ASSAM INLAND WATER TRANSPORT DEVELOPMENT SOCIETY
GOVERNMENT OF ASSAM

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

IN-IWT-242294-CS-QCBS

ESIA REPORT FOR NEAMATI MODULAR 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
AoI	Area of Influence
ASEB	Assam State Electricity Board
CITES	Convention on International Trade in Endangered species.
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
GC	General Consultant
GoA	Government of Assam
GoI	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
PIU	Project Implementation Unit
PMU	Project Management Unit
PAPs	Project Affected Persons
PWD	Public Works Department
NGO	Non-Government Organizations
NW	National Waterway
SPCB	State Pollution Control Board, Assam
SPL	Sound Pressure Level
TSSC	Technical Supervision & Support Consultant
TPM	Third Party Monitoring

EXECUTIVE SUMMARY

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.

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.

PROJECT FEATURES

Neamati is the most important terminal for the residents of Majuli travelling to Jorhat. The Neamati Ghat also serves as the entry point to Majuli, the largest river island in the world. The ghat is not only of importance to Jorhat but also to several neighbouring towns and villages in upper Assam. Neamati Ghat is about 17 km from Jorhat city centre.

There is an existing operational ferry terminal in the Neamati and the riverine infrastructure of the ferry terminal consisting of floating pontoon facility for berthing of vessels and boarding and de boarding of passengers. This terminal also accommodates RO-PAX vessels with inbuilt ramps for the transport of two and four-wheeler vehicles. The terminal is lacking with basic land side infrastructure and facilities for the safe embarking and disembarking of passengers. On an average

about 1000 passengers travel to and from Neamati to Kamalabari and Neamati to Aphalamukh Terminal. During the peak tourist and festival season i.e October to February, more than 5000-6000 passengers use these ferry services to reach Majuli, the cultural capital of Assam from this terminal. The geo-coordinates of the proposed terminal location is 26°51'39.12''N, 94°14'31.18"E. As per DPR, Movable floating pontoon and linkspan has been planned for Neamati Ghat Terminal.

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
- Landscaped areas
- Parking areas
- Terminal building
- Utilities for Electrical, water tanks, sewage management etc.

Riverine Facilities:

- Approach ramps
- Sloping linkspans
- Pontoons

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. 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.

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.

Physico-Chemical Aspects

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 2609 mm. The mean monthly temperature ranged from 18.8°C to 28.1°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.

The study area is a part of Jorhat district. It is the flood plain of the Brahmaputra River in the north. The recent alluvial soils of recent rivers are light grey to dark grey in colour and are confined to the flood plain area adjacent to the Brahmaputra River and its tributaries.

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.

Land use Pattern- Flooded Vegetation is in 56.98% of the total land, which is followed by crop land (13.83%), Waterbodies (13.63%), built area (12.28%) and Open Land (3.28%).

The soil type of the area is sandy loam.

The BOD and COD levels at Neamati terminal are 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 after conventional treatment.

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 the proposed terminal in the study area. Baseline ambient air quality is found to be within the standard.

The noise levels were observed to be well within permissible limit (55 dB(A)) specified for residential area and (65 dB(A)) specified for commercial area.

Terrestrial Ecological Aspects

During the floristic survey, a total of 113 plant species were recorded from Neamati site. Of these, Herbs (37), Tree (32), Shrubs (19), Climbers (4), Bamboo (3), and Grass (18) species recorded.
A total of 113, plant species were recorded from Neamati site were dicot (90) and monocotyledon (23), belonging to 46 families were recorded in the Neamati site. The most dominant families recorded in the Neamati site were- Poaceae (17), followed by Asteraceae & Fabaceae (8), Myrtaceae (5) Amaranthaceae, Apocynaceae, Euphorbiaceae, Lamiaceae, Malvacea and Verbenaceae (4).

A total of 17 tree species (≥ 5 cm dbh or ≥16 cm GBH), 20 shrub and 42 herb species were recorded from Neamati site,

Agriculture is the chief occupation, Neamati site. Rice (Oryza sativa) is the predominant crop.

Terrestrial Fauna

Faunal Diversity in and around Neamati site were identified by direct observation during field survey and signs of their pellets, scats, pugmarks and claw marks were also considered. Several Mammal, Avi fauna, Herpetofauna and 14 species of butterflies were found in the study area.

Riparian Habitat

River bank vegetation is ecologically termed as riparian flora, and is highly dynamic. It links terrestrial and aquatic habitat, under the influence of waterways such as riverbanks. It is represented by a particular type of vegetation that grows along the sides of rivers, which are called the river's riparian zone.

Protected and Eco-sensitive areas

The Hatishal Eco Park is at distance of 4km and Dolphing sighting area is just 2km from the project site.

Aquatic Ecology

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*, *Zygnem*a sp., *Anabaena* sp. *Oscillatoria* sp. *Achnanthes* sp. *Cymbella* sp. etc.

Zooplanktons

Zooplankton community comprised of Cladocera, Copepoda, Euglenophyceae, Protozoa and Rotifera. The most dominant 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

Major ichthyofauna observed are *Rita rita, Labeo boga, Cabdio morar, Chanda nama, Barilius bendelisis, Amblypharyngodon mola, Pethia ticto, Puntius chola, Monopterus cuchia, Labeo gonius, Mystus tengara, Mystus cavasius.*

Socio Economic Aspect

Socio-Economic study was carried out in the radius of 500 meters from the proposed terminal site. Six vendors earning their livelihood near the existing terminal site may be affected/ displaced during construction period. However, no sensitive receptor (e.g., schools, hospitals etc) were found within the 500 meters distance.

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.

The land identified for the proposed project is submerged private land (26,505 sq.m) belongs to 9 titleholders land owners. In addition, 6 squatters were also identified who were selling fruits, drinking water, running tea & food stall etc. near the proposed site. To mitigate the adverse impact on PAFs/PAPs, Resettlement Action Plan has been preprared separately with budgetary allocation. Impact due to labour influx, risk of GBV, SEA/SH, occupational health and safety etc. were assessed during construction phase of the project. Mitigation measures for the same has also been provided.

AIWTDS has developed GRM to address the issue of stakeholders, PAFs, PAPs, local community, pherry passengers etc. within stipulated timeline and responsibility.

This exercise has provided a sound basis for formulation of different management plans, which are presented in the ESMP document of the project.

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.

RISK ASSESSMENT AND EMERGENCY PREPAREDNESS PLAN

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 natural or climate induced hazard includes the following

- Bank failures.
- 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.
- Hazards would also arise due to varying weather conditions and due to the establishment of temporary structures.

The Emergency Preparedness Plan includes Emergency planning, evacuation & escape routes planning and Communication & Notification Systems. A detailed training program will be formulated to implement the emergency management. Local fire departments and emergency services will be well collaborated to ensure coordination and support during an incident including fire emergency.

- Terminal is 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.
- 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.

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.

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 PM_{10}, $PM_{2.5}$, NOx, SO_2 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

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 terminal, environmental monitoring, training, awareness and technical support for establishment, enhancement measures and environmental guidelines. Environmental budget for Neamati terminal is estimated as Rs. 50.80 lakh for construction stage and the cost of implementing the EMP during the operation phase by DIWT/AIWCL is extimated as Rs. 54.25 Lakh.

The estimated costs for various activities for social management under the project is Rs.45 lakh.

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 identity 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/ Third Party Monitoring (TPM) Consultant 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 the proposed Assam Inland Water Transport Project is likely to entail certain environmental impacts due to the proposed intervention at Neamati. 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.

CONCLUSION

The Environmental and Social Impact Assessment study was conducted in line with WB guidelines. The Project activities at proposed terminal construction at Neamati shall take place in a sensitive ecological hotspot of dolphins and other aquatic species which might have impact on this habitat. It is thus considered Category A from the environment point of view. Since the construction of the proposed terminal involves acquisition of private land and there are also 06 number of squatters whose livelihood may be affected due to the construction activities, so the project is considered as Category A for social impacts as well.

The cost of the project is estimated to be INR 67.4 crores for the development of Neamati terminal. The proposed project will have positive impact on social and economic improvement of the region by overall improvement in living standard. Employment generation of this sector will also increase considerably; a number of other indirect and intangible benefits may also flow from the increase in economic activity, including development of tourism and water sports, conservation of biodiversity, and sectoral development with a growth in related services.

In Addition, the proposed project will have Environmental and Social benefits which would lead the project for a sustainable operation.

As per the EIA-EMP study, the project is found to be viable from all aspects such as technical, economic, environmental and social aspects.

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**).

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 Panchayat, Zilla Parishads and autonomous councils. There are many places in Assam which are connected to the mainland only through waterways, Majuli, 'the cultural capital' of Assam being one of them. In the river areas (islands) of the river Brahmaputra locally known as 'chaar chapori', the prime mode of transport for the inhabitants are private boats locally known as 'bhutbhootis'. Thus, there is a need to provide safer means of ferries and related infrastructure, facilities to the people by development of wider IWT sector.

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.

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 baring 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.

Development of the IWT sector shall accelerate the development of the hinterland and the opening up of new business opportunities along the rivers.

Thus, there is an urgent need for improvement of 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°51'39.12”"N, 94°14'31.18"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 Terminal	Location
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 ESIA report is for proposed construction of modular terminal at Neamati ghat.

1.4 SCREENING AND SCOPING STUDY

Screening and Scoping exercise has been done for Neamati 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

- Improved facilities and connectivity with Majuli Island.
- Improvement in income and living standards due to increase in tourism; potential for development of tourism cicuits viz. Guwahati-Kaziranga via Tezpur, Tezpur-Singri-Viswanath, Kaziranga-Neamati-Sibsagar
- Employment generation of this sector will also increase considerably; a number of other indirect and intangible benefits may also flow from the increase in economic activity, including development of tourism and water sports, conservation of biodiversity, and sectoral development with a growth in related services.

1.4.2 Negative Impacts

- Proposed terminal area is prone to erosion and construction activities may further aggrevate erosion of the river Bank. There is need to protect the river bank from erosion which is already evident in the area. Bank protection measures through liaising with concerned departments need to be undertaken to stabilise the terminal and make it operational.
- Anticipated natural hazards at site are floods, cyclone and earthquakes. Since the proposed interventions are planned along the river and as the site is prone to flooding, terminal should be designed considering the 50 years return HFL level of the river. To prevent flood hazard, off-shore and on-shore structures should be above the HFL level. Highest flood level recorded in the area was

87.37 m in the year 1991. It is also necessary to take into consideration in the design so that the structure can withstand earthquake of moderate to high intensity.

- 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.
- 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.
- Acquisition of Private land of 26,505 sq.m from 9 titleholders land owners.
- Impact on livelihood of 6 (six) squatters selling fruits, drinking water, running tea & food stall etc. near the proposed site.
- The proposed project site is the shortest and convenient access route for the tourist and regular commuters from the ferry terminal to Majuli Island. Hence, alternative access route needs to be identified and developed during project construction phase.
- The number of passengers travelling from Neamati to Aphalamukh and Kamalabari Ghats (Majuli) increases during the Raas festival generally in the month of Novemeber and tourist season (October-February). Construction schedule should be planned considering emergencies like stampedes etc due to overcrowding.
- Crowd management plan need to be prepared for festivel time and tourist season.
- Noise and vibration due to use of machinery and movement of vessels.

The Project activities at proposed terminal construction at Neamati shall take place in a sensitive ecological hotspot of dolphins and other aquatic species which might have impact on this habitat. It is thus considered Category A from the environment point of view. Since the construction of the proposed terminal involves acquisition of private land and there are also 06 number of squatters whose livelihood may be affected due to the construction activities, so the project is considered as Category A for social impacts as well. Based on the identified risks, the impacts could be significant and hence, the ESIA study shall be conducted with emphasis on following aspects:

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 private land, thus loss of private land is a major risk
- Assessment of loss of livelihood of squatters

- Preparation of Site-Specific Conservation Plan for Dolphins with budgetary provision for construction and operation phases
- Preparation of Livelihood Restoration Plan for squatters 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	Describes 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 ESIA 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 Neamati Terminal.

2.2 DESCRIPTION OF THE TERMINAL

Neamati is the most important terminal for the residents travelling from Jorhat to Majuli. The Neamati Ghat also serves as the entry point to Majuli, the largest river island in the world. The river port is not only of importance to Jorhat but also to several neighbouring towns and villages in Upper Assam. Neamati Ghat is about 17kms from Jorhat city centre.

IWT have 02 ROPAX in operational mode to carry passengers and vehicles from Neamati Ghat Terminal to Aphalamukh Terminal. There are 2 ferry routes from Neamati. Neamati-Aphalamukh, and Neamati- Kamalabari. On an average about 1000 passengers travel to and from Neamati to Kamalabari and Neamati to Aphalamukh Terminal. During the peak tourist and festival season, October to February more than 5000-6000 passengers use these ferry services to reach Majuli, the cultural capital of Assam from this terminal. Additional ferries are arranged by IWT during the aforesaid months.

The first boat leaves the Ghat at 7:30 am and the last one leaves at 4 pm in the evening. About 1000 passengers including students, servicemen, traders and tourist per day travel from Neamati to Majuli. Adequate facilities at boat and terminal were noticed which includes seats, life jackets and a washroom etc. in the boat. This washroom is barely used by passengers due to its unhygienic conditions. The approach road to the ghat is about 2.5 m wide and 600 m length is kaccha (unmetalled) road which becomes slippery during rainy seasons may cause mishaps. The terminal has waiting area, drinking water facility and electricity. The existing riverine infrastructure in the ferry terminal consists of floating pontoon, facility for berthing of vessels and boarding and deboarding of passengers and two wheelers.

There is a need to develop a ferry terminal with all basic infrastructure and facilities. This ferry terminal shall be planned for the movement of passengers and the vehicular traffic especially two and four wheelers. The co-ordinates of Neamati terminal are 26°51'39.12''N, 94°14'31.18"E and the location map is given in **Figure-2.1.**

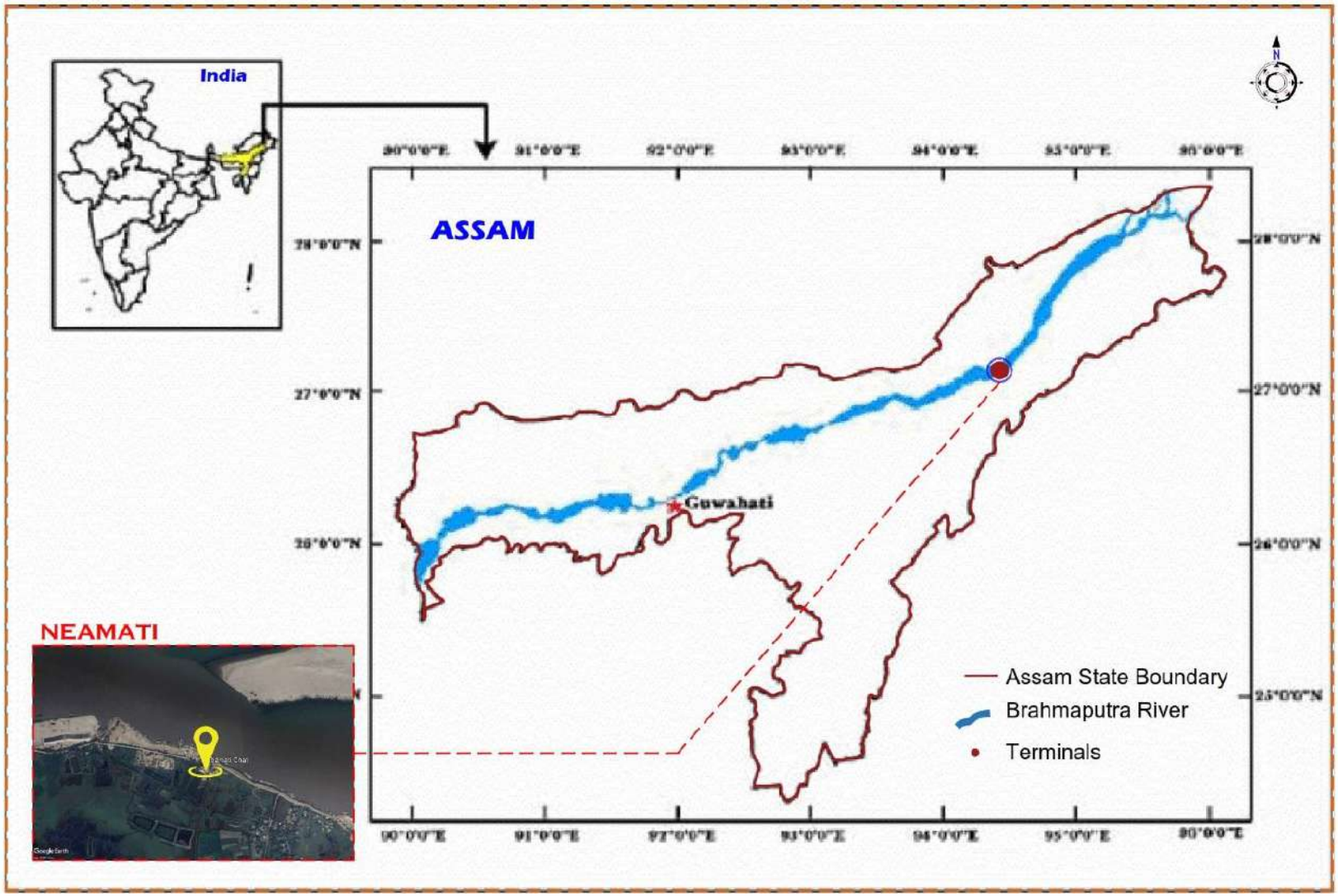


Figure 2.1: Location Map of Neamati Terminal

2.3 EXISTING FACILITY AT NEAMATI GHAT

The existing facilities at Neamati Ghat Terminal are as listed below:

a) The existing Ghat is just a makeshift type which lacks basic necessities such as toilets, waiting area and staff seating area.
b) Floating pontoon facility for berthing of country vessels
c) Kachcha approach road.
d) At the land side there is no terminal building, dedicated waiting areas and the ticketing counters etc. Presently the ticket counter is operated from waiting area.

