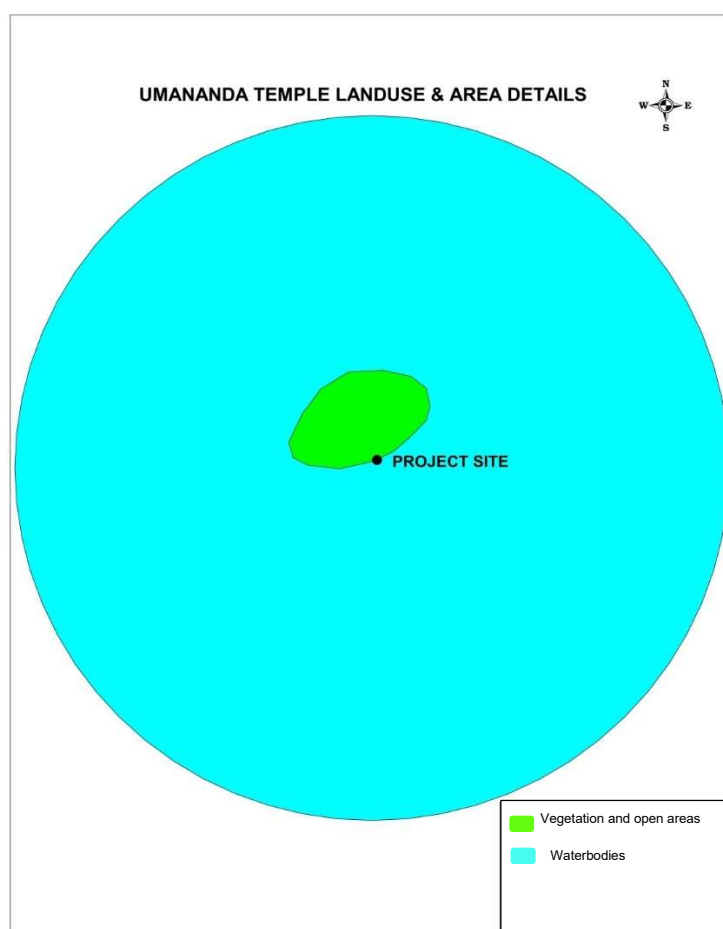


Figure 5.2: Land use pattern of Umananda Ghat

5.3.5 Soil Quality

As a part of field studies, soil samples were collected at 2 locations from upstream and downstream of proposed terminal location in the study area. Sampling location is first cleared of surface litter. Auger was driven to a depth of 15 cm below the ground and soil sample was drawn. Soil samples were then carefully packed and labelled. Samples were then analysed at the NABL accredited laboratory. Sampling locations of Umananda Ghat are listed in Table-4.4. The sampling location map is enclosed as **Figures- 5.3**.

Table 5.4: Details of Soil Sampling Locations

Sampling Code	Location	Coordinates
SU1	Umananda (near terminal site)	26°11'46.12"N 91°44'42.73"E
SU2	Umananda (80 m u/s of terminal)	26°11'47.25"N 91°44'44.42"E

The analysis of soil sampling was conducted as per IS 2720 and results are given in **Tables- 5.5**. Laboratory monitoring reports for soil testing are enclosed as **Annexure-6**. pH was in the range of 7.79 to 7.87 which indicates that neutral range having slight alkalinity. The EC values are ranging between 456 to 475 $\mu\text{S}/\text{cm}$. The soil type of the area is sandy clay loam.

Table 5.5: Results of soil sampling analysis of study area for Umananda terminal

S. No	Parameters		SU1	SU2
1.	pH (1:5 suspension)		7.87	7.79
2.	Electrical Conductivity @ 25°C (1:1 suspension)		475	456
3.	Calcium (As Ca)		1953	1883
4.	Magnesium (As Mg)		401	370
5.	Sodium (as Na)		203	186
6.	Available Potassium (as K)		286	269
7.	Salinity @ 25°C (1:1 suspension)		307	292
8.	Organic Matter		1.32	1.15
9.	Sodium Absorption Ratio		1.19	1.19
10.	Nitrogen		0.10	0.09
11.	Available Phosphorus (As P_2O_5)		85	77
12.	Bulk Density		1.19	1.17
13.	Organic Carbon		0.77	0.67
14.	Particle Size Distribution	a. Sand	58.8	57.9
		b. Clay	21.6	19.6
		c. Silt	19.6	22.5
15.	Exchangeable Sodium Percentage		5.14	4.17



Figure 5.3: Soil sampling Location map of Umananda terminal

5.3.6 Water Quality

The proposed terminals are located on the banks of river Brahmaputra. As a part of the field studies, water samples were collected at 2 suitable locations in the study area for each terminal. Sampling from the river was done at mid depths. Glass containers were filled completely and closed in such a way that there is no air above the sample. Samples were then labelled and analysed at the NABL accredited laboratory for physic-chemical parameters. Details of sampling locations are listed in **Table- 5.6**. The sampling location map is enclosed as **Figures- 5.4**.

Table 5.6: Details of Water Sampling Locations

Sampling Code	Location	Co-ordinates
WU1	Umananda (near terminal site)	26°11'45.66"N 91°44'42.42"E
WU2	Umananda (near Uzan Bazar terminal)	26°11'34.60"N 91°45'6.70"E

The analysis of water samples was conducted as per IS:3025 and results of the analysis are given in **Table- 5.7**. Laboratory monitoring reports for water quality are enclosed as **Annexure- 7**. The results of water quality monitoring have been compared with Class C standard of River water quality standards (**Annexure- 8**). The Electrical Conductivity (EC) in water samples ranged from 212 to 280 $\mu\text{S}/\text{cm}$, Total Hardness ranged from 65.0 to 70.0 mg/l and Dissolved Oxygen ranges from 6.3 to 6.5 mg/l.

The BOD and COD levels is quite low and DO levels are quite good, which indicates the absence of organic pollution loading. This is mainly due to the low population density and absence of industries in the area. The heavy metal concentration in the study area is below the permissible limit used for drinking purposes. It can be concluded that water quality was observed to be quite good, as parameters are well below the permissible limits specified for meeting drinking requirements.

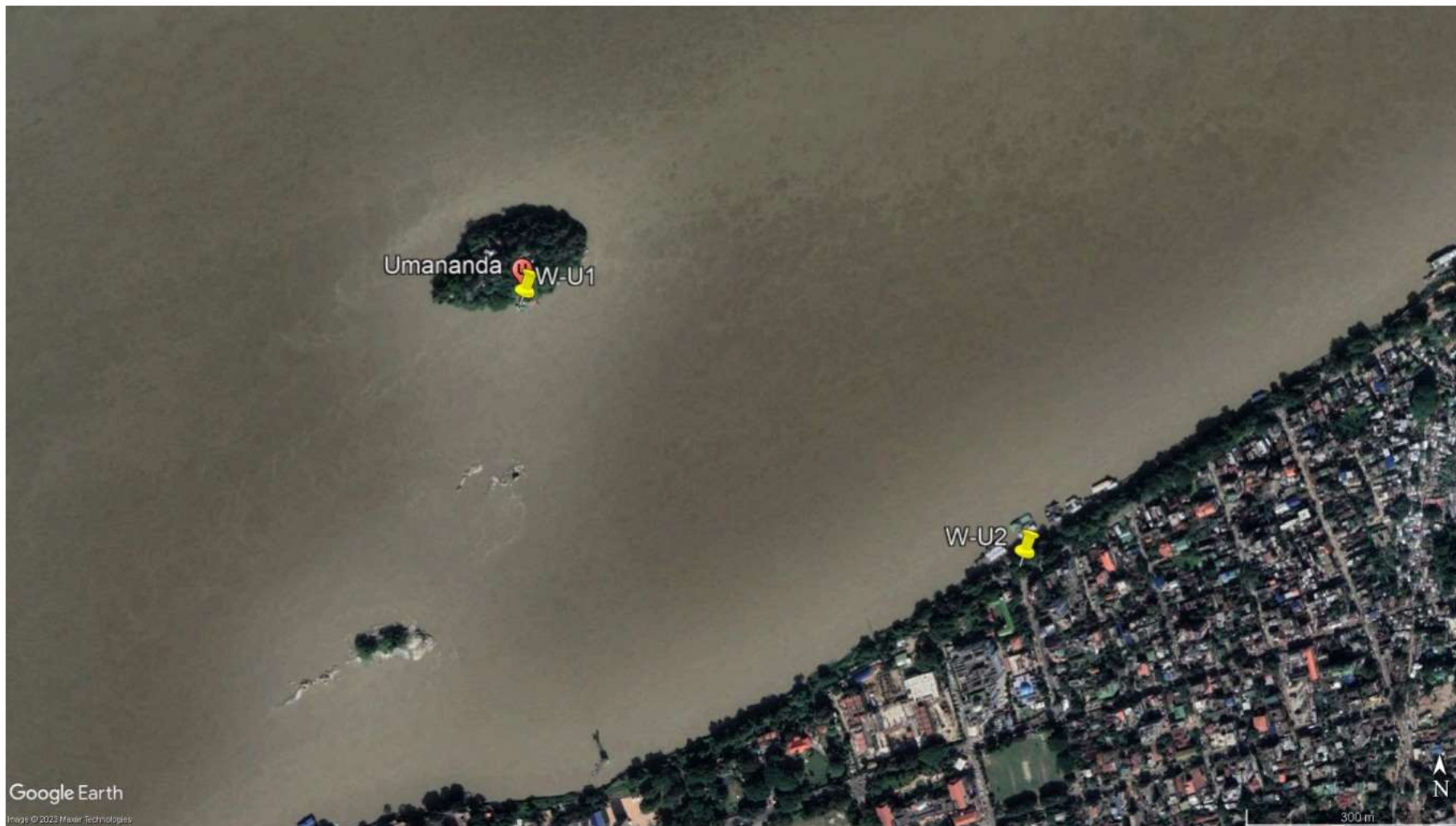


Figure 5.4: Water sampling Location map of Umananda terminal

Table 5.7: Water quality in the study area for Umananda terminal

S. No	Parameters	Unit	Permissible Limit (As per IS:2296)	WU1	WU2
1.	pH	6.5-8.5	7.14	7.16
2.	Colour	Hazen	300	<5.0	<5.0
3.	Electricity Conductivity	µs/cm	--	212	280
4.	Turbidity	NTU	--	<1.0	<1.0
5.	Total Hardness (As CaCO ₃)	mg/l	--	65.0	70.0
6.	Fluoride (as F)	mg/l	1.5	0.26	0.36
7.	Dissolve Oxygen	mg/l	4	6.3	6.5
8.	Chloride (as Cl)	mg/l	600	15.0	21.0
9.	Calcium (as Ca)	mg/l	--	15.0	16.0
10.	BOD (3 days at 27°C)	mg/l	3	<2.0	<2.0
11.	Nitrate (as NO ₃)	mg/l	50	1.8	2.1
12.	Total Dissolved Solid	mg/l	1500	138	182
13.	Sulphate (As SO ₄)	mg/l	400	2.0	4.5
14.	Magnesium as Mg)	mg/l	--	6.6	7.3
15.	Phosphate (as P)	mg/l	--	<0.05	<0.05
16.	Sodium (as Na)	mg/l	--	1.6	1.5
17.	Potassium (as K)	mg/l	--	<1.0	<1.0
18.	COD (as O ₂)	mg/l	--	6.0	4.0
19.	Residual Sodium Carbonate	mg/l	--	Nil	Nil
20.	Total Chromium (as Cr)	mg/l	0.05	<0.05	<0.05
21.	Iron (as Fe)	mg/l	0.5	0.08	0.10
22.	Manganese (As Mn)	mg/l	--	<0.10	<0.10
23.	Copper (As Cu)	mg/l	1.5	<0.05	<0.05
24.	Zinc (as Zn)	mg/l	15	0.09	0.09
25.	Arsenic (as As)	mg/l	0.2	<0.01	<0.01
26.	Cadmium (as Cd)	mg/l	0.1	<0.01	<0.01
27.	Cyanide (As CN)	mg/l	0.05	<0.01	<0.01
28.	Lead (As Pb)	mg/l	0.1	<0.01	<0.01
29.	Selenium (as Se)	mg/l	0.05	<0.01	<0.01
30.	Mercury (Hg)	mg/l	--	<0.001	<0.001

5.3.7 Ambient Air Quality

Air pollutants are added in the atmosphere from variety of sources that change the composition of atmosphere and affect the biotic environment. Air pollution in India is mainly caused from three sources namely vehicles, industrial and domestic sources. The concentration of air pollutants depends not only on the quantities that are emitted from air pollution sources but also on the ability of the atmosphere to either absorb or disperse these emissions.

Ambient air quality monitoring is conducted to assess the existing quality of ambient air from the active construction site. It helps us to understand the impact of emissions, from on-going/up-coming projects, on surrounding environment of the area. On the basis of these findings, mitigation measures suggested to minimize the impact and to keep the environment healthy.

As a part of field studies, ambient air quality was monitored at three locations (on the basis of wind direction i.e., North-East (NE) - 1 each in windward, leeward and crosswind direction) for each terminal in the study area. The ambient air quality monitoring was conducted twice a week on 24 hourly bases for four consecutive weeks. Monitoring was done following CPCB guidelines. The sampling locations are shown in **Figure- 5.5**. The ambient air quality monitoring stations are given in **Table- 5.8**.

Table 5.8: Ambient Air Quality Monitoring Stations

Sampling Code	Location	Coordinates
AAQ-U1	Umananda	26°11'46.28"N 91°44'39.63"E
AAQ-U2	Umananda	26°11'49.17"N 91°44'42.60"E
AAQ-U3	Umananda	26°11'46.18"N 91°44'42.72"E

Ambient Air Quality monitoring results are given in **Tables- 5.9 to 5.12**. Laboratory monitoring reports for air quality are enclosed as **Annexure- 9**.

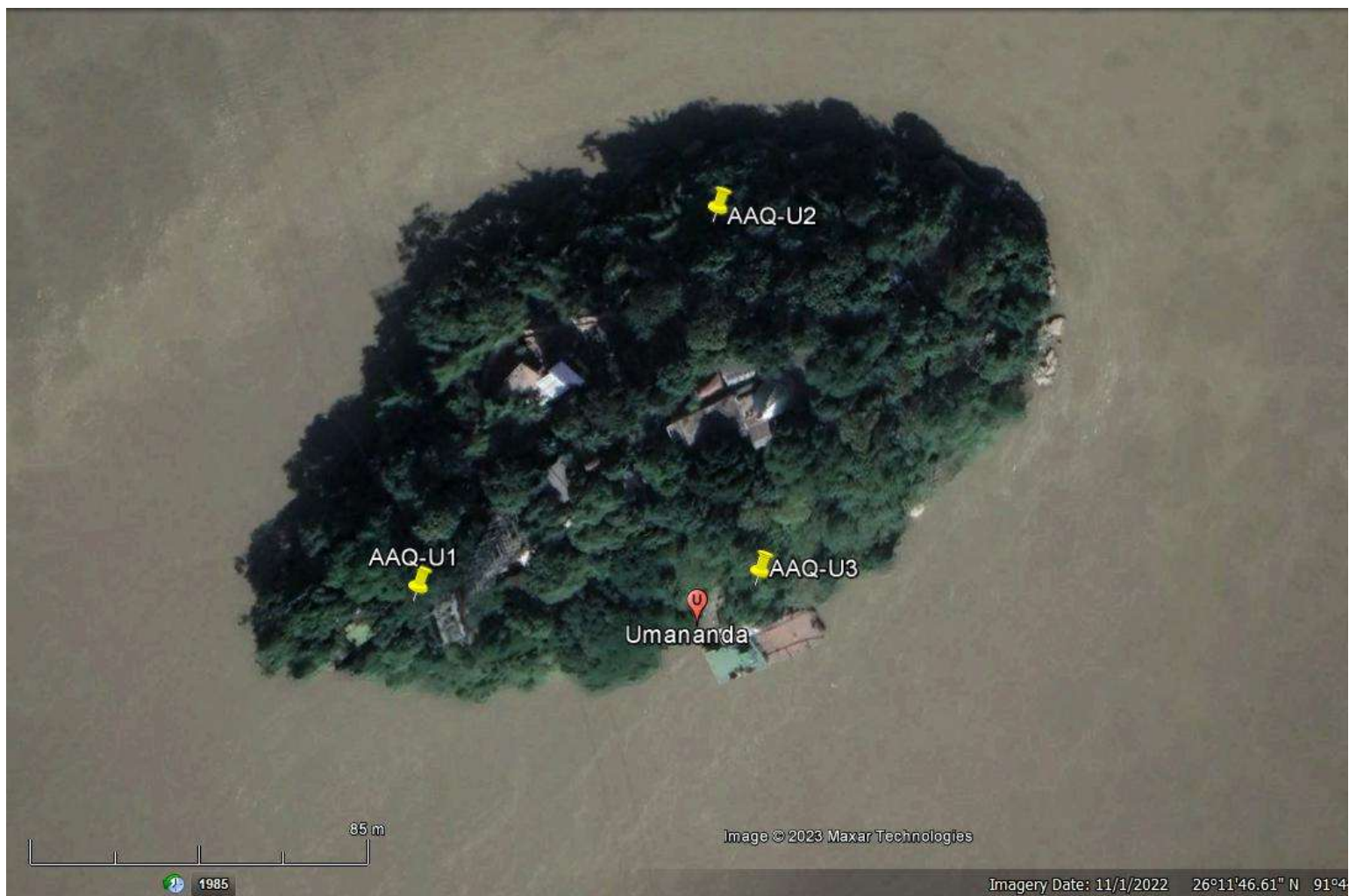


Figure 5.5: Air sampling Location map of Umananda terminal

Table 5.9: Ambient air quality monitoring at Umananda terminal (AAQ-U1)

S.N.	Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
NAAQ standards		100	60	80	80	02	100	400	1.0	20	06	05	01
1	02.08.2022	54.7	34.2	6.4	17.8	0.50	22.3	11.2	<0.01	<5.0	<1.0	<4.2	<0.5
2	05.08.2022	59.6	33.1	6.9	19.6	0.54	21.5	10.8	<0.01	<5.0	<1.0	<4.2	<0.5
3	09.08.2022	48.1	28.3	<6.0	15.3	0.38	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	12.08.2022	52.5	27.6	<6.0	16.7	0.40	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
5	17.08.2022	63.7	31.9	7.2	21.3	0.76	23.7	11.9	0.01	<5.0	<1.0	<4.2	<0.5
6	21.08.2022	59.2	34.8	6.6	18.5	0.62	20.8	10.4	<0.01	<5.0	<1.0	<4.2	<0.5
7	25.08.2022	53.1	25.3	<6.0	15.4	0.44	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	29.08.2022	64.7	35.9	<6.0	16.3	0.48	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5

*Source: Primary survey

Table 5.10: Ambient air quality monitoring at Umananda terminal (AAQ-U2)

S.N.	Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
NAAQ standards		100	60	80	80	02	100	400	1.0	20	06	05	01
1	02.08.2022	53.1	33.2	6.5	19.7	0.44	21.7	10.8	<0.01	<5.0	<1.0	<4.2	<0.5
2	05.08.2022	48.9	27.2	<6.0	15.1	0.38	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
3	09.08.2022	42.5	25.0	<6.0	15.9	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	12.08.2022	52.6	27.7	6.2	17.4	0.48	20.9	10.5	<0.01	<5.0	<1.0	<4.2	<0.5
5	17.08.2022	55.7	27.9	6.8	20.8	0.42	23.1	11.6	<0.01	<5.0	<1.0	<4.2	<0.5
6	21.08.2022	53.1	31.2	<6.0	16.5	0.54	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
7	25.08.2022	48.5	23.1	<6.0	15.7	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	29.08.2022	46.2	25.7	<6.0	14.9	0.34	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5

*Source: Primary survey

Table 5.11: Ambient air quality monitoring at Umananda terminal (AAQ-U3)

S.N.	Date	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
NAAQ standards		100	60	80	80	02	100	400	1.0	20	06	05	01
1	02.08.2022	73.1	45.7	7.4	23.8	0.76	25.1	12.5	0.02	<5.0	<1.0	<4.2	<0.5
2	05.08.2022	68.7	38.2	6.9	20.3	0.64	21.7	10.9	0.01	<5.0	<1.0	<4.2	<0.5
3	09.08.2022	76.2	44.8	7.8	25.1	0.74	26.3	13.1	0.02	<5.0	<1.0	<4.2	<0.5
4	12.08.2022	69.5	36.6	<6.0	17.6	0.72	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
5	17.08.2022	66.3	33.2	<6.0	16.3	0.68	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
6	21.08.2022	75.1	44.2	7.6	22.7	0.76	24.1	12.0	0.02	<5.0	<1.0	<4.2	<0.5
7	25.08.2022	69.2	33.0	6.8	18.9	0.68	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
8	29.08.2022	71.3	39.6	<6.0	15.3	0.74	23.2	11.6	0.01	<5.0	<1.0	<4.2	<0.5

**Source: Primary survey*

**Table 5.12: Summary of ambient air quality monitoring for Umananda terminal
(Unit: $\mu\text{g}/\text{m}^3$)**

Station	Minimum	Maximum	Average	98 percentile
Particulate Matter less than 10 micron (PM_{10})				
AAQ-A1	48.1	64.7	57.0	64.6
AAQ-A2	42.5	55.7	50.1	55.3
AAQ-A3	66.3	76.2	71.2	76.0
Particulate Matter less than 2.5 micron ($\text{PM}_{2.5}$)				
AAQ-A1	25.3	35.9	31.4	35.8
AAQ-A2	23.1	33.2	27.6	32.9
AAQ-A3	33.0	45.7	39.4	45.6
Sulphur dioxide (SO_2)				
AAQ-A1	6.4	7.2	6.8	7.2
AAQ-A2	6.2	6.8	6.5	6.8
AAQ-A3	6.8	7.8	7.3	7.8
Nitrogen dioxide (NO_2)				
AAQ-A1	15.3	21.3	17.6	21.1
AAQ-A2	14.9	20.8	17.0	20.6
AAQ-A3	15.3	25.1	20.0	24.9
Carbon Monoxide (CO)				
AAQ-A1	0.4	0.8	0.5	0.7
AAQ-A2	0.3	0.5	0.4	0.5
AAQ-A3	0.64	0.76	0.72	0.76
Ozone (O_3)				
AAQ-A1	20.8	23.7	22.1	23.6
AAQ-A2	20.9	23.1	21.9	23.0
AAQ-A3	21.7	26.3	24.1	26.2
NH_3				
AAQ-A1	10.4	11.9	11.1	11.9
AAQ-A2	10.5	11.6	11.0	11.6
AAQ-A3	10.9	13.1	12.0	13.1
Lead (Pb)				
AAQ-A1	0.01	0.01	0.01	0.01
AAQ-A2	<0.01	<0.01	<0.01	<0.01
AAQ-A3	0.01	0.02	0.01	0.02
Nickel (Ni)				
AAQ-A1	<5.0	<5.0	<5.0	<5.0
AAQ-A2	<5.0	<5.0	<5.0	<5.0
AAQ-A3	<5.0	<5.0	<5.0	<5.0
Arsenic (As)				
AAQ-A1	<1.0	<1.0	<1.0	<1.0
AAQ-A2	<1.0	<1.0	<1.0	<1.0
AAQ-A3	<1.0	<1.0	<1.0	<1.0
Benzene				
AAQ-A1	<4.2	<4.2	<4.2	<4.2
AAQ-A2	<4.2	<4.2	<4.2	<4.2
AAQ-A3	<4.2	<4.2	<4.2	<4.2
Benzo(a) pyrene (ng/m^3)				
AAQ-A1	<0.5	<0.5	<0.5	<0.5
AAQ-A2	<0.5	<0.5	<0.5	<0.5
AAQ-A3	<0.5	<0.5	<0.5	<0.5

The results of air quality monitoring have been compared with National Ambient Air Quality Monitoring Standards (**Annexure- 10**)

It is observed from **Table- 5.12** that average concentration of PM_{10} at various monitoring stations ranged from 49.9 to 70.6 $\mu g/m^3$. The highest PM_{10} value was recorded as 75.3 $\mu g/m^3$. The PM_{10} values monitored during the field survey were well below the permissible limit of 100 $\mu g/m^3$ for industrial, residential, rural and other areas.

The average concentration of $PM_{2.5}$ at various monitoring stations monitored ranged from 27.5 to 39.1 $\mu g/m^3$. The highest $PM_{2.5}$ value was recorded as 45.7 $\mu g/m^3$. The $PM_{2.5}$ values monitored during the field survey were well below permissible limit of 60 $\mu g/m^3$ for industrial, residential, rural and other areas.

The average concentration of SO_2 at various stations monitored ranged from 6.75 to 7.5 $\mu g/m^3$. The highest SO_2 value was recorded as 7.9 $\mu g/m^3$. The average concentration of SO_2 at various stations in the study area was well below the prescribed limits of 80 $\mu g/m^3$ specified for industrial, residential, rural and other areas.

The average NO_2 concentration at various sampling stations ranged from 17.0 to 20.0 $\mu g/m^3$. The average concentration of NO_2 at various stations in the study area was observed to be well below the prescribed limit of 80 $\mu g/m^3$ specified for industrial, residential, rural and other areas.

The average concentration of Ozone (O_3), Ammonia (NH_3), Lead, Nickel, Arsenic, Benzene, Benzo(a) pyrene are well below the prescribed limits specified for industrial, residential, rural and other areas.

5.3.8 Ambient Noise Levels

Baseline noise data has been measured using a weighted sound pressure level meter. The survey was carried out in calm surrounding. Sound Pressure Level (SPL) measurement in the outside environment was made using sound pressure level meter. Hourly noise meter readings were taken at various sites. The noise levels were monitored continuously from 6 AM to 9 PM at each location and hourly equivalent noise level was measured. The sampling location map is shown in Figure-4.6.

The hourly ambient noise levels monitored and daytime equivalent noise levels estimated for terminals are given in **Table- 5.13**. The daytime and night time equivalent noise level at various sampling stations is given in **Table- 5.14**. Monitoring reports for noise quality are enclosed as **Annexure- 11**. The results of noise quality monitoring have been compared with Ambient Noise Standards (**Annexure- 12**). The daytime equivalent noise level at various sampling stations ranged from 46.22 to 46.86 dB(A). The night-time equivalent noise level at various sampling stations ranged from 44.3 to 45.1 dB(A). The noise levels were observed to be well within permissible limit (65 dB(A)) specified for commercial area.



Figure 5.6: Noise sampling Location map of Umananda terminal

Table 5.13: Hourly equivalent noise levels - Umananda terminal (Unit: dB(A))

Location	N-U1	N-U2	N-U3
6-7 AM	43	42	42
7-8 AM	45	44	45
8-9 AM	46	45	47
9-10 AM	47	45	47
10-11 AM	48	47	48
11-12 Noon	48	48	48
12 noon – 1 PM	47	48	47
1-2 PM	47	46	47
2-3 PM	46	47	48
3-4 PM	46	49	48
4-5 PM	47	48	49
5-6 PM	47	48	47
6-7 PM	46	47	47
7-8 PM	44	46	45
8-9 PM	42	43	42

*Source: Primary survey

Table 5.14: Day and night-time equivalent noise levels – Umananda terminal

S. No.	Location	Co-ordinates	Zone	L _{eq} day (dB(A))	L _{eq} night (dB(A))	Permissible Limit
1.	N-U1	26°11'46.28"N 91°44'39.63"E	Commercial	46.59	44.3	65
2.	N-U2	26°11'49.17"N 91°44'42.60"E	Commercial	46.81	45.6	65
3.	N-U3	26°11'46.18"N 91°44'42.72"E	Commercial	47.20	45.1	65

5.4 TERRESTRIAL ECOLOGICAL ASPECTS

The baseline setting for Ecological aspects have been covered in this Chapter following floral, faunal and aquatic accounts of the area. Flora is categorized into three groups as herbs, shrubs and trees. Terrestrial faunas include insect (butterflies), reptile, bird and mammal. As a part of the ESIA study, ecological survey was conducted at different sites at Umananda terminal in March 2022. The objectives of the ecological survey were to: -

- Prepare a checklist of flora in the study area.
- Listing the rare/endangered species economically important species.
- Determine frequency, density, abundance and IVI of different vegetation components.
- Calculate species diversity indices of different plant communities in the study area.
- Identification of economically important species like medicinal plants, timber, fuel wood etc. and listing accordingly.
- To inventorize the faunal diversity in the study area

Methodology adopted for field survey.

Floristic survey and quantitative analysis of vegetation

For assessing the floral diversity in the study area both floristic survey and quantitative analysis of vegetation were undertaken. The quantitative analysis of vegetation was done by using quadrats as sampling units. The quadrats were laid randomly in identified sites (as per project impact). The vegetation analysis was undertaken by collecting numerical community data for trees, shrubs and herbs from the randomly laid quadrats. Quadrat size of 10 m x 10 m was used to enumerate trees, 5m x 5m was used to enumerate shrubs and herbs were enumerated through 1m x 1m quadrats. The numbers of quadrats laid for different vegetation components at different sampling sites are listed in Table- 5.15.

Table 5.15: Number and size of quadrats laid at different sites at Umananda Terminal

Study Site	Sites	Vegetation components	Number of quadrats laid	Size of quadrat
Site-1	Umananda Terminal (Umananda temple and adjoining areas)	Tree	25	10m x 10m
		Shrub	25	5m x 5m
		Herb	25	1m x 1m

During the survey, each individual within the quadrat was identified up to the species level, and the number of individuals of each species in each quadrat was counted. The GBH of all trees having girth of more than 16 cm (equivalent to 5 cm DBH) was measured. Based on the quadrat data, frequency, density and cover (basal area) for each species were calculated.

The total basal area was calculated from the sum of the total diameter of immerging stems. In trees, poles and saplings, the basal area was measured at breast height (1.5 meters) and by using the formula πr^2 . The importance value index (IVI) for different trees species were determined by summing up the Relative Density, Relative Frequency and Relative dominance. The Relative Density and Relative Frequency values were used to calculate the IVI of shrubs and herbs. The importance value index is a measure of the relative contribution of a species to the community.

Results

Floristic composition

During the floristic survey, a total of 74 plant species were recorded from Umananda site. Of these, Herbs (21), Tree (23), Shrubs (15), Climbers (5), and Grass (10) species recorded.

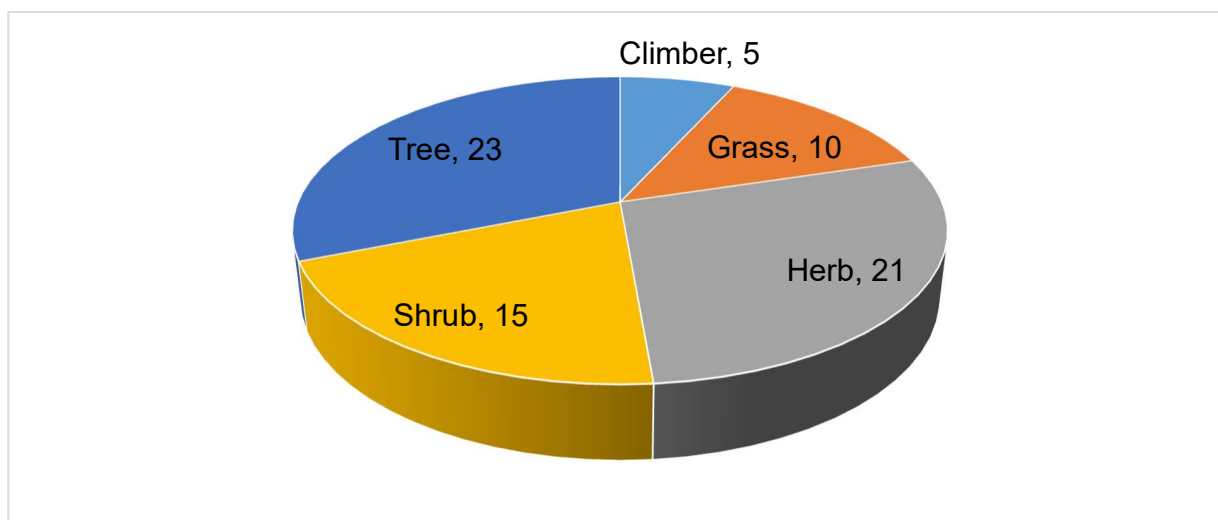


Figure 5.7: Graphical analysis of total number of trees, shrub, herb, grass, and climber were recorded in the Umananda site

Plant List

The checklist of the plant species, IUCN status etc. at Umananda site, is enclosed as an **Annexure-13**.

Total of 74 plant species were recorded from Umananda site were dicot (62) and monocotyledon (12), belonging to 35 families were recorded in the study area. The most dominant families recorded in the study sites were- Poaceae and Fabaceae (8) followed by Asteraceae (5), Apocynaceae and Verbenaceae (4), Amaranthaceae, Arecaceae, Malvaceae, Mimosaceae and Moraceae (3).

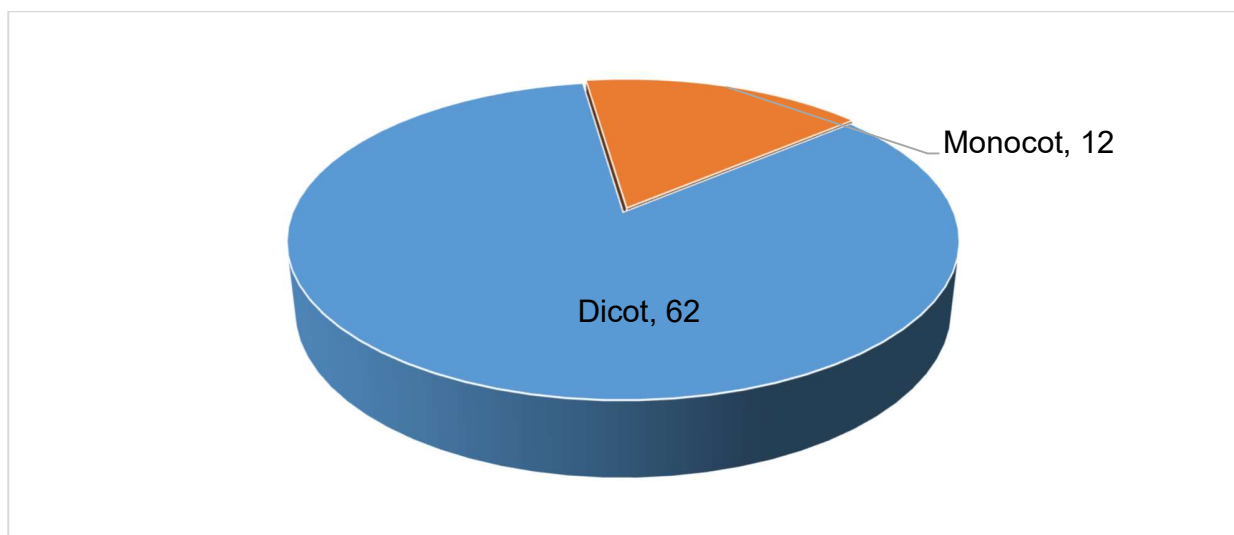


Figure 5.8: Graphical analysis number of Dicot and Monocot species was recorded from Umananda site.

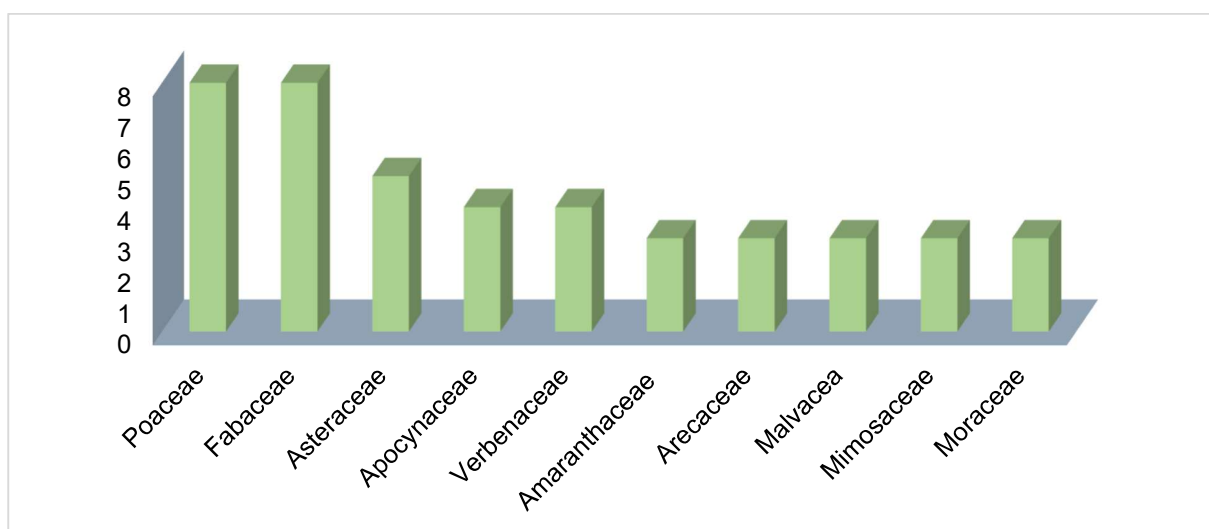


Figure 5.9: Graphical analysis of dominant family were recorded from Umananda site.

Economically important plant species

The list of some economically important plant species is enumerated in **Table- 5.16**.

Table 5.16: Economically important plant species recorded from Umananda site.

Botanical name	Local name	Usage
<i>Albizia saman</i> (Jacq.) Merr.	Rain tree	Fuel wood/Construction
<i>Alstonia scholaris</i> (L.) R. Br.	Chitwan	Ornamental
<i>Artocarpus heterophyllus</i> Lam.	Kothal	Fruit edible
<i>Bauhinia variegata</i> L.	Kanchan	Ornamental
<i>Bombax ceiba</i> L.	Semal	Ornamental
<i>Callistemon lanceolatus</i> (Sm.) Sweet	Bottlebrush	Ornamental
<i>Carica papaya</i> L.	Papaya	Fruit edible
<i>Cynodon dactylon</i> (L.) Pers.	Dub	Fodder
<i>Delonix regia</i> (Hook.) Raf.	Gulmohar	Timber/fuel wood
<i>Digitaria ciliaris</i> (Retz.) Koeler	Crabgrass	Fodder
<i>Digitaria sanguinalis</i> (L.) Scop.	Crabgrass	Fodder
<i>Ficus religiosa</i> L.	Peepal	Religious
<i>Fimbristylis dichotoma</i> (L.) Vahl	Fringe-rush	Fodder
<i>Mangifera indica</i> L.	Aam	Fruit edible/fuel wood
<i>Musa × paradisiaca</i> L.	Kala	Fruit edible
<i>Polygonum hydropiper</i> L.	Marsh pepper	Fodder
<i>Pongamia pinnata</i> (L.) Pierre	Karanja	Ornamental
<i>Saccharum spontaneum</i> L.	Wild sugarcane	Fodder
<i>Saraca asoca</i> (Roxb.) Willd.	Ashok	Ornamental

**Source: Primary field survey and secondary data (Discussions with local people)*

Medicinal Plant recorded in the study area

The list of medicinal plant observed in study area in different sites enumerated in **Table- 5.17**.

Table 5.17: Medicinal Plant species recorded from Umananda site

Botanical name	Local name	Usage
<i>Aegle marmelos</i> (L.) Corrêa	Bael	Used to treat dysentery, dyspepsia, mal-absorption, neurological diseases, edema, vomiting, and rheumatism
<i>Datura metal</i> L.	Dhatura	Treatment of asthma, cough and cold and painful conditions.
<i>Eclipta prostrata</i> (L.) L.	Bhringraja	Treatment of hepatitis, snake venom poisoning, gastritis, and respiratory diseases such as a cough and asthma.
<i>Cynodon dactylon</i> (L.) Pers.	Dub	Used as a laxative, coolant, expectorant, carminative and as brain and heart tonic.
<i>Euphorbia hirta</i> L.	Dudhi	Used for female disorders, respiratory ailments (cough, coryza, bronchitis, and asthma), dysentery, jaundice, pimple, gonorrhoea, digestive problems, and tumours.
<i>Ocimum sanctum</i> L.	Tulsi	For the treatment of bronchitis, bronchial asthma, malaria, diarrhoea, dysentery, skin diseases.
<i>Achyranthes aspera</i> L.	Apamaranga	Used in treatment of cough, bronchitis and rheumatism, malaria, fever, dysentery, asthma, hypertension and diabetes.
<i>Lantana camara</i> L.	Lantana	Used as antimicrobial, fungicidal and insecticidal properties.

**Source: Primary field survey and secondary data (Discussion with local people)*

Horticulture Crops

Horticultural crops grown in Umananda site were- Bel (*Aegle marmelos*), coconut (*Cocos nucifera*), Papita (*Carica papaya*) Kathal (*Artocarpus heterophyllus*), Tulsi (*Ocimum sanctum*), Peepal (*Ficus religiosa*), Ashok (*Saraca asoca*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Kala (*Musa × paradisiaca*) are common plant species.

Ecological Sensitive Areas

In Umananda site, there is no wildlife sanctuary, biosphere reserve, Tiger/Elephant reserves, wildlife corridor, and protected forest/wetlands observed during study periods. Deepar Beel Wild Life Sanctuary and RAMSAR site is approximately 20 kms from proposed location.

Quantitative Analysis

Tree

A total of 16 tree species (≥ 5 cm dbh or ≥ 16 cm GBH) were recorded during the field study. No tree will be cut for the project implementation. The density of tree species recorded was 186 individuals (ha^{-1}). In terms of density, *Tamarindus indica* were the dominant tree (18 individuals ha^{-1}) followed by *Mangifera indica* (16 individual's ha^{-1}). The total basal area of tree recorded were 128.62 $\text{m}^2 \text{ha}^{-1}$ from site 1. In terms of basal area *Tamarindus indica* has maximum basal area as compared to

another tree. In terms of importance value index (IVI), *Tamarindus indica* was the dominant tree (IVI= 34.50) followed by *Mangifera indica* (IVI= 27.49) in **Table- 5.18**.

Table 5.18: Frequency, density, basal area, abundance, IVI and volume

Botanical Name	Frequency (%)	Density (Individual ha ⁻¹)	Basal Area (m ² ha ⁻¹)	IVI	Volume (m ³)	Abundance
<i>Pongamia pinnata</i> (L.) Pierre	16	14	8.26	20.30	0.58	1.75
<i>Aegle marmelos</i> (L.) Corrêa	20	12	6.12	19.15	0.37	1.2
<i>Albizia procera</i> (Roxb.) Benth.	20	16	5.12	20.52	0.26	1.6
<i>Artocarpus heterophyllus</i> Lam.	16	14	12.46	23.56	1.12	1.75
<i>Artocarpus chama</i> Buch. - Ham.	12	6	2.82	10.18	0.17	1
<i>Azadirachta indica</i> A. Juss.	16	14	10.08	21.71	0.71	1.75
<i>Bauhinia variegata</i> L.	12	10	4.8	13.87	0.43	1.67
<i>Bombax ceiba</i> L.	16	14	12.74	23.78	0.89	1.75
<i>Cocos nucifera</i> L.	8	6	3.18	8.87	0.35	1.5
<i>Delonix regia</i> (Hook.) Raf.	20	14	9.66	22.97	0.87	1.4
<i>Ficus religiosa</i> L.	12	8	8.96	16.03	0.90	1.33
<i>Fraxinus angustifolia</i> Vahl	8	4	1.24	6.29	0.09	1
<i>Mangifera indica</i> L.	20	16	14.08	27.49	1.13	1.6
<i>Phoenix sylvestris</i> (L.) Roxb	8	6	3.48	9.11	0.21	1.5
<i>Tamarindus indica</i> L.	28	18	17.64	34.50	1.76	1.29
<i>Tectona grandis</i> L.f.	20	14	7.98	21.67	0.72	1.4
Total	252	186	128.62	300.0	10.54	23.49

*Source: Primary field survey

Shrub

A total of 18 shrub species were recorded during the field study. The density of shrub species recorded was 508 individuals (ha⁻¹). In terms of density, *Hibiscus rosa-sinensis* were the dominant shrub species (52 individual's ha⁻¹) followed by *Lantana camara* (44 individual's ha⁻¹). In terms of importance value index (IVI), *Hibiscus rosa-sinensis* was the dominant shrub species (IVI= 18.10) followed by *Lantana camara* (IVI= 16.86) in **Table-5.19**.

Table 5.19: Frequency, density IVI and abundance

Botanical name	Frequency (%)	Density (Individual ha ⁻¹)	IVI	Abundance
<i>Bauhinia vahlii</i> Wight & Arn.	12	20	7.31	1.67
<i>Coccinia grandis</i> (L.) Voigt	20	24	10.34	1.20
<i>Cocculus orbiculatus</i> (L.) DC.	20	24	10.34	1.20
<i>Smilax zeylanica</i> L.	16	20	8.43	1.25
<i>Boehmeria macrophylla</i> Hornem.	12	20	7.31	1.67
<i>Boerhaavia diffusa</i> L.	28	36	14.95	1.29
<i>Carica papaya</i> L.	8	12	4.61	1.50
<i>Cascabela thevetia</i> (L.) Lippold	24	36	13.83	1.50
<i>Catunaregam spinosa</i> (Thunb.) Tirveng	20	36	12.70	1.80
<i>Clerodendrum glandulosum</i> Lindl.	24	28	12.25	1.17
<i>Datura metel</i> L.	20	28	11.13	1.40
<i>Hibiscus rosa-sinensis</i> L.	28	52	18.10	1.86
<i>Jasminum nervosum</i> Lour.	12	20	7.31	1.67
<i>Lantana camara</i> L.	32	40	16.86	1.25
<i>Musa × paradisiaca</i> L.	24	32	13.04	1.33
<i>Ocimum sanctum</i> L.	8	12	4.61	1.50
<i>Parthenium hysterophorus</i> L.	20	32	11.92	1.60
<i>Ricinus communis</i> L.	28	36	14.95	1.29
Total	356	508	200.00	26.13

*Source: Primary field survey

Herb

A total of 22 herb species were recorded during the field study. The density of herb species recorded was 64800 individuals (ha⁻¹). In terms of density, *Cynodon dactylon* were the dominant herb species (5200 individual's ha⁻¹) followed by *Eclipta prostrata* (4400 individual's ha⁻¹). In terms of importance value index (IVI), *Cynodon dactylon* was the dominant herb species (IVI= 16.06) followed by *Eclipta prostrata* (IVI= 13.04) in Table- 5.20.

Table 5.20: Frequency, density IVI and abundance

Botanical name	Frequency (%)	Density (Individual ha ⁻¹)	IVI	Abundance
<i>Achyranthes aspera</i> L.	16	2800	7.89	1.75
<i>Cynodon dactylon</i> (L.) Pers.	36	5200	16.06	1.44
<i>Cyperus cyperoides</i> (L.) Kuntze	20	2800	8.79	1.4

Botanical name	Frequency (%)	Density (Individual ha ⁻¹)	IVI	Abundance
<i>Digitaria ciliaris</i> (Retz.) Koeler	24	3600	10.91	1.5
<i>Echinochloa colona</i> (L.) Link	8	1200	3.64	1.5
<i>Eleusine indica</i> (L.) Gaertn.	16	2000	6.66	1.25
<i>Heteropogon contortus</i> (L.) P. Beauv. ex Roem. & Schult.	20	2800	8.79	1.4
<i>Oplismenus compositus</i> (L.) P. Beauv.	16	2000	6.66	1.25
<i>Panicum paludosum</i> Roxb.	20	2800	8.79	1.4
<i>Senecio viscosus</i> L.	24	3200	10.30	1.33
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	28	3200	11.19	1.14
<i>Catharanthus roseus</i> (L.) G. Don	12	2000	5.76	1.67
<i>Diplazium esculentum</i> (Retz.) Sw.	20	2800	8.79	1.4
<i>Eclipta prostrata</i> (L.) L.	28	4400	13.04	1.57
<i>Euphorbia hirta</i> L.	20	3200	9.40	1.6
<i>Digitaria sanguinalis</i> (L.) Scop.	28	3600	11.81	1.29
<i>Leucas aspera</i> (Willd.) Link	20	2800	8.79	1.4
<i>Mikania micrantha</i> Kunth	16	2400	7.28	1.5
<i>Oxalis corniculata</i> L.	12	2000	5.76	1.67
<i>Plantago major</i> L.	28	3600	11.81	1.29
<i>Polygonum hydropiper</i> L.	20	3600	10.02	1.8
<i>Portulaca oleracea</i> L.	16	2800	7.89	1.75
Total	448	64800	200.00	32.30

*Source: Primary field survey

5.4.1 Diversity Index

Species diversity index can be considered as a measure of environmental quality and indicates the well-being of any ecosystem. To assess diversity of floral elements and structure of the plant community in different study sites, various diversity indices were computed. A diversity index is mathematical measures of species diversity in a community. They provide more information about community composition than simply species richness (i.e., the number of species present); they also take the relative abundances of different species into account. Three species diversity indices viz., Shannon index of general diversity (H), dominance index (D) and Evenness index (e) were computed using PAST software. Shannon index of general diversity (H) index for tree, shrub and herb of Umananda Terminal is given in **Table-5.21**.

Table 5.21: Shannon-Wiener Diversity Index

Project Sampling Site	Shannon-Wiener Diversity Index (H)		
	Tree	Shrub	Herb
Umananda Terminal	2.7	2.826	3.049

Dominance index is always ranges from 0 – 1, indicates species dominance within community gives greater weight to common species. In addition, the value of Dominance closer to 1 indicates areas dominated by single or few species. The value of Dominance had followed an opposite trend of diversity is shown in **Table- 5.22**.

Table 5.22: Dominance Diversity Index

Project Sampling Site	Dominance Diversity Index		
	Tree	Shrub	Herb
Umananda Terminal	0.07064	0.06256	0.04931

Gibson's Evenness Diversity Index for species richness and evenness is shown in **Table- 5.23**.