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

Figure 2.2: Existing conditions at Neamati Terminal

2.4 PROPOSED UPGRADATION AT THE TERMINAL

Neamati is the most important terminal for the residents of Majuli travelling to Jorhat. The Neamati Ghat also serves as the entry point to Majuli, the largest river island in

the world. The ghat is not only of importance to Jorhat but also to several neighbouring towns and villages in upper Assam. Neamati Ghat is about 17 km from Jorhat city centre. The geocoordinates of the prposed terminal location is 26°51'39.12''N, 94°14'31.18"E.

There is an existing operational ferry terminal in the Neamati and the riverine infrastructure of the ferry terminal consists of floating pontoon facility for berthing of vessels and boarding and de boarding of passengers. This terminal also accommodates RO-PAX vessels with inbuilt ramps for the transport of two and four-wheeler vehicles. The terminal is lacking with basic land side infrastructure and facilities for the safe embarking and disembarking of passengers.

The layout of the proposed Neamati Ghat Terminal is enclosed as **Figure-2.3.** As per DPR, Movable floating pontoon and linkspan has been planned for Neamati Ghat Terminal. The typical cross-sectional view shown in **Figure-2.4.**

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
- Landscaped areas
- Parking areas
- Terminal building
- Utilities for Electrical, water tanks, sewage management etc.

Riverine Facilities:

- Approach ramps
- Sloping linkspans
- Pontoons

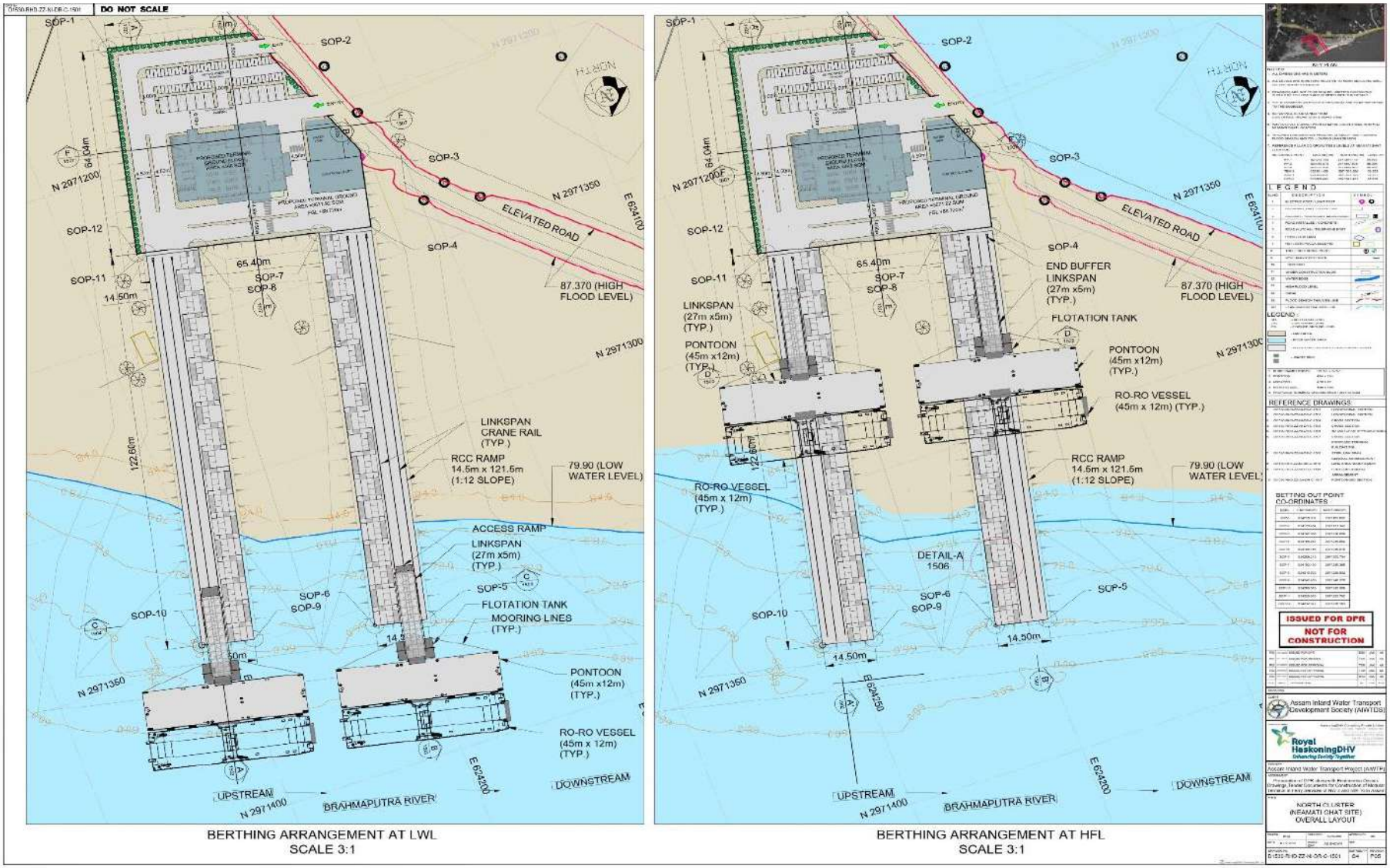


Figure 2.3: Layout of Neamati Ghat Terminal including Pontoon Linkspan and Sloping Access

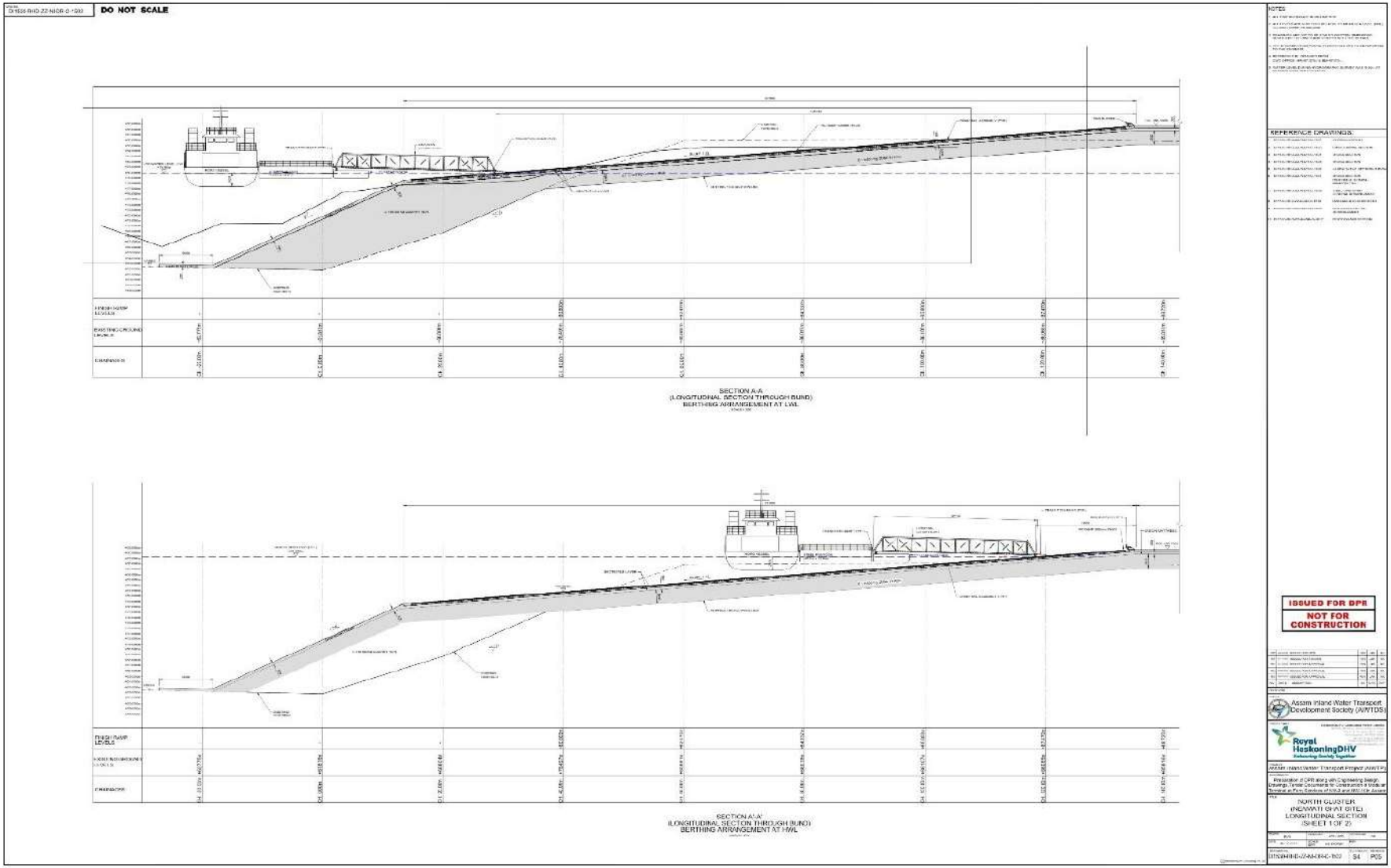


Figure 2.4: Cross Section Neamati Ghat

The summary of land and river components to be developed as a part of the project are given in **Table-2.1.**

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

Components	Nos	Dimension	Remarks
A. Riverine structures			
I. Type of berthing arrangement	Movable floating pontoon and linkspan		
II. Floating pontoon	2	45x12 m	Steel pontoon
III. Approach Bund	2	121 m length with 1 in 12 slopes with landing at every 5 m	Lane for cars, bikes and passengers and physically disabled person
IV. Link span	2	27m x 4.5m	Access/moveable steel structure which connects access the approach bund and the floating pontoon for the safe passage of the passenger and the wheeled vehicles. This shall be of 4.5 m as clear width and 2.5 m as clear height
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[1]
B. Land side facilities			
I. Total land area		3700 Sqm	
II. Building area		600 sqm	
• No. of floors		G+1	

**Source: DPR, 2023*

[1] 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.

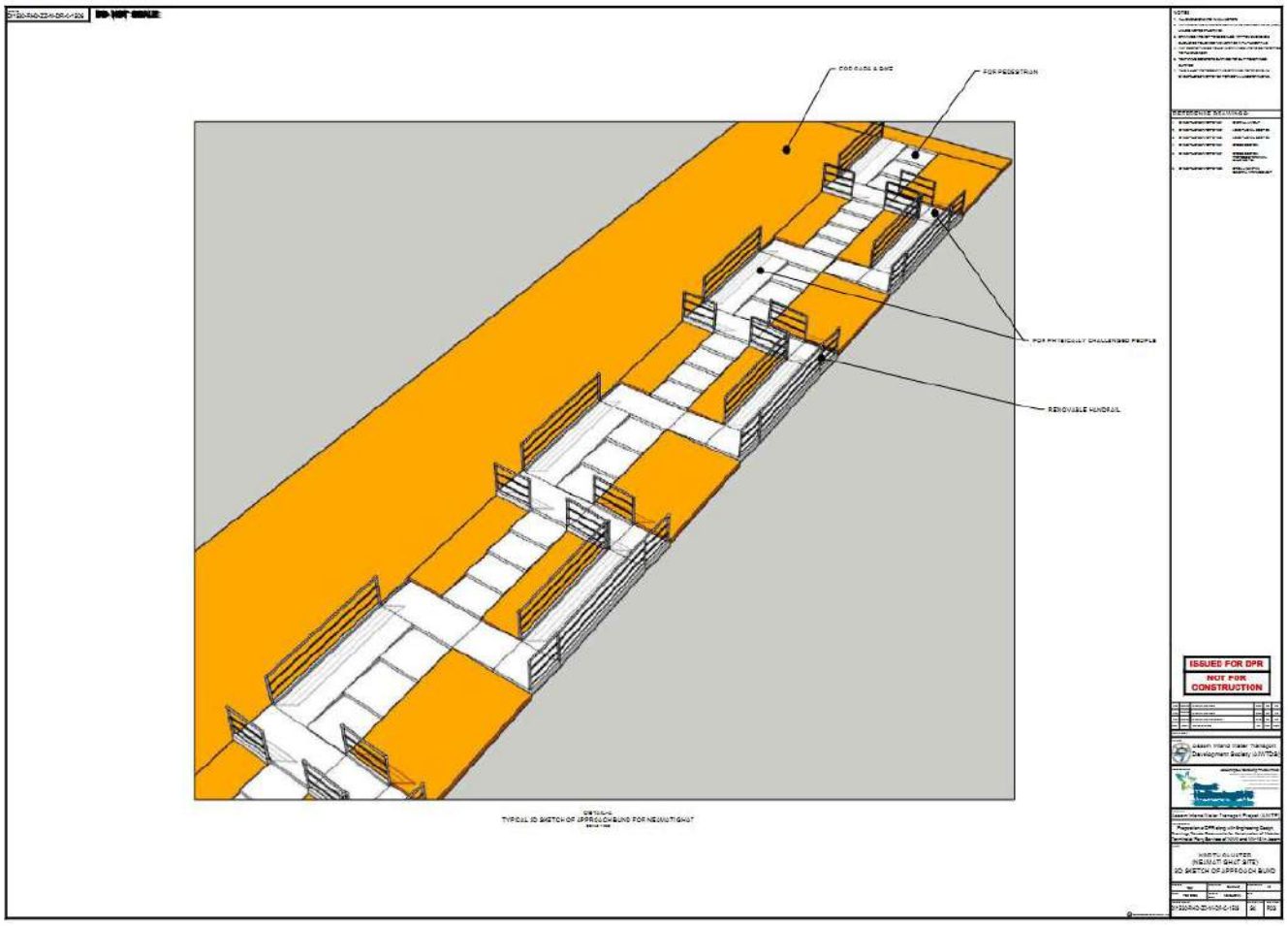


Fig: 2.5 Typical 3 D Sketch of Approach Bund for Neamati showing passage for cars, bikes, passengers including physically challenged people

Other amenities and facilities proposed at Neamati Terminal

- Surveillance System (CCTVs)
- Communication System
- Fire alarm and security system
- Internal HVAC
- Power
    - Power requirement: 300kVA

Source of power supply: The terminal location has power supply connection near the proposed location with 3-phase, 230-440V overhead connections. In order to meet the total power demand for river terminal, 11kV level power supply shall be provided by Assam State Electricity Board (ASEB) . The power tap-off location shall be in vicinity of Terminal building with a suitable breaker. The main electrical substation location shall be near the Terminal Building only.

Water

- **Demand**: Water demand of 38 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: Currently, there is no municipal water supply to the area, however, the state government will be providing municipal water connection till the site boundary under Jal Jeevan Mission (JJM) in the future. Till then, the water shall be sourced from the bore well planned near the water tank. Water shall be pumped to Ground Level Service Reservoir (GLSR). 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., 38 KL. From this GLSR, water will be pumped to the overhead tank (OHT) of the building using a submersible pump after requisite treatment. To prevent contamination of potable drinking water, the opening of the GLSR shall be above the HFL of 87.37m.

Sewage Management - The sewage treatment at the site has been recommended via a bio-digestor tank. A bio-tank of 12 KL occupying 6 sqm (2m X 3m) 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 Sewage management plan and Design detail of bio-digester is enclosed as **Annexure- 1.**

Storm Water Management: Storm water drains will be masonry channel drains with minimum width of 300 mm. The drains will be covered with steel grating cover trench grate covers. Storm water drains will have a slope of 1:500.

Solid Waste Management: In the terminal building the waste generated will be mainly Municipal Solid Waste. 2 bin system for separating Wet and Dry waste will be placed at various locations like approach bund, approach trestle, landing platforms, main pontoons, and terminal building for convenience of users/commuters. The site will have designated waste collection area where all the waste will be collected daily and segregated before it is collected by Municipal Waste Management system.

Design and specifications of inland vessels operating in the ghat shall have all the facilities for waste management and disposal as per the provisions specified in the Inland Vessel Rules, 2022. All the inland vessels shall have a holding tank of adequate capacity to store all sewage generated on board, for subsequent discharge into a shore reception facility. The terminal shall have all the provisions for sewage treatment at the shore. Sewage suction vehicle available with the Jorhat Municipal Corporation shall be engaged by DIWT/AIWCL for collecting the sewage from the vessel. Vessel can be berthed near the terminal building; the sewage shall then be pumped out and taken from the vessel to the shore-side facility through flexible HDPE pipe.

Firefighting System

Fire protection systems and other safety measures shall comply with relevant local regulations and the requirements of the local authorities. The systems shall generally be as per the recommendation/ guidelines of TAC and / or relevant IS code & NBC

Fire system of the terminal shall consist 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) / National Building Code of India (NBC)/ LPA (Loss Prevention Association of India). The static storage for firefighting has been recommended at 100KL as per NBC 2016 Norms. internal hydrants, sprinkler system and fire extinguishers are provided inside the building. 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. Pipeline for the internal hydrants and sprinkler system is tapped off from the external hydrant line routed around the building. Design life of the system shall be 20 years. The GLSR will have twin water compartments for firefighting and one potable water compartment. The water will be filled into the firefighting compartments via pumps and the overflow will be connected to the potable water compartment to maintain water circulation. Fire water sprinkler system consisting of Pendent type sprinklers covering certain area of the terminal building such as office areas, security cabin, feeding area, first aid room, restaurant, shops and ticket counters is provided.

Fire extinguishers of ABC type as per IS 14609 are provided at the entry and exit of the building and near restaurant along with exit signages as per IS 9457.

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 150mm and 125mm 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.

Details of emergency evacuation is further explained in Chapter 7.

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 physically 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 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.

2.5 RIVER BANK PROTECTION

River bank at the terminal location experience moderate erosion as per the technical studies conducted by the Design DPR Consultant. The time history satellite images show moderate shift of riverbank at terminal sites due to bank erosion. Riverbank protection for such location is both technically and economically viable. Geobags are already in place at the upstream and downstream of this terminal. Based on the data collection and desk study by the DPR Consultant, the overall shoreline was found to be stable in the vicinity of the existing terminal where the proposed construction under the Project shall take place.

Initiatives to protect the river bank is also being undertaken by the Water Resource department. The Project has also undertaken initiative to liaise with Water Resource Department, Flood and River Bank Erosion Management Authority (FREMA) to highlight the importance of Bank protection measures near the proposed terminal location and also undertand the departmental plans for erosion control and river bank stability in the terminal location. This is important for ensuring that investments made are for a climate resilient infrastructure under the Project. A meeting under the chairmanship of Additional Chief Secretary, Water Resources Department (WRD), Assam in presence of officials from IWT, AIWTDS, FREMA, WRD, Agriculture was conducted in Guwahati on 12th May, 2023. The plan and the technical drawing of the site was thereafter provided to WRD for their understanding of the project. This was followed by a visit to the proposed terminal site by the official of the WRD to have an onsite inspection. Following these it was informed by WRD that adequate river bank protection works are already being taken at Neamati. It was informed during the meeting that river Bank protection with reinforced cement concrete porcupines have

already been undertaken by the department. A spur dike placed upstream of the terminal location (100 m upstream) which was constructed under WRD is currently being repaired by the department. WRD officials also conducted a survey in the proposed terminal location and has prepared technical estimates for additional river bank protection works.

In addition, to the erosion projection works suggested by WRD, the project has also considered River bank protection measures in the immediate vicinity of the terminal under the project to address the scour and slope protection due to river flow. Both approach bund and riverbanks 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. Accordingly, ~ 0.5m thick gabion mattress has been proposed for slope protection. These gabion mattresses shall be filled with suitable aggregate material.

Since this issue is critical to the stability of the terminal an independent third-party opinion was sought on the protection works. A technical review was conducted by India Institute of Technology, (IIT), Guwahati. The slope stability report indicates that the proposed design of the approach bund is considered to be stable for construction.

Please refer **Annexure- 23** for Slope Stability Report by Indian Institute of Technology, Guwahati (IIT-G) along with Gabion Matress 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 Neamati terminal

S. No	Name of Terminal	Land Requirement (sqm)	Ownership
1	Neamati	26,505	Submerged Private land

As per approved RPF by World Bank for this project the process flow for Land Acquisition and R&R is well defined. This process includes Requisition of Land by AIWTDS. The proposal for acquisition of any private land will be made in the formats prescribed by the enacted rules of the Assam State Government on the RFCTLARR 2013. These formats will include Khasra maps, along with the details of area of land to be acquired. The process also emphasises Appointment of “Administrator” for R&R, Notification, Declaration and Preparation of Award, Notification, Declaration and Preparation of Award.

The Neamati Ghat is proposed on submerged private land. AIWTDS has submitted a proposal in Form-A to Deputy Commissioner, Jorhat for acquisition of the maximum area of land at Kumargaon village under Hezari Mauza of Jorhat West Revenue Circle for the development of Ferry Terminal at Neamati Ferry Ghat under Notification No RLA177-2021/3 dated 07.03.2022 by direct purchase policy of State Government.

After receiving the proposal, a District Level Land Purchase Committee (DLLPC) was formed under the Chairpersonship of Deputy Commissioner, Jorhat for purchase of land through negotiated settlement. Concerned Revenue Circle Officer and representative of Requisitioning Department conducted site inspection and ground verification and issued a general notice in accordance with the Notification to register objections/claim, if any, within 30 days of the publication of notice. The same was also published in two daily newspapers namely 'The Assam Tribune' and 'The Dainik Janmbhumi' on 21.02.2023. Initially, as per the Letter No. JRA. 129/2022 dated 29.03.2023, no objection/claim was received from any interested party/person.

Accordingly, a joint survey was conducted on 13th April 2023 by AIWTDS Officials along with Revenue Officials of Jorhat District Administration to conduct a socio-economic survey and a final field survey was undertaken on 9th June 2023 by Revenue Officials with AIWTDS Officials to finalize the number of squatters in the proposed project site. As per the findings of joint survey 6 numbers of squatters were identified operating small shops at proposed terminal.

The District Level Land Purchase Committee (DLLPC) has calculated an estimate of Rs.1,28,98,881.88 (Rupees One Crore Twenty-Eight Lakhs Ninety-Eight Thousand Eight Hundred Eighty-One and Eighty-Eight paisa) only for the compensation to 9 titleholders land owners and 6 squatters vide Letter No. JRA 129/2022/117 dated 21.06.2023.

However, a general meeting was held with Circle Officer of West Revenue Circle, Jorhat; GP President of 35 no GP; Gaon Pradhan of 35 no GP; GP Secretary of 35 no GP;Junior Engineer of IWT; Supervisor Kanungo of L A Branch, DC Office; Supervisor Kanungo of Jorhat West Circle; Lat Mandal of Jorhat West Circle, Land Revenue Assistant of LA Branch and AIWTDS Social Development Experts along with the available Pattadars of the land and Possessors of the shops at Neamati Ghat on 19th July, 2023 in the 35 no Gaon Panchayat Office premises regarding settlement of issues on land acquisition. After the meeting a letter from the Addl. Deputy Commissioner (LA), Jorhat was received stating that as per the report from the Circle officer, Pattadars of 5 numbers of dag have already communicated and process is already initiated to communicate with the pattadars of rest 4 numbers of dag out of total 9 numbers of dag which falls under the proposed acquisition. In addition to the stated Pattadars, 6 numbers of possessors/squatters have also been identified. The Land Related Public Notification, letters, minutes and other related documents have been enclosed within Annexure-2.

2.7 CONSTRUCTION PERIOD

The duration of construction phase for Neamati terminal is about 12 months.

2.8 COST ESTIMATE

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

Table 2.3: Cost of the project

S. No	Name of Terminal	Cost (Rs. Cr.)
1	Neamati	67.4

**Source: DPR, 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. & 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.	The Project should adhere to NEP principle of "enhancing and conservation of environmental resources and abatement of pollution". ESIA and ESMP to examine the provisions of this policy, examine the clauses that are attracted and suggest remedial measures.
2	• Environmental (Protection) Act, 1986, • Environmental Impact Assessment Notification, 2006 its amendments	• 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	• 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.	Applicable GoA notified Majuli located at the opposite bank of the proposed terminal location as "Majuli Biodiversity Heritage Site".

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to 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. The effluents would meet the discharge standards specified in the Rules. The bid documents for civil works contracts shall mention that the contractor would comply with the standards mentioned in these rules.
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 can be created during cruise operation.	The machicney and construction activities would comply with the standard specified in the reules. The bid documents for civil works contracts shall mention that the contractor would comply with the standards mentioned in these rules.
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. Contractor is required to keep all his vehicles maintained and control all the construction activities so that ambient air quality remain within prescribed limit. The bid documents for civil works contracts shall mention that the contractor would

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
			comply with the standards mentioned in this rule. 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 Bid document would include clauses to ensure that the Contractor has systems in place to comply with the Hazardous waste regulations During the Operation phase the Vesel Operators will also follow the procedures and comply with the rules
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.	Bid document shall have clauses for proper 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.	Bid document shall have clauses for ensuring that single use plastics are not used at site. In operation phase, project proponent will implement the provision of this Act for disposal of Plastic waste.

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
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. This is specially applicable during the operation phase for disposal of batteries.
11	Assam Fire Services Rules, 1989	Application for Fire Safety NOC and renewal	The Contractor needs to apply for fire safety NOC during construction of terminal. Similarly, fire NOC during operation of terminal fore NOC need to be taken by AIWCL/DIWT.
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	National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	NIOSH has laid down criteria for a recommended standard: occupational noise exposure. The standard is a combination of noise exposure levels and duration that no worker exposure shall equal or exceed.	Internationally recognized environmental standards. Contractors are required to provide necessary measures to ensure safe working environment. Employee/ Project workers are also required to ensure that they do not carry out "unsafe act" or "unsafe practices" which jeaopardise the safety of himself or other workers. The Bid document will cary specific clauses on the planning and

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
			implementation of Occupational Health and Safety during implementation.
15	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.
16	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.
17	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
18	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.
19	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	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
		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 required to reply expeditiously or within thirty days.	
20	RFCTLARR ACT,2013	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. 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. Independent SIA (Social Impact Assessment) study needs to be conducted	Not Applicable, as the project land is unsurveyed government land.
21	Assam LAAR Rules 2015	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. Similar provisions for SIA (Social Impact Assessment) study also exist in this act.	Not Applicable as the project land is unsurveyed government land
21	Sexual Harassment at the workplace	Sexual harassment at the workplace is prohibited by law and can lead to disciplinary,	AIWTDS has established an Internal Complaints Committee (ICC) on 16th

S. No.	National/ State Legislation	Description on provisions related to the Project	Relevance to the Project
	(Prevention, Prohibition and Redressal), 2013	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.	September'2020 for redressal of sexual harassment complaints as per the requirements of this act.

3.2.1 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 IWAI 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 4.01, 4.04 and 4.12 is applicable to the project and accordingly Envioronment Management Framework (EMF), Social Management Framework (SMF), RPF & Gender Development Framework and Environmental Codes of Practice (ECoP) 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 activities at Neamati shall take place in a sensitive ecological hotspot of dolphins and other aquatic species which might have impacts on this habitat. It is thus considered Category A from the environment point of view. Project involves private land acquisition of 09 no of pattadars and displacements of 06 no of Possessors and also haveimpact of labour influx, health and safety, for which the proposed construction at Neamati shall be considered as Category A.

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

Stakeholder	**Rationale**	**Relevance to the project**	**Strategy for engaging the Stakeholder**
Public Works Department (PWD)	Valuation of Structures	Impacted structures to be valued as per PWD rates	Official communication
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
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
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.

- **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.

- **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.

- **Focus Group Discussions (FGDs) at Priority Terminals**

Focus Group Discussions (FGDs) with different groups of people were conducted in the month of May'2022 (20.05.2022) 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	• Dedicated water ambulance for medical emergency • Toilets, apart from unhygienic conditions its location is pathetic and which cannot be used by commuters. • Independent queues for commuter and vehicles during	• Construction of new and proper washrooms and drinking water facility are also proposed • New structure to have wider approach road and corridor

Focused Group	Concerns Raised	Response & mitigation Measures
	boarding and de-boarding ferries • Disabled friendly ramp • Drinking water facility Availability of adequate lifesaving equipment's in ferries, and there should be provision for storage of emergency equipment's in the terminal building.	• Special design to cater the elderly and physically challenged people, Non slippery tiles are recommended • Digital display system proposed at terminal sites
Occasional Commuters (Tourist of all age groups including youth, women, aged persons and children)	• Proper signboards regarding ferry route and timing along with information on cancellation/delay of ferry service. Separate washroom facility at ferry/ terminals/ pontoon	• Digital display system proposed at terminal sites • Construction of new and proper washrooms and drinking water facility are also proposed
Shopkeepers	• Upgradation of ghat will attract more tourist. • Site development for business activities. Preference to existing stall owners, if shops are built in terminal building	• Facilities will also be upgraded
Ferry Operators	• The ferry operators demanded for more ramps as they often get late due to frequent changes in the ramp from one place to another with every arriving and leaving of the boats. • There was a major accident in Neamati ghat on 8th September 2021, where 2 casualties and 2 went missing. The boat collision occurred due to striking of one boat on another boat already parked at berthing. It was revealed that the accident occurred due to lack of sufficient berthing space and use of un-conventional engines in the motor boats by private operators.	• Up gradation will be beneficial to ferry operators as well as commuters

Focused Group	Concerns Raised	Response & mitigation Measures
	• Deployment of additional security personnel on the boat to look after passenger's safety and security. There was a suicidal attempt by a passenger some time ago from the moving boat. • 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 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:

- **Vessel Operators**

Inland Water Transport Officials (Date: on 20th 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 20 th 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 20th 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.

4.5.1 Relevant Department Officials on 20th 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 20th 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.