Table 5.23: Buzas and Gibson's Evenness Diversity Index

Project Sampling Site	Gibson's Evenness Diversity Index		
	Tree	Shrub	Herb
Umananda Terminal	0.9304	0.938	0.9585

At present the design or plans do not indicate the requirement for felling any of the tress present in the island. The photographs of common plant species observed during the study are enclosed as **Annexure- 14**.

Terrestrial Fauna

Faunal Diversity in and around Umananda site were identified by direct observation during field survey and signs of their pellets, scats, pugmarks and claw marks were also considered. A binocular (10 X 50) was used for bird watching and the important features were noted. The identification of avian fauna was made on the basis of available literature (Ali 1962, Gasten 1978 and Grimmett et al, 2000). Discussion with the villagers and local people were also made to generate information about wild animals and avian fauna. The secondary data and reported list of wildlife were also consulted. On the basis of on-site observations as well as secondary data, a check list of wild animals was prepared. The ecological status of the wild animals was categorized following IUCN Red Data Book, 1994. The terrestrial fauna in the study site is represented by mammals, birds, reptiles, butterflies and amphibians.

Mammal

No mammalian species were directly sighted. Based on the secondary information, information collected from Forest department and dialogue with locals, temple priests, following are recorded:

1. Mongoose (*Herpestes javanicus*)
2. Bay Bamboo rat (*Cannomys badius*)

3. Hoary Bamboo rat (*Rhizomys pruinosus*)

A biodiversity survey³in the island was conducted by J.Dutta, M. Choudhury and N. Chamuah in 2019 where they recorded the presence of Gee's Golden Langur (*Trachypithecus geei*), one of the endangered species of Primates. Their origin in the island is unknown. However as per the dialogue with the locals, it was found that the last Golden Langur died in the year 2020.

Avifauna

Avifauna observed is given in **Table- 5.24**.

Table 5.24: List of Avi-fauna

Zoological name	Local / Common name	IUCN / IWAP, 1972 Status
<i>Acridotheres ginginianus</i>	Myna	Least Concern / Schedule IV
<i>Clamator jacobinus</i>	Pied cuckoo	Least Concern / Schedule IV
<i>Coracias benghalensis</i>	Indian roller	Least Concern / Schedule IV
<i>Merops orientalis</i>	Little green bee-eater	Least Concern / Schedule IV
<i>Charadrius dubius</i>	Little ringed plover	Least Concern / Schedule IV
<i>Fulica atra</i>	Common coot	Least Concern / Schedule IV
<i>Rallus aquaticus</i>	Water rail	Least Concern / Schedule IV
<i>Lophura leucomelanos</i>	Kalij pheasant	Least Concern / Schedule IV
<i>Ardeola grayii</i>	Indian pond heron	Least Concern / Schedule IV
<i>Ardea cinerea</i>	Grey heron	Least Concern / Schedule IV
<i>Phalacrocorax carbo</i>	Great cormorant	Least Concern / Schedule IV
<i>Passer domesticus</i>	House sparrow	Least Concern / Schedule IV
<i>Coturnix coturnix</i>	Common grey quail	Least Concern / Schedule IV
<i>Ceryle rudis</i>	Pied kingfisher	Least Concern / Schedule IV
<i>Grus grus</i>	Common crane	Least Concern / Schedule IV
<i>Eudynamys scolopaceus</i>	Koel	Least Concern / Schedule IV
<i>Corvus splendens</i>	House crow	Least Concern / Schedule IV
<i>Motacilla cinerea</i>	Grey wagtail	Least Concern / Schedule IV

*Source: Prmary field survey and secondary data (Discussion with local people)

Butterfly

The floral biodiversity itself indicates the species of butterflies that can be predicated in that area. During the survey total of 11 species of butterflies belonging to 4 families were observed and are shown in **Table- 5.25**.

Table 5.25: List of butterflies

Zoological name	Common name	Family	Status	
			IUCN	IWPA' 1972

³ Understanding the biodiversity of Umananda:the smallest river island of the world

<i>Papilio demoleus</i>	Lime	Papilionidae	NA	Schedule IV
<i>Junonia orithya</i>	Blue pansy	Nymphalidae	Least Concern	Schedule IV
<i>Appias albina</i>	Common albatross	Pieridae	NA	Schedule IV
<i>Junonia hierta</i>	Yellow pansy	Nymphalidae	Least Concern	Schedule IV
<i>Neptis hylas</i>	Common sailer	Nymphalidae	NA	Schedule IV
<i>Junonia atlites</i>	Grey pansy	Nymphalidae	NA	Schedule IV
<i>Precis iphita</i>	Chocolate pansy	Nymphalidae	NA	Schedule IV
<i>Danaus chrysippus</i>	Plain tiger	Nymphalidae	Least Concern	Schedule IV
<i>Neptis hylas</i>	Common sailer	Nymphalidae	NA	Schedule IV
<i>Junonia lemonias</i>	Lemon pansy	Nymphalidae	NA	Schedule IV
<i>Athyma perius</i>	Common sergeant	Nymphalidae	NA	Schedule IV

**Source: Primary field survey and secondary data (Discussions with local people)*

Herpetofauna

From primary field survey and discussions with local people, total 4 species of Herpetofauna have been noticed. A complete checklist of Herpetofauna is listed in **Table- 5.26**.

Table 5.26: List of herpetofauna recorded from Umananda site.

Zoological name	Local / Common name	IUCN Status
<i>Polypedates leucomystax</i>	Tree frog	Least Concern
<i>Hylarana garoensis</i>	Water frog	Least Concern
<i>Calotes versicolor</i>	Indian garden Lizard	Least Concern
<i>Urosaurus ornatus</i>	Tree lizard	Least Concern

**Source: Primary field survey and secondary data (Discussions with local people)*

Protected and Eco-sensitive areas

The list of eco-sensitive protected areas and its distance from the proposed Umananda terminal is depicted in **Table- 5.27**.

Table 5.27: Protected and Eco-sensitive areas

Terminals	Protected and Eco sensitive area	Aerial Distance within 10 kms from Proposed Project
Umananda site	Amchang Wildlife Sanctuary	10.5
	Umananda Temple	0.2
	Kamakhya Temple	5.0
	Rani Reserve Forest & Jalukbari Reserve Forest	9.5
	Assam States Zoo cum Botanical Garden	6.0

5.5 AQUATIC ECOLOGY

5.5.1 Methodology

A literature review of all the available information on river dolphin management, conservation was conducted. Primary Survey along the stretch of River Brahmaputra was primarily focused on estimating abundance of dolphin population besides characterizing the habitat and anthropogenic covariates. Primary field data was collected through survey of the river stretches of 1 km of both sides around the project locations from river bank. Direct Count Method as suggested by Smith and Reeves (2000) for the river dolphin survey was followed during the study. Simultaneously, other fauna observed during the survey were also recorded. This includes different species of fishes, sightings and evidence of presence of herpetofauna, birds, and mammals if any around the vicinity of proposed project locations. The time and location of sightings, habitat features (viz. water-depth, channel type, channel width, bank type), the distance of dolphin for the nearest bank, and human activity were also be recorded. River width was estimated using a handheld range finder at the proposed project sites as provided by WAPCOS. All the spatial data generated from the field fed into a hand-held GPS (Garmin Inc.) and were plotted in a map using GIS with the help of computer. The results obtained were statistically analysed.

5.5.2 Study by WWF

Mitigation measures suggested in the study for dolphin conservation in Brahmaputra River with reference to the proposed project are some of the best practices that are being implemented for river dolphin conservation and management in different parts of the world based on drawing insights, lessons learnt, and best practices from the wealth of resources and approaches being used to conserve rivers, river biodiversity and river dolphins as suggested in the report, 'An in-depth study on global best practices for effective and conservation of the Ganges river dolphin (*Platanista gangetica*) commissioned by the World Bank and WWF. Another important study, 'River Dolphin Conservation and Management: Best Practices Around the World by WWF was referred for preparing the mitigation measures for dolphin management plan. The aforesaid documents present the mitigation measures for the entire river basin, however for the present ESIA, mitigation measures which are relevant to the Project during construction and operation phase of the proposed terminal at Umananda has been considered.

5.5.3 Study by ZSI

The Zoological Survey of India (ZSI) had carried aquatic ecology and Ganges River Dolphin (*Platanista gangetica gangetica*) on 5th September 2022. The detailed report of ZSI is submitted separately. The highlights of the study including primary and secondary data is described in the following paragraphs.

Dolphins are reported to occur on the 2.5 km river stretch upstream of the site in north east direction towards Umananda Ghat ((Wakid, 2009). However, there was no sighting of dolphin during the survey that was conducted by ZSI. This may be due to the fact that since the survey was only for one day and water current in the Brahmaputra River was heavy as a result of which the dolphins if inhabiting in the area have moved to shallower areas away from the Ghat. The findings from the present study corroborate the observations and results of study conducted

through AIWTDS during 2019. Therefore, precautionary measures should be adopted by the project proponent/authority during the construction and operation phase of the project. As a part of the EIA study, a survey was conducted in the Brahmaputra and Barak River to understand the effect of the project activities on the Gangetic dolphin population. The study mainly aimed at assessment of risks associated with the navigational activities and development of riverine infrastructure under the AIWT Project on the aquatic biodiversity and Gangetic dolphins, identification of breeding grounds and populated sites, good habitat for dolphins and preventive measures for avoiding and reducing any harmful impact on river dolphins and based on the study prepare a conservation plan for mitigating the anticipated impacts. The dolphin survey was carried out in the entire stretch of River Brahmaputra and Barak to understand the impact of project activities on the Gangetic dolphin population. The Dolphin Census was carried out for dry season from 26th March to 29th - March 2019 for dry season and for the monsoon season from 2nd August to 6th August- 2019. A total of 36 dolphins were sighted in the dry season and 57 during monsoon period was recorded in the study. Based on this study, the dolphin conservation plan was prepared which is being implemented during the construction of Guwahati Gateway Ghat (GGG) Terminal under the Project. This plan was also referred for preparing the dolphin conservation plan for the next set of interventions under the Project.

5.5.4 Methodology, Preservation, and Identification of Planktons

Planktons are a group of mostly microscopic organisms, plants and animals, which are found in all forms of aquatic ecosystems. They are so small and delicate that they are always at the mercy of the water current or tide for their movement. So, in running waters like streams and rivers, their diversity and density is relatively less in comparison to stagnant aquatic bodies like ponds, lakes etc. Though, they are microscopic in size, plankton play a very important role in the function of aquatic ecosystems. They occupy the base of the pyramid of energy and are the basis of the aquatic food chain. Phytoplankton account for about half of the photosynthesis on the planet, making them one of the world's most important producers of oxygen. Phytoplankton rely on nutrients found in their surroundings, such as phosphate, nitrate, and calcium, to thrive. Zooplankton, on the other hand feeds on phytoplankton and detritus and are being eaten by secondary consumers like crustaceans, fishes etc.

For collecting the samples standard methods were followed (Lind O., 1979 and Wetzel R.G., 1975). Random sampling technique has been applied in to study aquatic ecology collection procedure. The samples were collected from the different habitats of the study sites. Aquatic community specimens growing on moist cemented walls, stones, bark of trees, soil, and sand, in temporary and permanent water bodies like ditches, running water and ponds were selected for the study. The phytoplankton and zooplankton were collected by filtering 30 to 50 litres of water at each site the help of planktonic mesh net (pore size- 10 μ), while epiphytic forms were collected by squeezing the submerged plants. The residue left in the sieve was collected in a 50 ml vial. Three replicates were taken for each community and pooled for further analysis. Phytoplankton samples were preserved using Lugol's solution. The samples were stored in sterile plastic bottles

and recorded with GPS points. On return to the laboratory, they were washed thoroughly with water. No preservative was added in zooplankton samples.

Benthos samples were collected from each site by scraping the boulder surfaces of known quadrat area (5cm x 5cm). These samples were then preserved and analysed in the same way as described for the plankton. Further analysis was conducted in laboratory.

The samples are acid digested, centrifuged and thoroughly rinsed to get the cleared samples. Semi-permanent slides were prepared from each sample for the identification of various taxa and observed under trinocular research microscope. For treatment of samples, the standard method was followed (APHA, 2005). To count and identify the benthos, Pennak (1953) and Edmondson (1959) were followed.

Phytoplankton

The phytoplankton population comprised of representative elements from three groups namely- Bacillariophyceae, Chlorophyceae and Cyanophyceae. The most common species were- *Bacillaria* sp., *Noctiluca* sp., *Chlorella vulgaris*, *Cladophora glomerata*, *Spirogyra singularis*, *Zygnema* sp., *Anabaena* sp. *Oscillatoria* sp. *Achnanthes* sp. *Cymbella* sp. etc,

Zooplanktons

Zooplankton community comprised of Cladocera, Copepoda, Euglenophyceae, Protozoa and Rotifera. The most dominate species of zooplankton in study area were- *Daphnia* sp., *Euglena* sp., *Keratella* sp., *Moina* sp. *Synedra pulchella*, *Arcella* sp., *Cyclops* sp., *Fragilaria* sp., *Navicula* sp., etc.

Benthos

The benthos of River Brahmaputra comprised mainly of Gastropods, Bivalves, Oligochaets, Chironomids and aquatic insects. The quantitative abundance of benthos was found to range from 32/sqm to 365/sqm in different stretches of the river Brahmaputra (Pathak *et al.*, 2000).

Ichthyofauna

The list of major ichthyofauna observed is given in **Table- 5.28**

Table 5.28: List of the ichthyofauna

Species Name	Family	Order
<i>Chana striata</i>	Channidae	Anabantiformes
<i>Channa punctata</i>	Channidae	Anabantiformes
<i>Chanda nama</i>	Ambassidae	Ovalentaria
<i>Notopterus notopterus</i>	Notopteridae	Osteoglossiformes

Species Name	Family	Order
<i>Puntius sophore</i>	Cyprinidae	Cypriniformes
<i>Rita rita</i>	Bagridae	Siluriformes
<i>Labeo gonius</i>	Cyprinidae	Cypriniformes

5.6 SOCIO-ECONOMIC ASPECTS

The proposed Umananda terminal is an un-inhabited riverine island, being used by pilgrims, tourists, priests, ferry passengers and vendors in daytime only. No private properties, land etc. shall be affected due to proposed Project terminal within 500m. of the study area. However, approximately 04 (four) vendors earning their livelihood near the existing terminal site may be affected and displaced during construction period. Details of the same has been presented in the Table below:

Details of PAPs

Table 5.29: Details of PAPs

S. No.	Type of Shop	Gender of PAPs		Affected Employee	Total
		Male	Female		
1	Temporary with make shift arrangement	4	0	0	4

**Source: WPCOS Social Survey*

Socio-economic Profile of the Affected Persons

The data presented in the Table 5.30, reflects that out of the total PAPs, 75% comes under General Category while 25% are under OBC category of social stratification. None of the PAPs are falls under SC and ST category. Further, none of the affected person come under vulnerable category i.e. BPL, WHH, Differently Abled, Old Age, SC and ST.

Table 5.30: Social Stratification of PAPs

S. No.	Social Category	Numbers of Families	Percentage
1	General	3	75.00
2	OBC	1	25.00
3	SC	0	0.00
4	ST	0	0.00
5	Others	0	0.00
	Total	04	100.00

**Source: WPCOS Social Survey*

Demographic Profile of the Family of Affected Persons

Table 5.31 presents demographic profile of the families of Project Affected Persons (PAPs). Out of total 20 members of the families, 11 members are male while 9 are females. The average household size of the PAPs are 5 persons per family.

Table 5.31: Demographic Profile of the Family of PAPs

PAPs ID	Male	Female	Total
1	2	3	5
2	3	2	5
3	2	2	4
4	4	2	6
Total	11	9	20

**Source: WPCOS Social Survey*

Chapter 6 - ASSESSMENT OF IMPACTS AND MITIGATION MEASURES

6.1 INTRODUCTION

Based on the project details and the baseline environmental status, potential impacts that are expected to accrue as a result of the proposed project have been identified. The assessment for quite a few disciplines is subjective in nature and cannot be quantified. Wherever possible, the impacts have been quantified. However, for non-tangible impacts, a qualitative assessment has been done so as to formulate appropriate management measures for them as well. This Chapter deals with anticipated positive as well as negative impacts due to the construction and operation of the proposed project and strategies to mitigate them.

Limitations of the ESIA

The ESIA has been developed based on the Detailed Project report. The Technical assessment in the Detailed Project Report has not been reassessed. The ESIA has adopted these technical assessments in good faith. 'It further assumed that no blasting would be carried out for the development of the proposed terminal at Umananda. Therefore, any changes would require an updating of the ESIA.

6.2 ASSESSMENT OF IMPACTS

6.2.1 During Construction Phase

The impacts during construction phase will be localized and short-term and primarily related to civil works and erection of equipment. The duration of impact will be limited to the construction phase only which is assumed to be only 18 months. The following activities may cause environmental impacts during construction of the proposed project:

- Site preparation
- Rock Cutting, levelling and backfilling
- Hauling of Construction materials
- Erection of concrete and steel structures
- Operation of the Heavy Equipment
- Painting and finishing
- Clean up operations.
- Landscaping

The details of activities and probable impacts during construction phase are depicted in **Table-6.1**.

Table 6.1: Identification of Activities & Probable Impacts during Construction Phase

Activities	Sector	Anticipated Impacts
Site clearing and	Air	Fugitive dust emission
		Air emission from construction equipment and machinery
	Water	Run off from grass stripped area.
	Land	Loss of fertile topsoil
		Change in drainage pattern.
	Ecology	Loss of vegetation
Transportation and storage of construction material/ equipment	Air	Air emission from vehicles
		Fugitive dust emission due to traffic movement
	Water	Spilling of construction material and flow into streams.
		Run off from storage areas of construction material
	Soil	Deposition of spilled construction material and flow into streams
	Public utilities	Increased flow of traffic will lead to congestion on road
Civil construction	Air	Fugitive dust emission due to various construction activities
	Water	Run off from erection areas containing oils, paints
		Sewage from labour camps
		Can induce auditory damage at shorter distances and behavioural disturbance at longer distances in dolphins
	Culture & Heritage Resources	Temporary diversion of access towards cultural resources, temples; Safety issues to devotees during the construction stage various construction activities etc. Chances of vibration impact to these cultural resources during the construction work
	Socio-economic	Increase in employment
Influx of labours	Socio-economic	Stress on infrastructure
		Stress on social relation

6.2.2 Impacts due to pre-construction activities

6.2.1 Disturbance to Construction activities from existing ferry operations.

The proposed terminal would be developed in the location of the existing terminal. It was pointed out in the Screening report that there would be disturbances to the pilgrims during the construction activities because the space is narrow. During the joint site visit of the E&S and Technical Teams during the ESIA studies, it was decided that to avoid all conflicts with construction activities, the existing ferry operations would be temporarily shifted from the southern end where the new terminal is proposed. A similar ferry landing point exists on the western side. This would be modified, made friendly for the passengers and used for construction activities. These may include minor modifications of the land area and modification of the stairs. Minor civil works are envisaged.

6.2.2 Pre-construction activities

In addition, during the pre-construction activities at the existing terminal, there will be a requirement for the clearing of the debris. Given that Umananda is a rock, some areas may have to be flattened by cutting the rock for the staging of the equipment and machinery. Even though none of the workers would be staying at the site, basic facilities, e.g., toilets, have to be prepared. At Umananda, there is no space for storage of construction materials and equipment at the site. Moreover, the transportation of construction materials and equipment will also be an issue which needs careful planning. Apart from this labour camps and other utilities cannot be placed at the site due to space constraints.

Mitigation Measures: After award of the work, construction activities shall be planned very carefully. Construction material shall be stored on other side of the river and transported in a very strategic manner. The work force will have to travel every day to this site by ferry/boat. Labour camp shall be identified and established post award of the work after consultation with stakeholders and as per applicable standard and guideline for the establishment of labour camp.

6.2.3 Design Review

The design review should be undertaken to ensure that the terminal is resilient to floods and natural calamities. It should also be ensured that the design is friendly to the pilgrims especially elderly and people with specially-abled people.

Mitigation Measures: These activities would generate some impacts, but they would not be significant given that the scale of activities is low. However, it is suggested that the Contractor would implement the following mitigations

- The design of any reclamation and riverbank protection must be carefully assessed so that the hazards due to Bank failure do not affect the stability of the structure.
- The design of the ramps, staircase etc should conform to the Harmonized Guidelines & Standards for Universal Accessibility in India – CPWD, 2021.
- During the work for the Alternate landing site on the Western side, the entire area would be hard barricades.

- Green screens would be provided to prevent dust during the chiselling operations.
- The debris generated would be stored in a designated area with the temporary construction area and later shifted to the permanent construction area and reutilised in construction
- The Bio-toilets of adequate numbers should be installed at the site before any activity is carried out.
- No debris should be disposed off or dumped in the river
- Waste Management system, as described later, should be in place. Arrangement should be made for segregation of wastes into recyclable and non-recyclable wastes. Non-recyclable wastes to be disposed regularly through authorised agency. Recyclable wastes should be sold to authorized vendors.
- Construction wastes generated at site should be segregated into recyclable, reusable and rejected fraction. Recyclable should be sold to authorized vendors; reusable should be stored at site for usage and rejected fraction should be disposed at designated sites of municipal authority.
- As no debris or waste disposal sites exists in the proposed location, a site shall be identified by the Contractor in consultation with AIWTDS and this would be used and managed for the same as per the debris management plan.

6.2.3 Impacts due to Construction activities

6.2.4 Impact on Land Environment

➤ Impacts due to transfer of land

The proposed project envisages the construction of passenger jetties. The total land requirement for Umananda terminal has been estimated as 850 m². The total land majorly belongs to unsurveyed government land as per the available record provided by Land & Revenue dept. Since private land acquisition is not envisaged and hence no impacts due to transfer of land envisaged.

Mitigation measures: As the land belongs to government, it shall be transferred to AIWTDS from Govt. of Assam. As per present level of investigation, no private land is proposed to be acquired, hence no mitigation measures are required.

➤ Impact Due to rock cutting

The Umananda is a rock with outcrops or undulations. These have to be levelled to allow the construction of the ramps and other civil infrastructure. The chiselling of these rocks is necessary for construction. A pneumatic hand-held chisel would be used for breaking the rock. Machine-mounted rock breakers may be used, but the vibration and presence of archaeological remains are considered after consideration. The quarrying activity would also generate noise and debris. The debris generated will have, unless reutilized or stored separately can degrade the land environment.

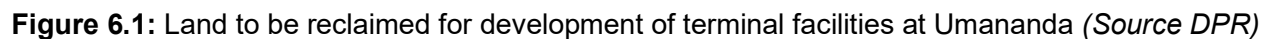
➤ Impact Due to Land Reclamation

For the construction of the Umananda Terminal, the land area, i.e., 850 sqm is not available due to constraints in the existing land available and the creation of land by hill cutting is not feasible. It is thus suggested that 225.39 sqm of land would be reclaimed beyond the low water level of which Terminal building area is 142.18 Sq.m and the remaining would be the protection works for the terminal. At Umananda the High Flood Level (HFL) is 48.38 (m) and Low Water Level (LWL) is 41.55 (m). When water line shifted to Low Water Level during the lean season there will be around 32.68-meter length developed between HFL and LWL. The Terminal Building is going to be developed in HFL; therefore, the entire area needs to fill up by gravel. This is reflected in the DPR section 8.1.3.4. For land reclamation, there would be mass concreting followed by filling with aggregate. Further there will be placing of Gabion mattress in slope beyond low water level supported by 0.5-meter-thick launching apron with Gabion mattress therefore the impact on water will be negligible. The drawing no. DI1530-RHD-ZZ-UA-DR-C-2202 revision P04 depicts the area to be reclaimed for the proposed development which may be seen in the **Figure 6.1**. Since only a small portion of the reclaimed land would be in the low water levels, the impacts are envisaged to be low.

For working in the water at low water levels, coffer dams would need to be developed. The construction of the coffer dam would have an impact on the water quality and noise environment. These have been discussed in the relevant sections. It will also have an impact on the health and safety of workers which is discussed in the health and safety section.

Mitigation Measures: However, the following precautions are to be taken by the contractor:

- Select a construction methodology that is least disturbing and appropriate for the in-situ soil condition.
- The reclamation work in the river must be undertaken during the low flow period -Schedule construction works to complete the construction work before the onset of the monsoon
- No material shall be stored inside the river bed or outside the construction area. All loose construction material which are liable to be washed away should be removed.
- Consider all the safety and noise mitigation measures for coffer dams as discussed in the respective sections.
- Measures adopted to prevent water pollution from coffer Dam and the safety of the personnel working have been addressed under Water Environment and Occupational Health and safety discussed later in the document.



➤ **Impact of Sourcing of material.**

Most of the construction materials will be sourced from outside the Umananda. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. It is essential to assess the impact of quarrying. The EIA Notification 2006 assess the impact during the award of the Environment clearance to quarries (Stone and sand). The construction material would only be sourced from sites which have prior environmental clearance to prevent all these impacts.

Mitigation measures:

- The material extracted due to site preparation shall be used to the maximum possible on the proposed sites for levelling and reclamation.
- No exclusive quarries are proposed to be opened for these projects
- Construction material will be procured from sources which have valid environmental clearance. The Contractor shall submit the required documents (copy of the environmental clearance, CTO) to the PMU for verification and obtain approval from the PIU before procuring any material
- Submit to PMU monthly documentation of sources of materials.
- If the contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from a third party, the contractor will ensure that all the parties/ suppliers have CTE/CTO from ASPCB and will collect a copy of these certificates and submit to PIU/consultants

6.2.5 Impact on noise environment

➤ **Due to the movement and operation of the Plant and Machinery**

The noise during construction phase is due to operation of various construction equipment. The noise levels generated by various construction equipment are given in **Table- 6.2**.

Table 6.2: Average noise levels generated by the operation of various construction equipment

Equipment	Noise level (dB(A))
Transit mixer	75
Winch-7.5 t capacity	75
Generator	85
Hydraulic Rig	85
Compressor	80
Hydra 12/15t	80
Wibro hammer	80
Concrete mixer	75
JCB-3D	85
Trailor	85

Equipment	Noise level (dB(A))
Excavator	80
Dumper	85
EoT cranes	80
Ordinary cranes	75

Under the worst-case scenario, considered for prediction of noise levels during construction phase, it has been assumed that equipment required during construction phase is operating at a common point. Likewise, to predict the worst-case scenario, attenuation due to various factors too has not been considered during noise modelling.

Modelling studies were conducted to assess the increase in noise level due to operation of various construction equipment's, and the results of this exercise are given in **Table- 6.3**.

Table 6.3: Predicted noise levels due to the operation of various construction equipment

Distance (m)	Ambient noise level (dB(A))	Increase in noise level due to construction activities (dB(A))	Noise level due to construction activities (dB(A))	Increase in ambient noise level due to construction activities (dB(A))
30	45	70	70	25
50	45	66	66	21
100	45	60	60	15
200	45	54	55	10
500	45	46	49	4
1000	45	36	46	1
1500	45	36	45.5	0.5
2000	45	34	45	-

It is clear from **Table- 6.3**, that at a distance of 1 km from the construction site, the increase in noise levels will be only 1 dB(A). There are no residential areas at Umananda island. The nearest residential areas are at a distance of 0.5 km from the site. Hence, no adverse impacts are anticipated on ambient noise levels during construction phase of the proposed project.

It would be worthwhile to mention here that in absence of the data on actual location of various construction equipment, all the equipment has been assumed to operate at a common point. This assumption leads to over-estimation of the increase in noise levels. Also, it is a known fact that there is a reduction in noise level as the sound wave passes through a barrier.

Walls of various houses or other structure will attenuate at least 30 dB(A) of noise. In addition, there is noise attenuation due to the following factors.

- Air absorption
- Rain
- Atmospheric in-homogeneities
- Vegetal cover

No increase in ambient noise level is anticipated, as a result of various activities, during project construction phase due to the following:

- Assumption that all equipment is operating from a common point led to over-estimation of increase in noise level
- Attenuation of 30 dB(A) of noise by wall of any structure
- Noise attenuation due to various factors.

As mentioned earlier, there will be significant attenuation due to various factors, e.g., absorption by construction material, air absorption, atmospheric in-homogeneities, and vegetal cover. Thus, no significant impact on this account is anticipated.

➤ Exposure to workers

The effect of exposure of high noise levels on the workers operating the various construction equipment is likely to be harmful. It is known that continuous exposure to high noise levels above 90 dB(A) affects the hearing acuity of the workers/operators and hence, has to be avoided. To prevent the adverse impacts, the exposure to high noise levels should be restricted as per the exposure period outlined in **Table- 6.4**. Workers operating in the high noise areas shall be provided with ear plugs.

Table 6.4: Maximum Exposure Periods specified by OSHA

Maximum equivalent continuous Noise level dB(A)	Unprotected exposure period per day for 8 hrs/day and 5 days/week
90	8
95	4
100	2
105	1
110	$\frac{1}{2}$
115	$\frac{1}{4}$
120	No exposure permitted at or above this level

Noise Control Measures

Measures to control noise from construction equipment are as follows:

- Noise from air compressors could be reduced by fitting exhaust mufflers and intake mufflers.
- Chassis and engine structural vibration noise can be dealt by isolating the engine from the chassis and by covering various sections of the engines.
- Noise levels from the drillers can be reduced by fitting of exhaust mufflers and the provision of damping on the steel tool.
- Exposure of workers near the high noise levels areas can be minimized. This can be achieved by job rotation/automation, use of ear plugs, etc.

Control of Noise due to DG Sets

The following Noise Standards for DG sets are recommended for the running of DG sets during the construction:

- Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the enclosure acoustically.
- The Acoustic Enclosure should be made of material of appropriate thickness and structural/ sheet metal base. The walls of the enclosure should be insulated with fire retardant foam.
- The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side.
- The DG set should also be provided with proper exhaust muffler.
- Proper efforts to be made to bring down the noise levels due to the DG set, outside its premises, within the ambient noise requirements by proper siting and control measures.
- A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.
- The construction activities shall be limited to day time. Suitable barriers shall be provided around construction sites.
- Staging of construction equipment and unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible

Provision for Noise control measures shall be kept as a part of project. Various measures listed above shall be made mandatory in the Tender Specifications for construction of the project

➤ Due to Piling for the preparation of coffer dam

For the Cofferdam development, temporary piling must be carried out. The piling activity would generate noise and vibration. This would impact both humans (pilgrims at the site) as well as aquatic animals. To reduce the impacts of the noise the following measures have been suggested:

Mitigation Measures:

- The Piling activity should not be carried out during the peak pilgrim time.
- Impact piling must be avoided. Rather than alternative piling methodology e.g., hydraulic, vibratory, and bored piling should be considered to reduce noise
- Installation of Bubble curtains, acoustic baffles to the bottom of the piling can reduce the noise
- No night-time piling should be carried out

6.2.6 Impact on Ecology

➤ Impact on Dolphins from underwater construction noise

Anthropogenic noise can have a range of effects on aquatic life. Richardson et al, (1995) identified four zones of influence: The zone of audibility, in which the animal might hear the noise; the zone of responsiveness, within which the animal reacts behaviourally or physiologically; the zone of masking, in which the noise interferes with other sounds such as those used in communication, echolocation, prey, predator or other natural sounds from the environment; and the zone of injury, where the noise results in damage to the auditory (or other) system. Additionally, the noise could mask sound cues from predators, prey or conspecifics, which may reduce the animal's fitness or its chance of finding a mate. These impacts are difficult to measure but may lead to important population impacts, particularly for vulnerable populations like dolphins. The zone of masking due to pile-driving noise was investigated for bottlenose dolphins (David 2006), who found that communication whistles may be masked up to 40 km from the piling source and echolocation clicks up to 6 km. No studies have specifically investigated the zone of masking. Since there is no scientific established zone of masking and it is known that the areas around Umananda and North Guwahati are known habitats of dolphins these would be considered as safe limits for the dolphins.

Mitigation Measures

The following mitigation measures are suggested.

- Construction Planning must be carried out so that No-construction Period (stop the construction activities in the water part between Mid- March to Mid-June)
- Effect of piling during the construction period will be managed by the adoption of vibratory piling
- The river area in which the piling is planned advisable to carefully determine drop sites before anchor placement to ensure that Dolphin and fish communities that could locally still be present in the area are not unnecessarily damaged
- Dolphin Watch must be carried out in the river for one hour before piling starts. Piling must commence if dolphins are not spotted for half an hour prior to the start of the activity
- Before starting piling, allow some time for aquatic fauna to displace from the piling area.
- Piling must be stopped for some time if any dolphin/turtle/RET species are sighted in the activity area
- Noise-reducing devices like mufflers, enclosures baffles must be fitted with the equipment as much as feasible.
- Usage of bubble curtains to disperse the fauna and reduce the noise level
- Fish exclusion devices must be installed in the water column around the pile driving area to prevent fish access
- Geo Textile synthetic sheet curtains & turbidity traps must be placed around piling and construction areas to prevent the movement of sediments and construction waste
- Aquatic ecology monitoring must be carried out before the start of construction and after completion of construction to assess the impact of construction activities on aquatic life.

- If, despite the introduction of preventive measures, fish kills or impact on aquatic life is observed, then the work will stop immediately, and the methods will be reviewed and corrected.
- All equipment will be adequately maintained to prevent potentially hazardous or toxic products from leaking or spilling. This includes hydraulic fluid, diesel, gasoline and other petroleum products.
- The piling activities must be carried out in the shortest possible timeframe.

➤ **Impact on Fisheries**

Discussion with the local fisherman, site observations indicated that there are no fishing activities in the vicinity of the Umananda site. No significant impact is envisaged on the fisheries from the proposed project. Suitable management measures have been suggested to check the disposal of oily waste and collection of spillage oil in case of accidental oil spillage from the boats.

Mitigation measures: Various measures recommended to minimise the impacts on aquatic life are given as below.

- Discharge of effluents from concrete mixers etc, without treatment is prohibited.
- Turbidity, DO and salinity will be monitored once every week at 3 locations: near the Berth, channel and records of monitoring will be maintained. If DO level goes 4.0 mg/l, then its causes will be investigated, and corrective actions will be taken.
- Spillage of material (sediment) from the vessel bucket to the surrounding water will be minimized by using trained operators
- Turbidity traps/curtains/ Geo-Textile synthetic sheet curtains would be placed around piling and construction areas to prevent sediments and construction waste movement.

6.2.7 Impact on Surface Water Quality

➤ **Impact from Construction of Cofferd Dam**

The construction of a coffer dam may lead to an increase in turbidity of the river water, direct discharge of the seepage water would result in increase of the turbidity of water, the degradation of the water quality and impact the aquatic flora and fauna. The following mitigation measures are suggested.

- Schedule the construction works during the low water level period – late winter months to pre-monsoon (February–June/July); ensure that works are completed during the same period prior to the onset of monsoon.
- Erect the coffer dam to form an enclosed construction area with the least disturbance.
- Avoid the discharge of turbid water directly to the river. Develop a settling tank of adequate capacity. The seepage / discharge from the construction activity should be allowed adequate time to settle the distributed solids prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt-laden water should be pumped to a silt pond.
- Avoid/minimise the use of fuels, chemicals, and lubricants; ensure no spillage.

- Clear the work site after completion, at least to pre-project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers/coffer dam; and
- Implement work site safety at works in water bodies.
- Impervious material or clayey soil in gunny bags to be used.
- The outer area of the coffer dam should be covered with thick plastic sheets to minimise turbidity.
- Inspection and maintenance of disturbed areas where mobilisation and barrier installation occur for sediment control measures.
- Barrier structures are of sufficient height to prevent waves or overflows from flooding in the enclosed area.

6.2.8 Impacts on Ambient Air Quality

Up-gradation of existing roads and construction of new roads approaching the proposed site involves cutting and filling of the earth. Within the project site, cutting and levelling activity would be required for Jetty.

The potential source of air quality impact arising from the establishment/ construction of the proposed project is fugitive dust generation. The dust, measurable as PM₁₀ and PM_{2.5} would be generated as a result of construction activities. The potential dust sources associated with the construction activities are loading and unloading of the materials, topsoil removal, etc.

The construction activities that contribute to the environmental impacts are broadly given below:

- Dust generation during levelling of earth.
- Dust generation due to the movement of vehicles on unpaved roads
- Emission of pollutants from vehicular exhaust
- Unloading of raw materials and removal of unwanted waste material from site
- Accumulation of excavated earth material

The impacts will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries. However, the project site is cordoned off by a high boundary wall and planned green belt; such impacts will be confined only within the project site.

➤ Impacts due to fugitive emissions

The major pollutant in the construction phase is SPM being air-borne due to various construction activities. The vehicular movement generates pollutants such as NO_x, CO and HC. But the vehicular pollution is not expected to lead to any major impacts. The soils in the project area are sandy in texture and are likely to generate dust as a result of vehicular movement. However, the fugitive emissions generated due to vehicular movement are not expected to travel beyond a distance of 200 to 300 m. The impact on air environment during construction phase is not expected to be significant, since there are no habitations in the vicinity of the site.

➤ Impacts due to construction equipment

The combustion of diesel various construction equipment could be one of the possible sources of incremental air pollution during the construction phase. The fuel utilization rates of various equipment expected to be in operation during construction phase is given in Table-5.6. Under the worst-case scenario, it has been considered that equipment used for construction of berth and earthwork at each site, are operating at a common point.

Table 6.2: Fuel combustion during construction

Equipment	Fuel consumption rate (lph)	No. of Units	Total fuel consumption (lph)
Dumpers	30	1	30
Generators	30	2	60
Dumpers	20	2	40
Loaders and unloaders	25	1	25
Excavators	25	1	25
Water tanker	8	2	16
Total			196

The major pollutant likely to be emitted due to construction of diesel in various construction equipment shall be SO₂. The short-term increase in SO₂ concentration has been predicted using Gaussian plume dispersion model. The results are summarized in **Table- 6.6**.

Table 6.3: Short-term (24 hr.) increase in concentration of SO₂ (µg/m³)

Wind Speed (m/s)	Distance (km)			
	0.1	0.2	0.3	0.4
0.2	0.47 x10 ⁻³⁴	2.3 x10 ⁻¹¹	1.15 x10 ⁻⁶	9.4 x10 ⁻⁵
0.85	2.8 x10 ⁻⁸	5.3 x10 ⁻⁴	4.4 x10 ⁻⁴	4.2 x10 ⁻⁵
1.53	7.4 x10 ⁻⁵	1.75 x10 ⁻⁴	4.2 x10 ⁻⁵	2.2 x10 ⁻⁴
2.78	1.09 x10 ⁻⁴	1.23 x10 ⁻⁴	2.6 x10 ⁻⁵	8.1 x10 ⁻⁶
4.30	9.4 x10 ⁻⁵	1.23 x10 ⁻⁴	2.6 x10 ⁻⁵	8.1 x10 ⁻⁶
5.98	7.1 x10 ⁻⁵	6.4 x10 ⁻⁵	1.28 x10 ⁻⁵	5.8 x10 ⁻⁵
7.00	6.8 x10 ⁻⁵	5.5 x10 ⁻⁵	1.09 x10 ⁻⁵	5.0 x10 ⁻⁶

It is evident from **Table 6.7** that the maximum short-term increase in SO₂ is observed as 0.00053 µg/m³, which is at a distance of 200 m from the emission source. The incremental concentration is quite low and does not require any specific control measure. Thus, the operation of construction equipment is not expected to have any major impact on the ambient air quality as a result of the project.

Mitigation measures

The following measures are recommended to control air pollution:

- Construction equipment shall be fitted with internal devices i.e., catalytic converters to reduce CO and HC emissions.
- The contractor will be responsible for maintaining properly functioning construction equipment to minimize exhaust.
- Construction equipment and vehicles will be turned off when not used for extended periods of time.
- Effective traffic management to be undertaken to avoid significant delays in and around the project area.
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

The measures to control emissions due to DG sets are recommended as below:

- Location of DG sets and other emission generating equipment should be decided keeping in view the predominant wind direction so that emissions do not affect nearby residential areas.
- Stack height of DG sets to be kept in accordance with CPCB norms, which prescribes the minimum height of stack to be provided with each generator set to be calculated using the following formula:

$$H = h + 0.2 \times \sqrt{\text{KVA}}$$

H = Total height of stack in meter

h = Height of the building in meters where the generator set is installed

KVA = Total generator capacity of the set in KVA

To minimize issues related to the generation of dust during the construction phase of the project, the following measures have been identified:

- Identification of construction limits (minimal area required for construction activities).
- When practical, excavated spoils will be removed as the contractor proceeds along the length of the activity.
- Excessive soil on paved areas will be sprayed (wet) and/or swept and unpaved areas will be sprayed and/or mulched.

Contractors will be required to cover stockpiled soils and trucks hauling soil, sand, and other loose materials (or require trucks to maintain at least two feet of freeboard).

- Regular spray of water over unpaved areas.
- Contractor shall ensure that there is effective traffic management at site. The number of trucks/vehicles to move at various construction sites to be fixed.
- The construction area and vicinity (access roads, and working areas) shall be swept with water sweepers on a daily basis or as necessary to ensure there is no visible dust.

Various measures listed above shall be made mandatory in the Tender Specifications for construction of the project.

6.2.9 Impacts on Socio-Economic Environment

The project aims to bring several positive and adverse social developmental impacts due to the modernisation of Umananda terminal through infrastructure development and better ferry services.

Positive Impacts

- Increased facilities and ferry services will add to the increased trading and economic development of the area. Enhancement of better and reliable access to work places, markets, religious places, educational and health facilities.
- Reduction of overall transport and travel times, and improved regional cohesion by affordable transport across the rivers at socially affordable conditions.
- From the Gender angle, it shall have positive impacts on mobility of women on the island, better job opportunities, entertainment facilities etc. Overall enhancement in socio-economic status.

Adverse Impacts

Umananda terminal shall be developed on Government land and hence land acquisition is not an issue as per DPR. However, following adverse impacts has been assessed:

- The proposed Umananda terminal is an island and un-inhabited, no properties, land etc. will be affected during construction. Based on the Census Survey findings conducted on 23.06.2023, 04 (four) vendors earning their livelihood near the existing terminal site will be affected/ displaced during construction period. As per the Entitlement Matrix of Resettlement Policy Framework, they are categorised as Kiosks/street vendors and are entitled for compensation under Section 6.3 of the same.
- Due to increased connectivity from various parts of the state and country, can lead to an increase in anti-social activities, unless adequate precautionary measures are taken.
- During construction phase approximately 25 manpower (including skilled, semi-skilled and un-skilled) would be required. Labour influx management shall be a temporary and minor; the impact shall be mitigated appropriately.
- Spreading of viral / communicable diseases including STDs due to influx of people from other places is another negative impact for which appropriate surveillance measures needs to be taken.

Mitigation and Enhancement Measures

Mitigation and enhancement measures are required to be planned appropriately to minimize the negative impacts and maximize the positive impacts of the Project from the social point of view.

- The affected vendors shall be compensated as per the provision made in Resettlement Policy Framework.
- The vendors shall also be shifted/relocated at alternate terminal site during project construction period after due consultation with ferry operators and Temple Management. The alternate site of the terminal is free from encroachment and is vacant.
- During the construction phase alternate arrangements will be made to ensure safe access to the river and connecting transport facilities both inland and water.
- All safety and security systems will be alerted to safeguard the interest of the travellers including women. To resolve the complaints related to such issues as part of the project AIWTDS has already formulated Grievance Redressal Mechanisms (GRM).
- Surveillance measures to control spreading of communicable diseases and AIDS control etc. will be strengthened in these areas, by strengthening the Health Surveillance systems.
- Potential impacts on gender and Indigenous people needs further in-depth analysis which will be done in further course of the study in consultation with the affected persons. First round of screening shows that there are no Indigenous people living in clusters within the project locations but are part of the main stream society, leading a main stream life.
- The status of women varies across the places which needs a close analysis and consultation to make further analysis and interpretations.
- The Child Labour (Prohibition and Regulation) Act, 1986 and its amendment in 2016 prohibits the employment/ engagement of children and adolescent in such a sector/industry which are hazardous to the lives and health. Proposed project comes under the "Building and construction industry" that prohibits engagement of child and adolescent. The M&E tool – ICT based system shall be developed to track the age of labour on real time basis for which a medical check-up would be carried out and a certificate shall be issued and uploaded on the M&E system. The provision of the Act shall be followed strictly and monitored by the TSSC/TPM/PIU/PMU during construction phase.

Labour Influx

The influx of workers, including jobseekers, can lead to temporary adverse social and environmental impacts on local communities, especially the residential area located near the labour camp sites. Adverse impacts may include increased demand and competition with existing social and health services, and goods and services. This can lead to price hikes, increased volume of traffic with higher risk of accidents, increased demands on the ecosystem and natural resources, social conflicts within and between communities, increased risk of spread of communicable diseases, and increased rates of illicit behaviour and crime.

Mitigation Measures

- Unskilled and Semi-skilled job opportunity shall be provided to the local people based on their skill and education. If required, skill development training shall be given to the local workers,

- The contractor shall take care of all the arrangements for the accommodation of the workers hired from outside and establish labour camp as per applicable standard and guidelines,
- Local staff engaged at proposed site during operation phase will be stationed in the nearby vicinity. Apart from this Quarters facility will be provided to the staff who are migrants or who are not resident of Guwahati.
- Labour camp and staff quarters must have proper basic facilities like drinking water, sanitation, hygiene, solid waste disposal, garbage collection and drainage etc.
- Labour Management Plan shall be developed and followed for the engagement and management of labour,
- Migrant workers shall be advised to respect local customs in order to facilitate good relationship with co-workers and avoid any sort of conflict,
- Implement policies to promote equal opportunities, eliminate gender-based discrimination, ensure fair wages and benefits, and prevent sexual harassment. Provide training on gender sensitivity and work-life balance,
- Onsite and offsite emergency plan should be made to take appropriate action during emergency. Mock drill at onsite for the emergency situation should be conducted. Proper training should be provided to the workforce engaged at the site.

Gender Based Violence and Harassment

Construction, particularly of major infrastructure projects, can be a high-risk environment for GBV/SEA/SH affecting community members, workers and service users. GBV risks can intensify within local communities when there are large influxes of male workers from outside the area. This may pose a risk in terms of sexual harassment and violence.

As per finding of baseline survey conducted by AIWTDS, female respondents shared incidents of theft and some form of gender based discrimination. Approximately 45.9% of female ferry users travelling alone have not encountered issues on ferries. Only 9.5% of female travellers travelling alone on ferry have registered complaints after facing issues, while 39.1% of female users have never registered any complaints about the issues encountered on ferry. It is interesting to know that 51.4% of female respondents travelling alone on ferries were not aware of the complaint process.⁴

Similarly, Uzanbazar-Umananda Ghat ferry services, only 20 cases of eve teasing has been reported during survey.⁵

Mitigation Measures

- Code of Conduct shall be signed by the workers.
- The Woman workers shall be made aware with several helpline numbers like 'Assam Women Helpline No. 181 and the National Commission for Women helpline no. 011-26942369, State Women Helpline No. +91-9345215029, +91-361-2521242, or email ssp_cid@assampolice.gov.in.

⁴ Baseline Survey Report V4, Assam Inland Water Transport Project, April 2023, Page No. 121

⁵ Baseline Survey Report V2, Assam Inland Water Transport Project, April 2023, Page No. 59

- Integration of GBV into existing strategy, Grievance Redressal Mechanism (GRM), safety talks, tool box meeting and regular trainings for the workers,
- Identification of GBV focal points through community consultations and training for the capacity building of focal point.
- The focal point for GBV would explaining GBV, SEA and SH in the context of the project, including identified GBV risks and hotspots. Awareness about the key mitigation strategies and GRM mechanisms for GBV incidents and response. It shall conduct continuous dialogue and feedback from the community for GBV prevention and mitigation.
- Identification of Hotspots for GBV within the project including construction sites and labour camps alongside the local communities, schools, vocational training centres, vicinity of Tavern shops, migrant labourers' residing in rented accommodations within the villages.
- Both men and women labours shall be made aware about the applicable rules and regulations.
- Formation of a committee comprising of representatives from but not limited to local NGOs/ CBOs, police, academia, law and enforcement agency, etc. with at least 70% women members. The committee shall meet every quarter in order to address the issues and challenges faced by the labours/ local community.
- AIWTDS has signed a MoU with State Commission for Women to address GBV issues. A copy of MoU is enclosed as **Annexure- 15**.

Impact on Livelihood

Four (4) numbers of vendors have been identified who are earning their livelihood through temporary shops, will be affected. Based on the site visit and Census Survey findings, conducted on 23.06.2023 and interaction with IWT officials, it is observed that about 04 four numbers of vendors may be affected temporarily during project construction period.

Mitigation Measures

Livelihood and Income Restoration Plan

The strategies for restoring the income of vendors includes providing the PAPs with adequate compensation prior to relocation/vacating the premises, along with transit allowances, one-time relocation allowance, transitional/subsistence allowances or grants and special allowances for eligibility as vulnerable groups as per RPF of the Project.

The affected vendors shall be relocated at alternative terminal sites after due consultation with Temple Management and Ferry Operators. The identified alternative terminal site is free from encroachment.

The due consideration be given to the skills of PAPs and the project related employment opportunities during the construction phases of the project.

The livelihood and income restoration plan for 4 (four) vendors has been prepared based on the World Bank's OP 4.12 and approved RPF of this project and shall be submitted separately as a RAP.

Income Generating Strategies

The long-term income generating strategies for the PAPs, Government of India along with state governments, various poverty alleviation programmes are considered.