4.5.2 Vendors on 20th May 2022

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. As per the joint survey conducted by Revenue Department and AIWTDS on 09th June 2023, 06 numbers of Kiosks/street vendors who are earning their livelihood through temporary shops will be affected.

4.5.3 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.

4.5.4 Stakeholder Meeting at Majuli, on February 8, 2023

A stakeholders consultation to present DPR and draft ESIA study for Neamati and Aphlamukh was organized by AIWTDS at Aphalamukh (Majuli) terminal location on 08.02.2023 under the Chairmanship of Honorary Advisor, AIWTDS and in presence of Additional Deputy Commissioner, Majuli District and other officials of Inland Water transport and AIWTDS, Panchayat, Water Resources, Forest Department, APGCL and local villagers

4.5.5 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/ Implementatio Inclusions
1	Separate entry and exit points.	Segregation of departure and arrival points and split between pedestrian movement and vehicular movement
2	Proper displays and announcements at the jett locations is essential	Provision of signage of appropriate visibility and public address systems to announce the operating status of the terminal, ferry timings and safety announcements
3	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.
4	Facilities for disabled and elderly passengers	Barrier free environment for differently abled and elderly
5	Medical/ First aid	Provision of first aid Services
6	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 Neamati are shown in **Figures- 5.1.**

The baseline status has been categorized as follows:

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

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 - 4th August to 29th August' 2022
  - Noise - 31st August'2022

- Ecological Aspects
  - Terrestrial Ecology - 10th March'2022
  - Aquatic Ecology - 27th August 2022

- Socio-economic Aspects
  - Social Screening and FGD - 15-22nd May 2022
  - Stakeholder Consultaiton - 8th February 2023
  - Census and Joint Survey - 09th June 2023

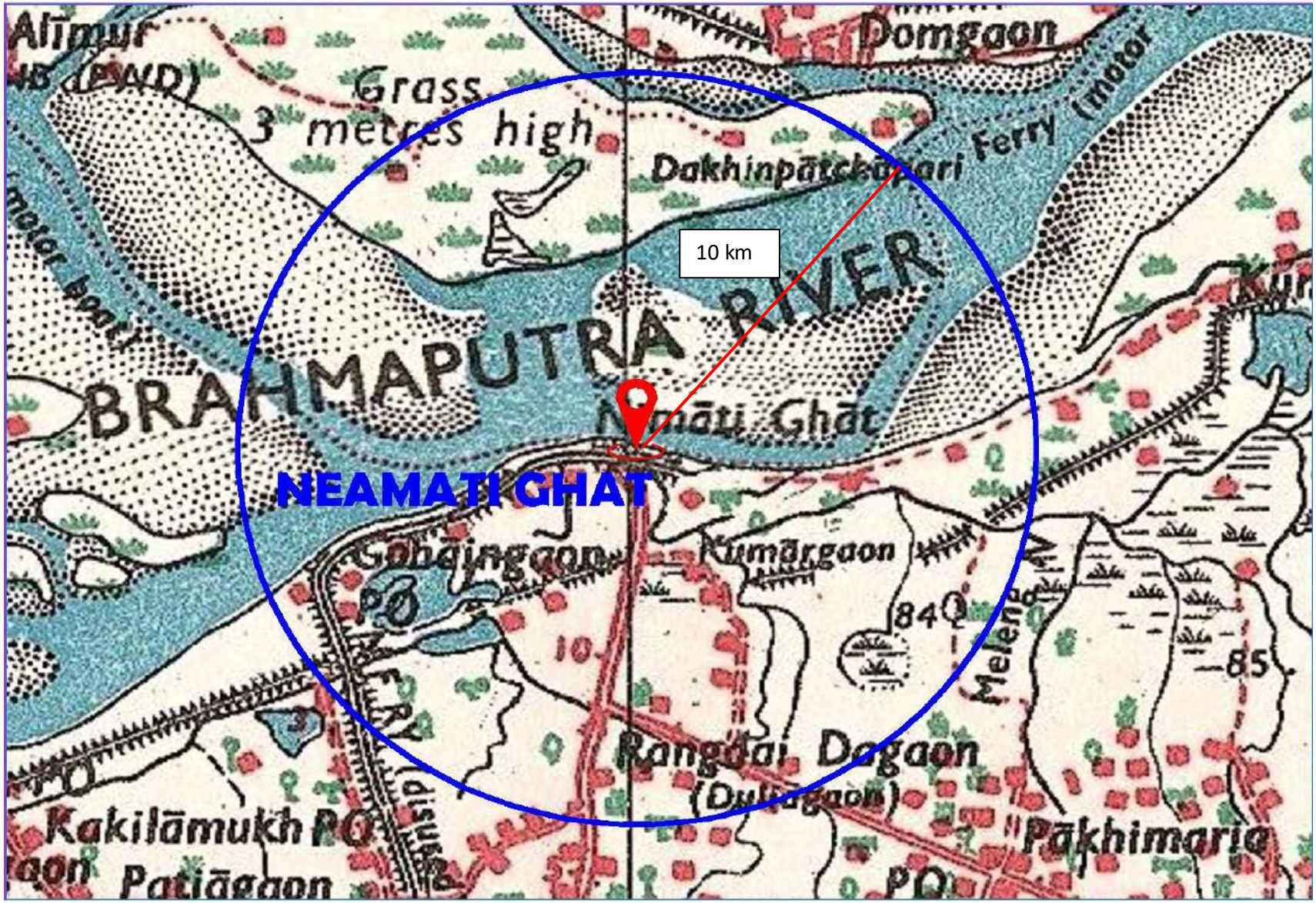


Figure 5.1: Study area map of Neamati terminal

5.3 PHYSICO-CHEMICAL ASPECTS

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 2609 mm. The mean monthly temperature ranged from 18.8°C to 28.1°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.

Geology

The study area is a part of Jorhat district. It is the flood plain of the Brahmaputra River in the north. The recent alluvial soils of recent rivers are light grey to dark grey in colour and are confined to the flood plain area adjacent to the Brahmaputra River and its tributaries.

Neamati project site falls into north 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 2	Loose silty SAND	0 - 3
Soil Unit 1	Firm to stiff silty CLAY	3 – 8.5
Soil Unit 3	Medium dense to very dense SAND	8.5 – 50.12

***Source:** DPR- 2023*

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

Unit	Description	Depth below GL m
Soil Unit 2	Loose silty SAND	0 - 4
Soil Unit 3	Medium dense to very dense SAND	4 – 80.10

***Source:** DPR-2023*

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.

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 Nemati terminal are given in **Table-5.3** and **Figure-5.2.**

Table 5.3: Land use Pattern of Neamati Terminal

S. No	Category	Area (m^2)	Percentage (%)
1.	Flooded Vegetation	447791.9	56.98%
2.	Open Land	25777.22	3.28%
3.	Built Area	96503.37	12.28%
4.	Crop Area	108649.43	13.83%
5.	Waterbodies	107110.35	13.63%

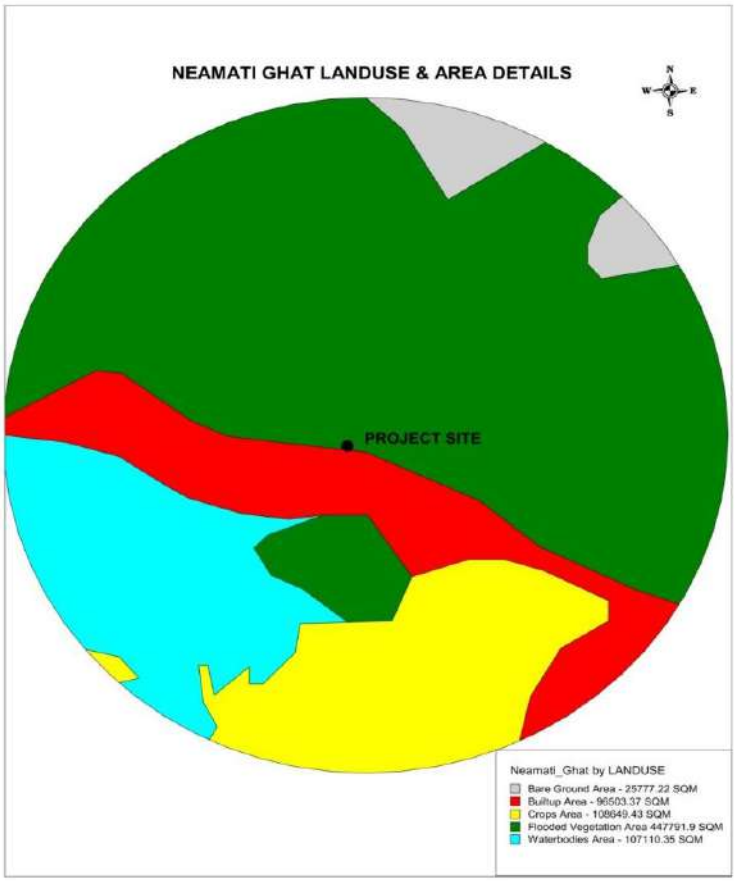


Figure 5.2: Land use pattern of Neamati Ghat

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 Neamati Terminal are listed in **Table-5.4.** The sampling location map is enclosed as **Figures-5.3.**

Table 5.4: Details of Soil Sampling Locations

Sampling Code	Location	Coordinates
SN1	Neamati (150 m u/s of terminal)	26°51'40.60"N 94°14'27.80"E
SN2	Neamati (150 m d/s of terminal	26°51'37.32"N 94°14'35.19"E

The analysis of soil sampling was conducted as per IS 2720 and results are given in **Table-5.5**. Laboratory monitoring reports for soil testing are enclosed as Annexure**-6**. The pH was in the range of 7.41 to 7.89 which indicates that neutral range having slight alkalinity. The EC values are ranging between 492 to 512 µS/cm. The soil type of the area is sandy loam.

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

S. No	Parameters		SN1	SN2
1.	pH (1:5 suspension)		7.41	7.89
2.	Electrical Conductivity @ 25^0C (1:1 suspension)		492	512
3.	Calcium (As Ca)		1986	2086
4.	Magnesium (As Mg)		383	338
5.	Sodium (as Na)		231	247
6.	Available Potassium (as K)		324	316
7.	Salinity @ 25^0C (1:1 suspension)		271	287
8.	Organic Matter		0.84	1.08
9.	Sodium Absorption Ratio		0.46	0.52
10.	Nitrogen		0.103	0.107
11.	Available Phosphorus (As P_2O_5)		148	135
12.	Bulk Density		1.26	1.19
13.	Organic Carbon		0.49	0.63
14.	Particle Size Distribution	a. Sand	60.3	54.7
		b. Clay	19.7	20.6
		c. Silt	20.0	24.7
15.	Exchangeable Sodium Percentage		4.16	4.61

Figure 5.3: Soil sampling Location map of Neamati terminal

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
WN1	Neamati (near terminal site)	26°51'40.66"N 94°14'32.19"E
WN2	Neamati (350 m d/s of terminal)	26°51'42.75"N 94°14'22.53"E
WN3	Neamati (375 m u/s of terminal)	26°51'35.93"N 94°14'43.41"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 216 to 292 μS/cm and total hardness ranged from 62.0 to 76.0 mg/l. Dissolved oxygen values ranges from 6.3 to 6.5 mg/l.

The BOD and COD levels at Neamati terminal are 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 after conventional treatment.

Figure 5.4: Water sampling Location map of Neamati terminal

Table 5.7: Water quality in the study area for Neamati Terminal

S. No	Parameters	WN1	WN2	WN3
1.	pH	6.85	6.92	7.16
2.	Colour	<5.0	<5.0	<5.0
3.	Electricity Conductivity	216	224	292
4.	Turbidity	<1.0	<1.0	<1.0
5.	Total Hardness (As $CaCO_3$)	62.0	64.0	76.0
6.	Fluoride (as F)	<0.10	<0.10	<0.10
7.	Dissolve Oxygen	6.5	6.4	6.3
8.	Chloride (as Cl)	76.0	80.0	88.0
9.	Calcium (as Ca)	12.0	12.5	15.5
10.	BOD (3 days at 27^0C)	<2.0	<2.0	<2.0
11.	Nitrate (as NO_3)	5.0	5.0	6.0
12.	Total Dissolved Solid	140	140	190
13.	Sulphate (As SO_4)	11.0	11.0	13.5
14.	Magnesium as Mg)	7.8	8.0	9.0
15.	Phosphate (as P)	<0.05	<0.05	<0.05
16.	Sodium (as Na)	4.0	3.5	4.8
17.	Potassium (as K)	<1.0	<1.0	1.4
18.	COD (as O_2)	6.0	4.0	6.0
19.	Residual Sodium Carbonate	Nil	Nil	Nil
20.	Total Chromium (as Cr)	<0.05	<0.05	<0.05
21.	Iron (as Fe)	0.13	0.11	0.13
22.	Manganese (As Mn)	<0.10	<0.10	<0.10
23.	Copper (As Cu)	<0.05	<0.05	<0.05
24.	Zinc (as Zn)	0.09	0.13	0.11
25.	Arsenic (as As)	<0.01	<0.01	<0.01
26.	Cadmium (as Cd)	<0.01	<0.01	<0.01
27.	Cyanide (As CN)	<0.01	<0.01	<0.01
28.	Lead (As Pb)	<0.01	<0.01	<0.01
29.	Selenium (as Se)	<0.01	<0.01	<0.01
30.	Mercury (Hg)	<0.001	<0.001	<0.001

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 the proposed terminal in the study area. The ambient air quality monitoring was conducted twice a week on 24 hourly basis 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-N1	Neamati	26°51'30.31"N 94°14'54.50"E
AAQ-N2	Neamati	26°50'49.19"N 94°14'7.62"E
AAQ-N3	Neamati	26°51'42.81"N 94°14'13.84"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 Neamati terminal

Table 5.9: Ambient air quality monitoring at Neamati terminal (AAQ-N1)

S.N.	Date	PM_{10} (µg/m3)	$PM_{2.5}$ (µg/m3)	SO_2 (µg/m3)	NO_2 (µg/m3)	CO (mg/m3)	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	04.08.2022	58.1	36.3	6.4	17.8	0.50	22.7	11.3	<0.01	<5.0	<1.0	<4.2	<0.5
2	07.08.2022	60.3	33.5	6.9	19.3	0.54	23.5	11.7	<0.01	<5.0	<1.0	<4.2	<0.5
3	11.08.2022	48.7	28.6	<6.0	15.7	0.44	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	14.08.2022	52.5	27.6	<6.0	16.4	0.52	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
5	19.08.2022	61.3	30.7	7.2	22.3	0.74	24.1	12.0	0.01	<5.0	<1.0	<4.2	<0.5
6	23.08.2022	59.2	34.8	6.8	18.7	0.68	23.5	11.8	<0.01	<5.0	<1.0	<4.2	<0.5
7	27.08.2022	55.0	26.2	<6.0	16.1	0.54	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	31.08.2022	64.1	35.6	<6.0	17.4	0.78	<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 Neamati terminal (AAQ-N2)

S.N.	Date	PM_{10} (µg/m3)	$PM_{2.5}$ (µg/m3)	SO_2 (µg/m3)	NO_2 (µg/m3)	CO (mg/m3)	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	04.08.2022	53.1	33.2	6.5	20.3	0.44	21.5	10.7	<0.01	<5.0	<1.0	<4.2	<0.5
2	07.08.2022	48.7	27.1	<6.0	15.3	0.38	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
3	11.08.2022	45.4	26.7	<6.0	14.7	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	14.08.2022	52.7	27.7	6.2	19.6	0.42	20.9	10.5	<0.01	<5.0	<1.0	<4.2	<0.5
5	19.08.2022	55.1	27.6	6.8	21.7	0.46	23.1	11.6	<0.01	<5.0	<1.0	<4.2	<0.5
6	23.08.2022	52.5	30.9	<6.0	18.9	0.50	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
7	27.08.2022	47.6	22.7	<6.0	15.3	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	31.08.2022	45.1	25.1	<6.0	14.8	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 Neamati terminal (AAQ-N3

S.N	Date	PM_{10} (µg/m3)	$PM_{2.5}$ (µg/m3)	SO_2 (µg/m3)	NO_2 (µg/m3)	CO (mg/m3)	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 Neamati Terminal (Unit: □g/m3)

Station	Minimum	Maximum	Average	98 percentile
Particulate Matter less than 10 micron (PM_{10})				
AAQ-A1	48.7	64.1	57.4	63.7
AAQ-A2	45.1	55.1	50.0	54.8
AAQ-A3	66.7	76.2	71.1	76.0
Particulate Matter less than 2.5 micron ($PM_{2.5}$)				
AAQ-A1	26.2	36.3	31.7	36.2
AAQ-A2	22.7	33.2	27.6	32.9
AAQ-A3	33.0	45.7	39.3	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	15.7	22.3	18.0	21.9
AAQ-A2	14.7	21.7	17.6	21.5
AAQ-A3	18.3	25.4	21.8	25.3
Carbon Monoxide (CO)				
AAQ-A1	0.4	0.8	0.6	0.8
AAQ-A2	0.3	0.5	0.4	0.5
AAQ-A3	0.6	0.8	0.7	0.8
Ozone (O_3)				
AAQ-A1	22.7	24.1	23.5	24.1
AAQ-A2	20.9	23.1	21.8	23.0
AAQ-A3	22.5	26.3	24.0	26.1
NH_3				
AAQ-A1	11.3	12.0	11.7	12.0
AAQ-A2	10.5	11.6	10.9	11.6
AAQ-A3	11.3	13.1	12.0	13.0
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

Station	Minimum	Maximum	Average	98 percentile
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/m3)				
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 50.0 to 71.1 $\mu g/m^3$. The highest PM_{10} value was recorded as 76.2 $\mu g/m^3$. 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 27.6 to 39.31 $\mu g/m^3$. 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 6.5 to 7.3 $\mu g/m^3$. The highest SO_2 value was recorded as 7.8 $\mu g/m^3$. 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 17.6 to 21.8 $\mu g/m^3$. 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.

Ambient air quality at site is found to be within the permissible standards as described above.

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-5.6.**

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 day time equivalent noise level at various sampling stations ranged from 46.42 to 46.94 dB(A). The noise levels were observed to be well within permissible limit (55 dB(A)) specified for residential area and (65 dB(A)) specified for commercial area.
Baseline ambient noise conditions are found to within the standards.

Figure 5.6: Noise sampling Location map of Neamati terminal

Table 5.13: Hourly equivalent noise levels - Neamati Terminal (Unit: dB(A))

Location	N-N1	N-N2	N-N3
6-7 AM	43	42	43
7-8 AM	45	44	44
8-9 AM	45	46	47
9-10 AM	47	45	47
10-11 AM	47	46	46
11-12 Noon	48	47	48
12 noon – 1 PM	47	47	48
1-2 PM	47	47	46
2-3 PM	48	48	47
3-4 PM	49	48	49
4-5 PM	48	49	49
5-6 PM	47	47	48
6-7 PM	46	46	48
7-8 PM	45	46	45
8-9 PM	45	43	44

**Source: Primary survey*

Table 5.14: Day and night-time equivalent noise levels – Neamati Terminal

S. No.	Location	Co-ordinates	Zone	L_{eq} day (dB(A))	L_{eq} night (dB(A))	Permissible Limit
1.	N-N1	26°51'42.81"N 94°14'13.84"E	Commercial	47.01	45.4	65
2.	N-N2	26°50'49.19"N 94°14'7.62"E	Residential	46.68	45.2	55
3.	N-N3	26°51'30.31"N 94°14'54.50"E	Commercial	47.15	46.0	65

5.4 TERRESTRIAL ECOLOGICAL ASPECTS

The baseline setting for Ecological aspects have been covered in this section following floral, faunal and aquatic accounts of the area. Flora is categorized into three groups as herbs, shrubs and trees. Fauna is divided into two groups i.e., terrestrial fauna includes insects (butterflies), reptiles, birds and mammals. As a part of the ESIA study, ecological survey was conducted at different sites in March, 2022, Terminal Proposed AIWTP Guwahati (Assam). The objective of the ecological survey was 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 Neamati Terminal

Site	Vegetation components	Number of quadrat laid	Size of quadrat
Neamati terminal 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 113 plant species were recorded from Neamati site. Of these, Herbs (37), Tree (32), Shrubs (19), Climbers (4), Bamboo (3), and Grass (18) species recorded, shown in **Figure-5.7**.

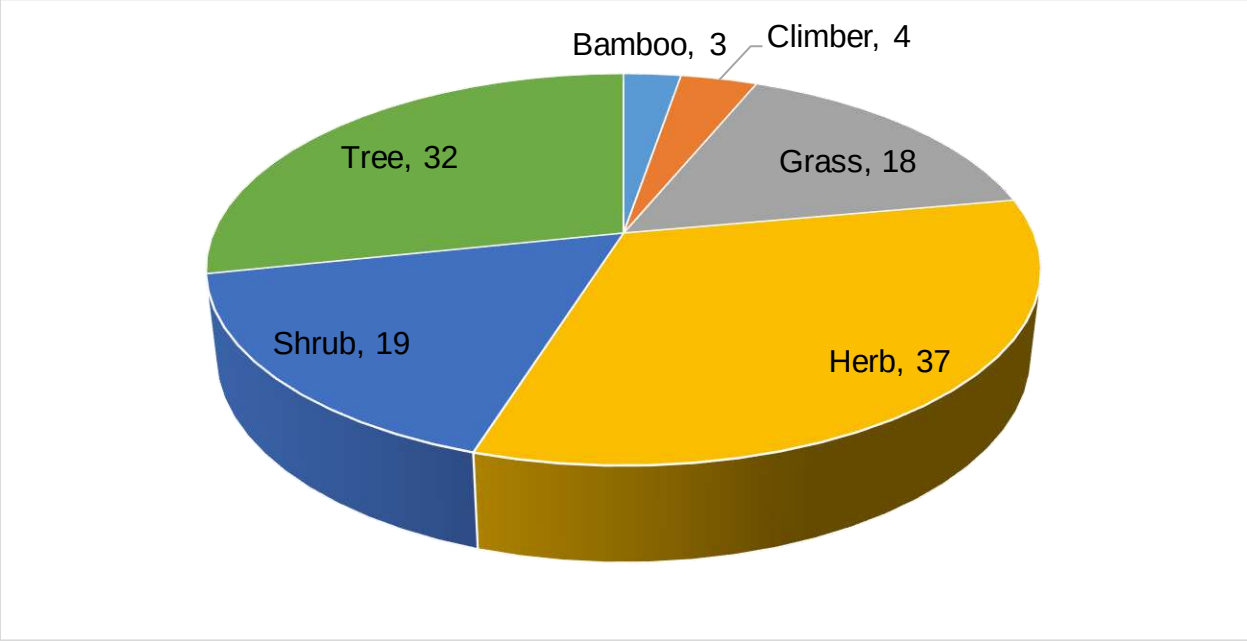


Figure 5.7: Graphical analysis of total number of tree, shrub, herb, bamboo, grass, and climber were recorded from Neamati site

Plant List

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

Total of 113, plant species were recorded from Neamati site were dicot (90) and monocotyledon (23), belonging to 46 families were recorded in the Neamati site **(Figure-5.8).** The most dominant families recorded in the Neamati site were- Poaceae (17), followed by Asteraceae & Fabaceae (8), Myrtaceae (5) Amaranthaceae, Apocynaceae, Euphorbiaceae, Lamiaceae, Malvacea and Verbenaceae (4), shown in **Figure-5.9.**

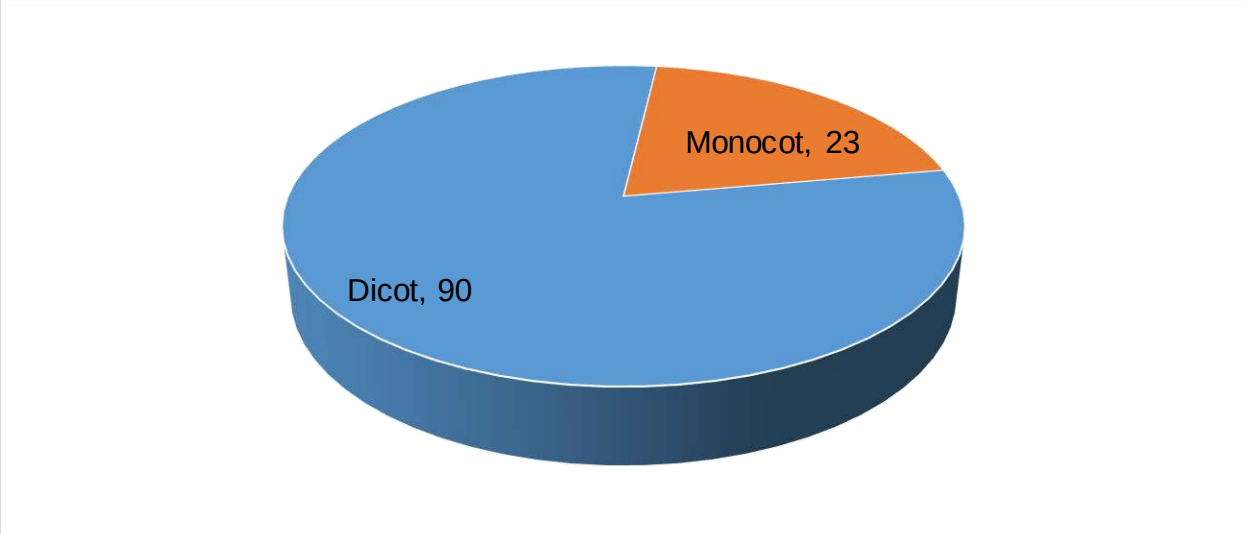


Figure 5.8: Graphical analysis number of Dicot and Monocot species was recorded from Neamati site.

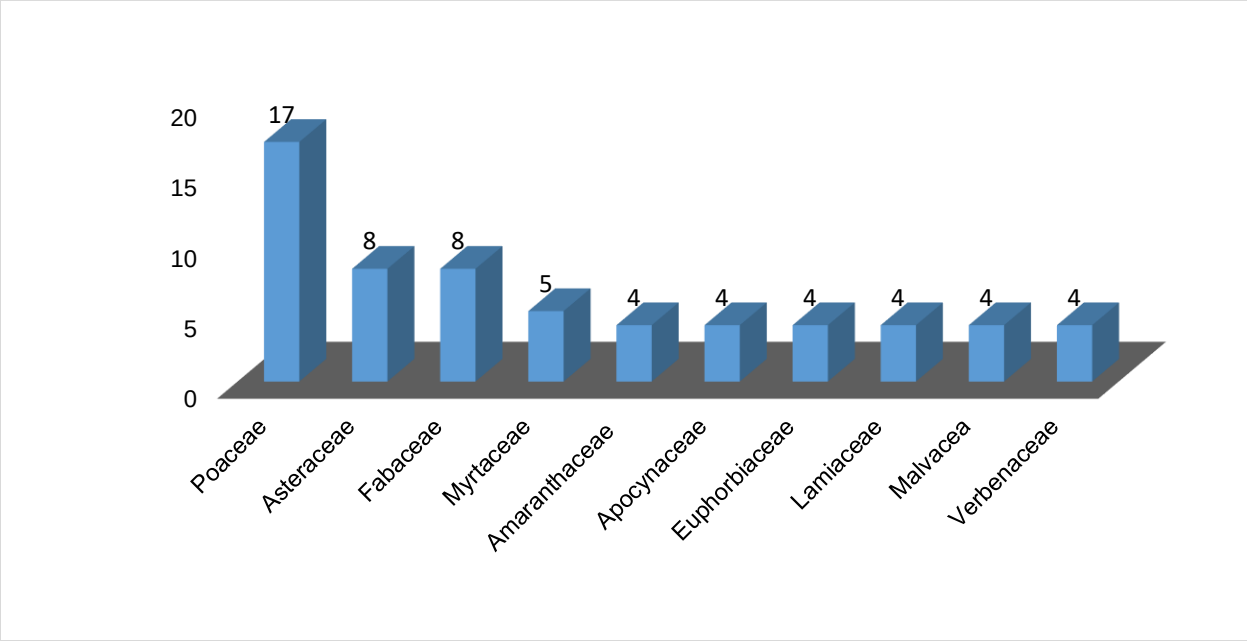


Figure 5.9: Graphical analysis of dominant family recorded from Neamati site

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 Neamati site

Botanical name	**Local name**	**Purpose *of* Use**
Aegle marmelos (L.) Corrêa	Bael	Fruit edible
Albizia procera (Roxb.) Benth.	Safed siris	Fuel wood/Construction
Albizia saman (Jacq.) Merr.	Rain tree	Fuel wood/Construction
Alstonia scholaris (L.) R. Br.	Devil's tree	Ornamental
Areca Catechu L.	Tamul	Fruit edible
Artocarpus heterophyllus Lam.	Kothal	Fruit edible
Bambusa arundinacea (Retz.) Willd.	Bara bans	Construction
Bambusa tulda Roxb.	Jati	Construction
Bauhinia variegata L.	Kanchan	Ornamental
Bombax ceiba L.	Semal	Ornamental
Callistemon lanceolatus (Sm.) Sweet	Bottlebrush	Ornamental
Carica papaya L.	Papaya	Fruit edible
Caryota urens L.	Sewa	Ornamental
Citrus limon (L.) Osbeck	Lemon	Fruit edible
Cocos nucifera L.	Coconut	Fruit edible
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	Safada	Construction/fuel wood
Cymbopogon martini (Roxb.) W.Watson	Rosha grass	Fodder
Cyperus cyperoides (L.) Kuntze	Flat Sedge	Fodder
Cynodon dactylon (L.) Pers.	Dub	Fodder
Dalbergia sissoo DC.	Sheesam	Timber/fuel wood
Delonix regia (Hook.) Raf.	Gulmohar	Timber/fuel wood
Dendrocalamus strictus (Roxb.) Nees	Bijuli	Construction
Digitaria ciliaris (Retz.) Koeler	Crabgrass	Fodder
Echinochloa colona (L.) Link	Jungle ricegrass	Fodder
Eleusine indica (L.) Gaertn.	Crowfoot grass	Fodder
Ficus religiosa L.	Peepal	Religious
Mangifera indica L.	Aam	Fruit edible/fuel wood
Melia azedarach L.	Chinaberry tree	Construction/fuel wood
Moringa oleifera Lam.	Sahjan	Fruit edible
Musa × *paradisiaca* L.	Kala	Fruit edible
Neolamarckia cadamba (Roxb.) Bosser	Kadam	Construction/fuel wood

Botanical name	Local name	Purpose *of* Use
Pongamia pinnata (L.) Pierre	Karanja	Ornamental
Psidium guajava L.	Amrud	Fruit edible
Saraca asoca (Roxb.) Willd.	Ashok	Ornamental
Shorea robusta Gaertn.	Sal	Timber

***Source:** Prmiary 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 Neamati site

Botanical name	Local name	Plant used for treatment
Calotropis gigantea (L.) Dryand.	Mudar	Used for diarrhea, somatic, sinus fistula, and skin disease.
Cassia fistula L.	Sonaru	Treatment of inflammatory swellings and as a cleaning agent for ulcers and wounds.
Datura metal L.	Dhatura	Treatment of asthma, cough and cold and painful conditions.
Eclipta prostrata (L.) L.	Bhringraja	Treatment of hepatitis, snake venom poisoning, gastritis, and respiratory diseases such as a cough and asthma.
Cynodon dactylon (L.) Pers.	Dub	Used as a laxative, coolant, expectorant, carminative and as a brain and heart tonic.
Ocimum sanctum L.	Tulsi	For the treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases.
Ricinus communis L.	Inde	Used to curing arthritis, backache, muscle aches, chronic backache and sciatica.
Achyranthes aspera L.	Apamaranga	Used in treatment of cough, bronchitis and rheumatism, malarial fever, dysentery, asthma, hypertension and diabetes.
Leucas aspera (Willd.) Link	Gayasaa	Used as antifungal, prostaglandin inhibitory, antioxidant, antimicrobial, anti-nociceptive and cytotoxic activities.