Some of the schemes which can be accessed by the PIU/ PMU along with NGO to benefits the impacted project affected persons includes:

- **DAY-NRLM:** Assam State Rural Livelihoods Mission Society (ASRLMS) is implementing the Deen Dayal Antyodaya Yojana-National Rural Livelihoods Mission (DAY-NRLM) in the State since November, 2011, with the objective of enhancing the social and economic empowerment of the rural poor in Assam. It has been designed as a multipronged approach to strengthen livelihoods of the rural poor by promoting SHGs, providing skill development and placement for youth for wage based occupations in different private/business organizations and imparting self-employment oriented training.
- **DDU-GKY:** Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) is the skill and placement initiative of the Ministry of Rural Development, Government of India (MoRD). It aims to skill rural youth who are poor and provide them with jobs having regular monthly wages at or above the minimum wages. It is one of the clusters of initiatives of MoRD that seeks to promote rural livelihoods. It is a part of the Deen Dayal Antyodaya Yojana- National Rural Livelihoods Mission (DAY-NRLM) - the Mission for poverty reduction. There is a continuum of skills that are required in an economy and there are various ways in which to acquire them.
- **Kalpataru Scheme:** Skill development of all eligible youth for self-employment and placement, also providing support to rural people working in large cities. The scheme provide financial support for employment generation in Agriculture, SSI and Service Sector to the people belonging to the BPL category. The subsidy component is 40% along with a 40% bank loan. Beneficiaries' contribution is 20%.
- **Mukhya Mantri Mohila Samridhi Achoni:** Under the scheme, capacity building training is provided to the women SHGs/Producers group so as to adopt modern weaving techniques.
- The GoI, Department of Animal Husbandry, Dairying and Fisheries under National Fisheries Development Board (NFDB) is promoting diversified agricultural and allied livelihoods, including livestock and horticulture. Under this scheme financial assistance is being provided for intensive aquaculture in ponds and tanks, fisheries development in reservoirs, mariculture, seaweed cultivation, fish dressing centres and solar drying of fish, domestic marketing and technology upgradation.
- The Government of Assam, Department of Fisheries are promoting diversified agricultural and allied livelihoods, including livestock and horticulture. Under this scheme employment

generation scheme through Self Help Group/ Matsya Mitra / Ornamental Fish Culture are promoted through entrepreneurship.

6.2.10 Impacts on Archaeology and Heritage

Umananda Terminal is located near archeologically important site. i.e., Umananda temple lies on the Umananda island in the middle of the river Brahmaputra. This is one of the smallest inhabited islands in the world. The temple was built in 1694 AD by Ahom king Gadadhar Singha but was broken down by an earthquake in 1897. The site is archaeologically significant with the presence of stone sculptures and carvings belonging to the early Medieval period. Permission of ASI is to be taken before construction.

Umananda is a famous pilgrim place and archaeological site in Guwahati. The site is significant with the presence of stone sculptures and carvings belonging to the early medieval period. Thus, construction activities may cause risk of damage or theft.

Mitigation Measures

- Develop a Cultural Heritage Management Plan (CHMP) that outlines strategies to avoid, minimize, or mitigate adverse impacts on cultural heritage resources,
- Consider alternative construction methods that minimize interference with cultural heritage sites or features,
- Engage with local communities, cultural experts and relevant stakeholders to incorporate their input and recommendations into the planning and decision-making process,
- Implement measures to raise awareness and promote respect for cultural heritage among project personnel and contractors,
- Provide training and capacity-building programs for local communities to actively participate in the preservation and management of their cultural heritage,
- Conduct periodic audits and evaluations to ensure ongoing compliance with cultural heritage safeguards.
- The Cultural Heritage Management Plan (CHMP) has been prepared and enclosed with the Report as **Annexure- 16**.

6.3 IMPACTS DURING PROJECT OPERATION PHASE

• Impact on Land Environment

➤ Impacts on Land Use Pattern of the Area

The proposed jetties are proposed near the existing jetty used for the water transport in Assam. The land required for these projects falls within periphery of the river and belongs to the government land. The projects will not interfere with natural drainage in the area. The operation of the proposed jetty will provide an impetus to the mushrooming of secondary and tertiary activities in the area. However, due to restriction of the land, there are less chances to stimulate ancillary developments

like shops, restaurant, repair shops, etc. in and around the jetty. Thus, no change in land use is expected at Umananda.

➤ **Impacts due to Generation of Solid Waste at jetty**

The solid waste generation is envisaged during operation phase could be the disposal of garbage or solid waste generated from various sources. The solid waste generated shall mainly comprise of packaging, polythene or plastic materials etc. Therefore, a system needs be devised whereby undue quantity of garbage is not permitted to accumulate in the jetty area and the same could be disposed-off at designated sites in a proper manner.

Mitigation Measures: Adequate facilities for collection, conveyance and disposal of solid waste will be developed. Provisions shall be made to separately store the degradable and non-degradable solid waste. The solid waste will be disposed at the designated landfill sites.

Various aspects of solid waste management include:

- Reuse/Recycling
- Refuse storage
- Collection and Transportation
- Disposal

Reuse/Recycling

Project proponent will explore opportunity to recycle the waste generated at the project site, in this context project will identify authorized vendors and send used batteries, used oil, and used oil filters for recycling. The municipal solid waste will be disposed by landfilling at a suitable site. List of authorised recyclers under SPCB, Assam is provided at **Annexure 18**.

6.3.1 Impact on Water Environment

➤ **Impacts due to Generation of Wastewater**

For major jetties, an average of 120-120 persons per day are expected at Umananda terminal depending on their capacity. Thus, the total daily demand is 9 KLD. The washing & wiping is to be done manually using powered low pressure portable washer jets and using organic detergents (phosphate free & biodegradable materials) & soft sponge, so that the channel waters are not polluted. Fire demand would be a dead storage and will be used only if there are any fire hazards at the terminals. Water demand at Umananda terminal is given in **Table- 6.10**.

Table 6.4: Water Requirement in operation phase

Name of terminals	Number of passengers expected	Water Requirement (KLD)	Bio-digester capacity (KLD)
Umananda	100-120	9	4

Total		100	
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Mitigation Measures: Suitable wastewater treatment measures will be provided for the treatment of domestic sewerage from the jetty premises. Biodigesters shall be provided at Umananda terminal to treat the sewage generated.

A part of the treated sewage will be reused in horticulture. The balance treated sewage shall be disposed in the river. It shall be ensured that the treated sewage meets the standards specified for disposal of effluents in inland waters.

➤ **Impacts of Boat Movement**

During the operational phase with additional facilities there will be increased activities of boat movement in the region. The boats will be Diesel-electric. Possible sources of such impacts on the aquatic environment would be disposal of wastewater from boats etc. Environmental implications during routine operations at the jetty could be due to release of waste generated from the boats including garbage, solid waste as well as sewage, washing of boats etc. Stringent measures will be applied to the disposal of waste from boats. Thus, movement of boats have insignificant impacts.

Mitigation Measures

Procedures to dispose- off waste in a safe and ecologically friendly environment should be included in the waste management manuals in order to minimize river pollution. Wastes such as plastic, metals, glass, batteries, medical wastes, oily rags, sludge, waste oils, etc. will be properly segregated before disposal. Solid and liquid waste will be disposed of at the facilities provided at the terminal after treatment.

6.3.2 Impact on Aquatic Ecology

➤ **Impacts on Fisheries**

The fishing activities are very limited near the terminal site. As there are no significant impacts are envisaged in the vicinity of the proposed terminal

➤ **Impacts on Dolphins**

As a precautionary measures to safeguard the aquatic flora and fauna as well as wildlife in and around the aquatic environment, any water base development work suggested to be refrained from interfering with the natural flow regime and to avoid constructing barriers to animals and sediment movement. The concerned should manage the water developmental activities in ways that will minimize the harm to aquatic life including dolphins and other aquatic species inhabiting the area.

The Gangetic River Dolphins mostly depend on eco-location to find their food and they are very sensitive to the impact of the sound as they are basically blind. Equilibrium between sediment erosion and deposition is necessary to maintain essential habitat features. Therefore, access to floodplains should be preserved to ensure natural spawning and rearing habitat for fishes which are prey base of the dolphin and there should have the provision for fish ways.

➤ **Impacts on dolphins due to Noise**

Dolphins are social mammals that communicate through squeaks, whistles and clicks. They also use echolocation in order to locate food and other objects. Therefore, anthropogenic noise coming from large commercial ships, military sonars or offshore drilling can severely impact their well-being. In the current projects these are passenger ships and hence the impact will not be insignificant. Noise can also disrupt 'echolocation', the sensory ability of dolphins to find food, socialise, and navigate underwater. In extreme cases, it can even cause physical harm, including temporary hearing loss, according to the World-Wide Fund (WWF).

Mitigation measures:

Reducing waterways intensification like downscaling vessel traffic to limit underwater noise. Apart from these technological improvements like improving propeller efficiency to cut down cavitation noise could be useful. Moreover, technological improvements may not only help reduce production of cavitation noise, but also improve fuel efficiency for vessels.

Assessing trade-offs between efficiency, vessel capacity, and technological improvements is thus essential to reduce and mitigate risks to river dolphins from vessel traffic.

Conservation plan

The following recommendations are given for the proper conservation of the Ganges River dolphin:-

- The establishment of Dolphin Conservation Centres and strengthening of research facilities available in India will aid in better coordination among agencies responsible for the conservation of the Ganga River dolphin.
- The use of nylon monofilament fishing gillnets in stretches of rivers having dolphin populations should be banned, as this net injures dolphins. Use of fishing nets made up of mosquito netting material (Hindi - 'Kaptajal') should also be banned as it collects small fish and freshwater prawns which serve as food for dolphins, and fetch very little or no income to fishermen.
- Since the Ganges River dolphin is a Schedule-I animal under Wildlife (Protection) Act 1972, use of its body parts, such as tissue and oil, is illegal. Wildlife officials should conduct frequent raids to enforce this law and culprits must be punished under the Wildlife (Protection) Act 1972, amended till date.
- Universities and research institutions and conservation organizations should be encouraged to develop dolphin research programs.
- The need for transboundary perspectives for conserving river dolphin populations. A transboundary approach requires cooperation among national and international agencies.

6.3.3 Impacts on Noise Environment

➤ **Impacts due to Noise on Aquatic Ecology**

During operation phase, there could be less noise levels due to operation of boats. As the boats are modern facilities, no adverse impacts on noise environment are anticipated during operation phase of proposed project.

As a part of the environmental protection activities, trees and ornamental horticultural trees and shrubs would be developed around the project area, which will attenuate noise levels to a certain extent.

6.3.4 Impact on Air Environment

During the project operation phase, major activity would be passenger service. The propulsion of the boats will be diesel electric. At normal operating speeds, the boats would operate with the help of batteries and there would not be any fuel consumption. The boats will operate on diesel only when batteries are completely discharged.

The key source of air pollution in the proposed project is due to the increased Boat movement in the project area.

Mitigation measures: The following management plan would reduce the impact of such emissions on the general environment.

- All equipment shall be properly maintained to minimize exhaust.
- Vehicles will be turned off when not used for extended periods of time.
- Effective traffic management to be undertaken to avoid significant delays in and around the project area.

6.3.5 Impacts on Socio-Economic Environment

The following impacts are envisaged in the project operation phase:

- In addition to direct employment, the operation phase would also lead to generation of direct and indirect employment opportunities and would increase the income levels of the local population.
- In the operation phase, project would lead to mushrooming of various allied activities. This will lead to marginal improvement in the employment scenario, which is a positive impact.
- Improvement in communications and transportation facilities.
- Development in transportation facilities will help the people to access the health, education and market facilities in the adjoining areas. This will be a positive impact.

Chapter 7 – RISK ASSESSMENT AND DISASTER MANAGEMENT

PLAN

7.1 INTRODUCTION

The present chapter outlines the Risk Assessment and Disaster Management Plan to be implemented in the event of an emergency in the proposed priority terminals at Umananda.

This Disaster Management Plan also sets out the procedures and measures to be taken into account in the event of loss of containment and consequence thereof in the proposed project.

7.2 RISK ASSESSMENT CONSIDERATIONS

The risk assessment has been conducted following the guidelines underlined in the Environmental Impact Assessment Guidance Manual for Ports & Harbours by the MoEF&CC as well as the IS: 15656 and National Disaster Management Guidelines on Boat Safety issued by National Disaster Management Authority, Government of India, September 2017.

The objective of the risk assessment study is to identify potential credible hazards arising out of the operations and maintenance of waterways passenger terminal facilities that manage the transport of passengers and goods from one terminal to another, to mitigate severity and to aid in preparing effective emergency response plans by delineating a disaster management plan to handle inland and riverine emergencies.

Risk Analysis, therefore, is the process of identifying the probability of occurrence of an accident and its consequence, when ports handle hazardous cargo or involve risky operations. Risk Analysis involves identification of hazards and the associated risks, if any, involved in these operations. Hazards could possibly originate either from within the or from sources outside the port boundary i.e., the operating area. However, as the facility based on operation of passenger vehicle in a waterway, suitable measures have been suggested based on the specific case and situation.

The risk assessment for the Umananda terminal has been designed considering the following assumptions.

- Passenger ferry terminal would cater to a passenger only.
- Passenger ferry terminal would consist of structures as per the relevant IS or acceptable international codes pertaining to the construction of such structures.

- The passenger ferry terminal would consist of several structures for passenger amenities including general office, waiting block, ticketing and sales office, public conveniences and medical or first aid facilities. The terminal would also house a firefighting section or provisions thereof.
- The facility would have provisions for sewerage and STPs (Bio-digester).
- The facility would be designed as per the hydro-geomorphology of the region as well as with bank erosion protection.
- Umananda has been considered as Category-3 under soil erosion. This implies stable soil condition as per the DPR. Upon preliminary study, it is understood that subsoil is observed to silty sand of 1m thick followed by weathered rock. At some part of locations exposed rock also observed due to hill outcrop. Considering this available condition, it is proposed that no ground improvement is required.
- In terms of traffic categorisation, Umananda has been considered under Category C- Ro Pax vehicles with only foot passengers.
- Under this category, the ferry terminals shall be planned with consideration of safe and efficient movement foot passengers on the Ro -Pax vessels. The berthing facility will have all the basic infrastructure that is needed for mooring the vessel and roll on and roll of vehicles.
- Passenger ferry terminal would provide necessary safety services to the passengers including public announcements and briefing as and when necessary.
- Safety boundaries as per the demarcation of HTL and LTL in the ferry is essential for ensuring overall safety of the passengers and vessels operating at the Passenger Ferry facility. Water level variation between high and low flows is in the range of 8-10m.
- Bank protection measures would be implemented for locations prone to erosion
- The passenger ferry service would also house a suitable weather station for alerts and warnings as and when required.
- Site would not have any storage of hazardous chemicals over and above the prescribed lower limit as specified in Column 3 of the MSIHC Rules 1989 amended 2004 for flammable and toxic chemicals.
- The site is protected by providing adequate security round the clock.
- Passenger terminal is based on flexible and mobile options for riverine infrastructure.

7.3 HAZARD IDENTIFICATION

The hazards conceived for the passenger ferry facility and its operations could be classified as two major categories.

- Technology and human induced.
- Natural or Climate induced.

In the first part of technology and human induced hazards, the hazards could arise both during construction and in operations. This also includes the malfunction of the passenger transport vessel and any on-site maintenance required thereof.

The risk of collision with other transport vehicles could pose a hazard to the passengers and environment. However, this risk assessment covers the terminal and on land facilities and therefore the risks during the transfer of goods and passengers in the river is beyond the scope of this chapter.

7.3.1 Technology and Human Induced

a) Hazards during construction

During construction, there is a fair probability of mechanical, civil, and electrical hazards due to human errors.

The construction stage is divided into three major activities,

- Mobilization and site set-up,

Umananda being a religious site, only a passenger terminal has been envisaged and the landside facilities are proposed to be completed within a period of 11 months. This includes a period of 2 months for the area development and about 7 months for the terminal building and 3 months for other utilities and finishing.

The other activity is the lead time for procurement and delivery of the pontoon and linkspan. The mobilization and site set-up are the most critical start-up activities to set the pace for timely construction of the terminal. Considering that the Umananda terminal is located on an island, a mobilization period of 3 months has been allowed for the site set-up.

- Construction of riverine facilities

The other activity that dictates the project schedule is the lead time for procurement and delivery of the pontoon and linkspan. The estimated time taken for delivery of the pontoon and linkspan is about 10 months and a further 2-month period is foreseen for the installation of the same. The completion of the terminal largely depends on this activity as all other activities can be expedited with the deployment of additional resources.

The reduced productivity due to monsoon is taken into consideration from the months of June to September while preparing this schedule. The riverine activities will be most affected due to the on-set of monsoons.

- **Landside development**

The construction of the approach bund and shore protection works will mainly depend upon the planning and timely procurement of rock. This work will be affected during the monsoon; however, some progress has been assumed considering a few dry spells.

There will be minimum two landing ramps on both ends of the pontoon and during the seasonal water variation in the river the respective ramp which is in the level of the access way landing point shall be placed on the landing point for the safe movement of the passengers.

b) Hazards during operations

There could be several situations which could lead to safety issues. These can be classified as mechanical, electrical, and structural. The structural hazards refer to the failure of civil components installed in the facility. One of the situations which could occur over long time period is the de-stability of the concrete slabs placed over the deck. (Concrete slab of 350 mm is provided which acts as a concrete deck over which the vehicular or passenger movement occurs).

The mechanical and electrical hazards are typical of the installation such as short circuits, power failure, mechanical glitches such as the failure of winch (Winch or the necessary mechanical arrangement shall be used for the movement of linkspan to cater to seasonal water level variation), etc. During operations, maintenance would be important aspect for preventing short term and long-term hazard conditions.

c) Structural aspects

Riverbank Protection

There is a need to protect the riverbank from the erosion and stabilise the riverbank to have the terminal operational. The proposed ferry terminal infrastructure will be under risk without proper bank protection measures. There are various methods available for the riverbank protection and the same can be achieved by having reno mattress or fabric form mattress.

Fabric form Mattress solution methodology

Initially riverbank steep slopes trimmed to achieve ideal slope where the placing of the riverbank erosion protection component becomes easy, and which gets good stability. On the trimmed surface of riverbank non-woven Geotextile shall need to be placed. The geotextile

shall be needle punched made up of polyester staple fibre. Finally, the fabric form mattress shall place over the geotextile surface. The fabric form mattress shall be filled with suitable filler material, in this case cement mortar considered as filler material shall be laid on geotextile base. The minimum ultimate strength of the fabric form mattress filled with cement mortar should be 75 kN/m.

Linkspan Parallel to Sloping Bund

The terminal would be a combination of floating pontoons (two Nos), guide piles, linkspan and sloping access bund. The main advantage of this option is the linkspan can be supported with intermediates supports to counter the heavy super imposed loads of the vehicle

Key activities

Key items of work include floating pontoons as the berthing facility, mooring and anchoring of the pontoons, linkspan, approach slope bund, associated landside infrastructure, miscellaneous works, general and other items.

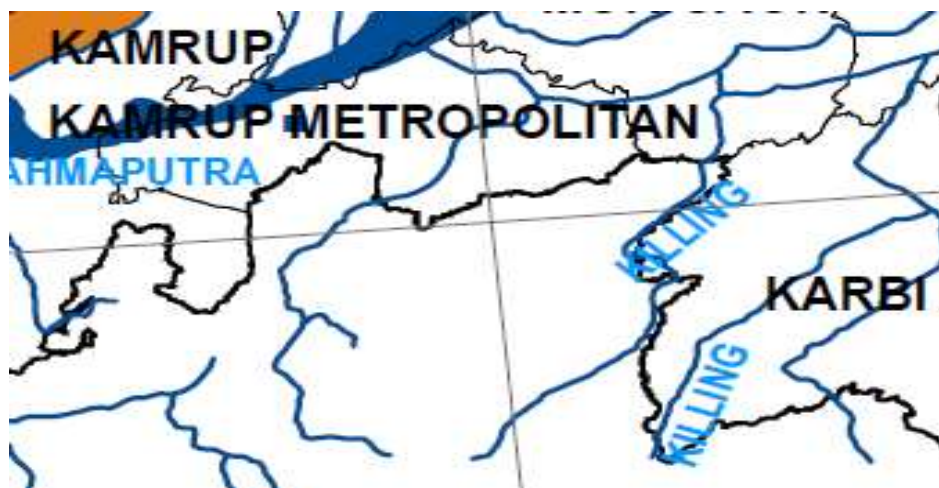
d) Other hazards anticipated at the terminal.

- Hazards arising from passenger movements during peak hours. This would cause stress to the physical structure at the terminal.
- Hazards arising from malfunction of the vessel.
This could cause more held up of the passengers at the terminal as well as prevent other passenger vessel for mooring. Hazards arising from passenger behavioural aspects on-board vessel and during transport. This could cause a safety and security concern. Hazards operating from fuel leakages. This situation could lead to the release of quantity of oil in the river environment.
- Hazards due to ramp structures
This could lead to slips of passengers especially the disabled or senior citizens. Other type of hazards such as noise hazards would be prevalent during the operational hours of the vessels. The side slopes of approach ramp are placed at 1V:2H by placing granular fill. However, to address the scour and slope protection due to river flow, approach ramp slopes on all over three sides shall be protected by Gabion mattress filled with aggregate. This layer will act as slope protection element for drag and lift caused by river flow. On preliminary basis it is understood that ~ 0.5m thick gabion mattress shall be sufficient for slope protection. These gabion mattresses shall be filled with suitable aggregate material.

7.3.2 Natural or Climate induced

The challenges in navigating through the site during construction also raise a fair hazard possibility for the construction team.

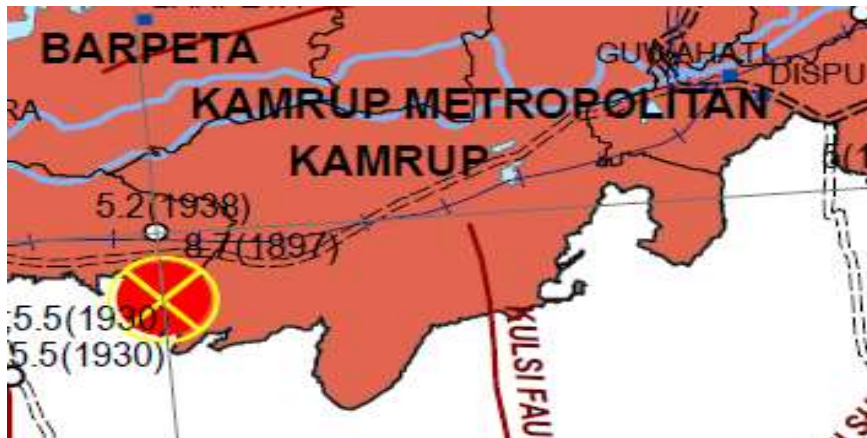
- Bank failures are rampant and seem to be a function of the hydraulic character of the flow and the engineering properties of the bank material.
 - Flooding is normal in Brahmaputra. Therefore, it is essential to develop adequate systems for ensuring the safety of the terminal and its assets during these times.
 - The hazards during construction would be slips and trips due to navigation on different soil conditions. It is essential that proper soil conditions and their stability be communicated to the project implementation team.
 - Hazards could arise due to shifting of the riverbank changes.
 - Hazards would also arise due to varying weather conditions and due to the establishment of temporary structures. Based on the topographic survey information, ground surface along the proposed jetty location varies between +23m in the river to +74m at the landside.
- **Floods**
Floods in 2019, affected the operation in Umananda terminal, which halted all services. Therefore, it would be important to address this type of scenario while planning and constructing the passenger ferry terminal. The flood map for Assam with focus on the specific region where Umananda is based, excludes it from areas where significant risk of flooding is present. HFL of 48.38 m is considered for designing the terminal. During the high flood period, the plying of boats/vessels need to be stopped to avoid any untoward incidents.



**Source: BMTPC Vulnerability Atlas, Assam*

- **Rains**
Torrential rains are also common in the area. Therefore, adequate rain protected infrastructure as well as shelter for general public should be considered in the planning of the passenger terminal.
- **Earthquake**

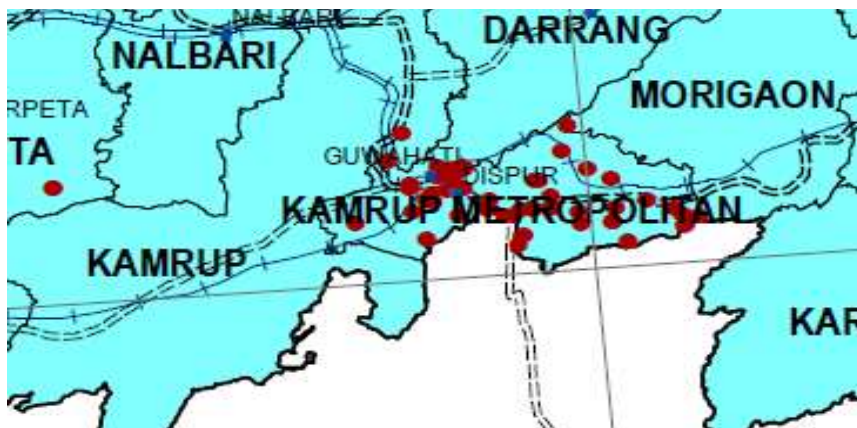
There are several online references of an earthquake in 1897 with richer scale of 8.1 in the area. The map below depicts the earthquake scale prevalent in the area where Umananda is situated. The crossed area towards the southwest of the map denotes an earthquake probability of >8.0 in Richter scale. The figure also provides the epicentre of the earthquake of 8.7.



*Source: BMTPC Vulnerability Atlas, Assam

- **Landslide and Soil Erosion**

The area is also susceptible to landslides and soil erosion. The image below depicts the landslide susceptible areas. The red dots denote areas which are prone to landslides. Umananda lies in Kamrup metropolitan area. The light blue background depicts the annual rainfall normal of 2000-3000 mm.



*Source: BMTPC Vulnerability Atlas, Assam

7.4 Emergency Evacuation

7.4.1 Emergency Planning

- Emergency response plan specifically tailored for the terminal, including evacuation procedures, assembly points, and communication protocols will be developed by Terminal operations team.
- Clear roles and responsibilities for employees and emergency response teams will be established with involvement of vessel crew, IWT-Quick Response Plan (QRT)s
- Regular drills and exercises to test the effectiveness of emergency plans will be conducted to enhance the preparedness of staff.
- Local fire departments and emergency services will be well collaborated to ensure coordination and support during an incident including fire emergency.

7.4.2 Evacuation and Escape Routes

- Terminals are designed with designated clearly marked emergency/fire exit routes as per NBC norms.
- The locations of all emergency routes are easily accessible. These exits will be always kept unobstructed and clearly indicated with signage.
- All emergency routes will be well lit with emergency lighting system. Periodical maintenance and testing of emergency lighting systems will be conducted.
- Well planned access routes equipped with ramps, refuge areas, etc for individuals with disabilities have been provided as per NBC and CPWD norms, including designated evacuation assistance points.
- All these exits will be clearly marked in comprehensive evacuation plan. Such plans, evacuation routes signages will be placed at all strategic locations clearly visible to all occupants.
- Plans with designated assembly points for passengers and staff, as well as clear instructions on how to evacuate the terminal safely will be shown in plans as well as will be announced during emergencies. Such plans will be pasted at all strategic locations.
- Detailed procedures to follow in the event of an emergency will be well established and such training will be given to all terminal staff.
- This plan should include designated assembly points for passengers and staff, as well as clear instructions on how to evacuate the terminal safely.

7.4.2 Communication and Notification Systems

- Terminal shall be equipped with integrated public address system to broadcast emergency instructions and updates to occupants. Passengers will be provided with information regarding fire safety measures and emergency procedures. This will be done through public announcements, signage, brochures, or briefings at the beginning of the cruise service.
- Multiple channels for communication, such as Audible Alarms (Sounders), hooters, Manual call points and visual alerts, have been planned to ensure warning will be noticed by everyone in the terminal.

7.4.2 Training and Education

- Regular fire safety training sessions for employees, focusing on prevention, response procedures, and the proper use of firefighting equipment will be conducted. This includes knowledge of evacuation routes, the use of fire extinguishers, and effective communication during emergencies.
- Periodical awareness among employees and visitors about potential fire hazards and the importance of adhering to safety protocols will be conducted.

Training on first aid and basic life-saving techniques to selected staff members will be provided.

- Regular mock drills and exercises to be conducted to test the effectiveness of emergency plans in line with the Emergency Search & Rescue plan of IWT with relevant stakeholders like Assam State Disaster Management Authority (ASDMA), National Disaster Response Force (NDRF), State Disaster Response Force (SDRF) etc

7.5 RISK ASSESSMENT

7.6.1 Risk Matrix

A simplified risk matrix based on the most probable incidents which could occur during the operations of the terminal has been depicted in **Table- 7.1**. The risk matrix provides the severity in four major categories in accordance with the IS:15656 as well as a probability of the incidents from frequent to 1 in a million days of operations.

The area could also experience heavy footfall in specific festival seasons. This could enhance the pressure on infrastructure and security. There could be a scenario wherein the footfalls could lead to crowd issues such as stampede or conflicts or skirmish.

Table 7.1: Simplified Risk Matrix

Probability	Severity			
Days of operation	Minor (1)	Major (2)	Critical (3)	Catastrophic (4)
Frequent to 1/100 (1)	Very minor to minor faults			
	Minor Crowd Issues			
		Major Crowd Issues		
1/100 to 1/10,000 (2)	Collision with terminal at low speed	Major fault at the terminal- suspension of operation		
1/10,000 to 1/1,000,00 (3)	Collision with terminal at high speed	Fuel Leakage scenario at terminal		
1/1,000,00 to 1/10,000,00 (4)		High speed Collision with fuel leakage		Major attacks or sabotage

The risk matrix for natural hazards is based on historical data and risk perception.

Hazard Scenario	Probability	Frequency	Risk (Probability x Frequency)
Flooding	Medium	Medium	Medium
Landslide	Medium	Medium	Medium
Earthquake	Low	Low	Low

Time sensitiveness for Probability and Frequency

Probability	Reference	Frequency	Time Reference
Low	>25%	Low	1 in 100 days
Medium	>50%	Medium	1 in 1000 days
High	>80%	High	1 in 10,000 days

The Risk Assessment and Disaster Management Plan for construction and operation phase has been enclosed as **Annexure- 20**.

Chapter 8 – ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN AND MONITORING PROGRAMME

8.1 GENERAL

The Environment and Social Management Plan (ESMP) is required to ensure sustainable development of the proposed terminal on river Brahmaputra both during the construction as well as operational phases. The ESMP is site and time specific. In order to effectively implement ESMP, an institutional framework has been developed and roles and responsibilities of various relevant agencies have been worked out. Capacity development program are also identified and part of the ESMP.

In general, Assam Inland Water Transport Development Society (AIWTDS), (with assistance from Contractor, Third Party Monitoring Consultant /Technical Support & Supervision Consultant) is the responsible entity for ensuring that the mitigation measures as suggested in the ESMP are carried out. A detailed ESMP has been prepared for Umananda terminal. The list provides reference implementing organisation and responsible entity.

8.2 COMPONENTS OF EMP

Key components of the EMP are summarized below and explained in detail in the following subsections:

- Mitigation Measures
- Monitoring Measures
- Institutional Arrangement
- Reporting Requirements
- EMP Budget

Site-specific environment and social riverine infrastructure along with the roles and responsibilities of the key persons involved at different phases of the proposed development are described below:

The Environmental and Social Management Plan for Umananda Terminal for both construction and operational phase is given in **Table 8.1, Table 8.1 (A)** and **Table 8.2** respectively.

Table 8.1: Environment Management Plan (Construction Phase)

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
Design					
Development of the Final Design	The design of the infrastructure must be resilient to the Floods	The design must take into consideration the projected rainfall levels as in the Assam State Action Plan on Climate Change (2015- 2020). The Annual rainfall is likely to increase by 10-25 %, and the extreme rainfall days will increase by 5-38%, with the extreme rainfall increase projected to increase between 25 and 150 mm.	Assessment of Design for Resilience	Contractor During the design phase	TSSC & PMU
	Design of the Riverbank Protection	The design of any reclamation and riverbank protection must be carefully assessed so that the hazards due to Bank failure do not affect the stability of the structure.	Assessment of Design for Resilience	Contractor During the design phase	TSSC & PMU
	Collection and Treatment of Solid and Liquid Waste	The design of bio-digesters at the Terminal must be an adequate size to meet the regular passenger demand. Additional space needs to be made available for setting up additional bio-toilets for the pilgrim / festival. Adequate space must be made available to store municipal solid waste.	Assessment of Capacity of Bio-Digester Assessment of space for the setting up bio-toilets, Adequate space for storage of Municipal Solid waste	Contractor During the design phase	TSSC & PMU
	Energy Efficiency	Energy-efficient measures in the terminal buildings will be implemented;	Use of Energy efficient Fitting and fixtures	Contractor During the design phase	TSSC & PMU

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		Solar power will be used in potential area			
Pre-Construction Activities					
Field Verification Surveys	Requirement for felling of trees	Permission of tree(s) removal from non-forest area -The GC/ PMU and the Contractor will carry out joint field verification to ascertain whether any tree would be affected and needs to be felled either for the construction activities or for safety purpose. - In case any tree must be felled. - Permissions must be obtained from the Forest Department, Government of Assam. No tree would be felled without permission. At present there is no requirement for felling of trees	Copy of the Permit of the Forest Department, Government of Assam	Contractor -if required during the pre-construction phase	PMU , GC and TSSC
Assessment of Impacts due to Changes/Additions in the Project	Additional Impacts	Site-specific EMP before the commencement of construction -In case of any change in the event of changes/revisions (including addition or deletion) in the project's scope of work or change in the site condition. the impacts of the changes need to be assessed. -The Contractor will also prepare site-specific EMP to address these additional impacts. The Site Specific EMP has to be submitted to the PMC for approval. The Construction activities must not start before the approval of site-specific EMP by the PMC.	Approved copy of the C-EMP	Contractor	PMU , GC and TSSC
Setting up of Plant and Machinery (Batching	Potential source of pollution (air quality, water quality, soil)	Location of Batching Plants	Consent to Establish and Operate	Contractor	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
Plants or concrete mixer location)		<p>-Batching plants will be sited sufficiently away from settlements, agricultural operations, or commercial establishments. Compliance with laws, ordinances, codes, rules, regulations, orders, or declarations</p> <p>-Concrete mixers and batching plants will comply with the requirements of the relevant emission control legislations and -</p> <p>Consent/NOC for all such plants obtained from the State Pollution Control Board will be submitted to the PIU.</p> <p>-The Contractor will not initiate plant/s operation till the required legal clearances are obtained and submitted. In case the concrete is procured from a third party, a valid consent of the plant, along with the latest copy of the Annual report, will be submitted to the PIU before the procurement of any material</p>			
Procurement of Other Construction Vehicles, Equipment and Machinery	Potential for air pollution and noise	<p>Statutory Compliance:-All Construction equipment⁶ and machinery to be used in the project will conform to BS IV standards to be adopted by the Ministry of Road Transport and Highways. The discharge standards promulgated under the Environment Protection Act, 1986, will be strictly adhered to.</p> <p>-Noise limits for construction equipment to be procured, such as compactors, rollers, front loaders, concrete mixers, cranes</p>	<p>Certification by Manufacturer of emission and noise levels/</p> <p>Pollution under Control Certificates, Insurance and Driving License of the driver to be submitted for all vehicles</p>	Contractor	PMU, GC & TSSC

⁶ Every agricultural tractor, construction equipment vehicle and combine harvester shall be so manufactured that it complies with the following standards of gaseous pollutants as per rule 115A, after sub-rule (8), of the Central Motor Vehicle Rules, 1989.

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		(moveable), vibrators and saws, will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. The Contractor will maintain a record of PUC for all vehicles and machinery used during the contract period.			
Sourcing of construction material	Unsustainable mining practices	-Contractor will finalise the stone quarry /sand mine / borrow area for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements. The -- Contractor will provide a copy of the Environmental Clearance Certificate of the quarry/sand mine and the Consent to Establish and Operate along with the recent compliance report to the PMU before any such quarry is engaged. -In case the contractor decides to use new quarries then the contractor will obtain the environmental clearance and all other permits and licenses and submit the same to the PMU before extracting any material. The contractor will submit a copy of the approval and the rehabilitation plan to the PIU and the Environmental Expert of the PMU Consultant. -Contractor will also work out haul road network and report to the Environmental Expert of the PMC. They will inspect and in turn report to PMU before approval.	Permission for mining/ quarrying of materials from the Mining Department, District Administration and District Level Environment Appraisal Committee	Contractor	PMU, GC & TSSC
Identification of water sources for construction	Adverse impact on water resources	-If the contractor will source water requirements for construction from groundwater, prior permission from the Ground Water Board is required. A copy of	Permission from the Ground Water Board for Groundwater usage	Contractor	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>the permission will be submitted to PIU prior to the initiation of construction.</p> <p>-A flow meter must be installed, and the records of water used for construction must be maintained. The usage of groundwater must be recorded.</p> <p>-The contractor can use fresh groundwater sources after the required treatment for drinking.</p> <p>Even if water is sourced from third parties, the above provisions must be followed.</p> <p>-In case, the river water is used, the permission of the Irrigation department must be obtained</p>	<p>Permission of the Irrigation /Water Resources Department in case of River water is used.</p>		
Environmental monitoring of air, noise, water, and soil	Considering environmental conditions mentioned in ESIA report as baseline and ascertain the impacts during the construction phase	Environmental monitoring to be carried out through recognised ⁷ Laboratory as per the locations, parameters and frequency specified in the environmental monitoring plan in Table 8.4	Submission of test results to PMU	Contractor	PMU, GC & TSSC
EMP Implementation Training	Lack of awareness of EMP can lead to irresponsible behaviour resulting in an Irreversible impact to the environment, workers, and community.	<p>-Project manager and all key workers will be required to undergo EMP implementation, including spoils management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labour laws, applicable environmental laws, etc. Additional modules for Dolphin Protection and Cultural Heritage Management</p> <p>- All new personnel joining the work need to undergo induction training. All personnel</p>	<p>-Certificate of Completion (Safeguards Compliance Orientation)</p> <p>-Posting of EMP at worksites.</p> <p>-Maintaining Records of training both induction and refresher</p> <p>-Submission of the Training records to the PIU every month</p>	Contractor	PMU, GC & TSSC

⁷ (National Accreditation Board for Testing and Calibration Laboratories (NABL) Accredited /Ministry of Environment Forest and Climate Change (MoEF&CC) / respective State Pollution Control Board (SPCB's)).

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		joining work after a break of more than 15 days need to undergo refresher.			
	Deployment of EHS Officer and OHS Officer	<p>Deploy qualified personnel and management committee.</p> <p>- Contractor must depute qualified EHS personnel in the start of the project to conduct training to all the personnel and effective monitoring of mitigation measures during construction.</p> <p>The name and functions of the responsible EHS persons and their relevant expertise must be notified in the Quarterly Report</p> <p>-If an EHS person resigns/ replaced/replaced or the team has been enlarged, the same must be reported to the Bank within 15 days of the incident</p>	Submission of records of the availability of the EHS personnel onsite in the Monthly Report and Quarterly Report	Contractor	PMU, GC & TSSC
Legal compliance	Environmental legal noncompliance may	<p>-Obtain all consents, clearances (CTE/CTO from ASPCB), permits NOCs etc., before start of construction works.</p> <p>-Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (Refer Table 3.1 in this report)</p> <p>-Following consents are required-</p> <p>-Tree cutting-local authority</p> <p>-Storage, handling, and transport of hazardous materials-ASPCB.</p> <p>-Sand mining, quarries, borrow areas-Department of mines and Geology.</p> <p>.-Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs etc.</p>	<p>Copy of the Permit/ Consent to be submitted with QPR to PMU</p> <p>-As per the report submitted to PMU on quarterly basis</p>	Contractor	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		-Include in detailed design drawings and documents all conditions and provisions; if necessary			
Chance finds	Damage / disturbance to artifacts	Construction Contractors to follow these measures in conducting any excavation work. -Create awareness among the workers, supervisors and engineers about the chance finds during excavation work. -Stop work immediately to allow further investigation if any finds are suspected. -Inform State Archaeological Department if a find is suspected and taking any action, they require to ensure its removal or protection in situ.	-Chance Find Protocol -Awareness training for workers	Contractor - As and when required	PMU, GC & TSSC
Preparation of Method Statement	Occupational Health Safety and Community Health Safety Impacts	Carry out a Hazard Identification and Risk Assessment for all tasks presented in the Method Statement Prepare occupational health and safety plan, including COVID-19 H&S Plan Prepare Community Health Safety Plan to ensure that the community/ pilgrims are segregated from the construction area Prepare a Debris/spoils management plan, Waste Management Plan.	- Occupational Health and Safety Plan (including HIRA) to be integrated with Method Statement - Community Health Safety Plan - Debris/spoils management plan, Waste Management Plan	Contractor -once for the construction phase	PMU, GC & TSSC
	Impact of Aquatic Species and Dolphins	Construction Planning must be carried out so that No-construction /piling (stop the construction activities) in the water part between Mid- March to Mid-June) Construction activities must not be planned on the waterside during the monsoon period.	Construction Scheduling	Contractor - once for the construction phase	PMU, GC & TSSC
Construction Stage					
Clearing and grubbing for site Preparation (Terminal Site, Base camp,	Landscape and Aesthetics	Permission of tree(s) removal from non-forest area	Verification of number of trees felled; Copy of NOC from forest dept.	Contractor	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
Construction Camp & Labour camp)		<p>-Vegetation will be removed from the construction zone before the commencement of civil works. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is avoided or minimized. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of the Consultant.</p> <p>The contractor, under any circumstances, will not cut or damage trees. Trees identified under the project and have received permission of felling from the Forest Dept will only be felled.</p> <p>- Compensatory afforestation must be carried out per the Tree Felling permission provisions.</p>		- once for the construction phase if required	
	<p>Loss of topsoil.</p> <p>Loss of natural resources (Earth/soil)</p>	<p>•Top soil (15 cm) would be stripped and kept separately in stockpiles for use in landscaping.</p> <p>• At least 10% of the acquired area for construction purposes must be kept for stockpiling of fertile topsoil</p> <p>•Precautions must be taken while stockpiling. The slope of the stockpile shall not exceed 1:2 (V:H) to retain soil & allow percolation of H₂O and the edges of the pile shall be protected by silt fencing. The piles shall be covered with gunny bags/ tarpaulin. The maximum height of the stockpiles shall be kept less than 2 m</p>	Site verification	<p>Contractor</p> <p>-Once during the construction period</p>	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<ul style="list-style-type: none"> •Excavated materials would be preferably used for site filling for land reclamation to construct the terminal 			
Transporting Construction Materials and Haul Road Management	Impacts on air quality and safety	<ul style="list-style-type: none"> -Contractor will maintain all hauls roads (existing or built for the project), which are used for transporting construction materials, equipment, and machineries as précised. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials or being blown away during the transportation. -Only major roads will be used by the contractor's vehicles or any of his sub-contractor or materials suppliers. --Roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. -Contractor will arrange for regular water sprinkling for dust suppression of all roads and surfaces. -The unloading of materials at construction sites in/close to settlements will be restricted to daytime only. -All stockpiles will be covered/protected to prevent dust generation 	<ul style="list-style-type: none"> Complaints from local community Visual observation in Site reports Monitoring of the air quality in the worksite and material storage area 	Contractor -Daily basis	PMU, GC & TSSC
	Impacts on Water Quality	<ul style="list-style-type: none"> - Boats/ Vessels carrying construction material must not be overloaded. - Loading and unloading activities must ensure that spillage does not occur. - loose and friable material transported by boat must be covered - Construction material must not be stored at the Umananda Site 	Site Reports	Contractor -Daily basis	PMU, GC & TSSC
Storage of Construction Material	Potential for waterlogging	<ul style="list-style-type: none"> -The contractor will ensure that no construction materials like earth, stone, sand, or appendage are disposed of so as 	Complaints of water logging	Contractor Daily basis	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>not to block the flow of water of any water course and cross drainage channels.</p> <p>-The contractor must not dump any excavated material into the river.</p> <p>-The contractor will take all necessary measures to prevent the blockage of water flow.</p> <p>-The stockpiled material must be prevented from erosion and deposition in the drainage channel from sites where these are stocked for construction.</p>			
	Water Pollution from Storage of Construction Material	<p>Run-off from a material stockpile can also contaminate water. To prevent the contamination of the construction material, the following measures must be adopted;</p> <p>- The quantum of construction material at the Umananda site must be minimal as possible</p> <p>-The runoff from the construction material storage yard must be channelled through peripheral drains</p> <p>-The peripheral drains must be connected to sedimentation tanks (holding tanks excavated in the ground) of adequate capacity</p> <p>All sedimentation tanks and peripheral drains must be cleaned before the monsoon.</p>	<p>-Site visit Report</p> <p>-Number of sedimentation tanks installed.</p> <p>- Records of surface water quality Monitoring.</p> <p>-No visible Sedimentation to nearby drainages, nallahs or waterbodies due to civil works</p>	Contractor Daily basis	PMU, GC & TSSC
	Water Pollution from Fuel and Lubricants	<p>- The contractor will ensure that all construction vehicle parking locations, fuel/lubricants storage sites, vehicle, machinery, and equipment maintenance are in accordance with the provisions stated in (Annexure 19 : Environmental Codes of Practice & Other Plans)</p>	<p>-Number of Oil interceptors installed.</p> <p>-Records of surface water quality Monitoring.</p> <p>- No visible degradation to nearby drainages, nallahs or waterbodies due to civil works</p>	Contractor -As and when required	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		-Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refuelling areas as per the design provided.			
	Pollution of water bodies from domestic activities	<p>-Wastewater from domestic activities such as bathing and washing at the camp site must be treated.</p> <p>-The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering streams, water bodies or the irrigation system. -- The liquid waste from the construction camp must be treated and disposed of. -In the absence of construction camp if the contractor takes a rental accommodation must be channelized to the nearest municipality drain. In the absence of a municipality drain, a septic tank and a soak pit system of adequate capacity must be constructed.</p> <p>-Stagnation of water should not be allowed at any place near the campsite as a precaution against vector-borne disease. Wastewater from the Umananda Worksite</p> <p>An adequate number of toilets must be provided</p> <p>Bio-toilets of adequate capacity must be provided for the workers based on no of users.</p> <p>The supernatant from the Bio-digester must be discharged into the soak pits.</p>	<p>-Adequate number of toilets as per no of labours</p> <p>- Records of surface water quality Monitoring;</p> <p>-No visible degradation to nearby drainages, nallahs or waterbodies due to civil works</p>	Contractor -Daily basis	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>The Supernatant from the. bio-toilets must be tested at periodic intervals to meet discharge standards</p> <p>Collection of Food waste and kitchen waste from Construction Camp</p> <p>-All waste arising from the project is to be stored and disposed of as per the provisions of Annexure 19- Environment Codes of Practices & other Plans or as directed by EHS Specialist of the PMU</p> <p>In the case of rented accommodation, arrangements must be made with the Municipal corporation for the disposal of the waste.</p> <p>Collection and Disposal of Food Waste from the Umananda Construction Site</p> <p>Adequate space must be provided in the Construction Site for the storage of Solid Waste</p> <p>No Solid waste should be discharged into the river</p> <p>Mechanisms of transporting and disposing of the Solid waste to Guwahati must be carried out.</p>			
Construction activities in Waterside	Degradation of Water Quality due to piling activities	<p>-The piling work in the river must be undertaken during low-flow periods.</p> <p>-Turbidity traps/curtains/ Geo-Textile synthetic sheet curtains would be placed around piling and construction areas to prevent sediments and construction waste movement.</p>	<p>-Construction methodology for waterside construction</p> <p>-Schedule of construction works to ensure completion of the works before monsoon/ develop a Monsoon Management Plan</p> <p>- Records of Works inspection</p>	Contractor -During the course of activity as required	PMU, GC & TSSC
	Impact on aquatic life and dolphins	-Construction Planning must be carried out so that No-construction Period (stop the	Preparation of the Dolphin / Aquatic Manal Management Plan	Contractor During the course of activity as required	PMU, GC & TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>construction activities in the water part between Mid- March to Mid-June)</p> <p>-The river area in which the piling is planned advisable to carefully determine drop sites before anchor placement to ensure that Dolphin and fish communities that could locally still be present in the area are not unnecessarily damaged</p> <p>-Before piling starts, Dolphin Watch must be carried out in the river for one hour. Piling must commence if dolphins are not spotted.</p> <p>- Before starting piling, allow some time for aquatic fauna to displace from the piling area.</p> <p>-Piling must be stopped for some time if any dolphin/turtle/RET species are sighted in the activity area</p> <p>-.Noise-reducing devices like mufflers ,enclosures baffles must be fitted with the equipment as much as feasible.</p> <p>-Fish exclusion devices must be installed in the water column around the pile driving area to prevent fish access</p> <p>-Geo Textile synthetic sheet curtains &turbidity traps must be placed around piling and construction areas to prevent the movement of sediments and construction waste</p>	<p>2. Logs for recording watch and ward for dolphins / turtles during the piling</p> <p>3. Log for aquatic fauna monitoring</p>		

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>-Aquatic ecology monitoring must be carried out before the start of construction and after completion of construction to assess the impact of construction activities on aquatic life.</p> <p>. Effect of piling during the construction period will be managed by the adoption of vibratory piling and the usage of bubble curtains to disperse the fauna and reduce the noise level</p> <p>-If, despite the introduction of preventive measures, fish kills or impact on aquatic life is observed, then the work will stop immediately, and the methods will be reviewed and corrected.</p> <p>-If drilling is carried out Polymer-based mud instead of bentonite to be used as drilling fluid with proper storage of polymer at designated storage areas. Drill cutting and spent drilling mud must not be disposed in the river</p> <p>- All equipment will be adequately maintained to prevent potentially hazardous or toxic products from leaking or spilling. This includes hydraulic fluid, diesel, gasoline and other petroleum products.</p> <p>-The piling activities must be carried out in the shortest possible timeframe.</p>			