Botanical name	Local name	Plant used for treatment
Lantana camara L.	Lantena	Used as antimicrobial, fungicidal and insecticidal properties.
Boerhavia diffusa L.	Puruni	For treatment of intestinal colic, kidney disorders, cough, hemorrhoids, skin diseases, alcoholism, insomnia, eye diseases, asthma and jaundice

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

Agricultural and Horticulture Crops

Agriculture is the chief occupation, Neamati site. Rice (*Oryza sativa*) is the predominant crop. The other crops grown are Wheat (*Triticum aestivum*), Maize (*Zea mays*), Onion (*Allium cepa*), Coriander (*Coriandrum sativum*), Mustard (*Brassica nigra, B. hirta*), Pea (*Pisum sativum*), Potato (*Solanum tuberosum*), Brinjal (*Solanum melongena*), Chillies (*Capsicum annuum*), Garlic (*Allium sativum)*, Turmeric (*Curcuma longa*) and Ginger (*Zingiber officinale*). In horticultural crops are- Bel (*Aegle marmelos*), Tea (*Camellia sinensis*), coconut (Cocos nucifera), Papita (*Carica papaya*) Tamul (*Areca Catechu*), Kathal (*Artocarpus heterophyllus*), Tulsi (*Ocimum sanctum*), Peepal (*Ficus religiosa*), Ashok (*Saraca asoca*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Kala Jamun (*Syzygium cumini*) and Bamboo species grown in the study area.

Quantitative Analysis of Neamati site

Riparian Habitat of River Brahmaputra

River bank vegetation is ecologically termed as riparian flora, and is highly dynamic. It links terrestrial and aquatic habitat, under the influence of waterways such as riverbanks. It is represented by a particular type of vegetation that grows along the sides of rivers, which are called the river's riparian zone (Dutta et al., 2011). Riparian plant habitats and communities are characterized by hydrophilic plants. Riparian vegetation consists of macrophytes, native grasses, sedges, climbers, shrubs and trees (Dutta et al., 2011). Riparian vegetation performs an important ecosystem functions, and provides a range of environmental services which include soil erosion control, thermal regulation of water bodies, filtration and retention of nutrients, maintenance of water quality, provision of food and habitat for wildlife and also provides aesthetic and recreational resources for human society.

The important riparian plant species in the project areas of Nemati terminal are given in following table

Table-: Riparian plant species

Scientific name	Family
Ageratum conyzoides	Asteraceae
Alternanthera sessilis	Amaranthaceae
Amaranthus hybridus	Amaranthaceae
Chromolaena odorata	Asteraceae
Convolvulus arvensis	Convolvulaceae
Cynadon dactylon	Poaceae
Cyperus brevifoilus	Cyperaceae
Eclipta prostrate	Asteraceae
Ipomoea aquatica	Convolvulaceae
Ipomoea carnea	Convolvulaceae
Leucas aspera	Lamiaceae
Parthenium hysterophorus	Asteraceae
Persicaria maculosa	Polygonaceae
Phragmites karka	Graminae
Pistia stratiotes	Hydrocharitaceae
Poa annua	Poaceae
Ranunculus sceleratus	Ranunculaceae
Rumex maritimus	Polyganaceae
Saccharum spontaneum	Poaceae
Senecio viscosus	Asteraceae
Solanum surattense	Solanaceae
Xanthium strumarium	Asteraceae

Tree

A total of 17 tree species (≥ 5 cm dbh or ≥16 cm GBH) were recorded from Neamati site, during the field study. The density of tree species recorded was 244 individuals (ha^{-1}). In terms of density, *Dalbergia sissoo* were the dominant tree (22 individual's ha^{-1}) followed by *Cassia fistula, Corymbia citriodora, Mesua ferrea, Psidium guajava, Tamarindus indica* and *Syzygium cumini* (18 individual's ha^{-1}). The total basal area of tree recorded were 155.42 m^2 ha^{-1} from site-8. In terms of basal area *Delonix regia* has maximum basal area as compared to other tree. In terms of importance value index (IVI), *Dalbergia sissoo* was the dominant tree (IVI= 25.11) followed by *Corymbia citriodora* (IVI= 23.39) in **Table-5.18.** No tree felling is envisaged in the DPR.

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

Botanical Name	Frequency (%)	Density (Individual ha^{-1})	Basal Area (m^2ha^{-1})	IVI	Volume (m^3)	Abundance
Albizia procera (Roxb.) Benth.	20	14	10.92	18.58	0.87	1.4
Bombax ceiba L.	16	12	10.56	16.36	1.06	1.5
Cassia fistula L.	28	18	8.82	21.19	0.71	1.29
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	24	18	14.04	23.39	1.26	1.5
Ficus benghalensis L.	20	14	14.7	21.01	1.18	1.4
Dalbergia sissoo DC.	32	22	10.56	25.11	0.74	1.38
Delonix regia (Hook.) Raf.	24	16	12.64	21.67	1.14	1.33
Ficus religiosa L.	16	10	8.8	14.41	0.70	1.25
Hibiscus elatus Sw.	16	14	11.06	17.51	0.88	1.75
Mangifera indica L.	12	10	4.9	10.74	0.34	1.67
Melia azedarach L.	8	6	4.5	7.68	0.27	1.5
Mesua ferrea L.	20	18	6.84	17.59	0.34	1.8
Neolamarckia cadamba (Roxb.) Bosser	16	12	10.44	16.29	0.94	1.5
Psidium guajava L.	28	18	4.14	18.18	0.21	1.29
Syzygium fruticosum DC.	8	6	2.34	6.29	0.12	1.5
Syzygium cumini (L.) Skeels	28	18	8.82	21.19	0.71	1.29
Tamarindus indica L.	28	18	11.34	22.81	1.02	1.29
Total	**344**	**244**	**155.42**	**300.00**	**12.49**	**24.62**

***Source:** Prmiary field survey*

Shrub

A total of 20 shrub species were recorded from Neamati site, during the field study. The density of shrub species recorded was 544 individuals (ha^{-1}). In terms of density, *Parthenium hysterophorus* were the dominant shrub species (56 individual's ha^{-1}) followed by *Ricinus communis* (52 individual's ha^{-1}). In terms of importance value index (IVI), *Parthenium hysterophorus* was the dominant shrub species (IVI= 20.05) followed by *Ricinus communis* (IVI= 15.66) in **Table-5.19.**

Table 5.19: Frequency, density IVI and abundance

Botanical name	Frequency (%)	Density (Individual ha^{-1})	IVI	Abundance
Bauhinia vahlii Wight & Arn.	8	12	4.64	1.5
Dioscorea bulbifera L.	16	20	8.55	1.25
Smilax zeylanica L.	8	12	4.64	1.5
Boerhaavia diffusa L.	16	20	8.55	1.25
Bougainvillea spectabilis Willd.	8	12	4.64	1.5
Calotropis gigantea (L.) Dryand.	20	32	11.98	1.6
Datura metel L.	16	28	10.03	1.75
Carica papaya L.	12	20	7.34	1.67
Cascabela thevetia (L.) Lippold	28	36	15.15	1.29
Hibiscus rosa-sinensis L.	20	28	11.24	1.4
Ipomoea carnea Jacq.	16	28	10.03	1.75
Isodon ternifolius (D.Don) Kudô	12	20	7.34	1.67
Jasminum nervosum Lour.	16	28	10.03	1.75
Lantana camara L.	20	44	14.19	2.2
Leptopus cordifolius Decne.	16	28	10.03	1.75
Musa × *paradisiaca* L.	20	36	12.72	1.8
Ocimum sanctum L.	16	20	8.55	1.25
Parthenium hysterophorus L.	32	56	20.05	1.75
Ricinus communis L.	20	52	15.66	2.6
Solanum erianthum D. Don	8	12	4.64	1.5
Total	**328**	**544**	**200.00**	**32.72**

***Source:** Prmiary field survey*

Herb

A total of 42 herb species were recorded from Neamati site, during the field study. The density of herb species recorded was 103200 individuals (ha^{-1}). In terms of density, *Digitaria ciliaris* were the dominant herb species (4800 individual's ha^{-1}) followed by *Plantago major* (4000 individual's ha^{-1}). In terms of importance value index (IVI), *Digitaria ciliaris* was the dominant herb species (IVI= 9.36) followed by *Plantago major* (IVI= 8.06) in **Table-5.20.**

Table 5.20: Frequency, density IVI and abundance

Botanical name	Frequency (%)	Density (Individual ha^{-1})	IVI	Abundance
Catharanthus roseus (L.) G.Don	12	1600	3.12	1.33
Achyranthes aspera L.	20	2800	5.33	1.40
Digitaria ciliaris (Retz.) Koeler	36	4800	9.36	1.33
Echinochloa colona (L.) Link	20	2800	5.33	1.40
Amaranthus spinosus L.	24	3600	6.63	1.50
Fimbristylis dichotoma (L.) Vahl	20	2800	5.33	1.40
Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.	12	1600	3.12	1.33
Panicum paludosum Roxb.	12	1600	3.12	1.33
Paspalum dilatatum Poir.	16	2000	4.03	1.25
Poa annua L.	20	2800	5.33	1.40
Saccharum spontaneum L.	16	2800	4.81	1.75
Setaria verticillata (L.) P.Beauv.	24	3200	6.24	1.33
Stenotaphrum secundatum (Walter) Kuntze	20	2400	4.94	1.20
Senecio viscosus L.	20	3200	5.72	1.60
Ageratum houstonianum Mill.	16	2000	4.03	1.25
Solidago gigantea Aiton	16	2000	4.03	1.25
Allantodia aspera (Blume) Ching	8	1200	2.21	1.50
Stellaria media (L.) Vill.	20	2400	4.94	1.20
Alternanthera sessilis (L.) R.Br. ex DC.	24	2800	5.85	1.17
Biophytum reinwardtii (Zucc.) Klotzsch	12	1200	2.73	1.00
Cyanthillium cinereum (L.) H.Rob.	12	1600	3.12	1.33
Desmodium triflorum (L.) DC.	20	2800	5.33	1.40
Diplazium esculentum (Retz.) Sw.	16	2000	4.03	1.25
Eclipta alba (L.) Hassk.	20	2800	5.33	1.40
Euphorbia hirta L.	20	3600	6.11	1.80
Persicaria chinensis (L.) H. Gross	12	1200	2.73	1.00
Leucas aspera (Willd.) Link	20	3200	5.72	1.60
Mazus pumilus var. delavayi (Bonati) T.L. Chin ex D.Y. Hong	12	1600	3.12	1.33
Melilotus indicus (L.) All.	16	2000	4.03	1.25
Mikania micrantha Kunth	20	3200	5.72	1.60
Mimosa pudica L.	16	2800	4.81	1.75
Oldenlandia diffusa (Willd.) Roxb.	28	3200	6.77	1.14
Oxalis corniculata L.	20	2400	4.94	1.20

Botanical name	Frequency (%)	Density (Individual ha^{-1})	IVI	Abundance
Perilla frutescens (L.) Britton	12	1600	3.12	1.33
Phyla nodiflora (L.) Greene	12	1200	2.73	1.00
Plantago major L.	32	4000	8.06	1.25
Polygonum microcephalum D. Don	20	2800	5.33	1.40
Portulaca oleracea L.	16	2000	4.03	1.25
Ranunculus sceleratus L.	16	2000	4.03	1.25
Tridax procumbens (L.) L.	20	3200	5.72	1.60
Sesamum indicum L.	20	2000	4.56	1.00
Sida acuta Burm.f.	16	2400	4.42	1.50
Total	**764**	**103200**	**200.00**	**56.58**

***Source:** Prmiary 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 Neamati 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
Neamati terminal	2.782	2.895	3.684

Value of Shannon Weinner index (H′) as seen from the **Table- 5.2.1** is 2.78 which indicates higher species diversity. Higher values of Shannon index i.e more than 2 also indicate that a particular community has more information. Diversity index (H) increases in value as the

number of species increases. Thus, higher the value of (H) the greater is the species diversity in the community.

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
Neamati terminal	0.06436	0.06045	0.02638

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
Neamati terminal	0.9499	0.9043	0.9475

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

Terrestrial Fauna

Faunal Diversity in and around Neamati 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

A complete checklist of the species is several faunae documented which is listed in **Table-5.24**.

Table 5.24: List of mammal (Fauna)

Zoological name	Local name	Family	IUCN / WPA, 1972Status
Platanista gangetica	Xihu/Dolphin	Platanistidae	EN
Sus scrofa	Wild boar	Suidae	Least Concern / Schedule III
Canis aureus	Jackal	Canidae	Least Concern / Schedule II
Herpestes edwardsii	Nevala	Herpestidae	Least Concern / Schedule IV
Macaca mulatta	Rhesus macaque	Cercopithecidae	Least Concern / Schedule II
Hystrix indica	Porcupine	Hystricidae	Least Concern / Schedule II
Rhizomys pruinosus	Hoary bamboo rat	Spalacidae	Least Concern
Mus musculus	Common mouse	Muridae	Least Concern / Schedule V
Lutra lutra	Common otter	Mustelidae	Near Threatened / Schedule II
Mus rattus	Indian rat	Muridae	Schedule V
Lepus nigricollis	Indian hare	Leporidae	Least Concern/Schedule IV
Macaca assamensis	Assam Macaque	Cercopithecidae	Near Threatened
Axis axis	Spotted deer	Cervidae	Least Concern / Schedule III
Bandicota bengalensis	Field rat	Muridae	Least Concern / Schedule V
Vulpes bengalensis	Fox	Canidae	Least Concern / Schedule II

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

Avifauna

Avifauna observed is given in **Table- 5.25.**

Table 5.25: List of Avi-fauna

Zoological name	Local / Common name	IUCN / WPA, 1972 Status
Acridotheres ginginianus	Myna	Least Concern / Schedule IV
Coracias benghalensis	Indian roller	Least Concern / Schedule IV
Merops orientalis	Little green bee-eater	Least Concern / Schedule IV
Charadrius dubius	Little ringed Plover	Least Concern / Schedule IV
Rallus aquaticus	Water rail	Least Concern / Schedule IV
Lophura leucomelanos	Kalij pheasant	Least Concern / Schedule IV
Egretta garzetta	Little egret	Least Concern / Schedule IV
Ardeola grayii	Indian pond heron	Least Concern / Schedule IV
Passer domesticus	Indian house sparrow	Least Concern / Schedule IV
Coturnix coturnix	Grey quail	Least Concern / Schedule IV
Ceryle rudis	Pied kingfisher	Least Concern / Schedule IV
Psittacula krameri	Rose ringed parakeet	Least Concern / Schedule IV
Grus grus	Common crane	Least Concern / Schedule IV
Eudynamys scolopaceus	Koel	Least Concern / Schedule IV
Nettapus coromandelianus	Cotton pigmy goose	Least Concern / Schedule IV
Corvus splendens	House crow	Least Concern / Schedule IV
Dicrurus macrocercus	Black drongo	Least Concern / Schedule IV
Anthus rufulus	Paddy field pipit	Least Concern / Schedule IV
Coracias benghalensis	Indian roller	Least Concern / Schedule IV
Motacilla cinerea	Grey wagtail	Least Concern / Schedule IV

Source: Prmiary 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 14 species of butterflies belonging to 4 families were recorded and listed in **Table-5.26.**

Table 5.26: List of butterflies

Zoological name	Common name	Family	IUCN / WPA, 1972 Status
Eurema hecabe	Common grass Yellow	Pieridae	Schedule IV
Junonia orithya	Blue pansy	Nymphalidae	Least Concern / Schedule IV
Papilio polytes	Common mormon	Papilionidae	Schedule IV
Neptis hylas	Common sailer	Nymphalidae	Schedule IV
Eurema libythea	Small grass Yellow	Pieridae	Schedule IV
Junonia atlites	Grey pansy	Nymphalidae	Schedule IV
Pantoporia perius	Common sergeant	Nymphalidae	Schedule IV
Danaus chrysippus	Plain tiger	Nymphalidae	Least Concern / Schedule IV
Graphium xenocles	Great zebra	Papilionidae	Schedule IV
Polyura eudamippus	Great nawab	Nymphalidae	Schedule IV
Neptis hylas	Common sailer	Nymphalidae	Schedule IV
Caltoris plebeia	Tufted swift	Hesperiidae	Schedule IV
Junonia lemonias	Lemon pansy	Nymphalidae	Schedule IV
Athyma perius	Common sergeant	Nymphalidae	Schedule IV

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

Herpetofauna

A complete checklist of Herpetofauna is listed in **Table-5.27.**

Table 5.27: List of herpetofauna recorded from Neamati site.