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
	Degradation of Water Quality due to land reclamation	<ul style="list-style-type: none"> -Select a construction methodology that is least disturbing and appropriate for the in-situ soil condition. - The reclamation work in the river must be undertaken during the low flow period - Schedule construction works to complete the construction work before the onset of the monsoon. -Turbidity traps/curtains/ Geo-Textile synthetic sheet curtains would be placed around the piling and construction area to prevent the movement of sediments and construction waste. 	<ul style="list-style-type: none"> -Regular monitoring of site - Water quality tests 	Contractor During the course of activity as required	PMU, TSSC and GC
	Degradation of water quality due to construction activity	<p>Select a construction methodology that is least disturbing and appropriate for the in-situ soil condition.</p> <p>Schedule construction works to complete the construction work before the onset of the monsoon.</p> <p>Schedule the construction works during the low water level period –ensure that works are completed during the same period before the onset of monsoon.</p> <ul style="list-style-type: none"> - Inspection and maintenance of disturbed areas where mobilisation and barrier installation occur for sediment control measures. -Washing of vehicles and equipment must not be carried out in rivers or nearby places. 	<ul style="list-style-type: none"> (i) Construction methodology for waterside construction -Schedule of construction works to ensure completion of the works before monsoon/ develop a Monsoon Management Plan -Records of inspection of the sedimentation chamber -Effectiveness of water management measures. -No visible degradation of water quality 	Contractor -Daily basis	PMU, GC and TSSC
	Degradation of water quality due to the coffer dam	<ul style="list-style-type: none"> Erect the coffer dam to form an enclosed construction area with the least disturbance. . Prohibit the discharge of turbid water directly into the river. - All silt-laden water from the coffer dam must be pumped to a settling tank. Develop 	<ul style="list-style-type: none"> -Water quality monitoring reports -No visible degradation of water quality 	Contractor - During the course of activity as required	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>a settling tank of adequate capacity, and allow sufficient time to settle the distributed solids before pumping out water from the coffer dam; only clear/clarified water shall be pumped back into the river.</p> <p>- Clear the work site after completion/ before monsoon at least to pre-project conditions; ensure that there are no materials, debris, spills etc., and before removal of temporary barriers/coffer dam/ before monsoon; and</p> <p>-Impervious material or clayey soil in gunny bags to be used.</p> <p>-Outer area of the coffer dam must be covered with thick plastic sheets to minimise turbidity.</p>			
	Water Pollution from Fuel and Lubricants and hazardous waste	<p>- Avoid/minimise storage of fuels, chemicals, and lubricants near the river/water; ensure no spillage</p> <p>- A temporary secured hazardous material handling and waste storage area must be provided at the construction site. As part of a design feature, a permanently secured ('bunded') impermeable surface and dykes capable of carrying 110% volume of materials for accidental spills or leakage must be constructed and maintained.</p> <p>Fuel transfer through decanting is prohibited. The use of a transfer pump with the proper fitting is suggested.</p> <p>-The storage area should be covered.</p> <p>- Dispose of any wastes generated by construction activities as per the guidance presented in Annexure 19 Environment Codes of Practices & other Plans and</p>	<p>- No of spills reported</p> <p>-Field observation</p> <p>-Water quality monitoring reports</p>	Contractor -Daily Basis	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<ul style="list-style-type: none"> - Conduct surface quality inspection and monitoring according to the EMP. - Contractors will have emergency spill equipment available whenever working near or on the water. 			
Construction on the landside	Deterioration of air quality from fugitive sources	<p>Prevent Dust Generation</p> <ul style="list-style-type: none"> -The soil/earth must be transported by covering the haulage vehicles with tarpaulin or any other good quality material. -Dust suppression measures by water sprinkling on worksites and temporary service and access roads. -All construction workers must be provided with pollution masks to mitigate the effect of dust generation on the health of workers. -Construction Material must be transported in covered dump trucks to the project site. This must not be stockpiled at the project site - Clean wheels and undercarriage of haul trucks before leaving the construction site. - Loading and unloading of construction materials must be made at designated locations with provisions of water sprinkling. -Construction vehicles, machinery & equipment must be regularly serviced and 	<ul style="list-style-type: none"> - Complaints from sensitive receptors. - Quarterly environmental monitoring report for ambient air, noise, water, and soil 	Contractor -Daily basis during the construction activities -Conducting quarterly environmental monitoring	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>maintained and would have a valid PUC certificate</p> <p>-Don't allow non-project vehicle access in the work area, limit soil disturbance and prevent access by barricading and security personnel.</p> <p>-Traffic detours and diversions must be designed to minimise bottlenecks and ensure smooth traffic.</p> <p>-Air pollution monitoring must be carried out at specified locations as described in the monitoring plan to verify that the contractor follows air pollution norms and that the air quality at the construction site does not exceed the prescribed limits.</p>			
Use of Plant, Equipment Machinery and Vehicle	Emissions from Construction Vehicles, Equipment and Machineries (Generation of Exhaust Gases) lead to the deterioration of air quality	<p>-The contractor will take every precaution to reduce the level of dust from batching Plant/Cement Storage/, construction sites involving earthwork by a sprinkling of water, encapsulation of dust source and by the erection of screens/barriers.</p> <p>-All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement.</p> <p>-The contractor will provide necessary certificates to confirm that all Plants, equipment, machinery, and vehicle used in construction conform to relevant dust emission control legislation.</p> <p>-No open burning of bitumen or preparation of hot mix is allowed.</p>	<p>- Heavy equipment and machinery with air pollution control devices.</p> <p>- Latest Six-Monthly Compliance Report to ASPCB</p> <p>- Valid Consent to Establish and Consent to Operate.</p> <p>- Certification that vehicles are compliant with Air Act</p> <p>- Quarterly environmental monitoring report for ambient air, noise, water and soil</p>	<p>Contractor</p> <p>- Daily basis during the construction activities</p> <p>-Conducting quarterly environmental monitoring</p>	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>-No burning of firewood is allowed in the construction camp. The Contractor must make provisions for LPG cylinders.</p> <p>-Compliance with laws, ordinances, codes, rules, regulations, orders, or declarations</p> <p>-All vehicles, plants and machinery used during construction must conform to the emission standards promulgated under the Environment (Protection) Act, 1986. The contractor will ensure that all vehicles, equipment, and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of PCB.</p> <p>-The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Valid PUC must be maintained throughout the construction period</p> <p>Monitoring results will also be submitted to PMU Consultant and PIU as per the monitoring plan.</p> <p>-Contractor will ensure that all vehicles, equipment, and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of CPCB emission standards</p>			
	Noise pollution leads to inconvenience for the people	<p>The Contractor will confirm the following:</p> <p>- All plants and equipment used in construction (including third-party plants and equipment) must conform to the MoEF&CC/ CPCB noise standards.</p>	<p>- Complaints from sensitive receptors.</p> <p>- Use of silencers in noise-producing equipment and sound barriers.</p> <p>-Weekly site visits and verification of records</p>	<p>Contractor</p> <p>- Daily basis during the construction activities</p> <p>-Conducting quarterly environmental monitoring</p>	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<ul style="list-style-type: none"> - All vehicles and equipment used in construction will be fitted with exhaust silencers. - Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked, and if found defective will be replaced. -The activities must be carried out during the daytime. Night-time activities may be carried out in an emergency, but all measures mentioned in the mitigation measures for night work must be strictly adhered to. - Limits for construction equipment used in the project, such as concrete mixers, cranes (moveable), vibrators and saws, must not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. -Maintenance of vehicles, equipment and machinery must be regular and up to the satisfaction of the Environmental Expert of the PMU Consultant to keep noise levels at a minimum. - No noisy construction activities will be permitted around educational institutes/health centres (silence zones) up to 100 m from the sensitive receptors, i.e., schools, health centres and hospitals between 9.00 am to 6.0 pm. -Restriction on Honking at the project site -Traffic management plans prepared during the construction mobilization period must 			

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>also be implemented during the construction stage. Effective traffic management must be taken care of in sensitive locations, major built-up areas, and along important highway junctions.</p> <ul style="list-style-type: none"> - Barricading (Temporary noise barrier) around the construction site to minimize the noise level -Monitoring must be carried out at the construction sites as per the monitoring schedule, and results will be submitted to PMC and PIU. -The Environmental expert of PMC will be required to inspect regularly to ensure the compliance of EMP. 			
	Vibration from the works.	<p>No explosives should be used in construction activities.</p> <ul style="list-style-type: none"> -Only mechanical equipment must be used to prevent Chances of damage from vibration. -If a mechanical vibrator/ pneumatic hammer is used within 100 m of the archaeological property, advice must be obtained from the State archaeological department for precautions. -The Contractor must employ an archaeologist to monitor the sites during the rock-cutting and piling activities. 	<ul style="list-style-type: none"> -Complaints from sensitive receptors, Archaeology dept. -Site verification -Availability of trained manpower (archaeologist) at site 	<p>Contractor</p> <ul style="list-style-type: none"> -During the course of activity as required 	PMU, GC and TSSC
	Contamination of Soil	<p>Ensure all equipment, vehicles and other sources of fuels and lubricants will be collected and contained to avoid soil/ groundwater contamination.</p> <ul style="list-style-type: none"> -Fuel must be stored in proper bounded and covered areas. 		<p>Contractor</p> <ul style="list-style-type: none"> -Daily basis 	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>-All spills and collected petroleum products must be disposed of in accordance with the provisions mentioned in Annexure 17- Oil & Waste Storage</p> <p>-Maintenance and refuelling of vehicles, machinery and other construction equipment must be carried out on an impervious surface so that spillage of fuels and lubricants does not contaminate the ground.</p> <p>-The runoff from the maintenance yard must lead to a peripheral drain and pass through an oil-water separator</p>			
Safety aspects during the execution of works	Community Health Safety risks in Work Zones	<p>The Contractor must ensure that :</p> <p>-The construction zone is hard Barricaded with MS Barricades of a height of 3.0 m.</p> <p>-The construction site must be access controlled, and the workers must be provided valid identification cards to allow entry.</p> <p>-Construction material must be stored in the barricaded area. If temporary storage is required (for 1-2 days) outside the demarcated construction area, the same must be discussed with the community. Hard Barricading with proper signages must be put to prevent the entry of commuters/pilgrims in the areas. The permission of the Environmental Officer is essential.</p> <p>-To prevent the dust from the construction area affecting the sensitive receptor/ commuters' green screens may be used over and above the Hard Barricading at the advice of the Environment Officer of the PMC</p>	<p>-Barricading of the worksites</p> <p>-Traffic management Plan construction works, including number of permanent signages, barricades and flagmen on the worksite</p> <p>-Number of signages placed at the project location.</p> <p>-Regular reporting of the measures in the Quarterly Report</p>	Contractor -Daily basis	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
	Occupational Health Safety: Personal Safety Measures for Labour	<p>The contractor will provide:</p> <ul style="list-style-type: none"> -Comply with all national, state and local labour laws (refer Table 7.1A: Social Management Plan -Develop and implement site-specific occupational health and safety (OHS) plan, which will include measures such as (a) excluding the public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents -Barricading of all excavation carried out for construction. For deep excavation -shoring and bracing must be provided Movement of equipment and machinery near the deep excavation of soft soil must be prohibited. - Flagmen must accompany all movement of equipment and vehicle inside. -All vehicles and equipment must be fitted with reverse horns, alarms etc. -Protective clothing as may be appropriate to the risk involved in the activities being undertaken by the labour. -Protective clothing must be as per the BIS standards -Earplugs for workers exposed to loud noise, and workers working in concrete mixing operations, piling and other high-noise-generating operations -Adequate safety measures for workers during the handling of materials at the site are taken up. 	<ul style="list-style-type: none"> -Site-specific OHS Plan. -Equipped first-aid stations. -Medical insurance coverage for workers. -Number of accidents. -Supplies of potable drinking water. - Clean eating areas where workers are not exposed to hazardous or noxious substances. - record of H&S orientation trainings - personal protective equipment. - % of moving equipment outfitted with audible back-up alarms; -permanent sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. -Compliance to core labour laws 	<p>Contractor</p> <p>-OHS plan shall be prepared once and implementation as per the approved plan on a daily basis</p>	<p>PMU, GC and TSSC</p>

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<ul style="list-style-type: none"> -All tools, tackle, lifting instruments, and cranes must have valid load certification. The tools and tackle must be regularly inspected by the Environment Officer / OHS officer of the PMU. -The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangways, stairwells, excavations, trenches and safe means of entry and egress. -All precautions must be taken for working at heights. -The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract. -Ensure that qualified first aid is always provided. Equipped first-aid stations must be easily accessible throughout the site. - Provide medical insurance coverage for workers. -The Contractor will not employ ad-hoc work procedures, follow best & acceptable work practices -The contractor will document work-related accidents. Provide qualified & easily accessible first-aid facilities all times at all sites. -Secure all installations from unauthorised intrusion and accident risks. -Adequate illumination would be provided at site during evening and night time till the work is being carried out 			

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<ul style="list-style-type: none"> -Rest area for workers would be provided with drinking water and protected from the elements of nature - Barrier structures are of sufficient height to prevent waves or overflows from flooding in the enclosed area. Regular inspection must be carried out for the coffer dam to ensure no water leakage in the construction area. -During working in River, workers must be made aware of risks of water depth, currents, and dangerous areas of water must be properly marked by fixed or floating barricades and signage of danger. Workers must also be made aware of the protection of the biodiversity of the water, and fishing must be strictly prohibited. A boat must be made available at the site to transport labour and materials and be well-maintained for emergencies. Workers must not be allowed to dip or bathe in rivers. A suitable working platform must be provided during construction works in water. -Life-saving equipment and lifeguards must be made available during the period of working in water. -The Contractor will mark 'hard hat' and 'no smoking' and other 'high-risk areas and enforce non-compliance of the use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilisation and will be approved by the Safety Officer of PIU. 			
	Injuries/fatalities to the employees	Accident/Incident Reporting for SHE	-Record of near misses	Contractor -Daily basis	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<ul style="list-style-type: none"> -The PIU must carry out an awareness campaign for the Do's and Do not's in construction sites. -Near misses must be recorded and reported on a regular basis <ul style="list-style-type: none"> • -Fortnightly meetings must be held with employees to make them aware of unsafe acts and practices. 	<ul style="list-style-type: none"> - Record of fatalities - No of workers' meetings -Labour Law Compliance Report generated through Labour Law Compliance system 		
	Cultural & Heritage Resources	<ul style="list-style-type: none"> - Adequate signs must be displayed in the access route for the devotees towards this cultural heritage and temples. -Warning signs about the construction activities must be provided to warn commuters/ pilgrims. - Regular supervision by an archaeologist to identify the impact on these archaeological properties from vibration -Make workers aware of chance finds and archaeological heritage <ul style="list-style-type: none"> • -Make workers aware of controlled vibration when working within 100 m of the site 	<ul style="list-style-type: none"> i. No. of training for workers on precautions against vibration ii. Report by the Archaeologist in the Quarterly report. 	Contractor -During the course of activity as required preferably once in a month	PMU, GC and TSSC
Sanitation, Health & Safety	Unhygienic and unsafe living and working condition.	<ul style="list-style-type: none"> • Hygiene in the camps would be maintained by providing good sanitation and cleaning facilities. • Camp would be well ventilated with adequate provision for illumination, kitchen and safe drinking water. Proper drainage to be maintained around the sites to avoid water logging. • Proper sanitation with toilet and bathing facilities would be provided at the sites and labour camps. Wastewater generated 	Site Verification	Contractor -Daily basis	PMU, GC and TSSC

Component	Environmental Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>from these facilities would be disposed through septic tanks and soak pit</p> <ul style="list-style-type: none"> • Preventive medical care to be provided to workers • Segregated solid waste would be disposed of at municipal solid waste disposal location. • LPG will be used for cooking in construction camps • Provision would be made for day crèche for children • First aid facilities, with room, personnel and ambulance would be available at the site. Also, tie-up with local hospitals would be done to handle emergency case, if any. • Rest area would be provided at the site where workers can rest after lunch • Working hours of labourers would not exceed the standard norms as per Factory Act • Wastewater from construction site would not be allowed to be accumulated. Septic tanks/soak pits would be provided for its disposal. 			

Table 8.2 (A) Social Management Plan

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators & Frequency	Institutional Responsibility	
				Implementation & Frequency	Supervision
1. Accident, Incident and Safety Risks					
1.1 Health & Safety	Accident and Incident risk from construction activities and safety of workers Temporary impacts on safety of visitors, commuters, tourists etc.	-Local labour would preferably be employed for construction. -Site would be barricaded and would have security guards. -Register would be maintained for entry to the construction sites. No unauthorized person would be allowed to enter the site. -A board in local language at entrance of site would display name of project, area and hazards associated for public awareness -Rest area for workers would be provided. -Contractors would adopt and maintain safe working practices. SOPs would be prepared and followed for all activities under supervision of site engineer -Complete medical check-up would be done for workers prior to joining and after six months of joining -Emergency telephone nos. of hospitals, ambulance and doctors would be displayed in first aid room.	-Regular health check-up of the workers once in a week -Training on communicable diseases.	Contractor -daily basis	PMU, GC and TSSC

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators & Frequency	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>-Working hours of labour should not exceed norms as per state factory law</p> <p>-Maintenance and repair of any local village road used for the project activities should be carried out both before and end of construction by contractor.</p>			
Labour Influx	<p>-Risk of STD, HIV/AIDS to local community Increased demand and competition for local social and health services</p> <p>-Social conflicts between the local community and the construction migrant workers.</p> <p>-Increased illicit behaviour and crime against women, which is a real threat for Assam where gender-based violence is rampant</p> <p>-Increase competition for jobs and have an impact on wage distribution</p>	<p>-Specifications on employment of local workforce including women should be reflected in the civil works bidding documents and subsequent contracts to ensure that the contractors fulfil these commitments. Locals including women may be screened further for skills, and adequate orientations can be provided to recruit for the work. AIWTDS can prepare a roster of interested workers and their skills</p> <p>-The project contractor needs to prepare a site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan.</p> <p>-Security personnel will be deployed at the construction sites, and emergency nos. including contact details of local law enforcement officers, project's helpline no., existing state-run women helpline nos. will be prominently displayed at the site. The contractors will ensure that an Internal Complaints Committee (ICC) for each establishment is set-up to meet their corporate requirement and legal</p>	<p>-Awareness training for applicable regulatory regulations.</p> <p>-</p>	<p>Contractor</p> <p>- site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan shall be prepared and submitted to PMU once during the construction period</p> <p>- Implementation of approved site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan on a daily basis</p>	TSSC & PMU

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators & Frequency	Institutional Responsibility	
				Implementation & Frequency	Supervision
		<p>mandate under the Sexual Harassment at the Workplace Act, 2013.</p> <p>-Health problems of the workers should be taken care of by providing basic health-care' facilities through health centres temporarily set up for the construction camp. The health centre should have the requisite staff, free medicines and minimum medical facilities to tackle first-aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses and critical cases.</p> <p>- Awareness camps on HIV/AIDS for both, construction workers and neighbouring villages must be organised at regular intervals by NGOs empanelled with NACO.</p> <p>-It is expected that among the women workers there will be mothers with infants and small children. The provision of a day care crèche as per the Building and Other Construction Workers (regulation of employment and conditions of service) act, 1996 is the contractor's responsibility. The crèche should be provided with trained women to look after the children.</p> <p>-In case work schedule extents up till night, it should be ensured that women workers are exempted night shifts.</p>			

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators & Frequency	Institutional Responsibility	
				Implementation & Frequency	Supervision
Gender Based Violence	There might be a possibility of gender-based violence arising from the inflow of migrant workers/ labours.	<ul style="list-style-type: none"> - Code of Conduct shall be signed by the workers. - Integration of GBV into existing strategy, Grievance Redressal Mechanism, safety talks, tool box meeting and regular trainings for the workers. - Identification of GBV focal points through community consultations. - Trainings shall be arranged for the workers on Occupational Health and Safety. - Identification of Hot Spots for GBV within the project including construction sites and labour camps alongside local communities, schools, vocational training centers, liquor shops, migrant laborers' residing in rented accommodations within the villages. - Both men and women labours shall be made aware about the applicable rules and regulations. - Formation of a committee comprising of representatives from local NGOs/ CBOs, police, academia, advocate, etc. with at least 70% women members. The committee shall meet every quarter in order to address the problems faced by the labours/ locals. <p>Consultation with women's groups should also be held during construction and operation phases</p>	<p>-Regular Training shall be conducted.</p> <p>-IEC material should be displayed at site</p> <p>-Awareness Campaign</p>	Contractor -Once in a month	PMU (AIWTDS+GC)and TSSC

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators & Frequency	Institutional Responsibility	
				Implementation & Frequency	Supervision
		to listen to their issues and concerns regarding labour, health and safety etc. as well as to solicit their ideas on various community initiatives.			
Community Health and Safety	<p>With the inflow of migrant workers and their interaction with the local population near labour camp, health issues among the local community might emerge.</p> <p>Health problems like STIs, HIV/AIDS, Hepatitis B&C, Tobacco chewing, Tuberculosis etc. might spread in the area because of this floating population</p>	<ul style="list-style-type: none"> - Regular medical camps can be conducted amongst the labours and the local population to make them aware about HIV/AIDS and associated factors. - Awareness on health issues like HIV/AIDS, Tuberculosis, Hepatitis B & C, Sexually Transmitted Infections, Dengue, Chikungunya, Malaria, Tobacco control, etc., shall be conducted periodically. - District AIDS and Prevention Control Unit (DAPCU), District level Agency for the implementation of National Health Mission and Employee's State Insurance Corporation (ESIs) Hospital shall be liasoned for the same. - Community based meetings, consultations in camp, distribution of leaf lets, IEC tools (outreach programmes, campaigns, awareness through newspapers, TV's, etc.), posters, banners. <p>Use of mobile phones shall be banned during driving and construction activities.</p>	<ul style="list-style-type: none"> - Regular health check-up of the workers - Training on communicable diseases 	<p>Contractor</p> <p>-communiyu consultation once in a month</p>	<p>PMU (AIWTDS+GC)and TSSC</p>

Table 8.3: Environment Management Plan (Operation Phase)

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
1.0 Climate				
Climate Change	Project is unlikely to cause negative effect on climate. However, project can contribute positively for climate	<ul style="list-style-type: none"> Energy efficient measures in the terminal buildings will be implemented Solar power will be used in potential area 	Kyoto Protocol, Forest Conservation Rules & National Forest Policy	DIWT / AIWCL
2.0 Air Quality				
Air Pollution	Emission from machinery, ferry, DG and vehicular movement.	<ul style="list-style-type: none"> Only Passenger ferry will be handled in the terminal hence no dust pollution anticipated. Water sprinkling would be provided in dust generating areas DG exhaust will be minimised by regular maintenance in AMC Monitoring of air quality shall be carried out on quarterly basis to check the level of pollutants and effectiveness of EMP Ferries, deployed, will have efficient fuel combustion system with minimum emission 	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981	DIWT / AIWCL
3.0 Soil Erosion				
Soil Erosion and management.	<ul style="list-style-type: none"> Soil erosion of embankment during heavy rainfall. 	<ul style="list-style-type: none"> Periodic checking of the slope stabilization measures (stone pitching or otherwise) would be carried to assess the damage if any. Necessary measures for repair shall be followed wherever there are failures 	Project requirement	DIWT / AIWCL
4.0 Wastewater Management				
Water pollution	<ul style="list-style-type: none"> Surface water pollution. 	<ul style="list-style-type: none"> Bio digester (4KLD) would be provided to treat the sewage generated. Treated water would be used for horticulture and plantation purpose at the site 	Project requirement	DIWT / AIWCL

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
	<ul style="list-style-type: none"> Siltation and erosion and contamination due to disposal of domestic waste 	<ul style="list-style-type: none"> Fuel shall be stored in leak proof containers and containers shall be placed on paved surfaces so that no spill occurs Fuelling of vessels will be leak proof system Quarterly Monitoring of surface water quality shall be carried out to check the level of pollutants and effectiveness of EMP 		
5.0 Noise Control				
Noise Pollution	<ul style="list-style-type: none"> Noise generation from operation of vehicle, equipment and machinery. Impact of underwater noise and risk of ship strikes 	<ul style="list-style-type: none"> Timely maintenance and servicing of transportation vehicles and the machinery/pumps/vessels to be used during operation phase to reduce the noise generation. Honking shall be prohibited at the project site Hearing test for the workers shall be undertaken before employing them and thereafter shall be done after every six months DG sets shall be provided with acoustic enclosure Monitoring of Noise levels shall be carried out on quarterly basis to check the level of pollutants and effectiveness of proposed EMP Impacts of underwater noise and risk of ship strikes can be mitigated by routing ship traffic away from critical dolphin habitats and implementing speed regulations. 	Noise Pollution (Regulation and Control) Rules, 2000	DIWT / AIWCL
6.0 Accidental Risk				
Accident and Incident.	Accidents due to Movement of Vessels and other hazards associated with site	<ul style="list-style-type: none"> Further encroachment of squatters within the ROW of approach road will be prevented. Monitor/ensure that all safety provisions included in design and construction phase are properly maintained Adequate illumination should be provided at the site during evening 	Project requirement	DIWT / AIWCL
7.0 Flora & Fauna				

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
Biodiversity loss	Loss of Aquatic Fauna including Dolphins and other macrophytes	<ul style="list-style-type: none"> • Propeller shall have net system to avoid any accident with dolphins and other aquatic animals. • No wastewater or waste shall be disposed in river from terminal site or from vessel into the water. Penalty shall be imposed on the vessels reported disposing waste/wastewater in the river • Run-off from stockpile area, storage yards, parking areas & roads shall not be disposed directly in to river. • Instruction should be given to all vessels and all employee and staff that no dolphin or any other endangered species shall be harmed due to any reason • Instruction shall be given to vessel operator that in case any accident with dolphin occurs that should be reported immediately to terminal authority • Waiting time of vessels shall be reduced at the terminal/lock sites by providing the adequate loading and unloading equipment and vehicles. • Vessels shall be instructed for not using sharp lights and sounds all the time as they may disturb aquatic organisms. 	Forest Conservation Act 1980, Wild Life Protection Act, 1972	DIWT / AIWCL

8.3 GRIEVANCE REDRESSAL MECHANISM

AIWTDS has a department website (<https://www.aiwtdsociety.in>) wherein complaints can be lodged or emailed (dir.iwtds-as@gov.in). Further, a dedicated Helpline no. for grievance redressal has been setup at the PMU, AIWTDS office, Guwahati (18008894717) where project related complaints can be registered at any time during project Pre-construction, Construction and Operation Phases. The AIWTDS will outsource the Helpline to a call centre for backend support services needed for its operation.

Procedure for Grievance Response

The steps to be taken by the AIWTDS for receiving and handling grievances pertaining to the Project are outlined below and graphically presented in **Figure** below:

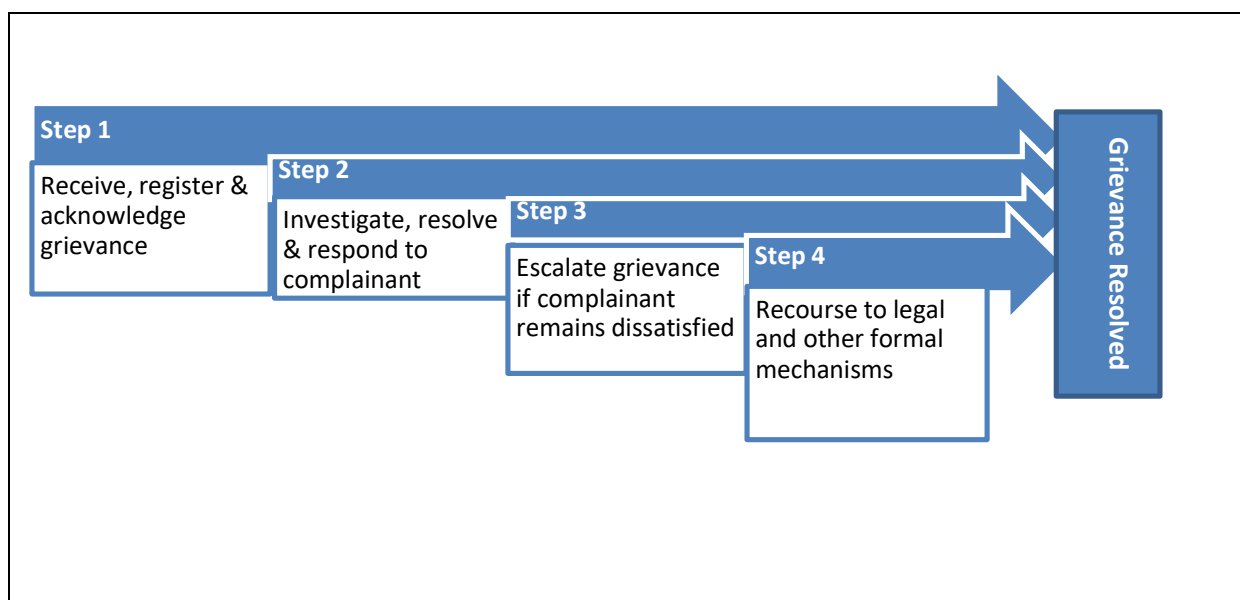


Figure 8.1: Procedure for Grievance Response

STEP 1: Receive, register, and acknowledge the Grievances

A grievance can be submitted to the AIWTDS through the following channels:

1. During regular meetings held between communities and project stakeholders (field level and PIU staff, contractors, supervision consultants, etc.);
2. Through communication directly with management – for example a letter addressed to site management, or other operational offices, or SPD/ASPD/DSPD AIWTD Society Ulubari, Guwahati-7;
3. Directly by e-mail to the official mail address, or online at website which is disclosed in the official website of AIWTDS (<https://www.aiwtdsociety.in>);
4. Placing a query in the community suggestion boxes in the local offices of the project;
5. Directly on toll free number displayed at ghats; and
6. Through twitter, Facebook and other social media accounts.

Upon receipt of complaints, unique identification number will be issued to each grievance for easy tracking- once it is logged into the online grievance register.

In cases of complaints received through **Channels 1 to 4**, the Project personnel (field and PIU level staff) will log the complaint in the online grievance register and inform the Helpline call center/operators within 3 working days. The helpline operators on behalf of the Project personnel will acknowledge the receipt of the complaint through a phone call or text message to the complainant. The acknowledgment will include the unique identification number so the complainant can use this as a reference to track the status of the complaint. If the grievance is not well understood or if additional information is required, the Project personnel or the Helpline operator will contact the complainant during this step for further clarification.

If the complaint is received through **Channels 5 and 6**, the Helpline call center/operator will log the complaint in the online grievance register and acknowledge its receipt immediately. The complaint will then be transferred to the Project personnel for investigation and resolution.

STEP 2: Develop resolution and respond to Complainant

Upon investigation, the Project personnel (field and PIU level staff) will propose a resolution as soon as possible, and in consultation with the complainant and others concerned. The Project personnel, through the Helpline operator will continually update the complainant on the progress of the investigation and the timeline for conclusion. The resolution is communicated to the complainant through the proper channel. The Helpline operator will ask the complainant for a written acceptance of the resolution, and close the grievance if he/she is satisfied with the resolution. The Project personnel will aim to complete investigation within 15 working days of the grievance first being logged.

STEP 3: Scale up the grievance if the complainant remains dissatisfied

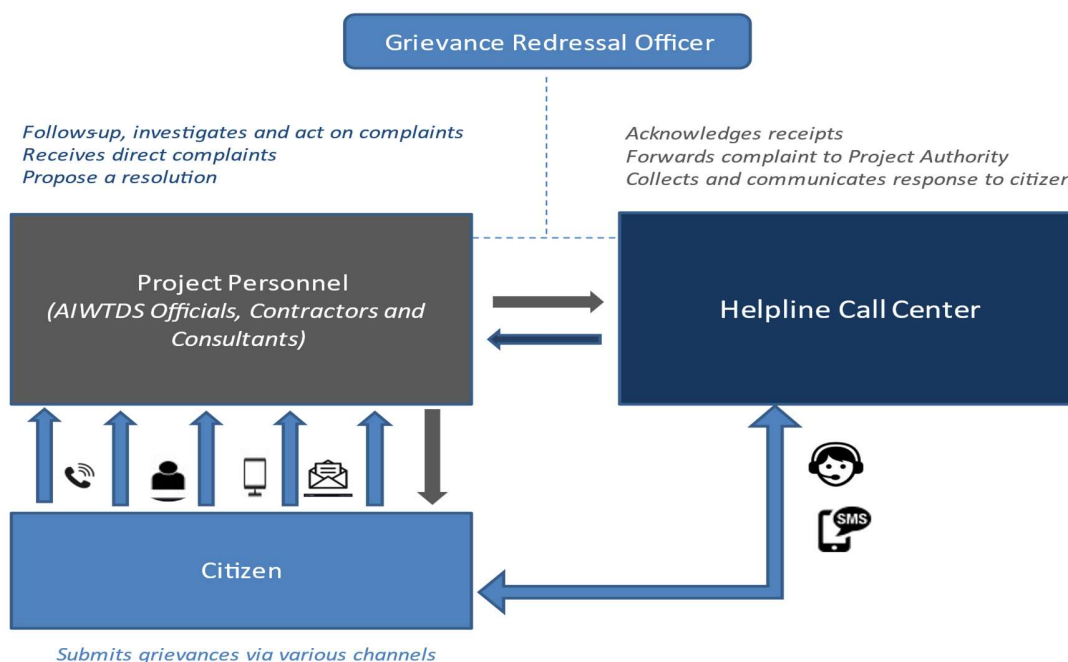
If the complainant rejects the proposed resolution, the Helpline operator will refer the case to the GRO (PMU) within 30 days of its decision. The GRO will facilitate to reach an agreeable resolution and will produce a resolution within 15 working days. If the resolution is accepted by the complainant, it will be implemented, and the grievance will be closed once the implementation is completed.

STEP 4: Recourse to legal and other formal recourse

If the complainant rejects the proposed resolution, the complainant is free to approach the court of law/any other formal mechanisms in place at the local/state level.

Record Keeping

All queries and grievances are to be logged into the online grievance register. This includes details of the queries/ grievance, the complainant, and the steps taken to resolve the grievance. Any accompanying documentation e.g. written statements, photographic evidence, or investigation reports are to be filed along with the grievance log both in hard and soft copies.



Roles and Responsibilities of Key Agencies

Grievance Redressal Officer (GRO): The GRO appointed at the PMU level, will be responsible for ensuring that the grievance mechanisms are responsive to the needs of the affected individuals. A master database will be maintained by the GRO to record and track management of all queries and grievances that will be periodically audited by the GRO. This will serve to help monitor and improve performance of the grievance mechanism. The GRO will also supervise the functioning of the Helpline Call Center and undertake trainings of staff, consultants and contractors on the grievance redressal process. Further, escalated complaints will be handled by the GRO.

Helpline Call Center/ Operator: The Helpline no. will be operated by the Call Center, which will be responsible for documentation and acknowledgement of complaints, and communication with complainants till their complaints are satisfactorily closed. The Helpline operators will also send alerts/reminders to the project personnel for investigation and resolution, so that grievances are resolved within the stipulated timeframe. The Call Center will be operational from 8.00 am till 10.00 pm in two shifts daily.

Project officials/personnel: Field level staff, supervision consultants, and contractors will be responsible for investigating and resolving grievances in a timely manner. They will also record direct complaints on the online grievance registration portal and follow-up with the Helpline operators to update them on the status of the complaint.

8.4 ENVIRONMENT MONITORING PLAN

Environmental Monitoring Programme is to ensure that the intended environmental protection goals are achieved and result in desired benefits of the project. The same will be included in tender / bid document. The broad objectives of the environment monitoring program are:

- To monitor impacts on the surrounding environment and the effectiveness of mitigation measures during the construction and operation phase.
- To ensure that the environmental control systems, installed are effective.
- Comply to the provisions of relevant environmental regulations.

Air quality monitoring with respect to PM₁₀, PM_{2.5}, NO_x, SO₂ and CO at selected locations to assess the impact.

Water quality with reference to DO, BOD, COD, suspended solids, turbidity, alkalinity, oil and grease at selected water bodies to ensure maintenance of BDU criteria.

Noise level at Ghat/commercial zone, Sensitive zones

Aquatic biodiversity and ecological monitoring

The parameters to be monitor, frequency of monitoring, number of samples, locations and responsibility of monitoring is given in **Table- 8.4**.

Table 8.4: Summary of Environmental Monitoring Programme: Construction and Operation Phase

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	No. of Samples	Location	Responsibility
1.	River Water					
	Physico-chemical parameters	pH, EC, TDS, Turbidity, Phosphates, Nitrates, Sulphates, Chlorides.	Construction Phase- For three seasons in construction phase; Turbidity, DO and salinity will be monitored once every week at 3 locations: near the Berth, channel and records of monitoring will be maintained during construction phase If DO level goes 4.0 mg/l, then its causes will be investigated, and corrective	Surface Water Upstream- 2 • Downstream- 2 • Near Project site- 1 Ground water- 2 near the project site	As per AIWTDS directions	Contractor

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	No. of Samples	Location	Responsibility
			actions will be taken			
			Operation Phase- For two seasons except monsoon			
	Biological parameters	Light penetration, Chlorophyll, Primary Productivity, Phytoplankton's, Zooplanktons	Construction Phase- three seasons Operation Phase- For two seasons except monsoon	Upstream- 2 Downstream- 2 Near Project site- 1	As per AIWTDS directions	Contractor
2.	Sediments					
	Physico-chemical parameters	Texture, pH, Sodium, Potassium, Phosphate, Chlorides, Sulphates, Hg, Pb, Fe, Cu, Zn, Cd	Construction Phase- three seasons Operation Phase- For two seasons except monsoon	Upstream- 2 Downstream- 2 Near Project site- 1	As per AIWTDS directions	Contractor
	Biological parameters	Benthic Micro-fauna, Benthic Macro-fauna	Construction Phase- three seasons Operation Phase- For two seasons except monsoon	Upstream- 2 Downstream- 2 Near Project site- 1	As per AIWTDS directions	Contractor
3.	Ambient Air Quality	PM _{2.5} , PM ₁₀ , SO ₂ and NO ₂	- Construction Phase- three seasons phase - Operation Phase- one season except monsoon. - Twice a week for four consecutive weeks per season.	Upwind- 2 Downwind- 2 Near Project site- 1	As per AIWTDS directions	Contractor
4.	Noise Quality	Equivalent Noise Level	During peak construction activities	Construction site- 1 Labour Camp- 2	As per AIWTDS directions	Contractor

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	No. of Samples	Location	Responsibility
5.	Soil Quality	N, P, K and Heavy metals	Construction Phase- 2 samples pre-monsoon season and 2 samples post-monsoon Operation Phase- one season except	Construction site- 1 Labour Camp- 2	As per AIWTDS directions	Contractor
6.	Dolphin study	Assessment and presence of Dolphins, survival etc.	Once per year	--	As per AIWTDS directions	AIWTDS

*Note: All the Samples to be collected as per standard norms. Parameters and components may vary as per requirement.

8.5 BUDGET FOR EMP

Tentative Environment budget has been prepared for design, construction and operation phase of the project which includes the cost of environmental structures like septic tank & soak pit, Air Pollution Control System at terminals, monitoring, enhancement measures, training and awareness and technical support for establishment, enhancement measures and environmental guidelines. Environmental budget for Umananda Terminal is estimated as approx. Rs. **60.46** lakhs in construction phase and approx. 54.86 Lakh in operation phase. The summary of the environmental budget is given below. The detailed break-up of costs is given in **Table- 8.4 and 8.5**.

Table 8.5: Summary of Environmental Budget- Construction Stage

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
A.	Monitoring Measures⁸			
1	Water Quality Monitoring	Pre -Construction	20000	Contractor
		Construction	120000	Contractor
2	Biological Monitoring	Pre -Construction	125000	Contractor
		Construction	750000	Contractor
3	Sediments: Physico Chemical	Pre -Construction	25000	Contractor
		Construction	150000	Contractor
4	Sediments: Biological	Pre -Construction	25000	Contractor
		Construction	150000	Contractor
5	Ambient Air Quality	Pre -Construction	32000	Contractor

⁸ Contractor shall undertake the environmental monitoring as per the frequency specified in Table 8.4

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
		Construction	192000	Contractor
6	Noise Quality	Pre -Construction	10000	Contractor
		Construction	180000	Contractor
7	Soil Quality	Pre -Construction	32000	Contractor
		Demobilisation	32000	Contractor
8	Groundwater	Pre -Construction	8000	Contractor
		Construction	48000	Contractor
		Camp/Kitchen During Construction	192000	Civil works contract
		Decommissioning	8000	
	Subtotal (A)		20,99,000	
B.	Capacity Building			
1	General environmental awareness; environmental and social sensitivity of the project influence area; Key findings of the EIA; Mitigation measures; EMP; Plans and Protocols Social and cultural values of the area. (1 day)	Training for Selected staff of AIWTDS, supervisor, and contractors, Vessel Operators (at the beginning of Contract)	4,00,000	TSSC
2	Training for Ghat management'	Section officers/ Vessel operators/ Masters/ Khalasi, Ghat officers, Ghat Maintenance workers etc.(At Beginning of Construction)	2,50,000	Contractor
3	Community issues; Awareness of transmissible diseases; social and cultural values.	Construction Crew (once every six months)	2,00,000	Contractor
4	EMP; Waste disposal, Cultural values and social sensitivity.	Once every year or as directed by the PIU	1,00,000	Contractor
5	Road/waterway safety; Defensive driving/sailing; Waste disposal;	Drivers; boat/launch crew, (once every year)	1,00,000	Contractor
6	Camp operation; Waste disposal; Natural resource conservation; Housekeeping.	Camp staff (once every quarter)	2,00,000	Contractor

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
7	Construction Implementation requirements; handling situations for important flora / fauna especially Dolphin; Physical Cultural resources;	PIU; supervisor Selected crew members and contractors (once every six months)	2,00,000	Contractor
8	Health and safety equipment on board and in terminals	Selected crew members and Vessel operators/ Masters/ Khalasi etc.	2,00,000	Contractor
9	Environment Management tracking System	AIWTDS	50,000	Contractor
	Subtotal (B)		21,50,000	
C.	Construction Contractor EMP Implementation			
5.	Water Sprinkling Measures for Dust Suppression	Construction	-	The cost is integrated as part of the civil work cost
6	Development and Implementation of the Dolphin Management Plan of Contractor	Construction	-	The cost is integrated as part of the civil work cost
7	Providing, fixing, maintaining, shifting & refixing, barricading of minimum 2.0m height at stipulated active site of the same project site, made with angle iron frame of 50x50x5mm and GI sheet of 0.63mm thick including primer painted initially, painting, lettering & border with reflective paint at the time of every shifting, traffic diversion arrangement, safety guard, suitable lightning arrangement during night, complete in all respect till completion of the project as per technical specification and direction of Engineer-In-charge and same shall be possessed by the contractor after completion of the Project	Construction	-	The cost is integrated as part of the civil work cost
8	Supplying and fixing of cautionary and or informative signs boards including the cost of posts, fixtures, fixing, foundation, fitting and fixing. Sheeting will be made of	Construction	-	The cost is integrated as part of the civil work cost

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
	encapsulated lens type of retro-reflective type and message / borders will be screen printed complete as per screen specification in IRC SP 55: 2001. To be made available at all time at the work sites as required and directed by the engineer			
9	Supplying and fixing of flashing beacon warning lights including the cost of posts, fixtures, fixing, foundation, fitting and fixing, cost of material , labour, loading, unloading, lead, lift, shifting, transportation etc. and as per specification in IRC SP 55: 2001	Construction	-	The cost is integrated as part of the civil work cost
10	Provision and maintenance of Bio toilets with 1 male and 1 female units including cost of material , labour, loading, unloading, lead, lift, transportation, shifting etc. And shall be made available at worksite at the direction of the PIU. The facility shall complete with water arrangement, privacy, lighting arrangement. The WC and /urinals should be made of stainless Steel and the partitions should be made of aluminium framework with FRP panels. The bio-digester tank should be approved by Defence Research & Development Organisation (DRDO)or any other competent agency. The whole toilet shall be mounted on MS framework with skids; Overhead water tank shall be made of HDPE with proper arrangement of ball cock and mosquito proof cover. These should also be provided with two dustbin for wet and dry waste. The bio-digester toilets shall be mounted on skids and shall not require any creation of permanent structure so that	Construction	-	The cost is integrated as part of the civil work cost

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
	they can be shifted from one worksite to another			
11	Provision of Helmets (IS CODE 2925 : 1984) , Safety Shoes (IS CODE 5852 : 1996), Googles (•IS CODE 5983 : 1980), Reflective Jackets, mitten/ gloves (IS 2573) , safety nose masks to all personnel (including temporary labour) involved in the worksites	Construction	-	The cost is integrated as part of the civil work cost
12	Provision of First Aid Kits for worksites	Construction	-	Civil works contract
13	Provision and maintenance of waste collection bins in sets of 2 (blue and green) for collection of municipal solid waste generated at the worksite including cost of material , labour, loading, unloading, lead, lift, shifting, transportation etc.	Construction	-	The cost is integrated as part of the civil work cost
14	Environment, Health & Safety Engineer/Supervisor having Bachelors in Env Science / Management/ B. Tech (Env Eng.)	Construction	-	The Manpower Cost is integrated into the cost of the Civil Works
15	Diploma in Central Labour Institute / Regional Labour Institute (Mandatory)	Construction	-	The Manpower Cost is integrated into the cost

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
				of the Civil Works
	Subtotal (C)			
D	PIU/AIWTDS EMP Implementation cost			
1	EMP Supervision Cost	Construction	2,40,000	PIU Cost
2	Equipment	Construction	1,50,000	PIU Cost
	Sub Total (D)		3,90,000	
	Total (A+B+C+D)		57,59,000	
E	Contingency (@5% of (A+B+C+D))		2,87,950	
	Total (A+B+C+D+E)		60,46,950	

EMP Implementation Cost to TSSC	400000
EMP Implementation Cost to PIU/ AIWTDS	3,90,000
EMP Implementation Cost to Contractor	40,49000

Table 8.6: Summary of Environmental Budget- Operation Stage

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
A.	Monitoring Measures			
1	Water Quality Monitoring	Operation	2,00,000	AIWCL /DIWTCost
2	Biological Monitoring	Operation	12,50,000	AIWCL /DIWTCost
3	Sediments: Physico Chemical	Operation	2,50,000	AIWCL /DIWTCost
4	Sediments: Biological	Operation	2,50,000	AIWCL /DIWTCost
5	Ambient Air Quality	Operation	1,20,000	AIWCL /DIWTCost
6	Noise Quality	Operation	2,25,000	AIWCL /DIWTCost
8	Groundwater	Operation	-	Civil works contract
	Subtotal (A)		2295000	
B.	Capacity Building			

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
1	General environmental awareness; environmental and social sensitivity of the project influence area; Key findings of the EIA; Mitigation measures; EMP; Plans and Protocols Social and cultural values of the area. (1 day)	Training for Selected staff of AIWTDS, supervisor, and contractors, Vessel Operators (once a year for 5 years)	2,50,000	AIWCL/DIWT
2	Training for Ghat management'	Section officers/ Vessel operators/ Masters/ Khalasi, Ghat officers, Ghat Maintenance workers etc. (once a year for five years)	2,50,000	AIWCL/DIWT
3	Community issues; Awareness of transmissible diseases; social and cultural values.	Construction Crew (once every year for five years)	2,50,000	AIWCL/DIWT
	Subtotal (B)		7,50,000	
C.	Operations Stage EMP Implementation			
5.	Wastewater Management (Biodigester cost in NBC) based on number of people/ hour	Operation	-	Capital Cost covered through the Engineering Design
	Provision of drinking water facilities	Operation	-	The cost is integrated as part of the civil work cost
	Waste Management System	Operation	-	
	Providing, fixing, maintaining, shifting & refixing, barricading of minimum 2.0m height at stipulated active site of the same project site, made with angle iron frame of 50x50x5mm and GI sheet of 0.63mm thick including primer painted initially, painting, lettering & border with reflective paint at the time of every shifting, traffic diversion arrangement, safety guard, suitable lightning arrangement during night, complete in all respect till completion of the project as per technical specification and direction of Engineer-In-charge and same shall be possessed by the contractor after completion of the Project	Operation	-	The cost is integrated as part of the O&M Cost

S. No.	Particulars	Stages	Cost	Costs Covered By
			(INR)	
6	Supplying and fixing of cautionary and or informative sign boards including the cost of posts, fixtures, fixing, foundation, fitting and fixing. Sheeting will be made of encapsulated lens type of retro-reflective type and message / borders will be screen printed complete as per screen specification in IRC SP 55: 2001. To be made available at all time at the work sites as required and directed by the engineer	Operation	50,000	AIWCL/DIWT
	Supplying and fixing of flashing beacon warning lights including the cost of posts, fixtures, fixing, foundation, fitting and fixing, cost of material , labour, loading, unloading, lead, lift, shifting, transportation etc. and as per specification in IRC SP 55: 2001	Operation	-	The cost is integrated as part of the civil work cost
	Provision of Helmets (IS CODE 2925 : 1984) , Safety Shoes (IS CODE 5852 : 1996), Googles (•IS CODE 5983 : 1980), Reflective Jackets, mitten/ gloves (IS 2573) , safety nose masks to all personnel (including temporary labour) involved in the worksites	Operation	2,00,000	AIWCL/DIWT
	Provision of First Aid Kits for worksites	Operation	30,000	AIWCL/DIWT
	Provision and maintenance of waste collection bins in sets of 2 (blue and green) for collection of municipal solid waste generated at the worksite including cost of material , labour, loading, unloading, lead, lift, shifting, transportation etc.	Operation	-	The cost is integrated as part of the civil work cost
	Terrestrial and Aquatic Fauna including surveillance audit and Dolphin Conservation Management Plan	Operation	10,00,000	The Manpower Cost is integrated into the cost of the Civil Works
	Subtotal (C)		1280000	
D	EMP Implementation cost			
	EMP Supervision Cost	Construction	9,00,000	AIWCL/DIWT Cost
	Sub Total (D)		9,00,000	
	Total (A+B+C+D+E)		5225000	
F	Contingency @ 5% of (A+B+C+D)		261250	
	Total (A+B+C+D+E+F)		5486258	

** Cost of conducting environment monitoring is calculated based on cost of per sample plus the no. of samples to be tested**

EMP Implementation Cost to AIWCL/DIWT

Rs.54,86250/-

8.6 BUDGET FOR SMP

The estimated costs for various activities for social management under the subproject is Rs.45 lakh it is given in **Table-8.6**.

Table 8.7: Estimated Cost for SMP

Item of SMP	Duration	Estimated costs (Rs.) lakh
<p>Training for contractor staff on labour laws such as:</p> <p>Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996;</p> <p>The Indian Factories Act, 1948 and State Rules;</p> <p>The Bonded Labour System (Abolition) Act, 1976;</p> <p>The Workmen's Compensation Act, 1923;</p> <p>The Contract Labour (Regulation & Abolition) Act, 1970 and Rules;</p> <p>The Child Labour (Prohibition and Regulation) Act, 1986;</p> <p>Public Liability and Insurance Act, 1991 etc.</p> <p>The new labour Act like The Code on Social Security, 2020 and The Code on Wages, 2019, etc.</p>	Actual, before and during the project implementation time	15.0
<p>Social safeguards training including training of staff on GRM, contractor's code of conduct, SEA/SH,</p> <p>GBV training (SEA, SH)</p>	Actual, before and during the project implementation time	15.0
<p>Environmental and Health and Safety Officer and Social Development Specialist hired by contractor, for on-site supervision</p>	Actual during the project implementation	15.0

Item of SMP	Duration	Estimated costs (Rs.) lakh
Total (Rs.)		45.0

There are 4 (four) vendors identified during Census Survey at Umananda terminal. The tentative provisions for these vendors will be Rs. 1.50 lakhs (**Table-8.7**).

Table 8.8: Budget for Rehabilitation and Resettlement

S. No.	Parameter	Cost (Rs. Lakh)
1.	Budget for Vendors	1.5

***Note:** Budget for Vendors will be done by AIWTDS

8.7 SAFETY PRACTICES DURING CONSTRUCTION PHASE

The Contractor is required to comply with all the precautions as far as possible for safety of the workers. The contractor will supply all necessary safety appliances such as masks, ear plugs, etc., to the workers and staff. The contractor shall comply with all regulation regarding, working platforms, excavations, trenches and safe means of entry and egress.

In order to guarantee construction safety, efficient lighting and safety signs shall be installed on temporary roads during construction and adequate traffic regulations shall be adopted and implemented for temporary roads. The key safety practices are given as below:

- Provide personal protective equipment to the labours.
- Ensure the labours are trained to work on the specific project.
- For untrained labour – training should be provided before permission to work on the site.
- The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the Engineer- In charge.
- Contractor shall follow all relevant provisions of the Factories Act, 1948 and the building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labour camp.
- Construction camps shall not be proposed within 1000m or sufficiently away from nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction.
- Safety and sanitation facility should be provided in the labour camp. Uncontaminated water shall be supplied to the construction workers at labour camps.
- The contractor shall arrange for a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone, Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital
- Always maintain a fully equipped first aid box in the construction camp.

Some of the safety sign boards to be displayed at construction site are as follows:



The code of practices to be adopted during the construction period are already given in the ESMP. The same code of practice is included as **Annexure- 19**. The contractor shall be responsible for implementing the management measures suggested for construction phase.

8.8 IMPLEMENTATION OF EMP &SPM

8.8.1 Constitution of Environmental & Social Management Cell

It is recommended that project authority to establish an Environmental & Social Management Cell (ESMC) at the project site with requisite manpower. The task of the Environmental and Social Management Cell will be to coordinate various environmental activities, to carry out environmental monitoring and to evaluate implementation of environmental enhancement measures for positive impacts and environmental mitigation measures for negative impacts.

The Environmental & Social Management Cell (ESMC) will report to the appropriate authority having adequate powers for effective implementation of the Environmental Management Plan (EMP) in various phases of project development. The Contractor shall also maintain Environmental & Social Management Cell (ESMC) at project level, which consist of Environment, Social & Safety officers and shall assist and report to concerned officers of ESMC of AIWTDS at project level.

The ESMC will closely monitor the environmental aspects of the proposed project and identify problems and accordingly, suggest certain measures to mitigate the same. In addition, it will also all the statutory requirements in the area of environmental protection.

The key task of the Environmental & Social Management Cell (ESMC) will be to coordinate specific studies to:

- Monitor implementation of Environmental Mitigatory measures
- Coordinate activities outlined as a part on Environmental Audit
- Coordinate Environmental Monitoring Programme
- Suggestion of additional measures/studies, if any.

The Environmental & Social Management Cell (ESMC) will report to the appropriate authority having adequate powers to implement the required measures. The manpower required for Environmental & Social Management Cell (ESMC) with qualification, experience and role & responsibility is given in **Table- 8.8**.

Table 8.9: Environmental & Social Management Cell (ESMC) Detail

Designation EMC	in Number	Qualification	Exposure/ Experience	Roles/Responsibilities
Environmental Expert	1	M.E./ M.Tech / M. Sc. (Environmental Science)	10 years of working Experience	Overall EMP Compliance and monitoring
Social Development Expert	1	Masters in social sciences	10 years of working Experience	Overall SMP Compliance and monitoring
Safety Officer	1	M.E./M.Tech / M. Sc. (Environmental Science) and diploma in Safety management	5 years of working Experience	Overall Safety Compliance and monitoring

8.8.2 Third Party Monitoring

AIWTDS will engage an independent consulting firm to conduct external and independent monitoring of the EMP & SMP implementation. The main purpose of the external monitoring will be to ensure that all the key entities including E&S Construction Supervisor, and contractors are effectively and adequately fulfilling their designated role for EMP & SMP implementation and that all the ESMP requirements are being implemented in a timely and effective manner. TPM shall carry out a periodic quarterly review of environmental and social safeguard activities being implemented in the project and provide specific recommendations to mitigate the issues identified during the review period as per the approved ESMP of contractor. Monitoring shall be on-going throughout the project life cycle and must be implemented to ensure that environmental & social impacts are within the predicted levels and that specified environmental & social performance targets are being achieved. Cost of hiring a third-party monitoring consultant shall be made from the Project side.

Chapter 9 - SUMMARY AND CONCLUSION

The state Government of Assam (GoA) has taken up a Project titled “Assam Inland Water Transport Project (AIWTP)” to improve the quality of inland water transport services and integrate high quality passenger and vehicle ferry services in river Brahmaputra. The World Bank is financing the GoA to achieve this objective. Assam Inland Water Transport Development Society (AIWTDS) has been formed by the GoA under Transport Department to implement the Assam Inland Water Transport Project (AIWTP) to modernize IWT in Assam. The development of National Waterway as a supplementary mode would enable diversion of traffic from over-congested roads and railways. This will ensure enormous gains in terms of economic growth, livelihood generation and prosperity, leading to political and social stability.

Currently, the facilities and infrastructure built at these terminals are not sufficient to meet the growing demand of traffic volume as they lack facilities for safety, berthing, parking, storage areas and other essential facilities such as toilets, drinking water, safety features etc. They usually consist of one pontoon with shore connection for embarking and debarking passenger and cargo.

Thus, there is an urgent need for improvement in passenger ferries and require upgradation of supporting infrastructure which is being planned through the Assam Inland Water Transport Project (AIWTP).

At Umananda, due to space constraints a floating pontoon and ramp connecting sloping access on the riverbank and the pontoon. This involves stepped concrete ramp which is mainly used for areas with inadequate land.

The landside and riverine infrastructure proposed for the ferry terminal are robust structures and provide floating but permanent boarding/de-boarding locations for the passengers and vehicles. The design will also ensure a greater sense of safety amongst the passengers, travelling through these vessels. The project is likely to occur impacts on quality of life, livelihood, social status, economy, terrestrial and aquatic ecology, air quality, water quality, noise levels etc. The anticipated impacts are both positive and negative but will be significant.

The Project would undertake land reclamation and is in a sensitive ecological habitat i.e., dolphins and other aquatic species. Further, the project activities e.g., piling required, would have impacts on this habitat. It is thus considered Category A for the environment. The social impacts are limited to 4 number of vendors so the project is considered as Category B.

ESIA studies were conducted for the site and stakeholders meeting were conducted at different stages of the ESIA study. Baseline conditions of the site were assessed and information on relevant environmental parameters were collected through primary and secondary sources in order to understand the present environmental setting of the proposed project site. Anticipating the quantum of change, efforts were also made to analyse the degree of alternations and strategies for suitable management to ameliorate the negative impacts project activities. This exercise has provided a sound basis for formulation of different management plans, which are presented in the ESMP document of the project. ESIA study of the proposed project was carried out and monitoring

plans have been framed based on the severity of impacts in different areas. The preventive/curative measures to reduce the ill effects of construction activities on these parameters have been suggested under various plans. A holistic approach has been adapted for monitoring of air, noise and water related factors under different heads with suitable financial provisions for their implementation. An important element of mitigation is emergency planning, i.e., recognizing that accidents are possible, assessing the consequences of such accidents and deciding on the emergency procedures, both on-site and offsite, that would need to be implemented in the event of an emergency both during construction and operation phase of the terminal.

A site-specific Environmental & Social Management Plan (ESMP) has been prepared for avoiding, mitigating, checking the adverse impacts envisaged during ESIA studies on various environmental components during construction and operational phase of the project with a budget for implementing the ESMP is kept. TSSC for the Project along with GC shall provide requisite support to AIWTDS and Contractor for implementing the ESMP. AIWTDS will engage an independent consulting firm to conduct external and independent monitoring of the ESMP implementation. The main purpose of the external monitoring will be to ensure that all the key entities including E&S Construction Supervisor, and contractors are effectively and adequately fulfilling their designated role for ESMP implementation and that all the ESMP requirements are being implemented in a timely and effective manner. Monitoring shall be on-going throughout the project life cycle and must be implemented to ensure that environmental & social impacts are within the predicted levels and that specified environmental & social performance targets are being achieved. Thus, it can be concluded that the proposed Assam Inland Water Transport Project project is likely to entail certain environmental and social impacts due to the proposed intervention at Umananda. However, these impacts can be ameliorated to a large extent by implementing appropriate mitigation measures with proper monitoring and reporting mechanism, these anticipated impacts shall be largely mitigated both during the construction and operation of the terminal.

Annexure - 1

Sewage Management & Details of Bio-Digester

1. Sewage Management

1.1 Reference Standards

CPHEEO:2013 - Manual on sewerage and sewage treatment

SP35:1987 - Handbook on water supply and drainage

NBC:2016 - National building code

CPCB/ SPCB/ MoUD guidelines

Guidelines on Bio-Tank for Indian Railways

1.2 Demand Estimation

Only flushing water has been considered for treatment; therefore, estimation has been picked from NBC 2016 norms. The sewage generation has been summarised in Table 1.1 below.

Table 1.1: Sewage Generation estimation

User Type	Average Daily Numbers	Sewage generated Per Day (lpcd)	Total sewage (lpcd)
Passenger	520	5	2600
Staff	23	20	460
Total Sewage (lpcd)		3060	
Total Sewage (kld)		3	
Capacity of treatment setup (KL)		4	

1.3 Treatment

The sewage treatment at the site has been recommended via a bio-digester tank. Provision for an STP has not been provided due to the limited availability of space, the high capital cost and difficult maintenance. A bio-digester tank is a better alternative to a septic tank as septic tanks are not adequate for elimination of pathogens and foul smell and also require periodical cleaning.

Defence Research & Development Establishment (DRDE) – an R&D organization of DRDO has developed a technology of bacterial inoculums for sewage treatment under diverse geo-climatic conditions. The zero- waste bio-digester technology breaks down human excreta completely into usable water and gas through anaerobic process. It does not have any geographical or temperature limitation and goes away with the need to set up large sewage tanks and regular sludge cleaning. Bio-digester tanks or Bio tanks are an excellent low-cost alternative.

Table 1.2: Advantages of Bio tank over Septic Tank

SEPTIC TANK	BIO TANK
Requires larger space, bigger volume	Requirement is 40 to 70% less.
Not efficient	Effluent is well treated and safe
Sludge needs periodic evacuation	No such needs
Obnoxious smell	No smell. Generation of odourless and inflammable biogas
Maintenance intensive	Only one time charging of Inoculums
Unhygienic disposal	No such requirement
Water requirement is high	Minimizes water consumption
Cost intensive	Cheaper in long run

A bio-tank of 4 KL occupying 4 sqm (2m X 2m) would be sufficient for the site. The sewage from the terminal building will be conveyed to the bio-tank from the inspection chamber. The effluent from the bio-tank will be connected to a reed bed, with at least 1:250 slope to achieve self-cleaning velocity. From the reed bed, the effluent will be further treated for discharge to river. All sewer pipes will be of HDPE DWC type with a nominal diameter of 150 mm. The outlet parameters of the bio-digester plus reed bed system will be as follows:

Table 1.3: Outlet Parameters of the Bio-digester

DETAILS	RANGE
pH	7.0-7.2
Turbidity (NTU)	2-5
TSS (mg/L)	50-80
TDS (mg/L)	100-300
VS (mg/100ml)	5-12
COD (mg/L)	15-25
BOD (mg/L)	2-4
Coliforms (MPN/ml)	0-12

The sludge from the Bio-digester tank will need to be removed and transported following all safety protocols. The responsibility of safe collection and transportation of the sludge will be with the municipal body, which deals with the collection and transportation and final disposal of sludge from septic tanks in the locality as well.

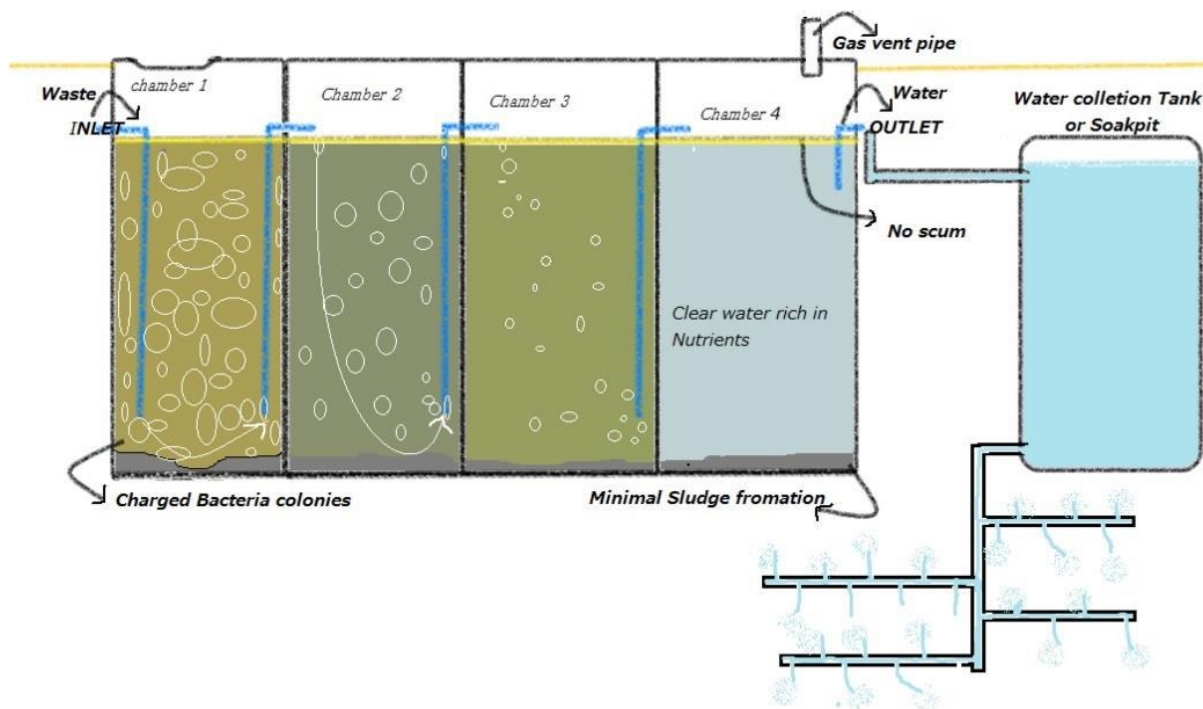


Figure 1.1: Schematic of biobank sourced from DRDO

The grey water from the terminal building gully trap will be connected to the biotin. However, an oil/grit separator will be used to intercept sediment and hydrocarbons before the grey water can be conveyed to the biobank. Soluble pollutants will pass through oil/grit separators.

The oil/grit separator will have two chambers. The greywater will enter the first chamber, which will contain a permanent pool of water and coarse sediment will be trapped by settling. The first chamber will also trap floating trash and debris, such as leaves. The runoff will be drawn from the lower part of the pool with an inverted pipe elbow to trap floating oils and hydrocarbons, which will eventually be discharged from to the second chamber. The second chamber will also contain a permanent pool of water for a second settling opportunity. Hydrocarbons which may have been adsorbed to sediment particles will be settled out in this chamber.

There are several proprietary oil/grit and oil/water separator devices available for the treatment or pre-treatment. Since the performance of oil/grit separators is dependent on the frequent removal of trapped sediments and floating products and should be cleaned out at least twice a year.

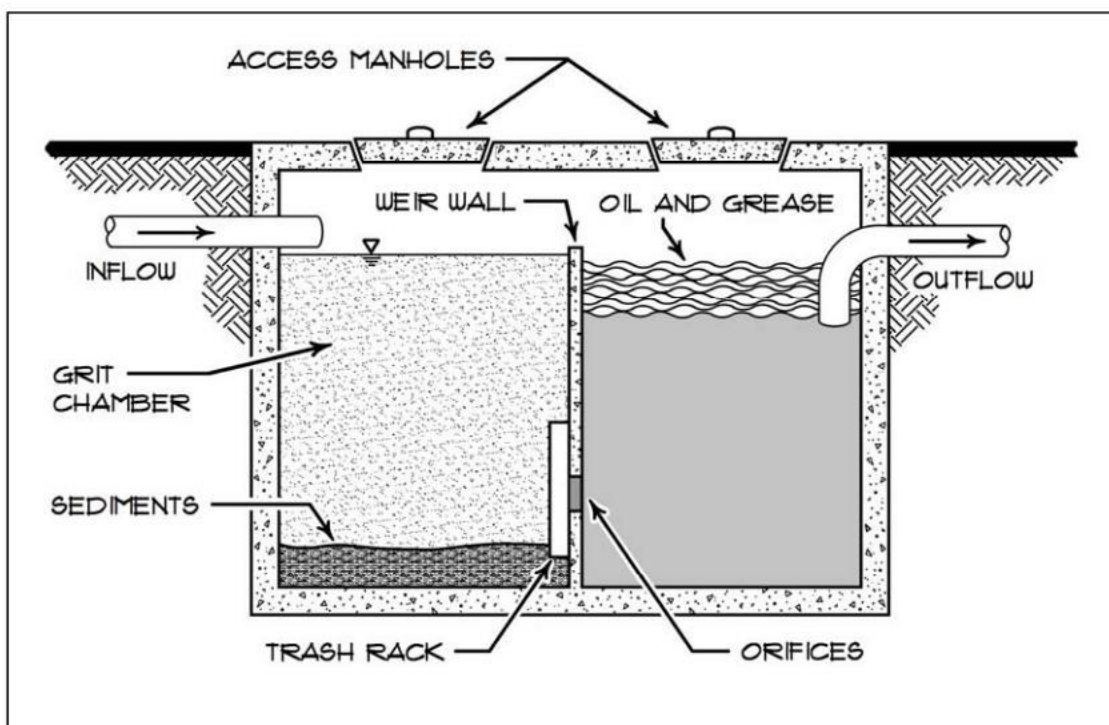


Figure 1.2: Schematic of Oil/Grit Separator

Annexure - 2

NOC from Director of Archaeology

**GOVERNMENT OF ASSAM
DIRECTORATE OF ARCHAEOLOGY, ASSAM,
AMBARI, GUWAHATI-01.**

NO.ARCH.410/2022-23/ 504

Dated Guwahati, the 24th August, 2022

From : Dr. Deepi Rekha Kouli
Director,
Directorate of Archaeology, Assam,
Ambari, Guwahati-1.

To : ✓ Sri Partha Pegu, ACS
Director,
Inland Water Transport and
Addl. State project Director,
AIWTD Society, Ulubari
Guwahati - 7.

Sub. : Regarding 'No Objection' for construction of passenger ferry terminal
at Umananda and North Guwahati.

Ref. : Letter No. AIWTDS/57/2019/121, Dated 26/07/2022.

Sir,

With reference to your subject cited above, I have the honour to inform you that the Directorate is pleased to allow the Assam Inland Water Transport Development Society to carry out the proposed work as mentioned in your letter under reference at the sites – near Umananda Temple and near Ashwaktanta Temple, without hampering the integrity and authenticity of the archaeological sites.

This is for the favour of your kind information only.

Yours faithfully,



Director,
Directorate of Archaeology, Assam,
Ambari, Guwahati-781001

Memo NO.ARCH.410/2022-23/ 504

Dated Guwahati, the 24th August, 2022

Copy for information to -

1. The Secretary to the Govt. of Assam, Indigenous and Tribal Faith and Culture Department,
Dispur, Guwahati – 6.

Director,
Directorate of Archaeology, Assam,
Ambari, Guwahati-781001.

Annexure – 3

Sample Format of FGD

Hiring of Safeguards Consultant for Environmental and Social Assessment Studies for Assam Inland Water Transport project, Phase-II

Socio-Economic Survey of the families in selected Project Villages

[illegible]

4a.	Family assets							
4b.	Land owned (area in Acres)							
4c.	Type of house	Pucca	Kutchha			Temporary		
4d.	Owner of the house/Tenant							
5a.	Whether a native /migrant to the village							
5b.	Do you have ration card?	Yes/No		BPL card /APL card				
5c.	Do you have Aadhar card?	Yes /No		Card No-				
5d.	Do you have voter's id?	Yes/ No						
6	Will the project impact the family property/assets	Yes /No		Details if impact				
6a	Immovable Properties impacted							
6b	House							
6c	Shop							
6d	Water-mills							
6e	Cattle-shed							
6f	Wells							
6g	Ponds							
6h	Any other							
6 i	Estimated cost of loss (Rs)							
7	Livestock Population	Buffalo	Ox	Goat	Sheep	Horse	Mule	Cow
7a.	Number of possession							
8	Health Status							
8a	Is there any chronic patients in the family	Yes / No						
8b.	Nature of illness							
8c	Treatment facilities (within the village/ distant place?)							
9	Project information							
9a	Are you aware of the project	Yes	No					
9b	How will the project impact you	Positive/negative/neutral						

12	Give reasons for the said impact	
	1.	
	2.	
	3.	

Surveyor's Name and signature:

Signature of the Respondent:

Date of survey:

Part (B) in addition to the above, following information required in case of Land acquisition

1	Loss of Land and other properties	1. Land 2. Residence/House 3. Land+House 4.Shop 5.other (specify)
2	Total Land Owned by Family before land acquisition	
3	Total Land acquired for the project	
4	Total Cost of Land	
4a	Ownership of land	
4b	Any Government land encroached? or in possession(details)	
5	Kinds and quantity of Crops Grown	1. Paddy_____Maize_____ 2. Bajra_____Jowar_____ 3. Fruits_____Vegetables_____ Others (Specify)_____
6	Details any yielding trees lost	
7	Type of House	1. Kutcha house (Mud/Grass Roof) 4. Semi- Pucca (Concrete + Tin sheet) 5. Pucca(RCC)
8	Total Area of the house	
9	Expected cost of construction of such a house	
10	Other non-movable assets in the land	Dug well/ bore well/cattle shed/motor shed/pond/ others
11	Loss of Livelihood due to the project (details)	
11a	Alternate choice to restore livelihood	
12	Any Common Property resources lost?(grazing land/playground/market/ cremation ground etc) Provide details	
12 a	Is there any other impact other than the above? Provide details	

**Hiring of Safeguards Consultant for Environmental and Social Assessment Studies for Assam
Inland Water Transport project, Phase-II**

Village information / community consultations in selected PIA villages

I	Basic Information			
a.	Name of the study village			
b.	Name of the Gram Panchayat			
c.	Number of villages in Gram Panchayat			
d.	Number of habitations in the village			
e.	District			
f.	Name of village head			
g.	Sex			
h.	Contact details			
i.	Total Population of the study village			
j.	Male			
k.	Female			
l.	SC Population			
m.	ST Population			
n.	No. of BPL cardholders			
II	Details of existing Infrastructure facilities in the village			
	Socio Economic Infrastructure	No of units	Details	If 'No' Nearest Place
a	Anganwadi centres			
b	Primary Schools			
c	Middle Schools			
d	High Schools			
e	Colleges			
f	Professional colleges			
g	Post Office			
h	Police Station			
i	Ration Shops			
j	Banks			
k	Co-operative Societies			
l	PHC/CHC			
m	Private clinic/hospital			
n	Major Government offices			
o	Mobile clinics			
p	Ambulance			
q	Bus service			
r	Markets			
s	Veterinary Hospitals			
t	Cremation grounds			
u	Play grounds/stadium			
v	Drinking water facilities and coverage (%)			
w	Sanitation facilities and coverage			
x	Are there any unique Cultural/tourism centres in the village?			
y	Number of religious centres Temples/mosques/churches/ guru dwaras/ashrams etc			

III	Livelihood status of the villagers		
a	Major livelihoods of the people in the community(list)	1) Agriculture, 2) Horticulture 3) Livestock 4) Fisheries 5) Traditional works 6) Household business 7) Forest produce collection	
b	Details of traditional craft workers in the village		
c	Major agricultural /Horticultural products of the village?		
d	Where do you market your products?		
e	List out details of factories /industries in the village?		
f	How many private boats and ferry men operate from the village?		
IV	Project information		
a	Are you aware of this Inland Water Transport project?	Yes /No	
b	What will be the impact in your village?		
c	What are your suggestions for this project?		
d	Is there any land acquisition in your village proposed, for the purpose of this project?		

Name/Signature of village head

Signature of Data Collector

Date of consultation:

Hiring of Safeguards Consultant for Environmental and Social Assessment Studies for Assam Inland Water Transport project, Phase-II

Key Informant interview with the Ferry operators

1	Village Name	
2	Jetty Name	
3	River	
4	Date of interview	
5	No of Stakeholders Present (attach attendance sheet)	

S No.	Points Discussed	Outcomes
1.	How many boats currently operates through this jetty	
2.	Time of boats services	
3.	Daily Passengers Number	
4.	Main category of passengers (Workers, Traders, Students etc)	
5.	Highest number of crowd on jetty/time	
6.	Facilities on Boat Jetty	
7.	Major routes / area where people travel from this jetty	
8.	Fares and time required for water transport and road transport	
9.	Alternative Route to travel from one bank to another	
10.	Access Road to the jetty	
11.	Public Demand in terms of <ul style="list-style-type: none"> • Infrastructure Facilities • Better service • No of services and timing • Capacity development of staff • Safety conditions and precautions • List other ,if any 	
12.	General trend in river course changes and its impacts on public transport	
13.	Problems faced by passengers during monsoon season	
14.	Any accidents reported and reasons thereof	
15.	Overall observations	

**Hiring of Safeguards Consultant for Environmental and Social Assessment Studies for Assam
Inland Water Transport project, Phase-II**

Gender issues

Focus Group Discussions/PRA Mapping exercise

1	Name of village	
2	Ghat/landing center	
3	Date of FGD	
4	No of participants(attach attendance sheet)	
5	Time management –How do women of the village spend their time (PRA mapping and list out below)?	
6	Educational background of the women in the group and employment status. Map this analysing the reasons for their educational backwardness and low work participation rate, if any, and list out below?	
7	List out the major issues of the women in the village?	
8	Is there any gender violence reported in the area? Yes/ no	
	a. How many women and girls are victims of such violence?	
	b. What are the root causes of violence against women and girls?	
	c. What interventions were there to help them?	
9	Is there any local NGOs working on Gender Based Violence? Details	
	<p>Name and signature of the PRA team</p>	

Indigenous groups

PRA Mapping exercise/ Focus Group Discussions

1	Name of village	
2	Ghat/landing center	
3	Date of FGD	
4	No of participants(attach attendance sheet)	
5	List of indigenous people in the village	
6	Map the special issues pertinent to indigenous people/groups in the village.	
7	List out the special rights protections (if any) applicable and enjoyed by these groups.	
8	List out the special requirements of indigenous people or inclusion with reference to that village/hamlet.	
9	List out the perception of Indigenous people about the river and the project and their suggestions for inclusion.	

**Hiring of Safeguards Consultant for Environmental and Social Assessment Studies for Assam
Inland Water Transport project, Phase-II**

Format for Focus group discussions

(Village level)

1.	Name of village		
a	Category of Respondents		
b	Number of participants/male/female		
c	Venue of the meet		
2.	List out the Existing facilities and limitations of the Inland water transport programme in the village		
3.	What are the major suggestions for improvement		
4.	Description of the focus group in general		

**Hiring of Safeguards Consultant for Environmental and Social Assessment Studies for Assam
Inland Water Transport project, Phase-II**

Participants List

DATE:

PLACE:

[illegible]

Annexure – 4

Institutional Stakeholders Consultation Meeting Details

ANNXURE-II

Institutional Stakeholders Consultation Meeting

Meeting-1

Consultation Meeting No.	Date	No. of Stakeholders Attended
1	07.05.2022	42
Venue	Conference Hall, Hotel Lily, Guwahati	
Details of The Discussion		
Brief Introduction of the discussion: The meeting was inaugurated By Mr. Ankur Jain (IPS), State Project Director AIWTDS in presence of Sri Partha Pegu (ACS), Director IWT & ASPD, AIWTDS and Sri Rahul Chandra Das, ACS Deputy State Project Director, AIWTDS. Mr. Nabin Sarma (SDE, AIWTDS) was compering the activities. The meeting started with brief introduction about AIWTDS project, ESIA study and objectives of stakeholder’s consultation meeting. On behalf of project proponent WAPCOS Limited, Consultant for ESIA study led the consultation meeting. Mr. P D Karkhanis (General Manager, WAPCOS) made a detailed presentation on the works awarded to WAPCOS, activities performed till date by WAPCOS and importance of stakeholder’s consultation meeting under this project. Mr. Rahul Chandra Das, ACS Deputy State Project Director, AIWTDS presented vote of thanks to all stakeholders who has spared time from their busy schedule to attend the meeting and shared their experiences for better outcome of the activities awarded to WAPCOS as well as from the overall project. Discussion by stakeholders on various points were also discussed during the consultation meeting which are summarized as below:		
Name & Designation of Stakeholder	Issue Raised during Interaction	Remark (reply By Project Proponent)
Professor P C Bhattacharya (Retd.)	Management and practice to be followed for situations as: <ul style="list-style-type: none">Fluctuations in water levels of the river Brahmaputra due to climate change.Safety and carriage capacity of passenger livestock & vehicles in emergency situation.Provision for EV charging, PA address system and collaboration with ASDM for operation and management of terminals.	<ul style="list-style-type: none">River characteristics and weather conditions will be taken into account while designing the terminals.Well planned terminals that would cater number of passengers and livestock in emergency would be the priority.
Mr Mridul Buragohain (A.E.E) MoRTH	<ul style="list-style-type: none">Two (02) number bridges are proposed in the vicinity of the project and taken into consideration to avoid any conflicts of interest?	<ul style="list-style-type: none">It was assured that the upcoming bridges and the proposed terminals will not affect each other.
	<ul style="list-style-type: none">River development program under smart city project between Kachari Ghat and DC bungalow having a length of	<ul style="list-style-type: none">AIWTDS assured that the matter will be looked into before finalizing the design.

	15m height 51.5m from road level may come into conflict with the proposed terminal location at Uzan Bazar.	
Dr. Dipendra Singh (Environmental Expert) PWRD	<ul style="list-style-type: none"> What will be the length of the stairs from terminal platform to pontoons? 	<ul style="list-style-type: none"> The length of the stairs will vary as per location.
Mr Mridul K Das (Executive Engineer) Pollution Control Board	<ul style="list-style-type: none"> In case of air pollution dust collector, ESP etc. and for water pollution ETP or STP with five stages Physical treatment, Biological treatment, Chemical treatment, Filtration and Sludge management must be included? 	<ul style="list-style-type: none"> It was clarified that appropriate measures will be taken to control any kind of pollution.
Mr P K Das (Member AIWTDS)	<ul style="list-style-type: none"> Consultation meetings, surveys etc. shall be done in coordination and involvement of respective administration and prominent stakeholders. 	<ul style="list-style-type: none"> Suggestions will be followed.
Dr Abhinandan Saikia (TISS Guwahati)	<ul style="list-style-type: none"> Raised the issue of sustainable development and methodology to be used in Dolphin study? Suggestion for reducing carbon footprint futuristic vessels on alternate fuels like solar, electricity and hybrid should be explored. 	<ul style="list-style-type: none"> It was clarified that Government of Assam and World Bank policies would be followed for development activities and Zoological Survey of India (ZSI) has been involved for Dolphin study.
Representative from local NGO	<ul style="list-style-type: none"> Compensation for land acquisition and livelihood 	<ul style="list-style-type: none"> Impacts if any occurred will be treated as per project norms.
Mr Nabin Sarma, Social Development Expert, AIWTDS	<ul style="list-style-type: none"> Approach about the labour influx and gender based inequality & violence during construction phase? 	<ul style="list-style-type: none"> The issue would be taken on priority and every possible measures/ policies will be practiced, once the design details gets finalized by DPR consultant.

Meeting-2

The stakeholders consultation for Modular Terminals on Detailed Project Report (DPR) and Environmental and Social Impact assessment Report (ESIA) for the proposed terminals at North Guwahati and Umananda Ghat was organized at the conference hall, AIWTDS on 06.02.2023 under the Chairmanship of Shri Ankur Jain (IPS), State Project Director, AIWTDS and Commodore Shri K.C.Choudhury, Honorary Advisor, AIWTDS and in presence of officials of Royal Haskoning, Design DPR Consultant, WAPCOS Ltd. Safeguard Consultant, Environment and Social safeguard Assessment studies for Modular Terminals, AIWTDS and invitees from line departments, PWD-EAP, ASDMA, APART, APGCL etc.

Consultation Meeting No.	Date	No. of Stakeholders Attended
1	06.02.2023	22
Venue	Conference Hall, AIWTDS, Guwahati	
Details of The Discussion		
Brief Introduction of the discussion: <p>The meeting started with a welcome note by Commodore Sri K.C. Choudhury, Honorary Advisor, Assam Inland Water Transport Development Society welcoming all the participants in the Stakeholder's meet. He apprised the members that the main purpose of the stakeholder consultation is to identify the views of local communities, relevant institutional and other stakeholders on the project which facilitates identification of any environmental, social components for which mitigation measures may be undertaken to minimize any adverse impacts both during the construction and operation phase of the Project.</p> <p>An overview of all the components of the project was briefed in details by Commodore K.C. Choudhury, to all the participants. He invited for suggestions from everyone present in the meeting citing the fact that the feedback plays an important part in finalizing the DPR as well as the Environment and Social Impact assessment studies. He highlighted that the upcoming terminals will cater to the requirements of passengers of all age, genders and differently-abled. He also suggested that a small office for quick communication with the jetty be considered so that the office can act as a first point of contact in case of any untoward incidents.</p> <p>In further continuation to this Mr. P.D. Karkhanis, General Manager, WAPCOS apprised the meeting that, along with the technical aspects of the DPR, the Social & Environmental aspects are also studied. He gave a detailed presentation on the Social and Environmental aspects of the project for the proposed terminals at North Guwahati and Umananda Ghats. He apprised that the current meeting is a part of stakeholders consultation to be held at draft ESIA stage for dissemination of information on project and its key impact and proposed mitigation measures.</p> <p>Mr. Karkhanis further apprised the participants that the design for both the terminals is environment friendly with no dredging involved. He stated that anticipated impacts of construction as well as operation phase is studied and proper mitigation measures are planned. During the construction phase, labour camps with proper water arrangement facility, sanitation facilities should there, health and safety preventive medical care should be provided. He further emphasized that both the sites being a known habitat for dolphins had been carried out by Zoological Survey of India (ZSI). The findings of the study are now a part of the ESIA.</p> <p>Discussion by stakeholders on various points were also discussed during the consultation meeting which are summarized as below:</p>		
Name & Designation of Stakeholder	Issue Raised during Interaction	Remark (reply By Project Proponent)
Mr. N. Bhattacharjee Member Umananda Devalaya	<ul style="list-style-type: none">• Need of a “Snaan Ghat” which will allow them to complete a few rituals quite comfortably.• Need of toilets and drinking water facility as well as proper lighting at the ghat and temple premises.• They do have facilities for drinking water and toilets but most of the time they struggle to provide water also incurring huge expenses in	AIWTDS officials stated that the points are noted and taken into consideration in the DPR.

	<p>diesel genset just for pumping water.</p> <ul style="list-style-type: none"> • Since there is no electricity they are unable to supply water to the toilets or keep the area illuminated. • Requested for a permanent place to store their water pump in the terminal building which is currently left out in the open. • Concrete posts to tie the pontoon at ghat 	
Dr Pradip Kumar Sarmah, Advisor, Aswaklanta Devalaya, North Guwahati	<ul style="list-style-type: none"> • Dr Sarmah, welcomed the project and stated that this is very important project and suggested that the approach road should be considered along with proper illumination of the Ghat. • He further suggested that there should be signage and displays for real time information on ferry timings, cancellation if any, weather etc. • He also suggested that like earlier times, the ghat may be renamed as Aswaklanta Ghat. 	
Miss Mandira Buragohain, Project officer, ASDMA	<ul style="list-style-type: none"> • During the monsoon/ flood period, high flood level marking in DPR before construction should be considered • Ecosystem of river should be thoroughly studied • Provision for Disaster Management Room for storing of emergency rescue equipment • Training of local youths under Aapda Mitra 	
Mr. Laksheswar Sarma, President Aswaklanta Devalaya	<ul style="list-style-type: none"> • Appreciated the Aapda Mitra training for the local youths and suggested to avail such trainings 	
Mr. Subhram Goswamai Senior Consultant, PWC (APART Project)	<ul style="list-style-type: none"> • Provision for transport of agriculture and allied products at reduced freight charges 	

Shri Ankur Jain, (IPS) State Project Director, AIWTDS	<ul style="list-style-type: none"> • Water tank to be constructed at the Umananda temple premises so that water can be supplied at terminal through gravity flow 	
Commodore K.C.Choudhury, Honorary advisor, AIWTDS	<ul style="list-style-type: none"> • Battery operated vehicle facility especially for senior citizen and disabled to reach pontoon • Provision for Harbour master control room • Incorporation of VVIP room 	

Meeting-3

The stakeholders consultation for Modular Terminals on Detailed Project Report (DPR) and Environmental and Social Impact assessment Report (ESIA) at Aphalamukh- IWT Ghat, Majuli for the proposed terminals at Neamti and Aphalamukh Ghat was organized on 08.02.2023 under the Chairmanship of Commodore Shri K.C.Choudhury, Honorary Advisor, AIWTDS and in presence of Sri Kartik Kalita, (ACS) Additional Deputy Commissioner, Majuli District and other officials of Inland Water transport and AIWTDS, Panchayat, Water Resources, Forest Department, APGCL and local villagers.

Consultation Meeting No.	Date	No. of Stakeholders Attended
1	08.02.2023	43
Venue	IWT Ghat, Aphalamukh, Majuli	
Details of The Discussion		
Brief Introduction of the discussion:		
<p>The meeting started with a welcome note by Commodore Sri K.C. Choudhury, Honorary Advisor, Assam Inland Water Transport Development Society welcoming all the participants in the Stakeholder's meet.</p> <p>Commodore K.C. Choudhury, Honorary Advisor, AIWTD Society at the very onset, gave an overview of all the Project components that aims to transform the quality of inland water transport services and integrate high quality passenger and vehicle ferry services into Assam's wider transport network. He apprised the participants that modular terminals are being proposed to be developed at Aphalamukh and Neamati Ghats along with the facilities for night navigation. He explained that the meeting is a part of the final stage of discussions with stakeholders for finalizing the design DPR of the terminals and sharing the findings of the environment and social safeguard assessment studies.</p> <p>This was followed by a power point presentation by Sri Dipankar Das, Project Manager (Technical) of the AIWTD Society on the various issues pertaining to the Technical aspects of the project and how they have been taken care of as per the World Bank guidelines and the various findings of the studies related to Environment and Social Impact Assessment of the project which has been considered in the design of the proposed terminals at Neamati and Aphalamukh.</p> <p>Mr. Karkhanis further apprised the participants that the design for both the terminals is environment friendly with no dredging involved. He stated that anticipated impacts of construction as well as operation phase is studied and proper mitigation measures are planned. During the construction phase, labour camps with proper water arrangement facility, sanitation facilities should there, health and safety preventive medical care should be provided. He further emphasized that both the sites being a known habitat for dolphins had been carried out by Zoological Survey of India (ZSI). The findings of the study are now a part of the ESIA.</p>		

Discussion by stakeholders on various points were also discussed during the consultation meeting which are summarized as below:

Name & Designation of Stakeholder	Issue Raised during Interaction	Remark (reply By Project Proponent)
Harendra Borah (Local villager)	He enquired about the job, and possibility of the project initiation.	In response to this, Sri Dipankar Das, Project Manager (Technical), AIWTDS apprised that for the development of terminal works, local contractors will be hired which will in turn engage the local people of those areas.
Jibeswar Hazarika (Local villager)	The Land issue topic was raised by one of the locals who informed that there are instances where the same land belongs to the villagers and then listed as a Govt. Property also.	In this regard, Sri Kartik Kalita, ACS, Addl. Deputy Commissioner, Majuli District informed that there will be proper verification of the land records where a Circle Officer will be sent to check and resolve the issue.
Rita Kalita (Local villager)	One of the female participant requested for job and asked about the employment prospect for women.	In response to this, it was apprised that Self Help Groups will be created for the development of women empowerment.
Sri Kartik Kalita, ACS, Additional. Deputy Commissioner, Majuli District	He raised the concern about the basic amenities that are missing like toilets, waiting area, parking facilities etc and also the communication problem at Aphalamukh Ghat. Proper approach road towards the terminals to be constructed as during floods and rainy season roads become dilapidated making it difficult for users.	In this regard, Sri Dipankar Das, Project Manager (Technical), AIWTD Society apprised that all these facilities will be provided and taken care of during the upcoming terminal port construction works at the Ghats.

Invitation Letter for Stakeholder Meeting (07.05.2022) Guwahati



অসম আভ্যন্তৰীণ জল পৰিবহন উন্নয়ন সমিতি
(অসম চৰকাৰৰ পৰিবহন বিভাগৰ অধীনস্থ স্বতন্ত্ৰ সংস্থা)

Assam Inland Water Transport Development Society

(An Autonomous Body under the Transport Department, Government of Assam)

3rd floor, Directorate of Inland Water Transport, Ulubari, Guwahati - 7::email: dir.iwtds-as@gov.in::Tel:+91361-2462677

No: AIWTDS/266/2021/195

Dated:

To,

**The Chief Engineer
PWD –EAP, Assam
Guwahati**

Subject: Stakeholder Meeting for proposed Construction of Modular Terminals, Slipways and CTC under AIWT Project, Transport Department, GoA

Sir/Madam

With reference to the subject cited above, I wish to inform you that Assam Inland Water Transport Development Society, an apex autonomous body under Transport Department, Govt. of Assam has initiated AIWT Project with financial assistance from the World Bank for transforming the quality of inland water transport services and integrate high quality passenger and vehicle ferry services into Assam's wider transport network.

M/S WAPCOS Ltd. an accredited public sector enterprise under the aegis of the Union Ministry of Jal Shakti, has been engaged as consultant for conducting Environment and Social Impact Assessment (ESIA) and CIA study for the aforesaid interventions of the Project. The Consultant has already conducted field visits to all the proposed locations and have submitted their inception report where they have suggested a stakeholders meet for better understanding and co-ordination. In this regard, AIWTD Society in association with M/S WAPCOS Ltd is organising the Stakeholder meeting for the better understanding of the environmental impacts due to the proposed interventions as well as other projects in the vicinity of AIWT project locations viz. Construction of Ferry Terminal & Riverine Infrastructure at Guwahati Gateway Ghat (GGG), South Guwahati and Modular Terminals at North Guwahati, Umananda, Uzan Bazar, Kurua, Goalpara, Bahari (Barpeta) Gujjan (Tinsukia), Disangmukh (Sivsagar), Ghagor (Lakhimpur), Matmora (Lakhimpur), Kacharighat (Dhubri), Aphalamukh (Majuli) and Neamati (Jorhat), two Slipways at Dikhowmukh (Sivsagar) and Dhubri along with setting up of Crew Training Centre (CTC) near the Pandu Port.

Accordingly, you are requested to attend the meeting as per the schedule. Please find enclosed the draft Agenda, Questionnaire for your reference and needful action.

Venue of the Meeting: Hotel Lily, Khanapara

Time: 10:30 AM onwards

Enclosed: Note on Assam IWT Project

Thank you

Yours faithfully

Sri. Ankur Jain, IPS
State Project Director
AIWTD Society

Meeting Schedule

**STAKEHOLDER CONSULTATION OF
ASSAM INLAND WATER TRANSPORT PROJECT ON
ENVIRONMENTAL AND SOCIAL SAFEGUARDS STUDIES AND CUMULATIVE
IMPACT ASSESSMENT (CIA) STUDIES**

SATURDAY, MAY 07, 2022

HOTEL LILY
G S ROAD, KHANAPARA, GUWAHATI, ASSAM 781022

10.30 – 11.00 am	Registration	
11.00 am	Inaugural Address	Sri. Ankur Jain, IPS State Project Director, Assam Inland Water Transport Development Society (AIWTDS)
11.15 am	Welcome Note Background to the Assam Inland Waterways Transport Project and Workshop Objective	Sri. Partha Pegu, ACS Director, IWT & ASPD, AIWTDS
11.30 -12.00 noon	Participants Introduction	
12:00 - 12:30 pm	Overview of the Environment and Social and CIA Study Objectives, Methodology and Results	WAPCOS Ltd.
12.30 - 1.00 pm	DPR Presentation on smaller terminals	Royal Haskoning DHV Consulting Pvt. Ltd
1.00 – 1.30 pm	Question and Answers/ Queries/ Group Discussion	WAPCOS/ Royal Haskoning
2.00 pm	Vote of thanks	Sri. Rahul Ch. Das, ACS Dy. State Project Director, AIWTD Society
2.15 pm	Lunch	

Advertisement of Stakeholder Consultation (06.02.2023 & 08.02.2023)

10 THE ASSAM TRIBUNE, GUWAHATI



ASSAM INLAND WATER TRANSPORT DEVELOPMENT SOCIETY

O/O: THE DIRECTORATE OF INLAND WATER TRANSPORT, ULUBARI: GUWAHATI - 781007

INVITATION FOR WORKSHOP

The Transport Department of the Government of Assam has embarked on transforming the quality of Inland Water Transport services and integrate high quality passenger and vehicle ferry services into Assam's wider transport network with the World Bank financed Assam Inland Water Transport Project (AIWTP) which is being implemented by Assam Inland Water Transport Development Society. AIWTD Society has now engaged M/s. WAPCOS Ltd. (A Govt. of India Enterprise under the Ministry of Jal Shakti) to prepare the Environment and Social Impact Assessment (EIA/SIA) for the Construction of Modular Ferry Terminals at North Guwahati, Umananda, Aphalamukh and Neamati. Environment and Social Impact Assessment (EIA/SIA), Environment and Social Management Plans (EMP & SMP) and Cumulative Impact Assessment (CIA) Report has been prepared and reports are now publicly disclosed in the official website of AIWTD Society at www.aiwtdsociety.in.

A consultation workshop with stakeholders will be organised for integrating valuable suggestions and opinions on these published reports from different stakeholders. All stakeholders are requested kindly to make it convenient to attend the workshop to be held as per date, time and venue as mentioned below:

Date	Time	Venue
06.02.2023 (Monday)	11.00 am	AIWTD Society Office O/o. Directorate of Inland Water Transport, 3 rd Floor, Ulubari, Guwahati - 781007
08.02.2023 (Wednesday)	11.00 am	Aphalamukh IWT Ferry Ghat, Majuli District

Sd/-

State Project Director
Assam Inland Water Transport Development Society
Guwahati - 781007



ASSAM INLAND WATER TRANSPORT DEVELOPMENT SOCIETY

O/O: THE DIRECTORATE OF INLAND WATER TRANSPORT, ULUBARI: GUWAHATI - 781007

INVITATION FOR WORKSHOP

The Transport Department of the Government of Assam has embarked on transforming the quality of Inland Water Transport services and integrate high quality passenger and vehicle ferry services into Assam's wider transport network with the World Bank financed Assam Inland Water Transport Project (AIWTP) which is being implemented by Assam Inland Water Transport Development Society. AIWTD Society has now engaged M/s. WAPCOS Ltd. (A Govt. of India Enterprise under the Ministry of Jal Shakti) to prepare the Environment and Social Impact Assessment (EIA/SIA) for the Construction of Modular Ferry Terminals at North Guwahati, Umananda, Aphalamukh and Neamati. Environment and Social Impact Assessment (EIA/SIA), Environment and Social Management Plans (EMP & SMP) and Cumulative Impact Assessment (CIA) Report has been prepared and reports are now publicly disclosed in the official website of AIWTD Society at www.aiwtdsociety.in.