Zoological name	Local / Common name	IUCN / WPA, 1972 Status
Hoplobatrachus tigerinus	Indian bull frog	Least Concern
Fejervarya limnocharis	Common pond frog	Least Concern
Hylarana garoensis	Water frog	Least Concern
Ptyas mucosa	Common rat nnake	Least Concern / Schedule II
Bungarus fasciatus	Banded krait	Least Concern / Schedule IV
Hemidactylus frenatus	House gecko	Least Concern
Calotes versicolor	Indian garden lizard	Least Concern

***Source:** Prmiary 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 Neamati terminal is depicted in **Table- 5.28.**

Table 5.28: Protected and Eco-sensitive areas

Terminal	Protected and Eco sensitive area	Aerial Distance within 10 kms from Proposed Project Site
Neamati site	Hatishal Eco Park	4.0
	Dolphing sighting area	2.0

5.5 AQUATIC ECOLOGY

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.

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 sub-Project during construction and operation phase of the proposed terminal at Neamati has been considered.

Study by ZSI

Zoological Survey of India, Kolkata a premier Govt. of India Organization, has undertaken the study "Aquatic Ecology and Comprehensive Study of the Gangetic Dolphin in the River Brahmaputra"**.** ZSI has been assigned this study by WAPCOS as a part of the ESIA study of Modular Terminals. The survey was carried out along the Brahmaputra River, Assam to document the aquatic faunal diversity and the presence and absence of the **Ganges river dolphin** (***Platanista gangetica gangetica***) near proposed terminals, CTC and slipwayThe 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.

There was frequent sighting of Dolphins near the Ghat. There are good population of Gangetic Dolphins observed at Neamati Ghat during the survey, several Dolphins were sighted in the deeper part of the river near the Ghat as per the survey conducted by ZSI.

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 project preparation, 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 for the entire river basin. Based on the basin level management plan mtitgation measures are drawn up for each of the sub-projects.

Planktons

Methodology, Preservation, and Identification of Planktons

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- 10µ), 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*, *Zygnem*a sp., *Anabaena* sp. *Oscillatoria* sp. *Achnanthes* sp. *Cymbella* sp. etc,

Zooplanktons

Zooplankton community comprised of Cladocera, Copepoda, Euglenophyceae, Protozoa and Rotifera. The most domianat 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- 5.29**

Table 5.28: List of the ichthyofauna

Zological name	Family	Local name	IUCN Status
Amblypharyngodon mola	Cyprinidae	Moa	LC
Batasio tengana	Bagridae	Batasimas	LC
Chanda nama	Ambassidae	Chanda	LC
Gudusia chapra	Clupeidae	Karoti	LC
Laubuca laubuca	Cyprinidae	Laopota	LC
Monopterus cuchia	Synbranchidae	Rice eel	LC
Mystus tengara	Bagridae	Tingara	LC
Puntius sophore	Cyprinidae	Puthi	LC
Puntius terio	Cyprinidae	Puthi	LC
Rita rita	Bagridae	Catfish	LC
Xenentodon cancila	Belonidae	Kakila	LC

5.6 SOCIO-ECONOMIC ASPECTS

Socio-Economic study was carried out in the radius of 500 meters from the proposed terminal site. The outcomes of the details recorded during study are enclosed as **Annexure-15.** During Socio-economic Survey and Joint inspection conducted by Revenue Department on 09th June 2023, 06 numbers of Posessors were identified who are earning their livelihood through temporary shops will be affected. Thus, 06 (six) vendors earning their livelihood near the existing terminal site may be affected/ displaced during construction period. However, no sensitive receptor (e.g., schools, hospitals etc) were found within the 500 meters distance. Details of the same has been presented in the Table below:

Table 5.30: Details of PAPs

S. No.	Type of Shop	Gender of PAPS		Total
		Male	Female	
1	Temporary with make shift arrangement	5	1	6

**Source: Joint Survey by DLLPC and AIWTDS*

Socio-economic Profile of the Affected Persons

The data presented in the Table 5.31, reflects that out of the total PAPs, 50% comes under SC Category and 50% under General.

Table 5.31: Social Stratification of PAPs

S. No.	Social Category	Numbers of Families	Percentage
1	General	3	50.00
2	OBC	0	0.00
3	SC	3	50.00
4	ST	0	0.00
5	Others	0	0.00
	Total	**06**	**100.00**

Demographic Profile of the Family of Affected Persons

Table 5.32 presents demographic profile of the families of Project Affected Persons (PAPs).

Table 5.32: Demographic Profile of the Family of PAPs

PAPs ID	Male	Female	Total
1	2	2	4
2	2	3	5
3	1	4	5
4	1	5	6
5	2	4	6
6	1	3	4
Total	**9**	**21**	**30**

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 Neamati. Therefore, any changes would require an updating of the ESIA.

6.2 ASSESMENT 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 levelling (cutting,	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
	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
	Socio-economic	Increase in employment
Influx of labours	Socio-economic	Additional pressure on existing social infrastructure
		Issue of GBV/SEA/SH
		Social Discrimination

6.2.2 Impacts due to pre-construction activities

- **Pre-construction activities**

Pre-construction activities include the clearing, stripping and levelling the sites, earth filling, excavation for foundations and construction activities would result in generation of debris and construction wastes. The proposed development is taking place near existing terminal. After award of the work, construction activities shall be planned very carefully. Construction material & equipment shall be stored on site. 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 as per the Environmental Code of Practices for this Project presented in Annexure- 19.

- **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 passengers 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 the entire area would be hard barricades.
- Green screens would be provided to prevent dust during the chiselling operations.
- The Bio-toilets should be installed at all sites before any activity is carried out.
- 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.
- The review should ascertain that mitigation measures which have to be implemented later during the Constrction activities are incorporated in the design and the constrction planning.
- The Occupational Hazard Risk Assessment has been carried out and the Occupational health Safety Plan is in Place for the implementation. Similar activities should also be carried out for Community Health Safety.

6.2.3 Impacts due to Construction activities

- **Impact on Land Environment**

➢ **Impacts due to transfer of land**

The proposed project envisages construction of passenger ferry terminal. The total land requirement for Neamati terminal has been estimated as 26505 m^2. The total land is private land submerged in river.

Mitigation measures: As per current level of information about 26,505 m^2 (2.65 ha) of private land which is currently submerged in river and is being purchased through negotiated settlement as per existing rules of State Government. Measures shall be taken that compensation shall not be less than the compensation estimated as per RFCTLARR Act, 2013.

➢ **Impacts due to pre-construction activities**

Pre-construction activities include the clearing, stripping and levelling the sites, earth filling, excavation for foundations and construction activities would result in generation of debris and construction wastes. The proposed development is taking place near existing terminal.

The existing roads would be utilised for gaining access for construction. There is sufficient space at terminal site and hence, the same would be utilised for the storage of material and siting of construction equipment. No temporary sheds would be necessary. Thus, impacts on land environment during pre-construction phase are not expected to be significant.

➢ **Impacts due to Sourcing of material**

The proposed jetties are proposed on the bank of rivers and envisages the construction of passenger jetty berth. The proposed sites need to be levelled for construction of jetty and backup facilities. The construction material shall be sourced from nearby approved existing quarries and markets.

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.

- **Impact on land Environment**

The terminal would be built on piles and no land reclamation is envisaged. Thus, impact on land environment is not envisaged.
The source and quantity of construction material is given in **Table-6.2.**

Table 6.2: Source and Quantity of Construction Material

S. No.	Name of Jetties	Quantity (m^3)	Source and distance from Site
1	Neamati	100000	Golaghat-65 km

(Source: DPR)

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 AIWTDS for verification and obtain approval from the AIWTDS before procuring any material
- Submit to PIU 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

- **Impacts due to construction activities**

The major components envisaged as a part of the proposed project includes construction of floating Jetties with various utility facilities like rest rooms, cloak room, terminal building, shops, restaurants, Bio-digesters, fire-fighting facilities etc. The construction material required for the project is proposed to be brought from nearest market and, which is about 65 km from the project site.

Mitigation measures: There is no major vegetation on the land to be acquired for the proposed sites and no major wildlife has been reported in the area. The following measures shall be implemented:

- A dedicated area shall be identified and demarcated for the temporary storage of debris. No debris from the excavation should be stored outside the designated area. All construction material shall be obtained from the licensed quarries. Before procuring any material, the contractor should submit the Environment Clearance

Certificate and CTO to the Client. Construction debris waste generated from the construction activities should be stored in a designated area. Municipal Solid Waste from the construction zone should be stored in two bin systems and transported to municipality for disposal.

- No exclusive quarries are proposed for these projects.
- During transportation of the material, adequate measures shall be implemented to avoid damages to the air and noise environment.
- Awareness programmes shall be undertaken to sensitize workers so as to avoid the loss of vegetation and disturbance to the faunal species in the area.
- On completion of construction activities, surplus materials, debris, discarded boxes, containers, drums etc; will be removed from the site and disposed in designated disposal site.

- 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 due to disposal of solid waste**

During construction phase, domestic solid wastes generated will contain mainly vegetable matter followed by paper, cardboard, packaging materials, wood boards, polythene, etc. The total solid waste that may be generated is estimated to be of the order of 20 kg/day for Neamati terminal @ 200 gm per person per day.

Mitigation measures: The solid waste management shall be based on the principle of reduce, reuse and recycle. Adequate facilities for collection and conveyance of municipal wastes generated at each post shall be developed. Garbage bins will be kept for collection of solid waste at appropriate locations at each construction site. Solid waste will be

disposed-off at designated landfill sites to be identified in consultation with local administration.

- **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- 6.3.**

Table 6.3: Average noise levels generated by the operation of various construction equipment

Equipment	**Noise level (dB(A))**
Batching Plant	90
Transit mixer	75
Winch-7.5 t capacity	75
Generator	85
Compressor	80
Hydra 12/15t	80
Concrete mixer	75
JCB-3D	85
Trailor	85
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- 6.4.**

Table 6.4: 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- 6.4,** that at a distance of 1 km from the construction site, the increase in noise levels will be only 1 dB(A). 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- 6.5.** Workers operating in the high noise areas shall be provided with ear plugs.

Table 6.5: 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	½
115	¼
120	No exposure permitted at or above this leve

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

- **Impact on Ecology**

There are no ecologically sensitive areas present near to proposed terminal. However, Majuli Island being a notified 'Biodiversity Heritage Site', which is located at the opposite river Bank, mitigation measures for managing the impacts during construction needs to be taken. No tree cutting is envisaged for the proposed project as per the DPR. The impacts and mitigation measures are given in **Table-6.6.**

Table 6.6: Ecological impacts and Mitigation Measures

Ecological impacts	Ecological Sensitive areas/ threatened species	Mitigation Measures
➢ During construction periods, dust generation have many negative impacts on the agricultural sector including- reducing crop yields, the loss of plant tissue and reduced photosynthetic activity. ➢ No tree cutting is involved in the project but has minor impact on vegetation during construction and cause isolation of the ungulates species, and nesting habitats of birds. ➢ Interference of Sound/noise generated due to construction and transport to the communication systems of the ungulates and avi-fauna species. ➢ Lighting effect from the vehicles during their movements will affect the wildlife which will result behavioural change, collision of animals and road kills. ➢ The waste produces during construction phase may cause impacts on aquatic life causing them to loss in their natural habitat. ➢ Presence of Gangetic Dolphin in and around the project site which is a schedule I species as per Wildlife Act.	➢ There is no wildlife sanctuary, biosphere reserve, Tiger/Elephant reserves, wildlife corridor, and protected forest/wetlands in the proposed site. ➢ Majuli is a notified biodiversity heritage site which is located in the opposite bank of the proposed terminal location.	➢ Need to minimize as much as possible the haul distances ➢ Reduce vehicle idling time ➢ Water sprinkling will be done on the haul road and other roads at regular intervals ➢ Reduce noise as much as possible during construction ➢ Minimize waste ➢ Dolphin Conservation Measures has been suggested as a part of EMP

Ecological impacts	Ecological Sensitive areas/ threatened species	Mitigation Measures
➢ Kaziranga National Park is located about 80 km away from Neamati Terminal		

Dredging is not envisaged as a part of the project. It was observed during the aquatic ecological survey that the project area has moderate productivity and berthing area has less and occasional presence of fishes. Hence, no major impacts are anticipated on marine ecology due to construction and operation of the proposed project.

➢ **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. However piling activities are not envisaged for Neamati.

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 , piling works are not envisaged in the current design.
- The river area in which if 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 locally fabricated by Contractor based on field requirement under the guidance of biodiversity expert to disperse the fauna and reduce the noise level shall be taken
- 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 be stopped 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.
- Use of polymer instead of bentonite as drilling fluid along with safe disposal of residue after usage.
- The Contractor shall engage a wildlife/biodiversity expert during the construction activities in the water part.
- Formation of Emergency Rescue Committee for accidental injury/trap of dolphins at site with members from Forest Dept, IWT, biodiversity expert and IWT.
- Signages for no-go areas, emergency helpline numbers of concerned officials for dolphin safety shall be displayed in the site.
- Dolphin safety measures shall be a part of the tool-box talks and regular awareness building of contractor staff, labours under the supervision of TSSC shall be undertaken.

➢ **Impact on Fisheries**

As per the baseline date collected during the site visits a total of 23 species belonging to 20 genera, 17 families and 10 orders have been recorded in and around the project locations of Brahmaputra River during the study period. The fish fauna of the river is more diverse though a representative of species could only be collected during the single visit to each location. Most of the fish species reported in the near to project sites are of Least Concern.

As there are no significant fishing zones reported in the vicinity of the proposed jetties, and considering the low fish catch at study area known to involve in fishing activity no significant impact are 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. The downstream impacts on fish populations are not envisaged.

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

- **Impact on Surface Water Quality**

➢ **Impact of Waterside Construction Works**

Waterside construction works includes bank protection works and berthing facilities etc. Noise from the construction work may affect the aquatic life including Dolphins. Construction activities may create turbulence in water, increasing the turbidity, which may affect the aquatic ecosystem.

During construction phase night-time electric lighting near water side may affect the number and types of flying insects and spiders living in grass beneath the lights, many of which have an insatiable attraction to these lights at night.

Mitigation measures: Night electric-lighting should be away from the water and no construction activity should be carried out at night time.

- **Impacts due to effluents from labour camps**

During construction phase, about 80-100 workers are likely to be engaged in the project. The details of labour and water requirements are given in **Table-6.7.**

Table 6.7: Details of labours involved and water requirement in construction phase

Name of terminals	Peak labour strength	Water Requirement (KLD)
Neamati	80-100	5

The labour involved in construction phase would come from the nearby villages. However, technical manpower is likely to be deployed from outside and will stay near the site during construction phase. It is assumed that about 25% of the total peak labour population will come from outside and a smaller number of labour camps needs to be constructed.
The total water requirement during construction phase for Neamati terminal has been estimated as 5 KLD.
The sewage generated is normally taken as 80% of the total water requirement. Thus, the sewage generated would be of the order of 4.0 KLD. The disposal of sewage without treatment could lead to significant problems related to water pollution and public health. The disposal of sewage without treatment can cause problems of odour and water pollution.

Normally untreated sewage would find its way to natural drainage system which ultimately confluences into the lake. It is proposed to treat the sewage from labour camps before disposal.