A consultation workshop with stakeholders will be organised for integrating valuable suggestions and opinions on these published reports from different stakeholders. All stakeholders are requested kindly to make it convenient to attend the workshop to be held as per date, time and venue as mentioned below:

Date	Time	Venue
06.02.2023 (Monday)	11.00 am	AIWTD Society Office O/o. Directorate of Inland Water Transport, 3rd Floor, Ulubari, Guwahati - 781007
08.02.2023 (Wednesday)	11.00 am	Aphalamukh IWT Ferry Ghat, Majuli District

Sd/- State Project Director

Assam Inland Water Transport Development Society
Ulubari, Guwahati - 781007

Janasanyog/DF/2115/22

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Meeting Schedule

**STAKEHOLDER CONSULTATION OF
ASSAM INLAND WATER TRANSPORT PROJECT ON
ENVIRONMENTAL AND SOCIAL SAFEGUARDS STUDIES AND CUMULATIVE
IMPACT ASSESSMENT (CIA) STUDIES AND DETAIL PROJECT REPORT (DPR)
FOR MODULER TERMINALS**

MONDAY, FEBRUARY 06, 2023

CONFERENCE HALL, AIWTD SOCIETY, ULUBARI, GUWAHATI, ASSAM 781007

10.30 – 11.00 am	Registration	
11.00 am	Inaugural Address	Comm. K C Choudhury, Hon. Advisor, Assam Inland Water Transport Development Society (AIWTDS)
11.10 am	Welcome Note Background to the Assam Inland Waterways Transport Project and Workshop Objective	Sri. Partha Pegu, ACS Director, IWT & ASPD, AIWTDS
11.15 - 11.30 am	Participant Introductions	
11.30 - 11.45 am	DPR Presentation on smaller terminals	Royal Haskoning DHV Consulting Pvt. Ltd
11.45 - 12.00 noon	Overview of the Environment and Social and CIA Study Objectives, Methodology and Results	WAPCOS Ltd.
12.00 – 12.15 pm	Question and Answers/ Queries/ Group Discussion	WAPCOS/ Royal Haskoning
12.30 pm	Vote of thanks	AIWTD Society
12.45 pm	Lunch	

Annexure - 5

Photographs of Stakeholders Consultation

Photographs of Stakeholders Consultation

North Guwahati and Umananda (06.02.2023)



Institutional Stakeholders Consultation at Guwahati (07.05.2022)





PHOTOGRAPHS FGDs AND SITE CONDITIONS

UMANANDA



Interaction with vendor selling drinking water

Approach road to Umananda ferry terminal from Uzan Bazar side



Interaction with commuters and devotees

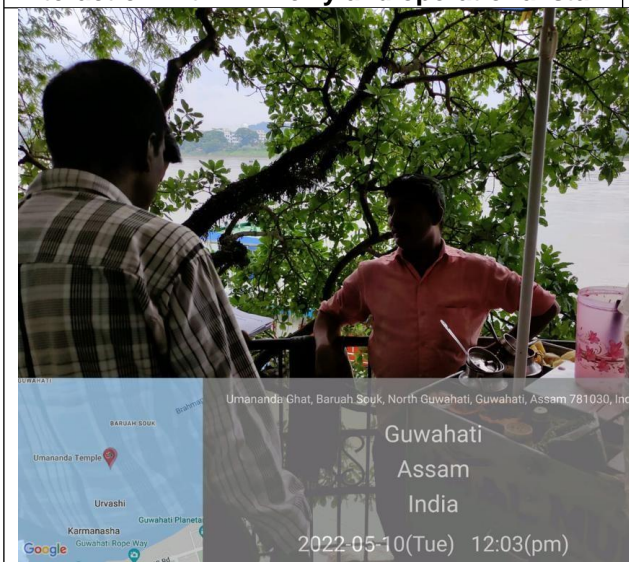
Existing pontoon at Umananda terminal



Interaction with IWT ferry and operational staff



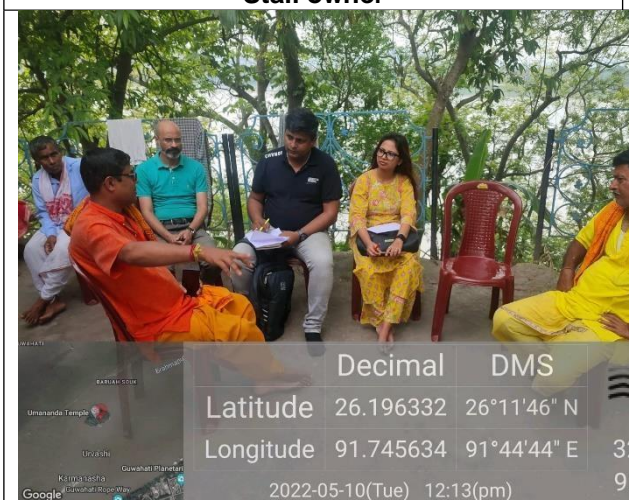
Stall owner



Stall owner



Woman stall owner



Interaction with temple committee members



Existing entrance at Umananda Ghat

Annexure - 6

Environmental Monitoring Report- Soil



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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Analysis	SS-260422-37	26-04-2022

Issued To: M/s Wapcos Limited (A Government of India Undertaking- Ministry of Jal Shakti)
76- C, Institutional Area, Sector- 18, Gurugram- 122015 (Haryana) India

SAMPLING & ANALYSIS DATA

Sample Received On : 30.03.2022
Project Name : Assam Inland water Transport Project, Phase II
Sample Description : Soil Sample collected from SU1
Sample Quantity : 2.0 Kg
Analysis Duration : 30.03.2022 to 25.04.2022

TEST RESULTS

S. No.	PARAMETERS	TEST METHOD	RESULT	UNIT
1.	pH (1:5 suspension)	IS:2720(Part-26)	7.87	-
2.	Electrical Conductivity @25°C (1:1suspension.)	IS:2720(Part-21)	475	µS/cm
3.	Calcium (as Ca)	STP/SOIL	1953	mg/kg
4.	Magnesium (as Mg)	STP/SOIL	401	mg/kg
5.	Sodium (as Na)	STP/SOIL	203	mg/kg
6.	Available Potassium (as K)	STP/SOIL	286	mg/kg
7.	Salinity @25°C (1:1suspension.)	STP/SOIL	307	µS/cm
8.	Organic Matter	STP/SOIL	1.32	% by mass
9.	Sodium Absorption Ratio	STP/SOIL	1.19	-
10.	Nitrogen	STP/SOIL	0.10	% by mass
11.	Available Phosphorus (as P ₂ O ₅)	STP/SOIL	85	mg/kg
12.	Bulk Density	STP/SOIL	1.19	gm /cc
13.	Organic Carbon	STP/SOIL	0.77	% by mass
14.	Particle Size Distribution			
	a. Sand	STP/SOIL	58.8	% by mass
	b. Clay	STP/SOIL	21.6	% by mass
	c. Silt	STP/SOIL	19.6	% by mass
15.	Exchangeable Sodium Percentage	STP/SOIL	5.14	% by mass

Notes: -

- The results given above are related to the tested sample, as received & mentioned parameters. The customer asked for the above tests only.
- Responsibility of the Laboratory is limited to the invoiced amount only.
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- This test report will not be used for any publicity/legal purpose.
- The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer.

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Authorized Signatory

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Analysis	SS-260422-38	26-04-2022

Issued To: M/s Wapcos Limited (A Government of India Undertaking- Ministry of Jal Shakti)
76- C, Institutional Area, Sector- 18, Gurugram- 122015 (Haryana) India

SAMPLING & ANALYSIS DATA

Sample Received On : 30.03.2022
Project Name : Assam Inland water Transport Project, Phase II
Sample Description : Soil Sample collected from SU2
Sample Quantity : 2.0 Kg
Analysis Duration : 30.03.2022 to 25.04.2022

TEST RESULTS

S. No.	PARAMETERS	TEST METHOD	RESULT	UNIT
1.	pH (1:5 suspension)	IS:2720(Part-26)	7.79	-
2.	Electrical Conductivity @25°C (1:1suspension.)	IS:2720(Part-21)	456	µS/cm
3.	Calcium (as Ca)	STP/SOIL	1883	mg/kg
4.	Magnesium (as Mg)	STP/SOIL	370	mg/kg
5.	Sodium (as Na)	STP/SOIL	186	mg/kg
6.	Available Potassium (as K)	STP/SOIL	269	mg/kg
7.	Salinity @25°C (1:1suspension.)	STP/SOIL	292	µS/cm
8.	Organic Matter	STP/SOIL	1.15	% by mass
9.	Sodium Absorption Ratio	STP/SOIL	1.19	-
10.	Nitrogen	STP/SOIL	0.09	% by mass
11.	Available Phosphorus (as P ₂ O ₅)	STP/SOIL	77	mg/kg
12.	Bulk Density	STP/SOIL	1.17	gm /cc
13.	Organic Carbon	STP/SOIL	0.67	% by mass
14.	Particle Size Distribution			
	a. Sand	STP/SOIL	57.9	% by mass
	b. Clay	STP/SOIL	19.6	% by mass
	c. Silt	STP/SOIL	22.5	% by mass
15.	Exchangeable Sodium Percentage	STP/SOIL	4.17	% by mass

Notes: -

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Annexure - 7

Environmental Monitoring Report- Water



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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Water Sample	W-300322-01	26/04/2022

Issued To: M/s Wapcos Limited (A Government of India Undertaking- Ministry of Jal Shakti)
76- C, Institutional Area, Sector- 18, Gurugram- 122015 (Haryana) India.

SAMPLING & ANALYSIS DATA

Sample Received On : 30/03/2022
Sample Drawn By : NTL
Project Name : Assam Inland Water Transport Project, Phase-II
Sample Description : Water Sample
Sampling Location : Water Sample (WU1).
Analysis Duration : 30/03/2022 to 25/04/2022

TEST RESULTS

S. No.	Parameter	Test Method	Results	Units
1.	pH	IS:3025(Part-11)	7.14	-
2.	Colour	IS:3025(Part-4)	<5.0	Hazen
3.	Electrical Conductivity	IS-3025(P-14)	212	µS/cm
4.	Turbidity	IS-3025(P-10)	<1.0	NTU
5.	Total Hardness (as CaCO ₃)	IS:3025(Part-21)	65.0	mg/l
6.	Fluoride (as F)	APHA 22 nd edit	0.26	mg/l
7.	Dissolve Oxygen	IS:3025(Part-38)	6.3	mg/l
8.	Chloride (as Cl)	IS:3025(Part-32)	15.0	mg/l
9.	Calcium (as Ca)	IS: 3025 (P- 40)	15.0	mg/l
10.	BOD (3 days at 27 ^o C)	IS-3025 (P-44)	<2.0	mg/l
11.	Nitrate (as NO ₃)	IS: 3025 (P- 34)	1.8	mg/l
12.	Total Dissolved Solid	IS:3025(Part-16)	138	mg/l
13.	Sulphate (as SO ₄)	IS: 3025 (P- 24)	2.0	mg/l
14.	Magnesium (as Mg)	IS: 3025 (P-46)	6.6	mg/l
15.	Phosphate (as P)	IS-3025(P-31)	<0.05	mg/l
16.	Sodium (as Na)	IS-3025(P-45)	1.6	mg/l
17.	Potassium (as K)	IS-3025(P-45)	<1.0	mg/l
18.	COD (as O ₂)	IS-3025 (P-38)	6.0	mg/l
19.	Residual Sodium Carbonate	APHA 22 nd edit 2012	Nil	mg/l
20.	Total Chromium (as Cr)	IS-3025(P-52)	<0.05	mg/l
21.	Iron (as Fe)	IS: 3025(P-53)	0.08	mg/l
22.	Manganese (as Mn)	IS 3025 (P-59)	<0.10	mg/l
23.	Copper (as Cu)	IS: 3025 (P-42)	<0.05	mg/l
24.	Zinc (as Zn)	IS: 3025 (P- 49)	0.09	mg/l

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TEST CERTIFICATE

25.	Arsenic (as As)	IS-3025(P-37)	<0.01	mg/l
26.	Cadmium (as Cd)	IS-3025(P-41)	<0.01	mg/l
27.	Cyanide (as CN)	IS-3025(P-27)	<0.01	mg/l
28.	Lead (as Pb)	IS-3025(P-47)	<0.01	mg/l
29.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	mg/l
30.	Mercury (Hg)	IS-3025(P-48)	<0.001	mg/l
MICROBIOLOGICAL REQUIREMENT				
S. No.	Parameter	Test Method	Results	
1.	Total Coliform MPN/100ML)	IS-1622	Absent	
2.	Faecal Coliform (MPN/100ML)	IS-1622	Absent	

Notes: -

1. The results given above are related to the tested sample, as received & mentioned parameters. The customer asked for the above tests only.
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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Water Sample	W-300322-02	26/04/2022

Issued To: M/s Wapcos Limited (A Government of India Undertaking- Ministry of Jal Shakti)
76- C, Institutional Area, Sector- 18, Gurugram- 122015 (Haryana) India.

SAMPLING & ANALYSIS DATA

Sample Received On	:	30/03/2022
Sample Drawn By	:	NTL
Project Name	:	Assam Inland Water Transport Project, Phase-II
Sample Description	:	Water Sample
Sampling Location	:	Water Sample (WU2)
Analysis Duration	:	30/03/2022 to 25/04/2022

TEST RESULTS

S. No.	Parameter	Test Method	Results	Units
1.	pH	IS:3025(Part-11)	7.16	-
2.	Colour	IS:3025(Part-4)	<5.0	Hazen
3.	Electrical Conductivity	IS-3025(P-14)	280	μ S/cm
4.	Turbidity	IS-3025(P-10)	<1.0	NTU
5.	Total Hardness (as CaCO ₃)	IS:3025(Part-21)	70.0	mg/l
6.	Fluoride (as F)	APHA 22 nd edit	0.36	mg/l
7.	Dissolve Oxygen	IS:3025(Part-38)	6.5	mg/l
8.	Chloride (as Cl)	IS:3025(Part-32)	21.0	mg/l
9.	Calcium (as Ca)	IS: 3025 (P- 40)	16.0	mg/l
10.	BOD (3 days at 27 ^o C)	IS-3025 (P-44)	<2.0	mg/l
11.	Nitrate (as NO ₃)	IS: 3025 (P- 34)	2.1	mg/l
12.	Total Dissolved Solid	IS:3025(Part-16)	182	mg/l
13.	Sulphate (as SO ₄)	IS: 3025 (P- 24)	4.5	mg/l
14.	Magnesium (as Mg)	IS: 3025 (P-46)	7.3	mg/l
15.	Phosphate (as P)	IS-3025(P-31)	<0.05	mg/l
16.	Sodium (as Na)	IS-3025(P-45)	1.5	mg/l
17.	Potassium (as K)	IS-3025(P-45)	<1.0	mg/l
18.	COD (as O ₂)	IS-3025 (P-38)	4.0	mg/l
19.	Residual Sodium Carbonate	APHA 22 nd edit 2012	Nil	mg/l
20.	Total Chromium (as Cr)	IS-3025(P-52)	<0.05	mg/l
21.	Iron (as Fe)	IS: 3025(P-53)	0.10	mg/l
22.	Manganese (as Mn)	IS 3025 (P-59)	<0.10	mg/l
23.	Copper (as Cu)	IS: 3025 (P-42)	<0.05	mg/l
24.	Zinc (as Zn)	IS: 3025 (P- 49)	0.09	mg/l

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25.	Arsenic (as As)	IS-3025(P-37)	<0.01	mg/l
26.	Cadmium (as Cd)	IS-3025(P-41)	<0.01	mg/l
27.	Cyanide (as CN)	IS-3025(P-27)	<0.01	mg/l
28.	Lead (as Pb)	IS-3025(P-47)	<0.01	mg/l
29.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	mg/l
30.	Mercury (Hg)	IS-3025(P-48)	<0.001	mg/l

MICROBIOLOGICAL REQUIREMENT

S. No.	Parameter	Test Method	Results
1.	Total Coliform MPN/100ML)	IS-1622	Absent
2.	Faecal Coliform (MPN/100ML)	IS-1622	Absent

Notes: -

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Annexure - 8

Drinking Water & National River Water Quality Standard For Different Uses

Drinking water quality standards

Characteristics	*Acceptable	**Cause for Rejection
Turbidity (units on JTU scale)	2.5	10
Colour (Units on platinum cobalt scale)	5.0	25
Taste and Odour	Unobjectionable	Unobjectionable
PH	7.0 to 8.5	<6.5 or >9.2
Total Dissolved Solids (mg/l)	500	1500
Total hardness (mg/l) (as CaCO ₃)	200	600
Chlorides as CD (mg/l)	200	1000
Sulphates (as SO ₄)	200	400
Fluorides (as F) (mg/l)	1.0	1.5
Nitrates (as NO ₃) (mg/l)	45	45
Calcium (as Ca) (mg/l)	75	200
Magnesium (as Mg) (mg/l) If there are 250 mg/l of sulphates, Mg content can be increased to a maximum of 125 mg/l with the reduction of sulphates at the rate of 1 unit per every 2.5 units of sulphates	30	150
Iron (as Fe) (mg/l)	0.1	1.0
Manganese (as Mn) (mg/l)	0.05	0.5
Copper (as Cu) (mg/l)	0.05	1.5
Zinc (as Zn) (mg/l)	5.0	15.0
Phenolic compounds (as phenol) (mg/l)	0.001	0.002
Anionic detergents (as MBAS) (mg/l)	0.2	1.0
Mineral Oil (mg/l)	0.01	0.3
Toxic materials		
Arsenic (as As) (mg/l)	0.05	0.05
Cadmium (as Cd) (mg/l)	0.01	0.01
Chromium (as hexavalent Cr) (mg/l)	0.05	0.05
Cyanides (as CN) (mg/l)	0.05	0.05
Lead (as Pb) (mg/l)	0.1	0.1
Selenium (as Se) (mg/l)	0.01	0.01
Mercury (total as Hg) (mg/l)	0.001	0.001
Polynuclear aromatic hydrocarbons (PAH)	0.2 µg/l	0.2 µg/l

Notes:-

*1.The figures indicated under the column `Acceptable` are the limits upto which water is generally acceptable to the consumers

**2. Figures in excess of those mentioned under `Acceptable` render the water not acceptable, but still may be tolerated in the absence of alternative and better source but upto the limits indicated under column "Cause for Rejection" above which are supply will have to be rejected.

IS: 2296-1982: National River Water Quality Standards for Different Uses

S. No.	Characteristics	Tolerance Limit				
		Drinking water source with conventional treatment	Outdoor bathing	Drinking water source with conventional treatment but after disinfection	Fish culture and wildlife propagation	Irrigation industrial cooling or controlled water disposal
		A	B	C	D	E
1.	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
2.	Dissolved Oxygen (mg/l), min	6	5	4	4	-
3.	BOD (5-days at 20 ⁰ C, mg/l, min	2	3	3	-	-
4.	Total Coliform Organism, MPN/100, max	50	500	5000	-	-
5.	Colour, Hazen units, max	10	300	300	-	-
6.	Odour	10	300	300	-	-
7.	Taste	Tasteless/ Unobj	-	-	-	-
8.	Total Dissolved Solids, mg/l, max	500	-	1500	-	2100
9.	Total Hardness (as CaCO ₃), mg/l, max.	300	-	-	-	-
10.	Calcium Hardness (as CaCO ₃), mg/l, max	200	-	-	-	-
11.	Magnesium Hardness (as CaCO ₃), mg/l, max	100	-	-	-	-
12.	Copper (as Cu), mg/l, max	1.5	-	1.5	-	-
13.	Iron (as Fe), mg/l, max	0.3	-	0.5	-	-
14.	Manganese (as Mn), mg/l, max	0.5	-	-	-	-
15.	Chloride (as Cl), mg/l, max	250	-	600	-	600
16.	Sulphates (as SO ₄), mg/l, max	400	-	400	-	1000
17.	Nitrates (as NO ₃), mg/l, max	20	-	50	-	-
18.	Fluorides (as F), mg/l, max	1.5	1.5	1.5	-	-
19.	Phenolic Compounds (as C ₆ H ₅ OH), mg/l, max	0.002	0.005	0.005	-	-
20.	Mercury (as Hg), mg/l, max	0.001	-	-	-	-
21.	Cadmium (as CD), mg/l, max	0.01	-	0.01	-	-
22.	Selenium (as Se), mg/l, max	0.01	-	0.05	-	-
23.	Arsenic (as As), mg/l, max	0.05	0.2	0.2	-	-
24.	Cyanide (as CN), mg/l, max	0.05	0.05	0.05	-	-

S. No.	Characteristics	Tolerance Limit				
		Drinking water source with conventional treatment	Outdoor bathing	Drinking water source with conventional treatment but after disinfection	Fish culture and wildlife propagation	Irrigation industrial cooling or controlled water disposal
		A	B	C	D	E
25.	Lead (as Pb), mg/l, max	0.1	-	0.1	-	-
26.	Zinc (as Zn), mg/l, max	15	-	15	-	-
27.	Chromium (as Cr ⁶⁺), mg/l, max	0.05	-	0.05	-	-
28.	Anionic Detergents (as MBAS), mg/l, max.	0.2	1	1	-	-
29.	Polynuclear Aromatic Hydrocarbons (as PAH)	0.2	-	-	-	-
30.	Mineral Oil, mg/l, max	0.01	-	0.1	0.1	-
31.	Barium (as Ba), mg/l, max	1	-	-	-	-
32.	Silver (as Ag), mg/l, max	0.05	-	-	-	-
33.	Pesticides	Absent	-	-	-	-
34.	Alpha emitters, uC/ml, max	10 ⁻⁹	10 ⁻⁹	10 ⁻⁹	-	-
35.	Beta emitters, uC/ml, max	10 ⁻⁸	10 ⁻⁸	10 ⁻⁸	10 ⁻⁸	10 ⁻⁸
36.	Free Ammonia (as N), mg/l, max	-	-	-	1.2	-
37.	Electrical Conductance at 25°C, mhos, max	-	-	-	1000 x 10 ⁻⁶	2250 x 10 ⁻⁶
38.	Free Carbon dioxide (as CO), mg/l, max	-	-	-	61	-
39.	Sodium absorption ratio	-	-	-	-	26
40.	Boron (as B), mg/l, max	-	-	-	-	-
41.	Percent sodium, max	-	-	-	-	-

Water Quality Standards (as per IS: 2296)

Class A – Drinking water without conventional treatment but after disinfection.

Class B – Water for outdoor bathing.

Class C – Drinking water with conventional treatment followed by disinfection.

Class D – Water for fish culture and wild life propagation.

Class E – Water for irrigation, industrial cooling and controlled waste disposal.

Unobj = Unobjectionable

Annexure - 9

Ambient Air Quality Monitoring Report

TEST REPORT

Name & Address of the Customer:

WAPCOS LIMITED**76-C, Institutional Area, Sector-18,****Gurgaon : 122015 (Haryana) Haryana 122015**

Report No. : MSK/GHY/2022-23/1546

Report Date : 15.01.2023

Sample Description : Ambient Air

Sampling Location : (AAQ-6) Umananda

Sample No. : MSKGL/ED/2022-23/09/01472-01479

Ref. No. & Date : W.O. No. : WAP/Envr./IWT Assam/2022/398 dt:30.03.2022, Date : 09/01/2022

ANALYSIS RESULT

SL.NO.	Date of Monitoring	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
1	02.08.2022	54.7	34.2	6.4	17.8	0.50	22.3	11.2	<0.01	<5.0	<1.0	<4.2	<0.5
2	05.08.2022	59.6	33.1	6.9	19.6	0.54	21.5	10.8	<0.01	<5.0	<1.0	<4.2	<0.5
3	09.08.2022	48.1	28.3	<6.0	15.3	0.38	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	12.08.2022	52.5	27.6	<6.0	16.7	0.40	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
5	17.08.2022	63.7	31.9	7.2	21.3	0.76	23.7	11.9	0.01	<5.0	<1.0	<4.2	<0.5
6	21.08.2022	59.2	34.8	6.6	18.5	0.62	20.8	10.4	<0.01	<5.0	<1.0	<4.2	<0.5
7	25.08.2022	53.1	25.3	<6.0	15.4	0.44	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	29.08.2022	64.7	35.9	<6.0	16.3	0.48	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
Limit as per CPCB notification, New Delhi, 18th Nov, 2009, for Ambient air quality		100	60	80	80	2	180	400	1	20	6	5	1
Sampling and Analysis done according to		IS: 5182 (Part-23) -2006 (Reaff. 2012)	USEPA CFR-40, Part-50, Appendix-L	IS: 5182 (Part-2) -2001	IS: 5182 (Part-6) -2006	IS 5182 : (Part10) : 1999	Air Sampling, 3 rd Edn. By James P. Lodge (Method-417)	Air Sampling, 3 rd Edn. By James P. Lodge (Method-401)	USEPA IO-3.4	USEPA IO-3.4	USEPA IO-3.4	IS 5182 : (Part11) : 2006	IS 5182 : (Part 12) : 2004 Rffm:2009

Limit as per CPCB notification, New Delhi, 18th Nov, 2009. For Ambient air quality

Report Prepared By :

For Mitra S.K. Pvt. Ltd.

 Authorised Signatory

- The results relate only to the item(s) tested.
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TEST REPORT

Name & Address of the Customer:

WAPCOS LIMITED

76-C, Institutional Area, Sector-18,

Gurgaon : 122015 (Haryana) Haryana 122015

Report No. : MSK/GHY/2022-23/1547

Report Date : 15.01.2023

Sample Description : Ambient Air

Sampling Location : (AAQ-6) Umananda

Sample No. : MSKGL/ED/2022-23/09/01480-01487

Ref. No. & Date : W.O. No. : WAP/Envr./IWT Assam/2022/398 dt:30.03.2022, Date : 09/01/2022

ANALYSIS RESULT

SL.NO.	Date of Monitoring	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
1	02.08.2022	53.1	33.2	6.5	19.7	0.44	21.7	10.8	<0.01	<5.0	<1.0	<4.2	<0.5
2	05.08.2022	48.9	27.2	<6.0	15.1	0.38	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
3	09.08.2022	42.5	25.0	<6.0	15.9	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	12.08.2022	52.6	27.7	6.2	17.4	0.48	20.9	10.5	<0.01	<5.0	<1.0	<4.2	<0.5
5	17.08.2022	55.7	27.9	6.8	20.8	0.42	23.1	11.6	<0.01	<5.0	<1.0	<4.2	<0.5
6	21.08.2022	53.1	31.2	<6.0	16.5	0.54	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
7	25.08.2022	48.5	23.1	<6.0	15.7	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	29.08.2022	46.2	25.7	<6.0	14.9	0.34	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
Limit as per CPCB notification, New Delhi, 18th Nov, 2009. for Ambient air quality		100	60	80	80	2	180	400	1	20	6	5	1
Sampling and Analysis done according to		IS: 5182 (Part-23) -2006 (Reaff. 2012)	USEPA CFR-40, Part-50, Appendix-L	IS: 5182 (Part-2) -2001	IS: 5182 (Part-6) -2006	IS 5182 : (Part10) : 1999	Air Sampling, 3 rd Edn. By James P. Lodge (Method-417)	Air Sampling, 3 rd Edn. By James P. Lodge (Method-401)	USEPA IO-3.4	USEPA IO-3.4	USEPA IO-3.4	IS 5182 : (Part11) : 2006	IS 5182 : (Part 12) : 2004 Rffm:2009

Limit as per CPCB notification, New Delhi, 18th Nov, 2009. For Ambient air quality

Report Prepared By :

For Mitra S.K. Pvt. Ltd.


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TEST REPORT

Name & Address of the Customer:
WAPCOS LIMITED
 76-C, Institutional Area, Sector-18,
 Gurgaon : 122015 (Haryana) Haryana 122015

Report No. : MSK/GHY/2022-23/1548
Report Date : 15.01.2023
Sample Description : Ambient Air
Sampling Location : (AAQ-6) Umananda
Sample No. : MSKGL/ED/2022-23/09/01488-01495

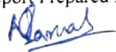
Ref. No. & Date : W.O. No. : WAP/Envr./IWT Assam/2022/398 dt:30.03.2022, Date : 09/01/2022

ANALYSIS RESULT

SL.NO.	Date of Monitoring	PM ₁₀ (µg/m ³)	PM _{2.5} (µg/m ³)	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	CO (mg/m ³)	O ₃ (µg/m ³)	NH ₃ (µg/m ³)	Pb (µg/m ³)	Ni (ng/m ³)	As (ng/m ³)	Benzene (µg/m ³)	Benzo(a) pyrene (ng/m ³)
1	02.08.2022	73.1	45.7	7.4	23.8	0.76	25.1	12.5	0.02	<5.0	<1.0	<4.2	<0.5
2	05.08.2022	68.7	38.2	6.9	20.3	0.64	21.7	10.9	0.01	<5.0	<1.0	<4.2	<0.5
3	09.08.2022	76.2	44.8	7.8	25.1	0.74	26.3	13.1	0.02	<5.0	<1.0	<4.2	<0.5
4	12.08.2022	69.5	36.6	<6.0	17.6	0.72	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
5	17.08.2022	66.3	33.2	<6.0	16.3	0.68	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
6	21.08.2022	75.1	44.2	7.6	22.7	0.76	24.1	12.0	0.02	<5.0	<1.0	<4.2	<0.5
7	25.08.2022	69.2	33.0	6.8	18.9	0.68	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
8	29.08.2022	71.3	39.6	<6.0	15.3	0.74	23.2	11.6	0.01	<5.0	<1.0	<4.2	<0.5
Limit as per CPCB notification, New Delhi, 18th Nov, 2009, for Ambient air quality		100	60	80	80	2	180	400	1	20	6	5	1
Sampling and Analysis done according to		IS: 5182 (Part-23) -2006 (Reaff. 2012)	USEPA CFR-40, Part-50, Appendix-L	IS: 5182 (Part-2) -2001	IS: 5182 (Part-6) -2006	IS 5182 : (Part10) : 1999	Air Sampling, 3 rd Edn. By James P. Lodge (Method-417)	Air Sampling, 3 rd Edn. By James P. Lodge (Method-401)	USEPA IO-3.4	USEPA IO-3.4	USEPA IO-3.4	IS 5182 : (Part11) : 2006	IS 5182 : (Part 12) :2004 Rffm:2009

Limit as per CPCB notification, New Delhi, 18th Nov, 2009. For Ambient air quality

Report Prepared By :



For Mitra S.K. Pvt. Ltd.



 Authorised Signatory

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Annexure - 10

National Ambient Air Quality Monitoring Standards

National Ambient Air Quality Monitoring Standards

Parameter	Industrial, Residential, Rural & other areas	Ecologically Sensitive Area Central Government
Particulate Matter PM 2.5 (µg/m ³)	60	60
Particulate Matter PM 10 (µg/m ³)	100	100
Sulphur Dioxide (as SO ₂) (µg/m ³)	80	80
Oxides of Nitrogen (as NO ₂) (µg/m ³)	80	80
Carbon Monoxide (as CO), (mg/m ³)	02	02
Ozone (as O ₃) (µg/m ³)	100	100
Lead (as Pb) (µg/m ³)	1.0	1.0
Ammonia (as NH ₃) (µg/m ³)	400	400
Benzene (as C ₆ H ₆) (µg/m ³)	05	05
Benzo (O) Pyrene (as BaP) (ng/m ³)	01	01
Arsenic (as As) (ng/m ³)	06	06
Nickel (as Ni) (ng/m ³)	20	20

Annexure - 11

Noise Quality Report



वाष्कोस लिमिटेड
WAPCOS LIMITED

(भारत सरकार का उपक्रम)
जल शक्ति मंत्रालय
(A Government of India Undertaking)
Ministry of Jal Shakti



Date: 04.08.2022

Hourly equivalent noise levels - Umananda terminal (Unit:dB(A))

Location	N-U1	N-U2	N-U3
6-7 AM	43	42	42
7-8 AM	45	44	45
8-9 AM	46	45	47
9-10 AM	47	45	47
10-11 AM	48	47	48
11-12 Noon	48	48	48
12 noon – 1 PM	47	48	47
1-2 PM	47	46	47
2-3 PM	46	47	48
3-4 PM	46	49	48
4-5 PM	47	48	49
5-6 PM	47	48	47
6-7 PM	46	47	47
7-8 PM	44	46	45
8-9 PM	42	43	42



Registered Office : 5th Floor, 'Kailash', 26, Kasturba Gandhi Marg, New Delhi-110001, INDIA
Ph.: +91-11-23313131, 23313132 • Fax : +91-11-23313134, 23314924

Corporate Office: 76-C, Institutional Area, Sector - 18, Gurugram - 122 015 (Haryana), INDIA
Tel. : +91-124-2399421-27 • Fax : +91-124-2397392

E-mail : ho@wapcos.co.in ; mail@wapcos.co.in • Website : <http://www.wapcos.co.in>

CIN : U74899DL1969GOI005070

Annexure - 12

Ambient Noise Standards

Ambient Noise Standards

Area Code	Category of Area	Limits in dB(A)Leq	
		Day time	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

- Note :**
1. Day time 6 A.M. and 9 P.M.
 2. Night time is 9 P.M. and 6 A.M.
 3. Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by competent authority. Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.
 4. Environment (Protection) Third Amendment Rules, 2000 Gazette notification, Government of India, date 14.2.2000.

Annexure - 13

Plant species of Umananda site

Annexure-XII

Checklist of plant species recorded from Umananda site

Botanical name	Local name	Family	Habitat	IUCN Status	Division
<i>Acacia nilotica</i> (L.) Delile	Babool	Fabaceae	Tree	LC	Dicot
<i>Achyranthes aspera</i> L.	Chaff-flower	Amaranthaceae	Herb	-	Dicot
<i>Aegle marmelos</i> (L.) Corrêa	Bael	Rutaceae	Tree	VU	Dicot
<i>Albizia procera</i> (Roxb.) Benth.	Safed siris	Mimosaceae	Tree	LC	Dicot
<i>Albizia saman</i> (Jacq.) Merr.	Rain tree	Mimosaceae	Tree	-	Dicot
<i>Alstonia scholaris</i> (L.) R. Br.	Devil's tree	Apocynaceae	Tree	LC	Dicot
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC	Sessile joyweed-	Amaranthaceae	Herb	LC	Dicot
<i>Artocarpus heterophyllus</i> Lam.	Kothal	Moraceae	Tree	-	Dicot
<i>Artocarpus chama</i> Buch.-Ham.	Lutta	Moraceae	Tree	-	Dicot
<i>Azadirachta indica</i> A.Juss.	Neem	Meliaceae	Tree	LC	Dicot
<i>Bauhinia vahlii</i> Wight & Arn.	Malu creeper	Caesalpiniaceae	Climber	-	Dicot
<i>Bauhinia variegata</i> L.	Kanchan	Fabaceae	Tree	LC	Dicot
<i>Boehmeria macrophylla</i> Hornem.	-	Urticaceae	Shrub	-	Dicot
<i>Boerhaavia diffusa</i> L.	Punarnava	Nyctaginaceae	Shrub	-	Dicot
<i>Bombax ceiba</i> L.	Semal	Malvaceae	Tree	LC	Dicot
<i>Carica papaya</i> L.	Papaya	Caricaceae	Shrub	DD	Dicot
<i>Cascabela thevetia</i> (L.) Lippold	Pila kaner	Apocynaceae	Shrub	LC	Dicot
<i>Catharanthus roseus</i> (L.) G.Don	Sadabahar	Apocynaceae	Herb	-	Dicot
<i>Clerodendrum glandulosum</i> Lindl.	Nephaphu	Verbenaceae	Shrub	-	Dicot
<i>Coccinia grandis</i> (L.) Voigt	Belipoka	Cucurbitaceae	Climber	-	Dicot
<i>Cocculus orbiculatus</i> (L.) DC.	Queen coralbead	Menispermaceae	Climber	-	Dicot
<i>Cocos nucifera</i> L.	Coconut	Arecaceae	Tree	-	Dicot
<i>Commelina benghalensis</i> L.	wandering jew	Commelinaceae	Herb	LC	Monocot
<i>Cynodon dactylon</i> (L.) Pers.	Dub	Poaceae	Grass	-	Monocot
<i>Cyperus cyperoides</i> (L.) Kuntze	Flat Sedge	Cyperaceae	Grass	LC	Monocot
<i>Dalbergia sissoo</i> DC.	Sheesam	Fabaceae	Tree	LC	Dicot
<i>Datura metel</i> L.	Dhatura	Solanaceae	Shrub	-	Dicot
<i>Delonix regia</i> (Hook.) Raf.	Gulmohar	Fabaceae	Tree	LC	Dicot
<i>Desmodium triflorum</i> (L.) DC.	-	Fabaceae	Herb	LC	Dicot
<i>Digitaria ciliaris</i> (Retz.) Koeler	Crabgrass	Poaceae	Grass	-	Monocot
<i>Digitaria sanguinalis</i> (L.) Scop.	Crabgrass	Poaceae	Grass	LC	Monocot
<i>Diplazium esculentum</i> (Retz.) Sw.	Dhekiasak	Athyriaceae	Herb	LC	Dicot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
<i>Echinochloa colona</i> (L.) Link	Jungle ricegrass	Poaceae	Grass	LC	Monocot
<i>Eclipta prostrata</i> (L.) L.	Bhringraj	Asteraceae	Herb	LC	Dicot
<i>Eleusine indica</i> (L.) Gaertn.	Crowfoot grass	Poaceae	Grass	LC	Monocot
<i>Euphorbia hirta</i> L.	Asthma Weed	Euphorbiaceae	Herb	-	Dicot
<i>Ficus religiosa</i> L.	Peepal	Moraceae	Tree	-	Dicot
<i>Fimbristylis dichotoma</i> (L.) Vahl	Fringe-rush	Cyperaceae	Grass	LC	Monocot
<i>Fraxinus angustifolia</i> Vahl	Ash	Oleaceae	Tree	LC	Dicot
<i>Gomphrena globosa</i> L.	Globe amaranth	Amaranthaceae	Herb	-	Dicot
<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	Kher/Sauri	Poaceae	Grass	-	Monocot
<i>Hibiscus elatus</i> Sw.	Majagua	Malvaceae	Tree	LC	Dicot
<i>Hibiscus rosa-sinensis</i> L.	Hibiscus	Malvaceae	Shrub	-	Dicot
<i>Ipomoea indica</i> (Burm.) Merr.	Blue morning glory	Convolvulaceae	Climber	DD	Dicot
<i>Jasminum nervosum</i> Lour.	Wild Kund	Oleaceae	Shrub	-	Dicot
<i>Lantana camara</i> L.	Lantana	Verbenaceae	Shrub	-	Dicot
<i>Leucas aspera</i> (Willd.) Link	Thumbai	Lamiaceae	Herb	-	Dicot
<i>Mangifera indica</i> L.	Aam	Anacardiaceae	Tree	DD	Dicot
<i>Melilotus indicus</i> (L.) All.	Sweetclover	Papilionaceae	Herb	-	Dicot
<i>Mikania micrantha</i> Kunth	-	Asteraceae	Herb	-	Dicot
<i>Mimosa pudica</i> L.	Lazvanti	Mimosaceae	Herb	LC	Dicot
<i>Musa × paradisiaca</i> L.	Kala	Musaceae	Shrub	-	Dicot
<i>Ocimum sanctum</i> L.	Tulsi	Lamiaceae	Shrub	-	Dicot
<i>Oplismenus compositus</i> (L.) P.Beauv.	-	Poaceae	Grass	LC	Monocot
<i>Oxalis corniculata</i> L.	Sorutengachha	Oxalidaceae	Herb	-	Dicot
<i>Panicum paludosum</i> Roxb.	-	Poaceae	Grass	-	Monocot
<i>Parthenium hysterophorus</i> L.	Gajar ghas	Asteraceae	Shrub	-	Dicot
<i>Phoenix acaulis</i> Roxb.	Khejur	Arecaceae	Tree	-	Dicot
<i>Phoenix sylvestris</i> (L.) Roxb	Wild date palm	Arecaceae	Tree	-	Monocot
<i>Phyla nodiflora</i> (L.) Greene	Frog fruit	Verbenaceae	Herb	LC	Dicot
<i>Plantago major</i> L.	Buckhorn	Plantaginaceae	Herb	LC	Dicot
<i>Plumeria rubra</i> L.	Kemboja	Apocynaceae	Shrub	LC	Dicot
<i>Polygonum hydropiper</i> L.	Marsh pepper	Polygonaceae	Herb	LC	Dicot
<i>Pongamia pinnata</i> (L.) Pierre	Karanja	Fabaceae	Tree	LC	Dicot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
<i>Portulaca oleracea</i> L.	Malbhugkhura	Portulacaceae	Herb	LC	Dicot
<i>Ranunculus sceleratus</i> L.	Buttercup	Ranunculaceae	Herb	LC	Dicot
<i>Ricinus communis</i> L.	Arandi	Euphorbiaceae	Shrub	LC	Dicot
<i>Rumex patientia</i> L.	Patience	Polygonaceae	Herb	-	Dicot
<i>Saraca asoca</i> (Roxb.) Willd.	Ashok	Fabaceae	Tree	VU	Dicot
<i>Senecio viscosus</i> L.	Sticky ragwort	Asteraceae	Herb	-	Dicot
<i>Smilax zeylanica</i> L.	Tikonibarua	Smilacaceae	Climber	-	Dicot
<i>Tamarindus indica</i> L.	Imli	Fabaceae	Tree	LC	Dicot
<i>Tectona grandis</i> L.f.	Teak	Verbenaceae	Tree	-	Dicot
<i>Xanthium strumarium</i> L.	Cocklebur	Asteraceae	Shrub	-	Dicot

Note- LC= Least Concern, VU= Vulnerable, DD= Data Deficient and - = Not listed

Source: Primary field survey and secondary data (Discussion with local people)

Annexure - 14

**Photographs of common plant species
observed during the study**

Annexure-XI

Photographs of common plant species observed during the study



Tamarindus indica



Araucaria heterophylla



Artocarpus heterophyllus



Tectona grandis



Saraca asoca



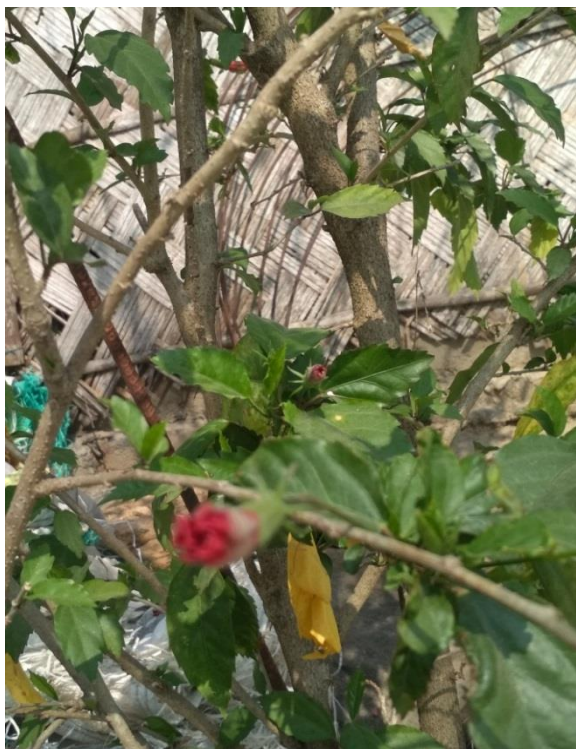
Phoenix sylvestris



Bombax ceiba



Bauhinia variegata



Hibiscus rosa-sinensis



Cascabela thevetia



Datura metel



Carica papaya



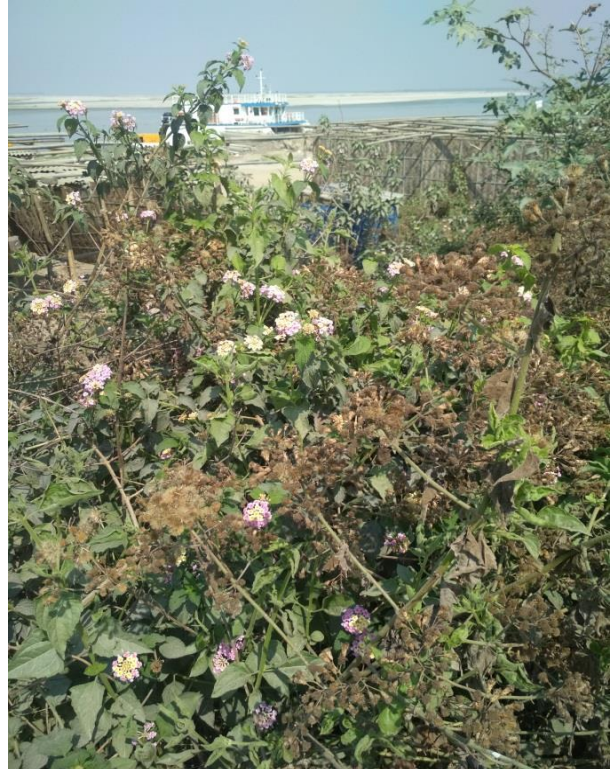
Ricinus communis



Digitaria ciliaris



Clerodendrum glandulosum



Lantana camara



Cynodon dactylon



Eclipta prostrata



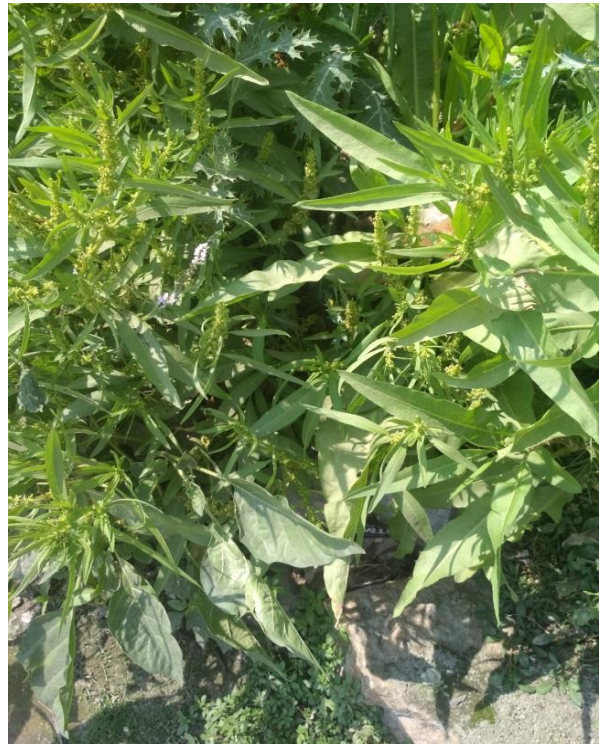
Leucas aspera



Euphorbia hirta



Argemone Mexicana



Rumex patientia



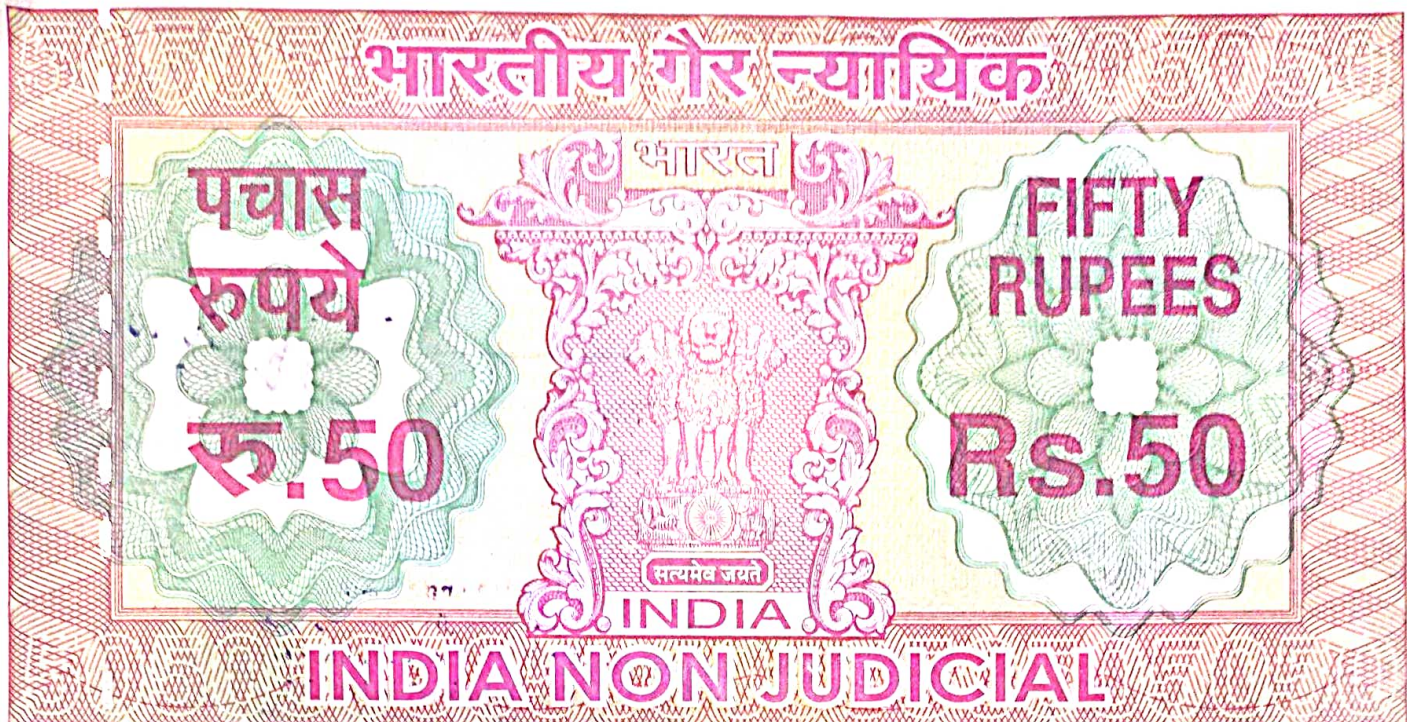
Solanum virginianum



Parthenium hysterophorus

Annexure - 15

AIWTDS MoU with State Commission for Women to address GBV issues



असम ASSAM

MEMORANDUM OF UNDERSTANDING

L 620999

This Memorandum of Understanding (the "MOU") dated 17th August 2022, by and between, Assam Inland Water Transport Development Society [AIWTDS] with a registered address at 3rd Floor Directorate of Inland water transport, Ulubari, Guwahati-781007 and Assam State Commission for Women [ASCW] with a registered address at Beltola, Maidamgaon, Guwahati - 781028. (Together hereinafter the "Parties" or separately the "Party").

BACKGROUND

- A. The Parties wish to enter into a joint agreement as outlined in this MOU; and
- B. The Parties wish to record their understandings and responsibilities in relation to the proposed agreement;

1. Purpose of the agreement. This MOU sets out the basic terms upon which the Parties would use their respective skills, knowledge, and assets for mutual benefit for achieving the following:

Statement of Purpose. Strengthen grievance redressal mechanism (GRM) to fast-track Sexual Exploitation and Abuse/Sexual Harassment (SEA/SH) complaints reported on vessels and terminals operated by the AIWTDS.

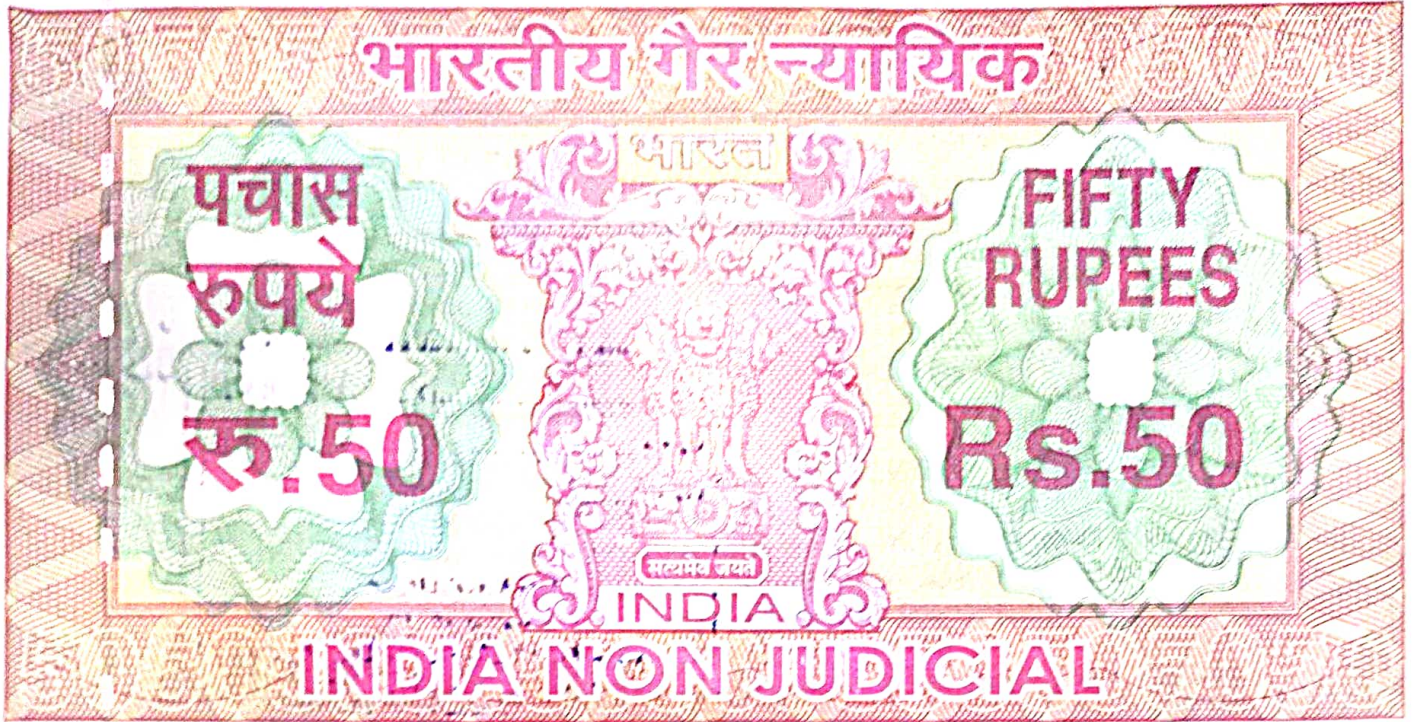
Brief Description of Expectations. It is expected that ASCW will provide support to AIWTDS in (a) registration and resolution of SEA/SH complaints reported on vessels and terminals, and construction sites operated by AIWTDS, (b) organizing gender sensitization and capacity building trainings for AIWTDS staff, crew and operators on prevention and response to SEA/SH, and (c) in creating public awareness on GRM for SEA/SH.

Partha Renu
Dr. Indira Devi

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L 620994

Justification for the Agreement. The AIWTDS does not have the requisite expertise and sufficient capacity to handle complaints related to SEA/SH. The ASCW has the necessary infrastructure and mandate to address emergency response to women affected by violence, has agreed to provide support to the AIWTDS in handling complaints related to SEA/SH incidents reported on vessels and terminals operated by AIWTDS.

2. **Mutual Understandings.** It is mutually agreed upon and understood by and among the Parties that:

- The Parties agree to work together and co-operate in good faith and to fully participate in achieving the objective of this MOU;
- None of the services, financing or resources set out in clauses 4 or 5 shall be deemed to be a commitment of funds; and
- Neither Party shall have any liability to the other Party in respect to any of the provisions of this MOU.

3. **Term and Termination.** The understandings and agreements outlined in this MOU shall subsist until such time as the Assam Inland Water Transport Project is completed or the AIWTDS develops the requisite expertise and sufficient capacity to handle complaints related to SEA/SH or until 31.12.2024 whichever is the earlier. The term may be extended only by agreement of both Parties in writing.

4. **Services provided by the Parties.** The Parties agree to work together in good faith in order to ensure the realization of the MOU and each party will endeavor to provide the following services in meeting the objective:

- Services to be provided by AIWTDS
 - Refer complaints of SEA/SH reported on vessels and terminals, construction sites to the ASCW

Dr. Partha Sengupta

Contd.....



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- ii. Maintain database of SEA/SH complaints received/referred and follow-up on status of case load with ASCW
- iii. Disseminate and display the Helpline no. 18008897417 on the vessels and terminals operated by AIWTDS. Further the complaints can be registered online on the AIWTDS official website (www.aiwtdsociety.in) under the CONTACT US > GRIEVANCE tab.
- iv. Disseminate and display the Helpline no. 18008897417 at the construction sites for terminals and slipways.
- v. Ensure that the contractor provides a copy of the Contractor's Code of Conduct (given in the Contract documents) to each of its personnel and obtain that person's a signature/fingerprint acknowledging receipt of the same.
- vi. Ensure that the Code of Conduct is visibly displayed in multiple locations on the construction site and any other place where the works will be carried out.
- vii. Provide the following logistical support in organizing gender sensitization and capacity building training of AIWTDS staff, crew and operators on prevention and response to SEA/SH.
 1. Develop a work plan and allocate budget for organizing gender sensitization and capacity building training in consultation with ASCW
 2. Organize gender sensitization and capacity building training as per the work plan
 3. Provide any other logistical support required such as venue, invitations, equipment, registration, catering, copies of training material, certificates, honorarium, etc.
- viii. Carry out the following tasks for public awareness on grievance redressal mechanism for SEA/SH in vessels and terminals.
 1. Develop the media strategy and share with the ASCW for feedback
 2. Provide resources needed for activities listed in the media strategy.
 3. Seek support of ASCW in reviewing materials/contents developed for public awareness as per the media strategy.
 4. Implement the activities listed in the media strategy.

b. Services to be provided by ASCW

- i. Register complaints of SEA/SH reported on vessels and terminals operated by AIWTDS, following the due process of law.
- ii. Register complaints of SEA/SH reported during the construction of terminals and slipways under the AIWTDS, following the due process of law.
- iii. To the extent possible, resolve the SEA/SH complaints within seven days from the date of filing the complaint.
- iv. Adhere to procedures for handling complaints and meet confidentiality requirements for dealing with SEA/SH complaints as per guidelines of ASCW.

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- v. Document the level of support given to an SEA/SH survivor, including referral to other service providers and share the following aggregate data on case load with AIWTDS on a quarterly basis:
 - Number of SEA/SH cases received/referred by the AIWTDS, disaggregated by age and by sex;
 - Number of cases open, and the average time they have been open; and
 - Number of cases closed, and the average time they were open
- vi. Provide the following support to AIWTDS against a work order issued by AIWTDS in organizing a gender sensitization and capacity building training of AIWTDS staff, crew and operators on prevention and response to SEA/SH. However no budget allocation or funds will be provided to ASCW. Expenditure related to trainings etc will be borne by AIWTDS.
 - 1. Provide resource persons for the trainings
 - 2. Develop training modules
 - 3. Provide training materials for the participants
- vii. Provide the following support to the AIWTDS in creating public awareness on grievance redressal mechanism for SEA/SH in vessels and terminals
 - 1. Provide inputs to the media strategy developed by AIWTDS
 - 2. Provide feedback on any materials/contents developed for public awareness.

5. **Resources Provided.** The Parties will attempt to secure all required financing and resources required for the tasks and will endeavor to provide the following financing, resources, intellectual property and labor:

- a. Financing and Resources to be provided by AIWTDS
 - i. Signage's on vessels and terminals operated by AIWTDS
 - ii. Financial and logistical support in organizing the gender sensitization and capacity building training on prevention and response to SEA/SH
 - iii. Financial and logistical support in developing and implementing the media strategy and materials/contents for public awareness.
- b. Resources to be provided by ASCW
 - i. Resource Persons for training on prevention and response to SEA/SH.
 - ii. Training Material for training on prevention and response to SEA/SH.
 - iii. Experts for reviewing the media strategy and materials/contents for public awareness.

Partha P. Singh
Asst. Secy. (Training)

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6. **Dispute Resolution.** The Parties will attempt in good faith to resolve any dispute arising out of or in relation to this MOU through negotiations to settle the relevant dispute. If the dispute cannot be settled amicably within 45 day from the date on which either Party has served written notice on the other of the dispute. The following Grievance procedure may be used.

I) Stakeholder can raise a complaint

- On the website of AIWTP : www.aiwtdsociety.in Or
- Through e-mail dir.iwtds-as@gov.in Or
- In writing to: GRO - Third Floor, Directorate of Inland Water Transport Assam, Ulubari, Guwahati – 07
- Through BSNL Landline no: 036124462677/ Toll free no: 18008897417

II) Confirmation of Receipt (within 2 business days)

- Notify receipt of complaint.
- Notify Project Team and other relevant staff of AIWTP
- Forward the complaint to the Officer concerned and preparation of the report.

III) Evaluation (within 10 business days of receipt)

- Assess complaint based on criteria set forth in procedures by the GRM Cell.
- Decide whether to process complaint
- Request the complainant for additional information if needed.
- Notify Complainant the status of complaint

IV) Formulation of proposal (within 30 days)

- Analyze issues raised with Project Team
- Project Team formulates proposal to address concerns
- Proposed action plan and timeline for addressing the complaint.
- Complainant agrees on final proposal
- Complainant rejects - complaint closed

V) Implementation of agreed action plan and resolution

- Project Team reports on progress of implementation of agreed actions
- Resolution - Complaint is closed when actions are satisfactorily implemented

6. **Notice.** All notices or communications required in this MOU shall be given in writing and must be delivered to the address(es) set forth above (or at such other address as the other Party may direct in writing): (a) in person, (b) by facsimile, (c) by registered mail, or (d) by a commercial courier that provides a signature of receipt. A signed receipt for the communication shall constitute proof of delivery, but if the sender can prove that delivery was made as provided for above, then it will constitute delivery despite the absence of a signed receipt.

Arbata Jegan
Dr. Indu Anand Rao.



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Official Use

7. **Entire Agreement.** The provisions herein contained constitute the entire agreement between the parties hereto and supersede all previous communication, representations, expectations, understandings and agreements whether verbal or written between the parties or their respective representatives with respect to the subject matter of this MOU and shall not be modified or amended except by written agreement signed by the parties.

8. **Governing Law.** The provisions of this MOU shall be governed by and interpreted in accordance with laws of India.

9. **Assignment.** Neither party may assign or transfer the responsibilities or agreement made herein without the prior written consent of the non-assigning party, which approval shall not be unreasonably withheld.

10. **Severability.** Should any part of this MOU be declared or held invalid for any reason, that invalidity shall not affect the validity of the remainder which shall continue in force and effect and be construed as if this MOU had been executed without the invalid portion and it is hereby declared the intention of the parties hereto that this MOU would have been executed without reference to any portion which may, for any reason, be hereafter declared or held invalid.

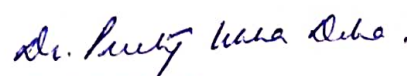
This MOU shall be effective as of the date first written above.



SIGNATURE

Director
Inland Water Transport, Assam &
Addl State Project Director
Assam Inland Water Transport
Development Society

ADDL. STATE PROJECT DIRECTOR
Assam Inland Water Transport Development Society
(AIWTDS)



SIGNATURE

Member Secretary
Assam State Commission for Women

MEMBER SECRETARY
Assam State Commission for Women
Rokola Guwahati-28

Annexure - 16

The Cultural Heritage Management Plan

CULTURAL HERITAGE MANAGEMENT PLAN

1. INTRODUCTION

Cultural heritage resources play an important role, not only as historical information, but also as an economic and social asset for local communities as well as for national development. The Cultural Heritage Management Plan (CHMP) sets out measures designed to protect cultural heritage throughout the project life-cycle.

Umananda is a famous pilgrim place and archaeological site in Guwahati. The site is significant with the presence of stone sculptures and carvings belonging to the early medieval period. Thus, construction activities may cause risk of damage or theft.

2. OBJECTIVE

The objective of the Cultural Heritage Management Plan (CHMP) is to prevent any inadvertent loss of cultural heritage during project pre-construction, construction and operation phases. The development of a CHMP is to be made an integral part of the Environmental Impact Assessment process. Typically, the plan includes measures for avoiding or mitigating any adverse impacts on cultural heritage, provisions for the management of chance finds, any necessary measures for strengthening institutional capacity, a monitoring system to track the progress of these activities, and takes into account the country's overall policy framework, national legislation and institutional capabilities regarding cultural heritage. The main objectives of the CHMP are:

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To address cultural heritage as an integral aspect of sustainable development.
- To promote meaningful consultation with stakeholders regarding cultural heritage.
- To promote the equitable sharing of benefits from the use of cultural heritage.

3. SCOPE OF THE CHMP

The CHMP will be implemented during all phases of the Project including project construction and operation phases. The term 'cultural heritage' encompasses tangible and intangible heritage, which may be recognized and valued at a local, regional, national or international level, as follows:

- Tangible cultural heritage, which includes movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Tangible cultural heritage may be located in urban or rural settings, and may be above or below land or under the water;
- Intangible cultural heritage, which includes practices, representations, expressions, knowledge, skills as well as the instruments, objects, artifacts and cultural spaces associated therewith that communities and groups recognize as part.

The Environmental and Social Standards (ESS-8) is applicable for the Umananda terminal as

the project impact area have cultural heritage sites. The Project will avoid supporting any sub-projects in the historic sites or its buffer. Though the initially identified components do not have an impact on heritage sites or its assets, there may be potentially minor impact on tangible and intangible forms of cultural heritage resources in potential project sites outside historic part or its buffer.

4. APPLICABLE STANDARDS

4.1 National Laws and Regulations

The applicable national policies are presented in Table-1.

Table-1: Applicable Policies for CHMP

S No.	Policy/ Act	Description
1	Ancient Monuments and Archaeological Sites and Remains Act 1958.	<ul style="list-style-type: none"> An Act to provide for the preservation of ancient and historical monuments and archaeological sites and remains of national importance, for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects.
2	Ancient Monuments and Archaeological Sites and Remains (Amendments and Validation) Act, 2010	<ul style="list-style-type: none"> The act declares certain monuments/ sites as being of “national importance”. Stipulates conservation of cultural and historical remains found in India. 100m radius is a “prohibited” area – no construction or reconstruction. Repairs allowed. A 200m radius is a “regulated” area (structures can be constructed by archaeological officers with due sanctions from a competent authority). Protection, maintenance, and conservation managed by the Archaeological Survey of India (ASI).
3	Indian Treasure Trove Act, 1878	<ul style="list-style-type: none"> Promulgated to protect and preserve treasures found accidentally but had archaeological and historical value.
4	Antiquities and Art Treasure Act, 1972	<ul style="list-style-type: none"> Effective control over moveable cultural property consisting of antiquities and art.
5	ESS 8: Cultural Heritage	<ul style="list-style-type: none"> To protect cultural heritage from the adverse impacts of project activities and support its preservation To address cultural heritage as an integral aspect of sustainable development To promote meaningful consultation with stakeholders regarding cultural heritage

4.2 International Standards

The applicable guidelines of World Bank for CHMP has been presented in the Table-2 below:

Table - 2: Applicable World Bank Guidelines of for CHMP

S. No.	E&S Standard	Description
1	ESS 8: Cultural Heritage	<ul style="list-style-type: none"> To protect cultural heritage from the adverse impacts of project activities and support its preservation.

S. No.	E&S Standard	Description
		<ul style="list-style-type: none"> To address cultural heritage as an integral aspect of sustainable development. To promote meaningful consultation with stakeholders regarding cultural heritage. To promote the equitable sharing of benefits from the use of cultural heritage.

5. POTENTIAL IMPACT TO CULTURAL HERITAGE

The indicative project activities, impacts and mitigation measures for inclusion in CHMP are given in Table-3.

Table-3: Possible Impacts and Mitigation Measures

Stage	Activity	Impact	Mitigation Measures
Pre-Construction Phase	Site Clearance	Physical and cultural impacts of cleared material strewn around heritage features	Follow proper stacking of cleared material in areas away from heritage features and ensure site housekeeping
		Chance find of heritage feature during works and damage	Training/ instructions to workers on chance finds Discussion with informants and Site examination with user group/ communities before initiating construction activities Chance find procedures to be followed Barricading the area, watch, and vigil till authorities are notified and take charge Photo documentation if allowed and directed by authorities
		Dust pollution due to the removal of cleared material from the	Dust suppression measures
	Transport and stacking of materials and Tools	Stacking of tools and material around heritage features	Follow proper covered/ safe stacking in areas away from heritage features, and ensure signage (with reflectors)
Construction and Operation Phase	Construction Activities	Public Nuisance	consultation with the priest/vendors/temple committee to ensure that they have a good understanding of Project activities and potential impacts on the temple (including the potential for the Project to disrupt ceremonies and activities), and the grievance mechanism.
	Noise and Vibration	Land slides	The Project shall plan to avoid use of large equipment and machinery which may cause noise and vibration disturbance

Stage	Activity	Impact	Mitigation Measures
			to the island.
	Excavation or material sourcing, shifting & use of assets	Chance Find of historic/ culturally important property (idols, structures, potteries, stone tools, fossils etc.	Discussion with informants and site examination with user group/ communities before initiating construction activities Chance find procedures to be followed Barricading the area, watch and vigil till authorities are notified and take charge Photo documentation if allowed and directed by authorities
		Structural and non-structural disturbances to physical or cultural heritage features, aesthetics or users/ occupiers due to construction activities	Plan to minimize disturbances, months, time and schedule (minimize vibration, festival period, tourist visiting hours) in consultation with communities, service provider and authorities. Repairs and other supports. Arrange protection in place, or scheduled visitations, or community-sanctioned movement of sacred items if required Preserve the physical and visual context of individual or groups of historic structures by considering the appropriateness and effect of project infrastructure proposed for location within the range of sight Guard against theft and illegal trafficking of movable cultural heritage items affected by the project and will notify relevant authorities of any such activity
		Erosion and slippage affecting downstream heritage features	Proper site planning to avoid erosion, slippage Protective measures like fencing, barricading of downstream heritage features
	Transportation/ loading/ unloading of material and waste	Negative aesthetic impact due to mismanagement of material and waste in the vicinity of heritage feature	Proper stacking& storage of material Waste management plan
		Dis-coloration of Monuments due to air emissions deposition of dust on the monument	Emission control measures Dust suppression and control measures
		Accidents affecting heritage features during construction or operations	Emergency preparedness and response plan

6. ROLES AND RESPONSIBILITIES UNDER CHMP

The identified risk, mitigations to be adopted, institutional responsibilities for Umananda heritage site management is outlined in Table-4.

Table-4: Roles and Responsibility of CHMP

S No.	Anticipated Risks and Impacts	Avoidance/ Mitigation/ Management Measures	Responsibility
1	Accidental Structural Damage	Prepare emergency preparedness and response plan considering potential accident scenarios.	Construction Contractor/ PIU
2	Aesthetically and functionally negative Impact	<ul style="list-style-type: none">• Proper stacking of material• Proper storage of C & D at the worksite• Waste management plan to be followed• Inform communities/ users of possible disturbances and support them in minimizing these	Construction Contractor/ PIU

7. MONITORING AND REPORTING

During construction, the contractor shall be responsible for implementing the CHMP activities in compliance with the CHMP. The Plan shall be monitored by TSSC on regular basis and TPM on quarterly basis. Monitoring results, including any non-conformances and associated corrective actions, will be reported to PMU and World Bank.

Annexure - 17

Oil & Waste Storage/Disposal Methods

Annexure 17: Oil and Waste Storage / Disposal Methods

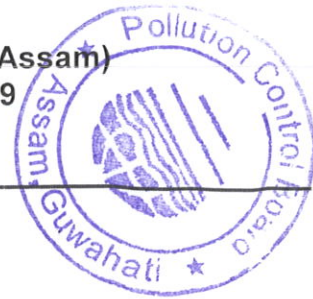
Type of Material	Separation Methods	Disposal and Recovery Methods
LIQUIDS		
Non-emulsified oils	Gravity separation of free water Mechanical removal of separated oil.	Use of removed oil as fuel or refinery stock Separated water discharged back into the environment.
Emulsified oils	Emulsion broken to release water by : Heat treatment Emulsion-breaking chemical Mixing with sand Mechanical removal of separated oil	Use of recovered oil as fuel or refinery feedstock Incineration Return of separated sand to sources Separated water may require further treatment before discharge back in to the environment
SOLIDS		
Oil mixed with sand	Collection of liquid oil leaching from sand during temporary storage Extraction of oil from sand by washing with water or solvent Removal of solid oils by sieving	Use of recovered liquid oil as fuel or refinery feedstock Direct disposal Stabilization with inorganic material Degradation through land farming, composting on site Bioremediation Incineration Burial in well aerated sandy soils (bioremediations)
		Separate water may require further treatment before discharge back into the environment
Oil Mixed with pebbles or shingle	Collection of liquid oil leaching from beach material during temporary storage Extraction of oil from beach material by washing with water or solvent	Direct disposal Incineration Separated water may require further treatment before discharge back into the environment

Annexure - 18

List of authorized recyclers under SPCB



Pollution Control Board:: Assam
Bamunimaidam; Guwahati-21
(Department of Environment & Forests :: Government of Assam)
Phone: 0361-2652774 & 2550258; Fax: 0361-2550259
Website: www.pcbassam.org



A. List of Authorized Recyclers in Assam of Used oil and waste oil (Schedule-IV, SI-20)

Sl. No.	Name of the Recycling Industries	Validity of Authorization	Contact details
1	M/s Modern Lube Industries, A.K Azad Road, Kamrup(M)	31.10.2022	Phone : 94351-17458 Email: modernlube@yahoo.in
2	M/s Progressive Industries, Rani Industrial Area, Kamrup (Rural)	15.02.2026	Phone : 9435-044441 Email: suniltaparia123@rediffmail.com
3	M/s G.S Lubes, Madalpur, Changsari, Kamrup (Rural)	09.07.2026	Phone : 8638873771 Email: gslubes11@gmail.com

B. List of Authorized Recyclers of Used Lead Acid Battery (Schedule-IV, SI-17)

Sl. No.	Name of Industries	Validity of Authorization	Contact details
1	Kamakhya Power Solution, 15th mile, Byrnihat, Kamrup(M)	31.03.2026	Phone: 9706025684
2	Shree Sai Vamika Industries, North Guwahati, Kamrup (Rural)	31.03.2026	Phone: 8811024400 Email: saivamika@gmail.com
3	RESS Iron and Steel LTD, IGC Matia, Goalpara	31.03.2024	Phone : 9957511434, 9988661432

(Shantanu Kr. Dutta)
Member Secretary

Annexure - 19

Environmental Codes of Practice & Other Plans

Environmental Codes of Practice (ECoPs) & other Plans to be followed by the Contractor

The environmental codes of practice (ECoPs) are generic, non-site-specific guidelines. The ECoPs consist of environmental management guidelines and practices to be followed by the contractors for management of all environmental issues. The contractor will be required to follow them by preparing site-specific management plans. The ECoPs are listed below and detailed in table below-

- ECoP 1: Waste Management
- ECoP 2: Fuels and Hazardous Substances Management
- ECoP 3: Water Resources Management
- ECoP 4: Drainage Management
- ECoP 5: Soil Quality Management
- ECoP 6: Erosion and Sediment Control
- ECoP 7: Top Soil Management
- ECoP 8: Topography and Landscaping
- ECoP 9: Air Quality Management
- ECoP 10: Noise and Vibration Management
- ECoP 11: Protection of Flora
- ECoP 12: Protection of Fauna
- ECoP 13: Protection of Fisheries
- ECoP 14: Road Transport and Road Traffic Management
- ECoP 15: River Transport management
- ECoP 16: Construction Camp Management
- ECoP 17: Cultural and Religious Issues
- ECoP 18: Workers Health and Safety

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
ECoP 1: Waste Management		
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	<p>The Contractor shall</p> <ul style="list-style-type: none">• Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to Construction Contractor for approval.• Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact.• Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.• Segregate and reuse or recycle all the wastes, wherever practical.• Prohibit burning of solid waste

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route • Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. • Provide refuse containers at each worksite. • Request suppliers to minimize packaging where practicable. • Place a high emphasis on good housekeeping practices. • Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Collect chemical wastes in 200 liter drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot. • Store, transport and handle all chemicals avoiding potential environmental pollution. • Store all hazardous wastes appropriately in bunded areas away from water courses. • Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. • Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. • Construct concrete or other impermeable flooring to prevent seepage in case of spills
ECOP 2: Fuels and Hazardous Goods Management		
Fuels and hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare spill control procedures and submit the plan for Construction Contractor approval. • Train the relevant construction personnel in handling of fuels and spill control procedures. • Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from watercourses. • Refueling shall occur only within bunded areas. • Make available MSDS for chemicals and dangerous goods on-site. • Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by DoE. • Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. • Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. • Store hazardous materials above flood plain level. • Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. • Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. • Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. • Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials. • Return the gas cylinders to the supplier. However, if they are not empty prior to their return, they must be labeled with the name of the material they contained or contain, information on the supplier, cylinder serial number, pressure, their last hydrostatic test date, and any additional identification marking that may be considered necessary.
ECOP 3: Water Resources Management		
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Follow the management guidelines proposed in ECoPs 1 and 2. • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of storm water. These changes in hydrological regime lead to increased rate of runoff, increase in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials • Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site • Divert runoff from undisturbed areas around the construction site • Stockpile materials away from drainage lines • Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot • Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay at the entrance of the construction site) to remove the mud from the wheels. This shall be done in every exit of each construction vehicle to ensure the local roads are kept clean
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion • Ensure that roads used by construction vehicles are swept regularly to remove sediment. • Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology	<p>The Contractor Shall</p> <ul style="list-style-type: none"> • Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site • Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary • Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. • Use environment friendly and nontoxic slurry during construction of piles to discharge into the river.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Reduce infiltration of contaminated drainage through storm water management design • Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets
Drinking water	<p>Groundwater at shallow depths is contaminated with arsenic and hence not suitable for drinking purposes.</p> <p>Depletion and pollution of groundwater resources</p>	<p>The Contractor Shall</p> <ul style="list-style-type: none"> • Pumping of groundwater shall be from deep aquifers of more than 300 m to supply arsenic free water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. • Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination • All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned • Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor the water quality and water levels. • Protect groundwater supplies of adjacent lands
ECOP 4: Drainage Management		
Excavation and earth works, and construction yards	<p>Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth</p>	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare a program for prevent/avoid standing waters, which Construction Contractor will verify in advance and confirm during implementation • Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line • Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there • Rehabilitate road drainage structures immediately if damaged by contractors' road transports. • Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by DoE, before it being discharged into the recipient water bodies. • Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate has storm water drainage to accommodate high runoff during downpour and that there is no stagnant water in the area at the end of the downpour. • Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. • Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>drainage system to avoid drainage congestion</p> <ul style="list-style-type: none"> • Protect natural slopes of drainage channels to ensure adequate storm water drains. • Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. • Reduce infiltration of contaminated drainage through storm water management design
Ponding of water	Health hazards due to mosquito breeding	<ul style="list-style-type: none"> • Do not allow ponding of water especially near the waste storage areas and construction camps • Discard all the storage containers that are capable of storing of water, after use or store them in inverted position
ECOP 5: Soil Quality Management		
Filling of Sites with dredge spoils	Soil contamination will occur from drainage of dredged spoils	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Ensure that dredged sand used for land filling shall be free of pollutants. Prior to filling, sand quality shall be tested to confirm whether soil is pollution free. Sediments shall be properly compacted. Top layer shall be the 0.5 m thick clay on the surface and boundary slopes along with grass. Side Slope of Filled Land of 1:2 shall be constructed by suitable soils with proper compaction as per design. Slope surface shall be covered by top soils/ cladding materials (0.5m thick) and grass turfing with suitable grass. • Leaching from the sediments shall be contained to seep into the subsoil or shall be discharged into settling lagoons before final disposal. • No sediment laden water in the adjacent lands near the construction sites, and/or wastewater of suspended materials excessive of 200mg/l from dredge spoil storage/use area in the adjacent agricultural lands
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Strictly manage the wastes management plans proposed in ECoP1 and storage of materials in ECoP2 • Construct appropriate spill contaminant facilities for all fuel storage areas • Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		commercial/industrial guideline validation results.
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall <ul style="list-style-type: none"> • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds
ECOP 6: Erosion and Sediment Control		
Clearing of construction sites	Cleared areas and slopes are susceptible for erosion of top soils, that affects the growth of vegetation which causes ecological imbalance	<ul style="list-style-type: none"> • Reinstate and protect covered areas as soon as possible • Mulch to protect batter slopes before planting • Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations
Construction activities and material stockpiles	The impact of soil erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullyng.	The Contractor shall <ul style="list-style-type: none"> • Locate stockpiles away from drainage lines • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds • Remove debris from drainage paths and sediment control structures • Cover the loose sediments and water them if required • Divert natural runoff around construction areas prior to any site disturbance • Install protective measures on site prior to construction, for example, sediment traps • Control drainage through a site in protected channels or slope drains • Install 'cut off drains' on large cut/fill batter slopes to control water runoff speed and hence erosion • Observe the performance of drainage structures and erosion controls during rain and modify as required.
ECOP 7: Top Soil Management		
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth agricultural development.	The Contractor shall <ul style="list-style-type: none"> • Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. • Remove unwanted materials from top soil like grass, roots of trees and similar others. • The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. • Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. • Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. • Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites • Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bunding of the

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		soil layers, water penetration and re vegetation
Transport	Vehicular movement outside ROW or temporary access roads will affect the soil fertility of the agricultural lands	<ul style="list-style-type: none"> • Limit equipment and vehicular movements to within the approved construction zone • Construct temporary access tracks to cross concentrated water flow lines at right angles • Plan construction access to make use, if possible, of the final road alignment • Use vehicle-cleaning devices, for example, ramps or wash down areas
ECoP 8: Topography and Landscaping		
Land clearing and earth works	Flood plains of the existing Project area will be affected by the construction of various project activities. Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as will change the local landscape.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Ensure the topography of the final surface of all raised lands (construction yards, approach roads, access roads, bridge end facilities, etc.) are conducive to enhance natural draining of rainwater/flood water; • Keep the final or finished surface of all the raised lands free from any kind of depression that insists water logging • Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography. • Cover immediately the uncovered open surface that has no use of construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping
ECoP 9: Borrow Areas Management		
Development and operation of borrow areas	Borrow areas will have impacts on local topography, landscaping and natural drainage	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Use only approved quarry and borrow sites • Identify new borrow and quarry areas in consultation with Project Director, if required. • Reuse excavated or disposed material available in the project to the maximum extent possible. • Store top soil for reinstatement and landscaping. • Develop surface water collection and drainage systems, anti-erosion measures (berms, re vegetation etc.) and retaining walls and gabions where required. Implement mitigation measures in ECoP 3: Water Resources Management, ECoP 6: Erosion and Sediment Control • The use of explosive should be used in as much minimum quantity as possible to reduce noise, vibration and dust. • Control dust and air quality deterioration by application of watering and implementing mitigation measures proposed in ECoP 10: Air Quality Management. • Noise and vibration control by ECoP 11: Noise and

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		Vibration Management
ECoP 10: Air Quality Management		
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Operate the vehicles in a fuel efficient manner • Cover haul vehicles carrying dusty materials moving outside the construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Water construction materials prior to loading and transport • Service all vehicles regularly to minimize emissions • Limit the idling time of vehicles not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites • Service all equipment regularly to minimize emissions • Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection aggregate handling, cement dumping, circulation of trucks and machinery inside the installations

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard	<ul style="list-style-type: none"> • Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted • Minimize the extent and period of exposure of the bare surfaces • Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site • Restore disturbed areas as soon as practicable by vegetation/grass-turfing • Store the cement in silos and minimize the emissions from silos by equipping them with filters. • Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations • Crushing of rocky and aggregate materials shall be wet-crushed, or performed with particle emission control systems
ECOP 11: Noise and Vibration Management		
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. • Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment. • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment • Avoid the unnecessary use of alarms, horns and

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		sirens
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Notify adjacent landholders prior any typical noise events outside of daylight hours • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Notify affected people if major noisy activities will be undertaken, e.g. pile driving • Plan activities on site and deliveries to and from site to minimize impact • Monitor and analyze noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas
ECOP 12: Protection of Flora		
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Reduce disturbance to surrounding vegetation • Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. • Get approval from supervision consultant for clearance of vegetation. • Make selective and careful pruning of trees where possible to reduce need of tree removal. • Control noxious weeds by disposing of at designated dump site or burn on site. • Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the • construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads, etc. • Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. • Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. • Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. Ensure excavation works occur progressively and re-vegetation done at the earliest Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction Supply appropriate fuel in the work caps to prevent fuel wood collection
ECOP 13: Protection of Fauna		
Construction activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,.	<p>The Contractor shall</p> <ul style="list-style-type: none"> Limit the construction works within the designated sites allocated to the contractor check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal
	Impact on migratory birds, its habitat and its active nests	<p>The Contractor shall</p> <ul style="list-style-type: none"> Not be permitted to destruct active nests or eggs of migratory birds Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	<p>The Contractor shall</p> <ul style="list-style-type: none"> Restrict the tree removal to the minimum required. Retain tree hollows on site, or relocate hollows, where appropriate Leave dead trees where possible as habitat for fauna Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition
Construction camps	Illegal poaching	<ul style="list-style-type: none"> Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	<p>The Contractor shall</p> <ul style="list-style-type: none"> Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water. Contain oil immediately on river in case of accidental spillage from vessels and ships and in

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources</p> <ul style="list-style-type: none"> Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river
Construction activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	<p>The Contractor shall</p> <ul style="list-style-type: none"> follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management
	Filling of ponds for site preparation will impact the fishes.	<p>The Contractor shall</p> <ul style="list-style-type: none"> Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat Install and maintain fish screens etc. on any water intake with drawing water from any water body that contain fish
ECoP 14: Protection of Fisheries		
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	<p>The Contractor shall</p> <ul style="list-style-type: none"> Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water. Contain oil immediately on river in case of accidental spillage from vessels and ships and in this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river
Construction activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	<p>The Contractor shall</p> <ul style="list-style-type: none"> follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management
	Filling of ponds for site preparation will impact the fishes.	<p>The Contractor shall</p> <ul style="list-style-type: none"> Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> Install and maintain fish screens etc. on any water intake with drawing water from any water body that contain fish
ECoP 15: Road Transport and Road Traffic Management		
Construction vehicular traffic	Accidents and spillage of fuels and chemicals	<p>The Contractor shall</p> <ul style="list-style-type: none"> Prepare and submit a traffic management plan to the Construction Contractor for his approval at least 30 days before commencing work on any project component involved in traffic diversion and management. Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs / lights, and road signs. Provide signs at strategic locations of the roads complying with the schedules of signs contained in the IWT Traffic Regulations. Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in Assam: <ul style="list-style-type: none"> Duration of construction period Period of proposed detour / alternative route Suggested detour route map Name and contact address/telephone number of the concerned personnel Name and contact address / telephone number of the Contractor Inconvenience is sincerely regretted. Restrict truck deliveries, where practicable, to day time working hours. Restrict the transport of oversize loads. Operate road traffics/transport vehicles, if possible, to non-peak periods to minimize traffic disruptions. Enforce on-site speed limit
ECoP 16: River Transport management		

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities in River	The presence of construction and dredging barges, pipe lines and other construction activities in the river can cause hindrance and risks to the river traffic.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Not obstruct other normal riverine transport while doing riverine transport and works • Identify the channel to be followed clearly using navigation aids such as buoys, beacons, and lighting • Provide proper buoyage, navigation lights and markings for bridge and dredging works to guide the other normal riverine transport • Keep regular and close contacts with Assam Inland Water Transport Authority (AIWTDS) regarding their needs during construction of the project • Plan the river transport and transportation of large loads in coordination with AIWTDS to avoid traffic congestions. • Provide signage for river traffic conforming to the AIWTDS requirements • Position the dredge and pipeline in such a way that no disruption to the channel traffic will occur
	Accidents	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Prepare an emergency plan for dealing with accidents causing accidental sinking of the vessels and ships • Ensure sufficient equipment and staffs available to execute the emergency plans • Provide appropriate lighting to barges and construction vessels
ECOP 17: Construction Camp Management		
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Submit to the Construction Contractor for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. • Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<p>Contractor shall provide the following facilities in the campsites</p> <ul style="list-style-type: none"> • Adequate housing for all workers • Safe and reliable water supply. Water supply from deep tube wells of 300 m depth that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of toilet facilities required is one toilet for every ten persons • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient. • Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads of at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon. • Provide child crèches for women working construction site. The crèche shall have facilities for dormitory, kitchen, indoor and outdoor play area. Schools shall be attached to these crèches so that children are not deprived of education whose mothers are construction workers • Provide in-house community/common entertainment facilities. dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed. • Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies,

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<p>mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition of wastes. Cover the bed of the pit with impervious layer of materials (clayey or thin concrete) to protect groundwater from contamination.</p> <ul style="list-style-type: none"> • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. • Initial health screening of the laborers coming from outside areas • Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis • Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling and testing • Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellent sprays during monsoon.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. • Maintain register to keep a track on a head count of persons present in the camp at any given time. • Encourage use of flameproof material for the construction of labor housing / site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding wind storms/cyclones. • Provide appropriate type of firefighting equipment suitable for the construction camps • Display emergency contact numbers clearly and prominently at strategic places in camps. • Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	<ul style="list-style-type: none"> • The Contractor shall • Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. • Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed • Give prior notice to the laborers before demolishing their camps/units • Maintain the noise levels within the national standards during demolition activities • Different contractors shall be hired to demolish different structures to promote recycling or reuse of demolished material. • Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site. • Handover the construction camps with all built facilities as it is if agreement between both parties (contractor and land-owner) has been made so. • Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner. • Not make false promises to the laborers for future employment in O&M of the project.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
ECOP 18: Cultural and Religious Issues		
Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. • Do not block access to cultural and religious sites, wherever possible • Restrict all construction activities within the foot prints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) shall there be any mosque/religious/educational institutions close to the construction sites and users make objections. • Take special care and use appropriate equipment when working next to a cultural/religious institution. • Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the Construction Contractor /PMU. Provide separate prayer facilities to the construction workers • Show appropriate behavior with all construction workers especially women and elderly people • Allow the workers to participate in praying during construction time • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process. • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters
ECOP 19: Worker Health and Safety		
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction	<p>The Contractor shall</p> <ul style="list-style-type: none"> • implement suitable safety standards for all workers and site visitors which shall not be less than those laid down on the international standards (e.g. National / International Labor for 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national standards of the Government of Assam and Government of India • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	material, solid waste, waste water, vector transmitted diseases etc), (ii) risk factors resulting from human behavior (e.g. STD, HIV etc) and (iii) road accidents from construction traffic.	<p>hazards in the work areas,</p> <ul style="list-style-type: none"> • Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job • Appoint an environment, health and safety manager to look after the health and safety of the workers • Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security Matters
	Child and pregnant labor	<p>The Contractor shall</p> <ul style="list-style-type: none"> • not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Bangladesh Labor Code, 2006
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	<ul style="list-style-type: none"> • Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations shall be easily accessible throughout the place of work Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health	<p>The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 17 Construction Camp Management</p> <ul style="list-style-type: none"> • Arrangement for trainings • Adequate ventilation facilities • Safe and reliable water supply. Water supply from deep tube wells that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul style="list-style-type: none"> • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. • Recreational and social facilities • Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2 • Solid waste collection and disposal system in accordance with ECoP1. • Paved internal roads. • Security fence at least 2 m height. • Sick bay and first aid facilities
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	The contractor shall provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities shall be at least 6 m away from storm drain system and surface waters. These portable toilets shall be cleaned once a day and all the sewerage shall be pumped from the collection tank once a day and shall be brought to the common septic tank for further treatment. Contractor shall provide bottled drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	<p>The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community</p> <ul style="list-style-type: none"> • ECoP 2: Fuels and Hazardous Goods Management • ECoP 4: Drainage Management • ECoP 10: Air Quality Management • ECoP 11: Noise and Vibration Management • ECoP15: Road Transport and Road Traffic Management • ECoP 16: River Transport management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	<p>The Contractor shall</p> <ul style="list-style-type: none"> • Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. • Train all construction workers in general health and safety matters, and on the specific hazards of their work Training shall consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. • Commence the malaria, HIV / AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counseling and testing. • Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		phase on ongoing and regular basis. This shall be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.

Construction Debris Management Plan

1. Introduction

Waste will be generated from the construction site and labour camps during the construction phase. Type of the waste to be generated during construction phase is given below.

2. Excavated Soil

Site is undulating and thus will require cut & fill for levelling. Finished level of the soil will be 37m. Top excavated soil of 15 cm shall be stripped and shall be stored separately under covered sheds. This soil shall be used for green belt plantation. Lower layers of excavated soil shall be re-used within the site for filling purpose, construction of approach & internal roads & railway link. If any extra soil is remained, then that should be disposed of to the approved debris disposal site

3. Construction Waste

Construction waste will comprise of broken bricks, dry cement, discarded timber, metal piece, cement bag, dry asphalt/bitumen, glass, paint/varnishes box etc. These wastes should be segregated into recyclable and non-recyclable waste. Recyclable waste shall be stored in the covered area and shall be sold to authorized vendors regularly. Non-recyclable waste shall be disposed at approved debris site in covered vehicles.

4. Municipal Waste

Municipal waste will be generated from labour camp. Dustbins for recyclable and non-recyclable waste shall be provided in labour camp area. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be disposed through authorized agency in area responsible for waste collection and management. Waste generated requires proper management so as to minimize the negative impacts on environment. Concept of reduce, re-use and recycle shall be followed at site. The rejected waste should be disposed in a secured manner. Thus a site should be identified for disposal of the rejected waste.

4.1 Selection of Disposal Sites:

The locations of Disposal sites have to be selected such that: Disposal sites are located at least 1000 m away from sensitive locations like settlements, water body, notified forest areas, wildlife/bird/dolphin sanctuaries or any other sensitive locations. Disposal sites shall not contaminate any water sources, rivers etc so the site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.

Public perception about the location of debris disposal site has to be obtained before finalizing the location. Permission from the village/local community is to be obtained for the Disposal sites selected. Environment Engineer of PMU and Executive Engineer of Contract Management Unit must approve the Plan before commencement of work.

Contaminated sediment (a permanent disposal site is required) disposal aspects;

- No sensitive areas
- Government owned land (encumbrance free)
- Private land (non-agricultural)
- Details of the safeguard measures of the contaminated sediment disposal is included in the Environment Management Plan (EMP)

4.2 Principles for lease agreement

The Project Management Unit of the AIWTDS will arrange land for disposal of the dredged materials following GOA law i.e. Acquisition. The land will be requisitioned through the concerned district collectors of the project districts. The PMU will pay the required amount to DC office as per law as required for renting/leasing for the particular land for the sand deposition. DC office will annually assess the rent for the land and claim fund from the PMU to disburse to the lessees.

A lease agreement would be signed between the PMU and the land owners according to the broad principles as under-

1. DC will identify the actual owners of the proposed land taking into account of the record of rights to the property
2. Rent would be paid through the DC office on yearly basis at the beginning of the year
3. Land will be used for project purposes only (sand deposition)
4. Land will be restored to original condition and returned to the land owners after agreed lease period. The lease agreement will be based on requisition of land

4.2 Precautions to be adopted during Disposal of Debris / Waste Material

The Contractor shall take the following precautions while disposing off the waste material. During the site clearance and disposal of debris, the Contractor will take full care to

ensure that public or private properties are not affected, there is no dwellings around the dumpsite and that the traffic is not interrupted. The Contractor will dispose debris only to the identified places or at other places only with prior permission of Engineer-in-Charge of works. In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Engineer-in-Charge of works. The Contractor will at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris. Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.

Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition. Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Engineer-in-Charge of works.

During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it. The debris should not be disposed along the bridges & culverts and near the water bodies. While disposing debris / waste material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems. Contractor should display the board at disposal site stating the name of project, usage of the site and type of debris being disposed. A guard shall be kept at disposal site to prevent any unauthorized disposal of waste at the debris disposal site. Material should be disposed through covered vehicles only. No contaminated/hazardous/e-waste shall be disposed at the debris disposal site.

4.3 Record Keeping

Site approved by site engineer only can be used as disposal site. Record of all such site should be maintained along with the area of disposal site, type & quantity of material disposed daily and capacity of disposal site.

4.4 Guidelines for Rehabilitation of Disposal Sites

The dumpsites filled only up to the ground level could be rehabilitated as per guidelines below and to be decided by the Engineer and the supervision consultant. The dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants. Local species of trees has also to be planted so that the landscape is coherent and is in harmony with its various components. In cases where a dumpsite is near to the local village community settlements, it could be converted into a play field by spreading the dump material evenly on the ground. Such playground could be made coherent with the landscape by planting trees all along the periphery of the playground. Closure of the disposal site should be up to the satisfactory level of site engineer.

4.5 Penalties

Stringent action & penalties should be imposed on contractor for dumping of materials in

locations other than the pre-identified locations. Grievance Readressal mechanism should be in place for taking note and action on such complaints.

Along with the Construction and Labour Camp management Plan ECoPs shall be followed by the Contractor.

Construction and Labour Camp Management Plan

1.0 Objective of the Plan

The objective of this plan 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. This plan is prepared in reference to the Workers accommodation: processes and standards (A guidance note by IFC and EBRD). The plan aims to promote “safe and healthy working conditions, and to protect and promote the health of workers.”

2.0 Selection and layout of construction camp

Labour camps, plant sites and debris disposal site shall not be located close to habitations, schools, hospitals, religious places and other community places. A minimum distance of 500m shall be maintained from the habitations, sensitive locations like temple, school & hospitals, forest areas and other eco-sensitive zones for setting up such facilities.

3.0 Facilities at workers' camps

During the construction stage of the project, the construction contractor will construct and maintain necessary (temporary) living accommodation, rest area and ancillary facilities for labour. Facilities required are listed and elaborated below.

- Site barricading
- Clean Water Facility
- Clean kitchen area with provision of clean fuel like LPG
- Clean Living Facilities for Workers
- Sanitation Facilities
- Waste Management Facilities
- Rest area for workers at construction site
- Adequate Illumination & ventilation
- Safe access road is required at camps
- Health Care Facilities
- Crèche Facility & Play School
- Fire-fighting Facility
- Emergency Response Area

3.1 Attendance & Working hours

Supervisor of the camp should take the attendance of the employee at each camp twice in a day (morning and evening) and should maintain the record. Further work hours of the workers should be maintained in accordance to the labour law and as mentioned in the labour licence. All workers should be provided with ID card and entry to the site should be through ID card only and should be ensured by security guard.

3.2 Site Barricading

Site should be completely barricaded from all the sides to prevent entry of outsiders and animals into the site. Entry gate should be provided at the site and labour camp which should be guarded by security guard. All workers should be issued ID cards and entry of outsiders shall be maintained in the register at the gate. Board should be displayed at the site and the labour camp, the name of project, capacity of project, authority carrying out projects, restriction of entry without authorization, no smoking zone and associated risks. Plant operation shall be restricted to 6:00 Am to 10:00 PM

3.3 Clean Water Facility

Potable water shall be provided for construction labour for drinking & cooking purpose. Cleanwater shall be provided for bathing, cleaning and washing purpose. Water quality testing for drinking water provided for workers shall be carried out on monthly basis. Water dispensers should be cleaned on monthly basis. Adequate water per person should be provided at site for drinking, cooking, bathing, cleaning and other use purpose

3.4 Clean Kitchen Area

Provision of clean kitchen area for cooking and storage of eatables shall be provided. Clean fuels like LPG shall be provided for cooking purpose. Burning of firewood, garbage, paper and any other material for cooking or any other purpose shall strictly be prohibited at the site. Separate utensil washing area should be provided with proper drainage system. Kitchen waste should be daily cleaned and disposed off. Water storage facility at kitchen should be covered and cleaned on monthly basis. Kitchen area should be away from washing, toilets and bathing area.

Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

3.5 Clean Living Facility for the Workers

Workers should be provided with proper bedding facility. Single bed should be provided to each worker and each bed should be at least 1 m apart from another. Double deck bedding should be avoided, in case provided, adequate fire-fighting facility should be provided. Bed linen should be washed regularly and should be applied with repellent and disinfectants so as to manage the diseases caused due to pests. Facilities for storage of personal belongings for workers should be provided in form of locker, shelf or cupboard. A separate storage area for the tools, boots, PPE should be provided. Proper ventilation through mechanical systems and lighting system should be ensured in construction camps.

3.6 Sanitation Facilities

Construction camps shall be provided with sanitary latrines and urinals. Toilets provided should have running water availability all the time. Bathing, washing & cleaning areas shall be provided at the site for construction labour. Washing and bathing places shall be kept in clean and drained condition. Adequate nos. of bathing & toilet facility should be provided at site and should not exceed 1 unit per 15 person. Toilets and bathing facility should be closed to the camps

Workers shall be hired especially for cleaning of the toilets and bathing area. Septic tanks and soak pits shall be provided at site for disposal of the sewage generated. The toilets should be cleaned on daily basis. These tanks should be evacuated through authorized vendors if

filled and at the time of closure. Pest management should be carried out at the camps if the area is infected by any pests. Adequate lighting should be ensured in camp area especially during night time. The area should be guarded by security guard to minimize the crime and thefts.

3.7 Waste Management Facilities

Waste generated should be segregated at the site by providing the different colour bins for recyclable and non-recyclable waste. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be handed over to authority responsible in area for waste management.

Waste management for construction site shall be as per waste management plan proposed in EMP. Waste management area should be cleaned on regular basis to avoid germination of flies, mosquitoes, rodents and other pests.

3.8 Rest Area for Workers at Site

A rest area/shelter shall be provided at the site for construction workers where they can rest after lunch time and shall not lay down at site anywhere. The height of shelter shall not less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 1.0 Sq. m per head.

3.9 Adequate Illumination & Ventilation

Construction worker camps shall be electrified and adequately illuminated. Illumination level shall be maintained after 5.30 P.M. at the site to minimum 200 lux. Labour camps shall be adequately ventilated. Fans shall be provided for ventilation purpose.

3.10 Safe Access Road for Labour Camps

Temporary paved surface shall be constructed to approach the labour camp from the site. Movement shall not be hampered during monsoon season due to water logging and muddiness.

3.11 Health care Facilities:

First aid box, first aid room and personnel trained in first aid (certified first-aider) shall be available at labour camp and site all the time (24X7). Equipment in first-aid box shall be maintained as per State Factory's Law. Ambulance/ 4 wheeler motorized vehicle shall be available at the site for carrying injured to the nearby hospital. Tie-ups should be made with nearby hospital to handle emergency, if any. Nos. of ambulance, doctors and nearby hospital shall be displayed in first-aid room, site office & labour camps. List of contact nos. of emergency personnel, hospitals, fire brigade and other emergency contact should be displayed at campsite, guard's room and first aid room. Workers shall be made aware about the causes, symptoms and prevention from HIV/AIDS through posters and awareness programs. Workers shall have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

3.12 Crèche Facility & Play School

Crèche facility and play school should be constructed at the site temporarily so as children of construction labour can be kept there. Care takers should be hired for taking care of children. Attendance records of children shall be maintained. Children should not be allowed to enter interactive work areas.

3.13 Fire-Fighting facilities

Fire-fighting facility such as sand filled buckets and potable fire-extinguishers shall be provided at labour camps and at site. Fire-extinguishers shall be provided as per NBC norms. Personnel trained in handling fire fighting equipment should be available at the site. Fire evacuation plans should be displayed at the site and should be communicated to all the workers and other staff at camp site.

3.14 Emergency Assembly Area

Area shall be demarcated as emergency collection area near the gate where all the workers shall be guided to collect in case of any emergency like fire, flood and earthquake.

4.0 Activities prohibited at site

- Activities which should be strictly prohibited at site shall include Open burning of wood, garbage and any other material at site for cooking or any other purpose
- Disturbance to the local community.
- Adoption of any unfair means or getting indulgence in any criminal activity
- Non compliance of the safety guidelines as communicated by safety officials and during the trainings
- Adoption and proper usage of PPEs all the time as required
- Operation of the plant and machinery between 10 pm to 6 am unless approved by team leader
- No animal (wild or domestic or bird) shall be harmed by any construction worker in any condition at site and nearby areas
- Cutting of tree without permission of team leader/authorized person
- No indigenous population shall be hurt or teased

5.0 Guidelines for night time working at the site.

No activity generating noise shall be carried out at the site after 10:00 PM. Night working protocol should be followed (if required) as per guidelines prepared by AIWTDS. Site should be well illuminated to maintain minimum illumination level of 200 lux. Personnel working shall obtain permit to work from the team leader prior carrying out any work in night time and the record of such working shall be maintained in register. Any accidents, if occurs at site during night time working shall be immediately reported and recorded. Penalty shall be imposed on the contractor for the accident. Analysis shall be carried out to find the reason for such accidents for future learning.

6.0 Record keeping & Maintenance

Record of entry/exit of the people in the construction site and labour camp area shall be maintained in register at gate. Record of material coming in and going out from site also shall be maintained.

7.0 Auditing & Inspection

Conditions of labour camp and site shall be inspected and audit report shall be submitted to IWAI on monthly basis.

8.0 Grievance redressal System

CA complaint register and a complaint box should be provided at the site so any person from local community can register their complaint, if any due to the camp, workers and other facilities. The system shall be communicated to local communities through consultations. Open house meetings should be conducted with workers on monthly basis to identify their problems and issues if any related health, hygiene, safety, comfort and other issues.

9.0 Security System

Site should be barricaded and should be guarded by security guards at all the gates. Security guards should allow only authorized personnel to the campsite. Guards should be available during both morning and night time. Guard should allow entry of workers to the site only by seeing the ID cards. Guard should report if any unusual or unfair practice happening at site and nearby area. Guards should be trained to handle emergency situations like fire fighting and should be responsible to contact the emergency personnel in case of any emergency.

10.0 Closure of the Construction Site and Construction labour Camps

Construction site and labour camps shall be restored back to the original site conditions. Following measures are required to be taken during closure

1. Septic tanks/soak pits should be dismantled
2. Any temporary/permanent structure constructed shall be dismantled
3. Construction/demolition waste, hazardous waste and municipal waste at site and labour camp site shall be disposed as per waste management plan in EMP
4. The site shall be cleaned properly
5. Tree plantation to be carried out, if any required for stabilizing the area
6. Any pit excavated shall be filled back

Along with the Construction and Labour Camp management Plan ECoPs shall be followed by the Contractor.

Annexure - 20

Risk Assessment & Disaster Management Plan

The Risk Assessment and Disaster Management Plan

1. RISK ASSESSMENT

1.1 Risk Matrix

A simplified risk matrix based on the most probable incidents which could occur during the operations of the terminal has been depicted in Table-8.1. The risk matrix provides the severity in four major categories in accordance with the IS:15656 as well as a probability of the incidents from frequent to 1 in a million days of operations.

The area could also experience heavy footfall in specific festival seasons. This could enhance the pressure on infrastructure and security. There could be a scenario wherein the footfalls could lead to crowd issues such as stampede or conflicts or skirmish.

Table Error! No text of specified style in document..1: Simplified Risk Matrix

Probability	Severity			
Days of operation	Minor (1)	Major (2)	Critical (3)	Catastrophic (4)
Frequent to 1/100 (1)	Very minor to minor faults			
	Minor Crowd Issues			
		Major Crowd Issues		
1/100 to 1/10,000 (2)	Collision with terminal at low speed	Major fault at the terminal-suspension of operation		
1/10,000 to 1/1,000,00 (3)	Collision with terminal at high speed	Fuel Leakage scenario at terminal		
1/1,000,00 to 1/10,000,00 (4)		High speed Collision with fuel leakage		Major attacks or sabotage

The risk matrix for natural hazards is based on historical data and risk perception.

Hazard Scenario	Probability	Frequency	Risk (Probability x Frequency)
Flooding	Medium	Medium	Medium
Landslide	Medium	Medium	Medium
Earthquake	Low	Low	Low

Time sensitiveness for Probability and Frequency

Probability	Reference	Frequency	Time Reference
Low	>25%	Low	1 in 100 days
Medium	>50%	Medium	1 in 1000 days
High	>80%	High	1 in 10,000 days

1.2 Crowd Management

The terminal has developed a passenger movement plan for ensuring that no untoward incident such as stampede or any crowded hot spot develop inside the premises. The traffic flow has been depicted in **Figure 7.1**. During festival time like Maha Shivratri and tourist season, special arrangement for traffic and crowd management plan will be prepared in coordination with traffic department of Guwahati.

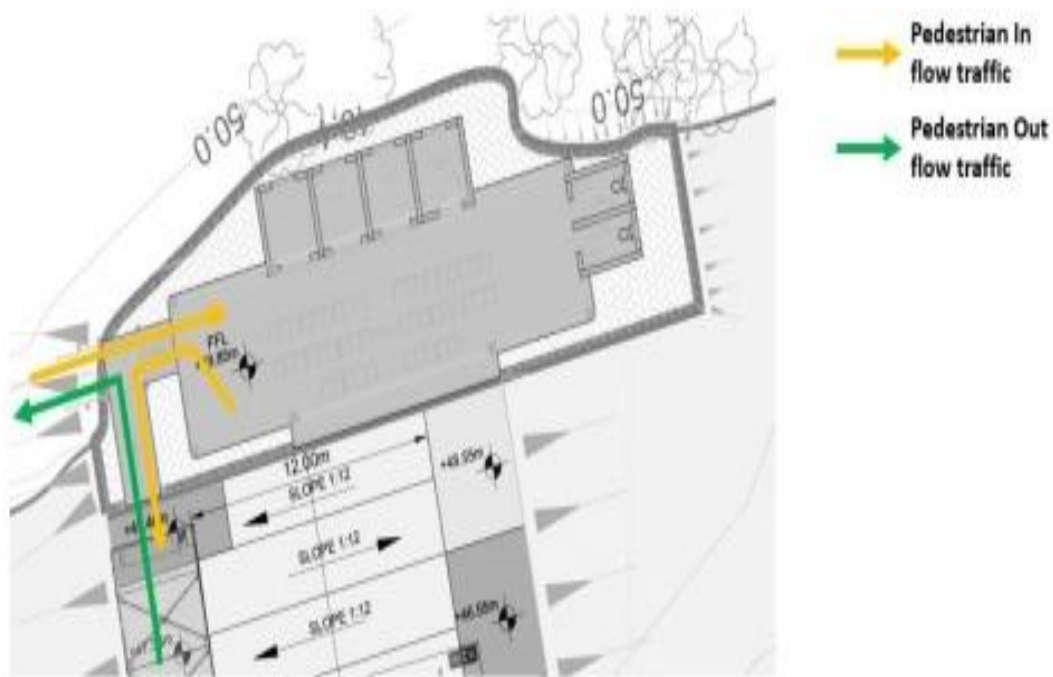


Figure Error! No text of specified style in document..1: Traffic safety management plan

1.3 Electrical Management

Electrical panel room

An area has been demarcated to cater space for panel room, metering room, DG set and transformer which will cater electrical supply to entire complex. The DG area and transformer will be RC platform with chain link fencing all around for security.

Emergency power required by emergency loads shall be made available by Emergency Diesel Generator (EDG) located in a separate room adjacent to the Electrical Room. EDG will be directly connected to emergency bus section of Switchgear and all emergency loads shall be fed from this bus section. Incomer breaker of EDG shall be Normally Open (NO). EDG shall start automatically after failure of normal power supply, however shut down of EDG shall be manual. Under emergency condition normal load (fed from on normal bus section) from Switchgear shall be shed off due to under voltage and Emergency load shall be connected. Emergency load shall also be in operational condition even during availability of normal power supply.

Earthing

The PV module structure components shall be electrically interconnected and shall be grounded. Earthing shall be done in accordance with IS 3043-1986, provided that earthing conductors shall have a minimum size of 6.0 mm² copper, 10 mm² aluminium or 70 mm² hot

dip galvanised steel. Unprotected aluminium or copper-clad aluminium conductors shall not be used for final underground connections to earth electrodes.

1.4 Fire Management

Reference Standards

Fire system comprises of fire detection, alarm and control system and fire protection system. The fire detection and protection system for the terminal infrastructure (such as pontoon/approach trestle/building/transformer/DG set etc.) are proposed to be designed, manufactured, and tested in accordance with latest applicable Indian Standards (IS) / NFPA (National Fire Protection Association, an American national Standard) / LPA (Loss Prevention Association of India) / Fire Protection Manual as stated below except where modified and/or supplemented by this specification.

Fire and portable water storage tank

Overground RCC water storage tanks with pump room has been considered for storage of domestic and firefighting water.

Fire water storage twin tank

The static storage for firefighting has been recommended at 100 KL as per NBC 2016 Norms. The fire water storage reservoir is divided into two equal compartments of 50 KL each, allowing easy cleaning, inspection, repair, and maintenance of the fire water storage tank. The pipes will be of Galvanized Iron material and nominal diameter of 150 mm. All underground utilities will have RCC NP3 type encasing, especially near entrance and exit of terminal and over road crossings.

It is proposed to select the fire pump of 2850 l/min. Thus, two pumps, one main pump (common for hydrant and sprinkler) and one common standby pump having capacity of 2850 l/min. In addition to that, one jockey pump of capacity 180 lpm will also be provided. Fire water pump's "inlet / suction pipe size" and "discharge pipe size" is selected as 150 mm and 125 mm diameter respectively. Main pump shall be AC operated and another pump, as standby shall be diesel engine driven. The water storage twin compartment is internally connected by pipes and isolating valve. Pressure in the fire hydrant pump will be at 4.5 kg/cm² to ensure adequate pressure at all hydrants.

External Hydrants

External hydrants shall be provided all around the Complex and all around the building. The hydrants shall be controlled by a sluice valve or butterfly valve. Each external hydrant hose cabinet shall be provided with a drain in the bottom plate.

Risk Reduction Measures

- The facility will operate two different sub-facilities namely the riverine side facility and the landside facility.
- The riverine side facility should be inspected on daily basis for any structural or mechanical faults or malfunctioning.
- All the structures will be as per the IS and NBC 2016.
- The buildings will be in accordance with local fire safety rules.
- The electrical fittings and fixtures are as per the local environment considering proximity to river.
- Regular preventive maintenance checks are conducted.
- Structural integrity as well as other safety interlocks are properly checked on regular basis.
- There should be provision of alarms and hooters in the facility.
- There is round the clock strong security vigil inside the premises.
- High mast light or adequate power back up should be provided for safety provisions.
- There should not be any flammable, hazardous or toxic materials stored at the site without prior approval of the factory inspector if the quantity is above Schedule 3 of the MSIHC Rules 1989, amended 2000. For other smaller quantities, MSDS should be adequate with proper firefighting facilities.
- The safety guidelines of IS 15656: 2006 need to be followed.
- National Disaster Management Guidelines on Boat Safety issued by National Disaster Management Authority, Government of India, September 2017 will be followed.
- The site would operate a DG set. This should be in accordance with the extant CPCB guidelines and should operate within permissible limits as prescribed under the EP Rules 1989. The stack of DG should be adequate in height for preventing any downwash of the emissions. The area of DG sets should be demarcated and properly fenced.
- The transformer area should be properly designed as per the IS and electrical codes.
- It is recommended to stop the construction activities in water part during breeding season of the Gangetic dolphin (for example piling, shore protection works and dredging, etc.) in between mid of March to Mid of June.
- At Umananda, it will be good to install Gabion mattress with aggregate as a filling material.
- Regular monitoring of erosion and deposition and formation of bars in the vicinity is required.

2. Disaster Management Plan

2.1 General

The Disaster Management Act, 2005 was enacted to provide the requisite institutional mechanisms for formulating and monitoring the implementation of Disaster Management Plans, ensuring measures by various wings of the Government for preventing and mitigating the effects of disasters and for undertaking a holistic, coordinated and prompt response to any disaster situation.

2.2 During Construction

The entrance of Umananda ghat is rocky and with slopes. It should be borne in mind that during construction, adequate provisions for personnel safety should be taken for preventing untoward incident. The ghat should be strengthened with structural measures during construction. Provision for emergency lights as well as first aid should be taken into account during the construction phase. The sensitivity of the area should be borne in mind during construction. These include complying with any cultural and religious requirements during the construction phase for solid waste and liquid waste management. The site has several steps leading to the temple. Therefore, structural, and civil provisions for safety must be followed during construction. A small passenger ferry should be maintained in stand-by for any emergency evacuation of the construction team. As the site would be accessed by general public even during construction, separate demarcation of the working site should be planned as per construction schedule. Adequate signages and support systems should be deployed during construction period. The site should not be treated as a dump yard for materials including paints, varnishes and other fire sensitive materials.

2.3 During Operation

2.3.1 Terminal

Prevention Plan

- Timely weather predictions displayed on website, advisory through RIS, notices be displayed at terminals, jetties, VHF broadcast and through sailing notices.
- All the terminals and jetties designed as per the hazard profile and accounting change in profile due to climate change impact.
- Storage area is distant from other buildings with provision of secondary containment Periodic Mock drills.

- Procurement of safety equipment.
- Evacuation route is marked at terminals.

Response Plan

- Assess immediate surroundings for dangers
- Direct Staff to safe exit and to assembly points at terminals
- Operating equipment should be shut down. If, required vessels should cast off from berth and proceed to safe waters, away from the immediate crisis or anchored in a safe zone
- A proper approach, check in and exit gate and parking area at the Ro-Ro terminal for cargo lorries/trucks and other vehicles is maintained and is in a safe and operational condition.
- A proper ramp for safe loading and discharging of cargo trucks and other vehicles is available.
- A concourse or hall for waiting passengers and a separate access gangway for passengers where feasible to embark and disembark from the vessel shall be maintained in good condition
- A separate entry and exit for passengers to safely enter and exit the Ro-Ro terminal/Jetty. Proper segregation is maintained between vehicles and people. Where feasible Passengers shall disembark vessel first on arrival.
- To ensure, the depth of water alongside the Ro-Ro jetty/terminal is adequate for berthing at all times.
- The status of the river, the tidal variation and currents strength and direction are within safe limits for operation of Ro-Ro vessels.
- The terminal/jetty can be safely used throughout the year with seasonal variations
- Proper securing arrangements to tie the Ro-Ro vessel safely is available.
- Systems in place for stoppage of Ro-Ro operations in adverse weather conditions.
- There is proper and safe connectivity to the loading point/port/terminal by Road.
- To ensure, the capacity of the terminal to handle trucks with turning radius, size restrictions etc. is adequate.
- The size of Ro-Ro vessels which can be handled safely at the terminal taking into account the dimensions of the loading terminal, depth of water available alongside, securing arrangements etc.

- To ensure, all permissions as required as per National, state and local regulations are available and in order.
- If handling any Hazardous cargo – All safety measures are taken, required permissions are obtained and all National, State and Local regulations should be complied with.
- Vehicles are properly stowed/parked and secured on the Ro-Ro / Ro-Pax vessel for the intended passage.
- The risk of pollution and that all measures are taken to reduce risk of pollution caused due to operations.
- To ensure, additional safety regulations like that of PESO, etc. are complied with.
- The terminal is provided with adequate safety equipment's like lifebuoys, life jackets, fire extinguishers etc.
- Vehicles being loaded are in proper condition and not leaking Oil or giving out fumes or carrying uncovered dusty cargo or undeclared hazardous goods or faulty refrigerated cargo etc.
- To ensure, properly trained staff is available at the terminal and working hours of all staff at the terminal is regulated.
- To ensure, properly Security arrangements for regulating vehicles and passengers' movement is available at the terminal
- To ensure, adequate lighting is available for safe operations.
- To ensure, noise level is maintained to the minimum during operations.
- To ensure, Ro-Ro/Ro-Pax Vessels decks are in proper condition and not slippery, oiled etc.
- To ensure, the correct size of vehicles/trucks are stowed/parked in the proper places
- The master of the vessel ensures that the loading of the vessel is done in accordance with the approved trim and stability booklet of the vessel. No overloading of the vessel is done and no carriage of oversize vessel above the design limit of deck strength of the vessel /design limit is done. The loading pattern adopted may ensure no undue trim and absolute minimum list of the vessel.
- To ensure proper traffic control at load and discharge operations with regard to directions, speed, weather, blind spots, reversing, parking etc. are observed.
- Master of the vessel to ensure that the vessel approaches the jetty in slow and guided manner to avoid any damage to the jetty or any fittings of the jetty.
- The master of the vessel to ensure that the ramp operating systems and safety devices, if any, are in proper working condition.

- Sufficient vertical clearance for the vehicles carried onboard Ro-Ro/ Ro-Pax vessels to be ensured.
- Ensure availability of sufficient numbers of adequate strength mooring lines both onboard the vessels and terminal.
- To ensure that before the vessel sails from the terminal, all the Navigational Aids and equipment's onboard like AIS, Echo sounder, GPS, wind indicator, Radar, Compass, etc. as required by rules and regulations are operational and in proper working condition

2.3.2 Functional Failure

Prevention Plan

- SOP for all the operational activities
- Checklist for inspection of structures, buildings, material handling equipment and vessel's seaworthiness
- Use of anti-corrosion paint, inspect structures periodically, report any cracks developed
- All the DPR's should consider appropriate loads according to the design use and possible loads caused by wind or vibrations(earthquake)
- Regular fitness check and maintenance

Response Plan

- Stop operations of that area
- Attend to if some personal injuries with help of medical officer.
- Provide first aid.
- Activate secondary structure/ equipment.
- If there is damage to cargo/container, unload it with the help of cranes and forklifts
- Remove the debris/ equipment parts
- Inspect the site and submit report. Assess liabilities if any

2.3.3 For Passenger Vessels

The Ministry of Ports, Shipping and Waterways on June 07, 2022 has issued the Inland Vessels (Life Saving Appliances) Rules, 2022.

The selected and relevant provisions of the rules are as followed:

Compliance by existing inland vessels:

- All existing inland vessels shall comply with the requirements existing prior to coming into force of these rules:
 - Provided that the existing inland vessels that undergo major conversion or modification shall comply with the requirements specified under these rules, as may be considered necessary by the Designated Authority:
 - Provided further that in the case of change of propulsion system or main engines, the new rules shall apply to that equipment and systems only:
 - Provided also that existing vessels shall comply with the requirements of provision of life jackets, life buoys and life-raft or buoyant apparatus specified in rule 7 and the safety equipment plan specified in Rule 16 within one year from the date of coming into force of these rules.
 - The owner and master of any new inland vessel, shall ensure that the vessel is constructed, maintained, and operated in accordance with the requirements of these rules and that the vessel is suitable for its intended service.
- In vessels carrying not more than 50 passengers in which the passengers have access to only one passenger compartment or space, a portable loud hailer may be carried in lieu of a public address system as required under sub-rule (1).
- Entertainment systems shall be turned off automatically when the public address system is used and option for manual shut off shall be available on vessels with loud hailers.
- The system shall be used to inform the passengers of the action they shall take in the event of an emergency which may lead to the vessel being abandoned and such information, shall be given either prior to or immediately on leaving the berth. The items specified in sub rule (7) shall be part of the information provided.
- A public address system shall be powered from the main source of electrical power and from an alternative source of electrical power situated in a location remote from the main source and the battery back-up or spare batteries shall be carried for loudhailers.

In the case of vessels which operate regular ferry service of short duration where compliance would result in very frequent broadcasting of the safety message, other arrangements shall be considered by the Designated authority and such arrangements may include drawing attention to the relevant safety notices.

Terminal Security Rules, to be observed by all visitors:

- No unauthorized passengers or personnel permitted.
- All passengers must meet facility ID requirements.
- No weapons allowed on Terminals property under any circumstances.
- Restricted and with permission only photography is permitted on terminal, duly approved by Terminals Management, local operating authority, IWWA, and/or other authorised security agency. Failure to adhere to this policy will result in the immediate suspension of privilege to enter the facility.
- No smoking.
- Public urination strictly prohibited. Failure to adhere will result in permanent revocation of privilege to access facility.
- Required PPE strictly enforced
- Passengers are required to adhere to warning and alarms including any call for evacuation
- Seatbelt required while operating vehicle

General Arrangements

- One small cabin of at least 4 m x 4 m on deck for keeping stores, material etc suitably located.
- Railing of at least 1.25 m height (fabricated out of IS 4923 grade steel) at suitable interval for safety parameters & the railing shall have minimum two (2) rows of bars/chains running throughout the pontoon. The railing on the receiving side of the pontoon to be of collapsible type.
- lifesaving appliances (at least 8 Nos. lifebuoys) to be provided.
- At least 04 number of portable dry powder fire extinguishers of 9 litre capacity for all classes of fire to be provided. In addition, 04 numbers Fire buckets (9 lit. Capacity) and 04 numbers Sand boxes (0.5 m x 0.5 m x 0.3 m to be provisioned. 02 numbers of Fire Hose with nozzle to be provisioned with fitting on Main Deck with provision to be connected from shore supply.

- Tactile tiles to be provided for visually impaired people
- Electrical fittings such as lights bulbs installed on poles etc. be fitted as per requirements at storage cabin and general-purpose lighting for operations during night etc.
- Shore power line connection have to be provided, with necessary cable and change over switches. The electric connections to be undertaken with duly approved P.V.C. insulated multi strand copper wire in flat casing capping conduit. The electric connections for deck fittings such as winches/davits to be provided as per requirement.
- One portable submersible pump of at least 10 tons/hr each along with discharge hose of adequate length to be provided for various pumping out purposes.
- The passage on the deck to be of non-skid type. The paint scheme on the top deck should be anti-skid type
- Adequate number of double bollards of standard size or as suitable to be provided on the main deck distributed on the port and starboard side suitable spacing for effective mooring.
- Steel fenders are to be provided on either side for 95% of the length of pontoon. Tyre fenders of sufficient size are also to be provided on both sides of pontoon.
- Adequate number of fairleads as per number of bollards located on either side of bollards to be provided

Emergency and Standby Power Supply

The emergency generator set shall be procured as a complete package and shall be designed to start automatically on power failure and feed the selected loads. It shall be capable of taking care of the load variations (e.g., starting of the largest rated motor). The unit shall be complete with necessary starting equipment, associated automatic mains failure control panel (AMF panel) and shall be suitable for auto/manual remote starting (in case of failure of AMF panel). AMF panel shall have facility to local manual starting of DG set.

The emergency generator set shall comprise of silent type Diesel Generating set having prime mover rating of 250 kVA, 415 Volts at 1500RPM, 0.8 lagging power factor at 415V suitable for 50 Hz, 3 phase system consisting of following Diesel Engine. The Diesel Engine 4 stroke water cooled electric start of suitable BHP at 1500 RPM suitable for above output of alternator and conforming to BS 5514, BS 649, IS 10000.

Communication System

The Communication system shall comprise of the following:

- General Telephone System

- Intercommunication System
- Loud speaking and staff locating system.

The communication system shall include the facility (recorders) for automatic recording of the conversation and its playback which are to be connected to the multifunctional telephone sets. The recorder can be coupled to the line both automatically and by hand.

The system shall include the PA and staff locating (paging) system. For this purpose, provision shall be made for amplifier station of 500W to be installed in the communication centre located in Electrical Room. The amplifier station shall permit paging of the personnel and passing of important messages to all areas over different feeders as well as to distribute music or speech programs. The feeders shall be programme controlled remotely from the operator's switchboard. The programme shall provide both selective and collective control of the feeders and distribute music or speech programs.

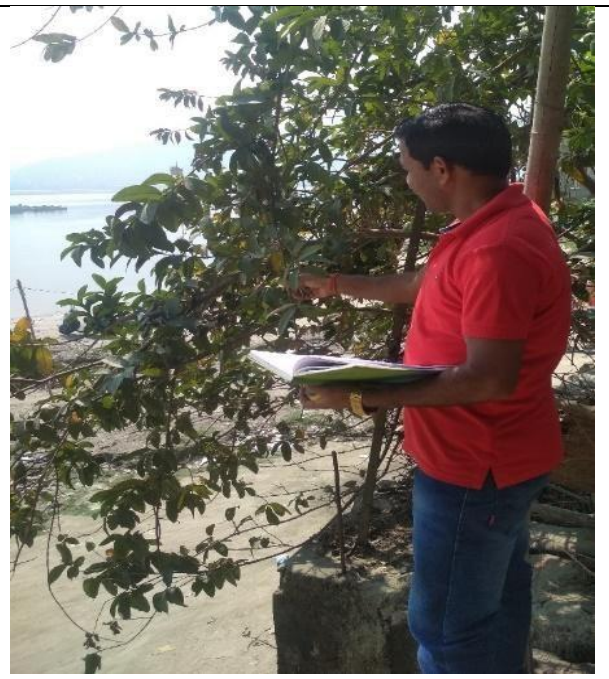
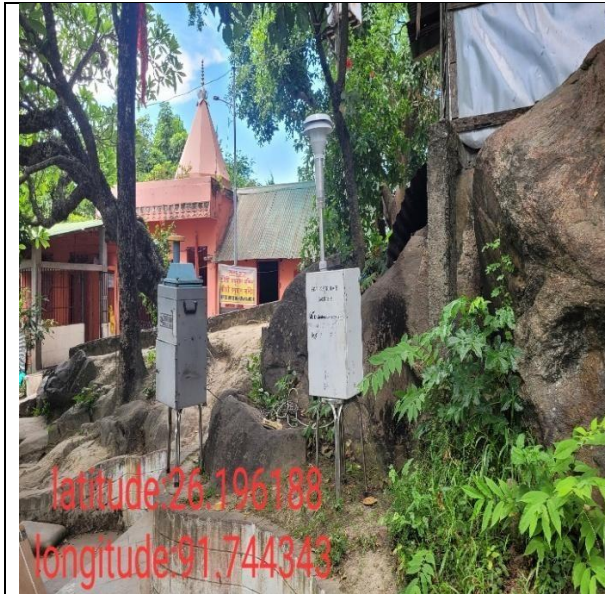
2.3.4 Natural hazards

The facility should consist of emergency communication channels through radio equipment. The installation of weather stations would assist the control room personnel for assessing climatic conditions with a fair degree of confidence for planning adequate emergency preparedness. The passenger terminal should establish hot lines with the local emergency responders such as police, fire, hospitals and district magistrate office. The Umananda temple is situated on an island in the middle of the Brahmaputra River. Therefore, it is essential to plan and prepare for any natural hazards such as floods, earthquakes, landslides or heavy rains. Proper communication would greatly assist in saving resources, staff, public and infrastructure. The terminal should provide for evacuation measures for such scenarios for transporting public to safe sites in the shortest possible time. The site should house public announcements in Hindi, English and local languages. This also means that the public disclosures regarding important emergency numbers as well as local contact at all critical points should be displayed at the site. The site emergency controller should initiate mutual safety agreements with passenger vessels for evacuation as well as transfer of public in the event of any natural hazards. The site should regularly monitor the increase in water levels for any anomaly, both in the short time as well as long time frames.

Annexure - 21

Environmental Monitoring Photographs

Environmental Monitoring at Umananda Terminal



Annexure – 22

Land Related Document & Translated Summary of the land document



চক্ৰ বিষয়াৰ কাৰ্য্যালয় :: গুৱাহাটী ৰাজহ চক্ৰ :: গুৱাহাটী
কামৰূপ মহানগৰ জিলা

নং গুঃচঃ ০৫/২০১৮/২০৬

তাৰিখঃ ২৭/১/২০২৬

প্ৰতি,

ৰাজ্যিক প্ৰকল্প পৰিচালক,
অসম আভ্যন্তৰীণ জল পৰিবহন উন্নয়ন সমিতি

বিষয়:-

উমানন্দ মন্দিৰলৈ যোৱা ফেৰী সেৱাৰ আসোৱাহ বিহীন সন্দৰ্ভত প্ৰতিবেদন দাখিল।

মহাশয়,

ওপৰোক্ত বিষয় সন্দৰ্ভত মহোদয়ক সন্মান সহকাৰে জনাও যে, চিঠিত উল্লেখ কৰা উমানন্দ মন্দিৰলৈ যোৱা ফেৰী সেৱাৰ ঘাট চহৰ গুৱাহাটী ২য় খণ্ড আৰু চহৰ গুৱাহাটী ৩য় খণ্ড গুৱাহাটী মৌজাৰ অন্তৰ্গত নহয় বুলি লাট-মণ্ডলে প্ৰতিবেদনত উল্লেখ কৰিছে।

মহোদয়ৰ বিহিত ব্যৱস্থাৰ বাবে প্ৰেৰণ কৰা হ'ল।

ভৱদীয়
চক্ৰ বিষয়া (সংলগ্ন)
গুৱাহাটী ৰাজহ চক্ৰ
গুৱাহাটী
গুৱাহাটী ৰাজহ চক্ৰ।

Office of the Director INLAND WATER TRANSPORT ASSAM
130 JAN 2023
Receipt No. 550
D.A.

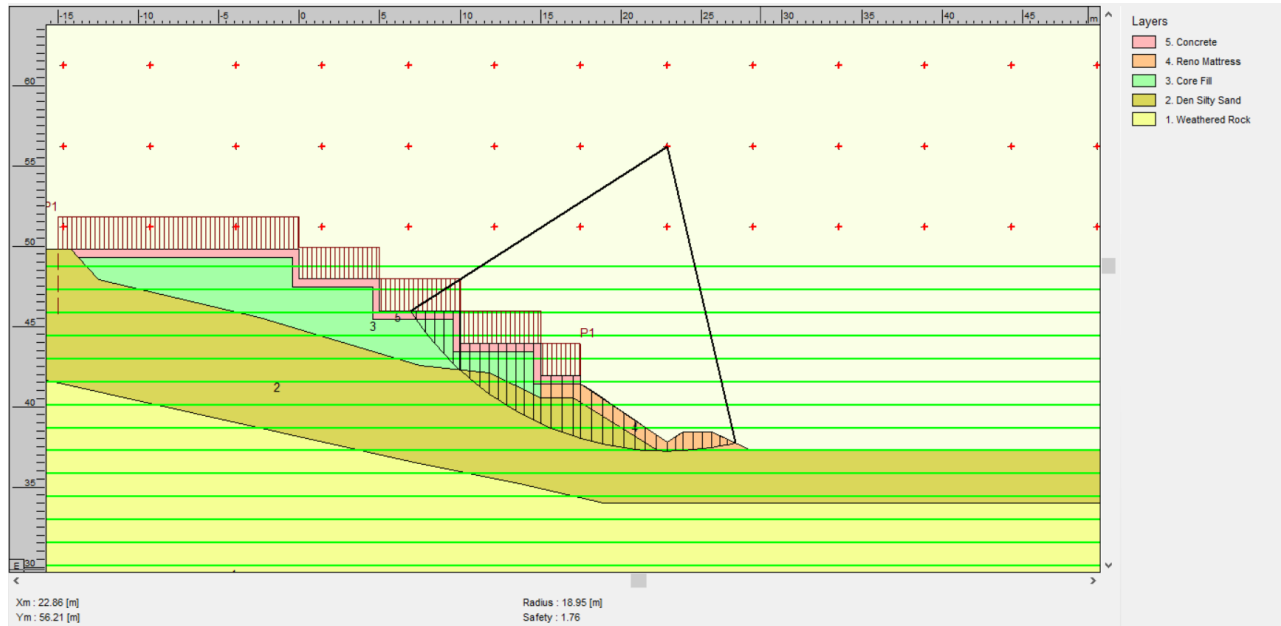
TRANSLATED SUMMARY OF THE LAND RELATED DOCUMENT

Enclosed land related document is a communication from Lat-Mondol to Circle Officer, Guwahati Revenue Circle based on the request submitted by AIWTD Society for providing NOC for construction of passenger ferry terminal at Umananda. He stated that the proposed terminal location doesn't come under the jurisdiction of 2 No. Guwahati Mauza and 3 No. Guwahati Mauza and thereby considered as unsurveyed Government land. He further requested the Circle Officer for providing necessary direction in this regard.

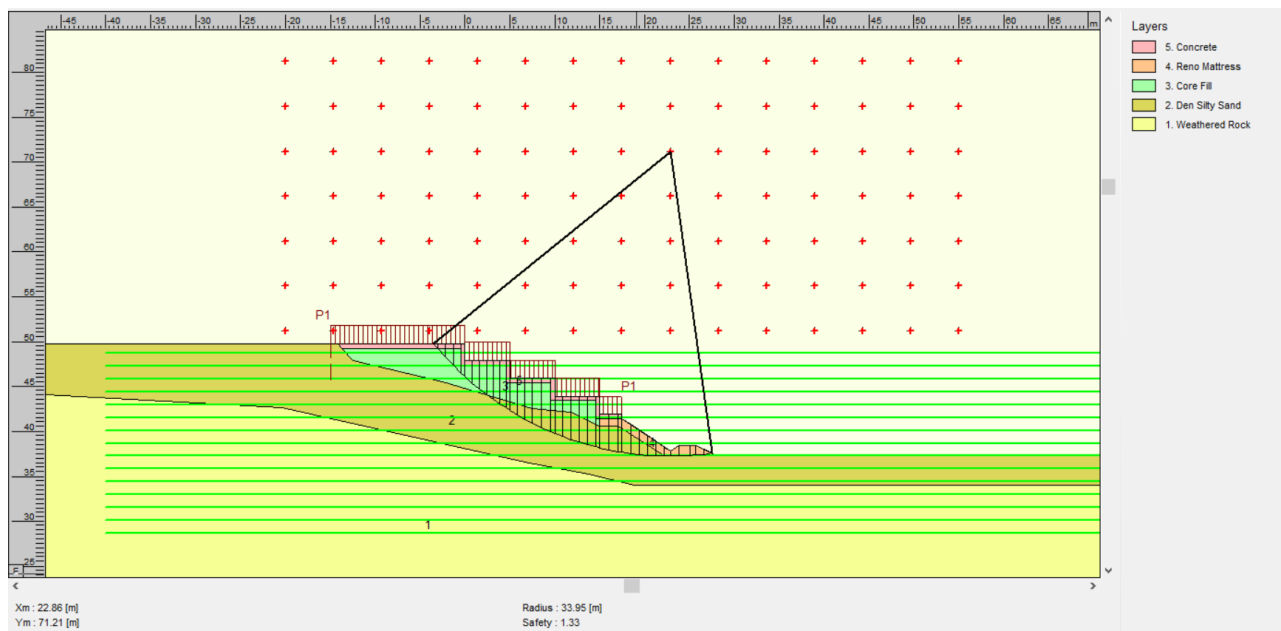
Annexure - 23

Slope Stability Report by IIT-G & Gabion Mattress design
calculation

Static Case: FoS ~ 1.76



Seismic Case: FoS ~ 1.33



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DESIGN OF LAUNCHING APRON & SCOUR DEPTH CALCULATION

(As per IRC SP 116:2018)

PROJECT NAME: Launching apron design
PROJECT NUMBER:
CLIENT: AIWT Assam
LOCATION: Umananda, Guwahati
REFERENCE SECTION:
DATE: 7/9/2022
REVISION: R0

CALCULATION OF SCOUR DEPTH

INPUTS

1 Design Discharge =	= 72238.00	cumecs	Note:
2 Maximum Velocity as per H.F.L	= 6.00	m/s	Given
3 Silt Factor	= 0.80		Given
4 Level of H.F.L	= 48.40	m	Assumed fine sand from IRC 78
5 LWL	= 41.55	m	Given
6 Unit weight of rock fills, γ_s	= 26.00	kN/m ³	Given

Calculation

According to clause 7.4 of IRC:SP:116:2018, the mean depth of scour below HFL (D) shall be calculated in accordance to the provisions

$$\text{DEPTH OF SCOUR BELOW H.F.L. (D)} = 0.473 \cdot (Q/f)^{1/3}$$

Where,

Q=Discharge
f=Silt factor

$$\text{Hence, Depth of scour below HFL } D = 0.473 \cdot (Q/f)^{1/3} = 21.22 \text{ m}$$

MAXIMUM DEPTH OF SCOUR (Dmax)

1	Scour Depth below H.F.L.(Dmax)	= 1.5 * D	
		31.83 m	(1.5 * d_{sm})
2	Scour Depth below L.W.L.(Dmax)	= Scour Depth below H.F.L. - (H.F.L. - L.W.L.)	
		24.98 m	

SHAPE AND SIZE OF APRON

3	Length of Launching Apron	= 1.5 * maximum scour depth below bottom of gabion mattress (L.W.L.)
		37.47 m
	Provide Launching Apron of length	38.00 m

MATTRESS THICKNESS CALCULATION

1. Velocity criteria

Refer IRC:SP:116:2018, Annexure II, CLAUSE 7.2

Table II-1 Indicative Thickness of Gabion Mattress in Relation to Water Velocity (mm)

Type	Thickness (m)	Stone size (m)	d_{50} (m)	Critical Velocity (m/s)	Limiting Velocity (m/s)
Revet mattress	0.15-0.17	0.07-0.10	0.085	3.5	4.2
		0.07-0.15	0.11	4.2	4.5
	0.23-0.25	0.07-0.10	0.085	3.6	5.5
		0.07-0.15	0.12	4.5	6.1
	0.3	0.07-0.12	0.1	4.2	5.5
		0.10-0.15	0.125	5.0	6.4
Gabion	0.5	0.10-0.20	0.15	5.8	7.6
		0.12-0.25	0.19	6.4	8.0

$$\text{Maximum velocity} = 6.00 \text{ m/sec}$$

Therefore,

Recommended value for thickness can be taken as =

0.5 m

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2. Tractive Force Theory:

Refer : IRC:SP:116:2018 Clause 7.3

Shear stress on revert mattress placed on channel bed or bank:-

Where

τ_b = Design shear stress (kN/m²)

γ_w = Unit weight of water (kN/m³)

Y = Maximum depth of water on revetment (m)

S_f = Slope of energy grade line

K_1 = Slope factor

1 - for horizontal

0.75 - for sloped surface

K_b = Bend coefficient . Ranges from 1.05 to 2.0

Bend coefficient is function of Radius of carvature 'Rc' and Top width 'T'

$K_b = 2$ For $2 \geq Rc/T$

$K_b = 2.38-0.206(Rc/T)+0.0073(Rc/T)^2$ For $10 > Rc/T > 2$

$K_b = 1.05$ For $10 \geq Rc/T$

Considering,

$K_b = 1.05$

$K_1 = 0.75$

$S_f = 0.0020$

$\gamma_w = 9.81$ kN/m³

Maximum depth of water on revetment, $Y = 6.85$ m

Therefore,

Design shear stress , $\tau_b = 0.11$ kN/m²

Note:

Straight stretch

Sloped surface

Assumed

Allowable Shear stress for the revert mattress :

τ_{All} - Allowable shear stress for the different thickenss of revert mattress are as follows:

Thickness of revert Matterss in m	*Allowable shear stress in N/m ²	Allowable shear stress in kN/m ²
Reno mattress - 0.17m	224	0.224
Reno mattress - 0.23m	268	0.268
Reno mattress - 0.30m	336	0.336
Gabion mattress - 0.50m	470.4	0.4704
Gabion mattress - 1.00m	470.4	0.4704

* Data as per Maccaferri test results and litrature

Therefore ,

Allowable shear stress for the 0.5 m thick mattress is

$\tau_{All} = TRUE$ kN/m²

$\tau_{All} > \tau_b$

Hence, SAFE

Resulting levels obtained referring Inputs

High Flood Level

= 48.40 m

Deepest Scour level

= H.F.L. - Scour depth below H.F.L.

16.57 m

HFL 48.40 m

L.W.L. 41.55 m

MSL 16.57 m

Provided length of Launching Apron

38.00 m

Toe wall is required to support the bank revetment and prevents undermining.

The launching apron is assumed to launch in 2H:1V post scouring

IRC:SP:116:2018 , CLAUSE 7.4

FILTER MEDIA DESIGN

A translational layer of fabric placed between the underlined soil and the structure prevents the migration of soil particles through the voids present in the structure.

Synthetic fabric filters have found considerable use as alternatives to granular filters .

Further,

Considering MoRTH Section 700, IRC 59 Page 28.

Geotile Type-1 is well suited for placement beneath mattress and characterized by a high resistance to installation damage, high water permeability, resistance to ultraviolet degradation and to biological & chemical environments normally found in soils.

Ref. As per MoRTH Section 700 - Table 700-1

Survivability and Endurance Criteria

Considering Type I and Elongation at failure > 50%

Strength Parameters	Standards	Mactex N 60.1 or Equivalent Fabric	As Per MORTH 700
Grab Strength in Newton (N)	ASTM D4632	910	900
Tear Strength in Newton (N)	ASTM D4533	375	350
Burst Strength in Newton (N)	ASTM D3786	2413	1700
Puncture Strength in Newton (N)	ASTM D6241	2380	2000

Mac Tex N 60.1 or any Equivalent filter satisfies the Survivability/Durability criteria can be used.

***Note:**

Any variation in the inputs mentioned shall be first intimated to design engineer, and as such the provided design shall not be valid.

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26 May 2023

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26.05.2023

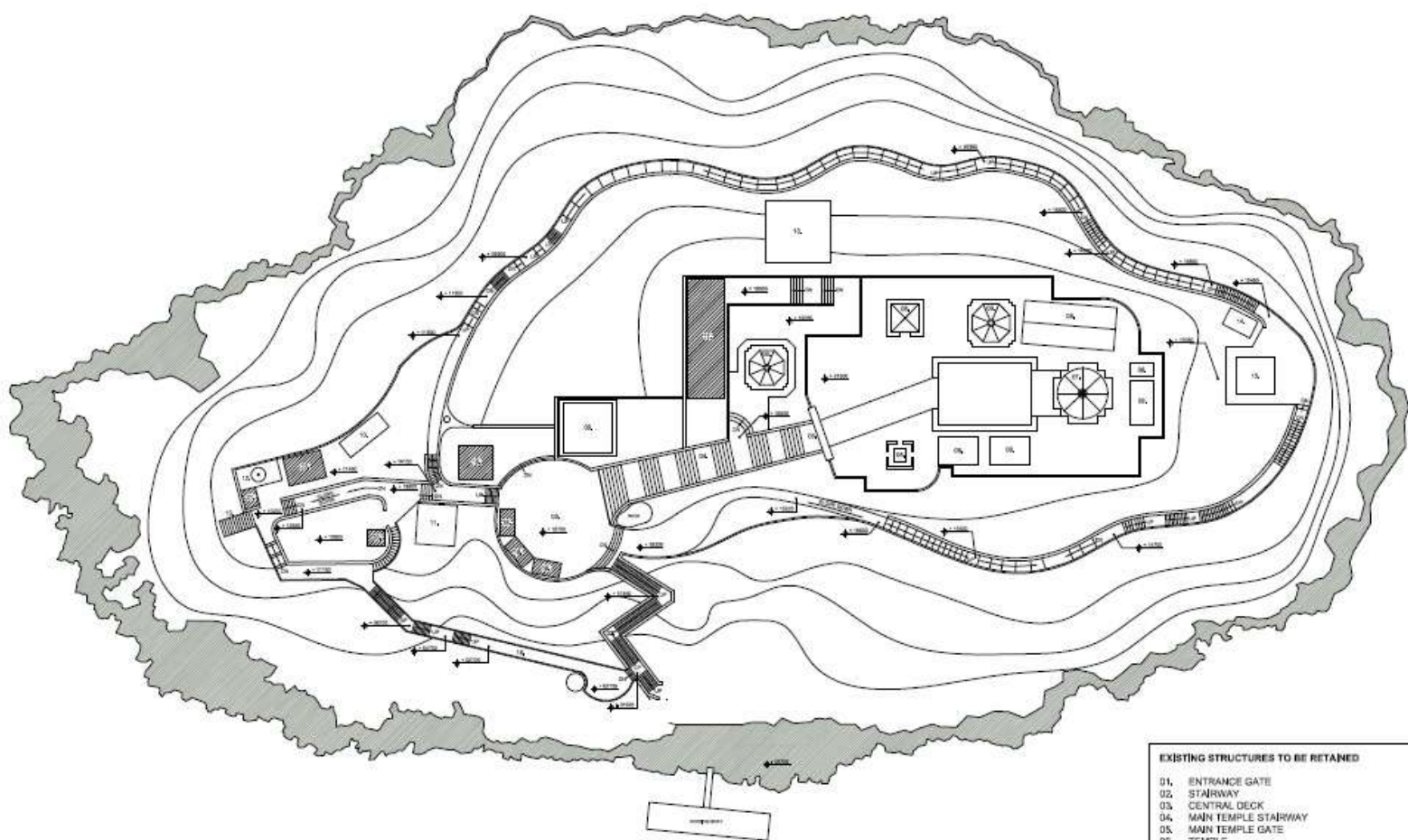
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Annexure - 24

**New Approach developed under Smart City
Project**



EXISTING STRUCTURES TO BE RETAINED

- 01. ENTRANCE GATE
- 02. STAIRWAY
- 03. CENTRAL DECK
- 04. MAIN TEMPLE STAIRWAY
- 05. MAIN TEMPLE GATE
- 06. TEMPLE
- 07. UMANANDA TEMPLE
- 08. STRUCTURES IN TEMPLE COMPLEX



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