Mitigation measures: Proper infrastructure for storage and if required treatment e.g., disinfection or other units, shall be provided to ensure potable water supply to the labour population.
During construction phase, total about 4KLD of sewage is expected to be generated at all the proposed sites. Modular Toilets to be provided for each construction site for the labours. The sewage from the community toilets can be treated in a biodigester. The treated effluent can be used for meeting irrigation requirements of areas being afforested under greenbelt development.
The construction machinery shall be staged in the construction yard. The wash water from the construction machinery has to be treated before discharge. Runoff from the constructions yard would have sediments, oil & grease this has to be treated before discharge.

- **Effluent from other sources**

Substantial quantities of water would be used in the construction activities. With regard to water quality, waste water from construction activities and runoff from construction site would mostly contain suspended impurities. Adequate care should be taken so that excess suspended solids in the wastewater are removed before discharge into water body.

Mitigation measures: The effluent is proposed to be treated by collecting waste water and runoff from construction sites and treating the same in settling tanks. The settling tanks shall be so designed that it has a detention time of 1.5 to 2 hours. No flocculants are proposed to be used for this purpose.

- **Effluent from workshops, oil storage, etc.**

The effluent from workshops, oil storage, etc. will contain oil and grease and needs to be treated prior to disposal.

Mitigation measures: The effluent shall be treated in oil skimmer and the decanted effluent shall be disposed. The collected oily component shall be stored in cans, etc. and disposed through authorized vendors of the Pollution Control Board

- **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 PM_{10} 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 NOx, 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-6.8. 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 6.8: Fuel combustion during construction

Equipment	**Fuel consumption rate (lph)**	**No. of Units**	**Total fuel consumption (lph)**
Dumpers	30	1	30
Generators	30	2	60
Batching plant	40	1	40
Dumpers	20	2	40
Loaders and unloaders	25	1	25
Excavators	25	1	25
Water tanker	8	2	16
Total			**236**

The major pollutant likely to be emitted due to construction of diesel in various construction equipment shall be SO_2. The short-term increase in SO_2 concentration has been predicted using Gaussian plume dispersion model. The results are summarized in **Table- 6.9**.

Table 6.9: Short-term (24 hr.) increase in concentration of SO_2 ($\mu g/m^3$)

Wind Speed (m/s)	Distance (km)			
	0.1	0.2	0.3	0.4
0.2	0.47×10^{-34}	2.3×10^{-11}	1.15×10^{-6}	9.4×10^{-5}
0.85	2.8×10^{-8}	5.3×10^{-4}	4.4×10^{-4}	4.2×10^{-5}
1.53	7.4×10^{-5}	1.75×10^{-4}	4.2×10^{-5}	2.2×10^{-4}
2.78	1.09×10^{-4}	1.23×10^{-4}	2.6×10^{-5}	8.1×10^{-6}
4.30	9.4×10^{-5}	1.23×10^{-4}	2.6×10^{-5}	8.1×10^{-6}
5.98	7.1×10^{-5}	6.4×10^{-5}	1.28×10^{-5}	5.8×10^{-5}
7.00	6.8×10^{-5}	5.5×10^{-5}	1.09×10^{-5}	5.0×10^{-6}

It is evident from **Table 6.9** that the maximum short-term increase in SO_2 is observed as 0.00053 $\mu g/m^3$, 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:

$H = h+0.2x \sqrt{KVA}$

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.

- **Impacts on Socio-Economic Environment**

The project aims to bring several positive and adverse social developmental impacts due to the modernisation of Neamati 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.

Negative Impacts

The proposed-up gradation of terminal needs to acquire private land and hence land acquisition is an issue for development of Neamati terminal. Based on Census Survey and joint visit conducted by Revenue Department and AIWTDS, there are 06 vendors near the proposed terminal who might lose the livelihood during construction period. They are squatters and are eligible for entitlements as per approved Resettlement Policy Framework of the project.

- During construction phase, approximately 40-45 manpower (including skilled, semi-skilled and un-skilled) would be required. Labour influx shall be temporary and minor; the impact shall be mitigated appropriately.
- Inward migration due to increased connectivity from various parts of the state and the country can lead to an increase anti-social activity. Hence, adequate precautionary measures need to be taken during project construction period.
- Spreading of viral / communicable diseases including STDs/AIDS 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.

- Fair compensation for the loss of land, assets and livelihood to the project affected people shall be provided as per existing State Governments Policy that shall not be less than approved RPF.
- 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 strengthened in these areas, by strengthening the Health Surveillance systems.
- 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 beissued 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 can lead to temporary adverse social and environmental impacts on local communities, especially the villages located along the terminal and 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. However, regular community awareness and monitoring can help in avoiding any form of social and environmental impacts or distubances on the local communities, especially the residential area located near the labour camp.

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 guideline.
- 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 Jorhat.

- 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 camp site community, passengers, tourists, co-workers and service users. GBV and SEA-SH 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 the baseline survey conducted by AIWTDS Nineteen (19) nos. case against Eve Teasing was registered in the project area. [2]

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.
- 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.

[2] Baseline Survey Report V4, Assam Inland Water Transport Project, April 2023, Page No. 59

- 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

The proposed project site has 06 squatters who are earning their livelihood through temporary shops will be affected. The squatters will be affected due to absence of passengers and construction activities.

Mitigation Measures

Livelihood and Income Restoration Plan

The strategies for restoring the income of squatters includes providing the PAPs with adequate compensation prior to relocation/vacating the premises as per existing rules of State Government.

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 06 (six) squatters has been prepared based on the existing regulation of the state Government.

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:

6.2.4 Impacts During Project Operation Phase

- **Impact on Land Environment**

Impacts on Land Use Pattern of the Area

The Project are proposed near the existing jetty used for the water transport in Assam. 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. The project would stimulate lot of ancillary developments like shops, restaurant, repair shops, etc. in and around the jetty. This will lead to conversion of barren land into commercial use near to the jetties.

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.**

- **Impact on Water Environment**

➢ **Impacts due to Generation of Wastewater**

For major jetties, an average of 200-300 persons per day are expected in each jetty depending on their capacity. Thus, the total daily demand is 38 KLD. The washing & wiping is to be done manually using powered low pressure portable washer jets and using organic detergents (phosphate free & bio degradable 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 Neamati terminal is given in **Table-6.10.**

Table 6.10: Water Requirement in operation phase

Name of terminals	Number of passengers expected	Water Requirement (KLD)	Bio-digester capacity (KLD)
Neamati	200-300	38	12

Mitigation Measures: Suitable wastewater treatment measures will be provided for the treatment of domestic sewerage from the jetty premises. Bio-digestors shall be provided at Neamati 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. Existing private boats and IWT vessels operating from Neamati Ghat runs on diesel. 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.

- **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 due to operations**

As a precautionary measures to safeguard the aquatic flora and flora 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.

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 offshore drilling can severely impact their well-being.
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:-

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.

- For conservation of dolphin, instruction should be given to all vessels' operators and all employee and staff that dolphins or any other endangered species should not be harmed due to any reason.
- Instruction should be given to vessel operators for maintaining a safe distance and speed if dolphins are spotted, in case of accidental injury to dolphins it should be reported immediately to terminal authority for informing the emergency rescue team.
- Vessel operators should be instructed for not using sharp lights and sounds as they may disturb the aquatic fauna.
- Provision for propeller guards should be provided for all the vessels to minimize the propeller inflicted injuries and scars.
- Regulation of vessel speed in Dolphin habited area.
- Sub-surface aquatic disposal is required, minimum one meter below the water surface. Careful mapping of sensitive areas directly affected by the dredge;
- Preventative maintenance of equipment to mitigate negative environmental impacts such as leakages and spillages
- The mess size of the iron wire to be used to fix the boulders below the steps at Ghats close to the water line or river edge should be four inches instead of eight inches.
- Any plantation if required, species identification should be done carefully with local people, experts natural amphibious/aquatic grasses of riparian zone of the river grow which should not be disturbed.
- There should be minimum or no noise under the water during implementation of the project.
- If any mechanized boat is used during implementation of the project, the same may have provision for propeller guards.

- Support for promoting fish productivity through setting up or supporting existing fish nurseries as a part of enhancement measures. Also providing training and awareness support through reputed institutes or experts like Central Inland Fishery Research Institute (CIFRI) for better fishing techniques. Provision of supporting studies for conservation and safety of dolphins should be made during the course of the Project for documenting the best practices as well as updating the conservation/management plan.

➢ **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.

Impact on Ambient Air Quality

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.

- **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 Neamati.

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 Neamati terminal has been designed considering the following assumptions.

- The passenger ferry terminal would cater to a multi modal vehicle type system.
- The 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 bio-digester.

- The facility would be designed as per the hydro-geomorphology of the region as well as with bank erosion protection.

- Although the DPR for Neamati has considered the terminal area as category-2 under soil erosion which implies moderate erosion as per technical assessment carried out during the preparation of DPR, however 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. The time history satellite images show moderate shift of riverbank at terminal sites due to bank erosion. Necessary bank protection measures are underway in the area by Water Resources Department and additional work shall also be taken by the concerned department for Bank protection. The project proponent has already discussed the matter with the concerned departements for necessary support.

- In terms of traffic categorisation, Neamati has been considered under Category A- Ro Pax vehicles with four and two wheelers with foot passengers.

    - Under this category, the ferry terminals shall be planned with consideration of safe and efficient movement of the four and two-wheeler vehicles and 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. The access ramp shall be planned in straight line for the easy movement of the four wheelers. In such situation where there is a constraint for planning the straight access ramp, curved access shall be planned with safe turning radius provisions.

- The 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 to prevent erosion. Plantation of suitable plant species in the river bank which includes *Tamarix dioica* (Jhaubon), *Vetiveria zizanioides (*Birinabon), *Ipomoea biloba* (Morning Glory) etc need to be taken to check erosion.

- The passenger ferry service would also house a suitable weather station for alerts and warnings as and when required.

- The 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.

- The 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,

  The mobilization and site set-up are the most critical start-up activities to set the pace for timely construction of the terminal. Considering the easily accessible location of Neamati a minimum mobilization period of 1.5months has been allowed for the site set-up

- Construction of riverine facilities

  The other activity 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 months 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 riverine activities will be most affected due to the on-set of monsoons, June to September.

- 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.

  Two ramps have been planned at Neamati, however, difficulties in accessing the location are envisages and a period of 12 months has been considered for completing the land side construction.

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 out of which the following solution is proposed for Neamati.

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
  For Neamati a minimum gradient of 1:12 with landings at every 5 meters of ramp run is considered. 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 +64m in the river to +88m at the landside.

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.

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.

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.

Figure 7.1: Typical signage map showing emergency exits and other amenities inside the building

(Source- DPR)

7.5 RISK ASSESSMENT

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			
	Collision with terminal at low speed	Major fault at the terminal- suspension of operation		
	Collision with terminal at high speed	Fuel Leakage scenario at terminal		
1/100 to 1/10,000 (2)		High speed Collision with fuel leakage		
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 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 Neamati 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 Neamati Terminal for both construction and operational phase is given in **Table 8.1 to Table 8.3.**

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[3]	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 (AIWTDS+ GC)
	Design of the Riverbank Protection	The design of any 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 (AIWTDS+ GC)
	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-	Assessment of Capacity of Bio-Digestor Assessment of space for the setting up bio-toilets,	Contractor During the design phase	TSSC & PMU (AIWTDS+ GC)

[3] Contractor shall develop the terminal based on the design & BOQ provided by PMU. EMP for design phase hence not applicable.

		toilets for the pilgrim / festival. Adequate space must be made available to store municipal solid waste.	Adequate space for storage of Municipal Solid waste		
	Energy Efficiency	Energy-efficient measures in the terminal buildings will be implemented; Solar power will be used in potential area	Use of Energy efficient Fitting and fixtures	Contractor During the design phase	TSSC & PMU (AIWTDS+ GC)
Pre-Construction Activities					
Field Verification Surveys	Requirement for felling of trees	**Permission of tree(s) removal from non-forest area** -The GC/ AIWTDS 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 (AIWTDS+ 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	Approved copy of the C-EMP	Contractor Once before the start of construction activities	PMU (AIWTDS+ GC)and TSSC

		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.			
Setting up of Plant and Machinery(Batching Plants or concrete mixer location)	Potential source of pollution (air quality, water quality, soil)	**Location of Batching Plants** -Batching plants will be sited sufficiently away from settlements, agricultural operations, or commercial establishments. Compliance with laws, ordinances, codes, rules, regulations, orders, or declarations -Concrete mixers and batching plants will comply with the requirements of the relevant emission control legislations and -Consent/NOC for all such plants obtained from the State Pollution Control Board will be submitted to the PIU. -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	Consent to Establish and Operate	Contractor Once before functioning/operation of plant & machinery	PMU (AIWTDS+ GC)and TSSC

		report, will be submitted to the PIU before the procurement of any material			
Procurement of Other Construction Vehicles, Equipment and Machinery	Potential for air pollution and noise	**Statutory Compliance:-**All Construction equipment[4] 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. -Noise limits for construction equipment to be procured, such as compactors, rollers, front loaders, concrete mixers, cranes (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.	Certification by Manufacturer of emission and noise levels/ Pollution under Control Certificates, Insurance and Driving License of the driver to be submitted for all vehicles	Contractor Once before deployment of all vehicles used throughout the contract period	PMU (AIWTDS+ GC)and TSSC
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	Permission for mining/ quarrying of materials from the Mining Department, District Administration and	Contractor Once if quarrying is required for sourcing of	PMU (AIWTDS+ GC)and TSSC

[4] *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.*

		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.	District Level Environment Appraisal Committee	construction materials	
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 the permission will be submitted to PMU prior to the initiation of construction. A flow meter must be installed, and the records of water used for construction must be maintained. The usage of	Permission from the Ground Water Board for Groundwater usage	Contractor Once before the start of construction activities	PMU (AIWTDS+ GC)and TSSC

		groundwater must be recorded.Contractor shall have provision for metring and piezometer. The contractor can use fresh groundwater sources after the required treatment for drinking. Even if water is sourced from third parties, the above provisions must be followed. -If the river water is used, the permission of the Irrigation department must be obtained	Permission of the Irrigation /Water Resources Department in case of River water is used.		
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[5] Laboratory as per the locations, parameters and frquency specified in the environmental monitoring plan in **Table 8.4.**	Submission of test results to PMU	Contractor Frequency of monitoring as per Table-8.4	PMU (AIWTDS+ GC)and TSSC
EMP Implementation Training	Lack of awareness of EMP can lead to irresponsible behaviour resulting in an Irreversible	-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	-Certificate of Completion (Safeguards Compliance Orientation) -Posting of EMP at worksites.	Contractor Once before initiating construction activities	PMU (AIWTDS+ GC)and TSSC

[5] (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)).

	impact to the environment, workers, and community.	environmental laws, etc. Additional modules for Dolphin Protection. - All new personnel joining the work need to undergo induction training. All personnel joining work after a break of more than 15 days need to undergo refresher.	-Maintaining Records of training both induction and refresher -Submission of the Training records to the PIU every month		
	Deployment of EHS Officer and OHS Officer	Deploy qualified personnel and management committee. - 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. The name and functions of the responsible EHS persons and their relevant expertise must be notified in the Quarterly Report -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	Submission of records of the availability of the EHS personnel onsite in the Monthly Report and Quarterly Report	Contractor EHS personnel to be engaged by the Contrcator for the entire period of contruction	PMU (AIWTDS+ GC)and TSSC
Legal compliance	Environmental legal noncompliance may	-Obtain all consents, clearances (CTE/CTO from ASPCB), permits NOCs etc., before start of construction works. -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)	Copy of the Permit/ Consent to be submitted with QPR to PMU	Contractor During the course of activity as required	PMU (AIWTDS+ GC)and TSSC

		-Following consents are required- -Tree cutting-local authority -Storage, handling, and transport of hazardous materials-ASPCB. -Sand mining, quarries, borrow areas-Department of mines and Geology. .-Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs etc. -Include in detailed design drawings and documents all conditions and provisions; if necessary			
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/ 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 (AIWTDS+ GC)and TSSC
	Impact of Aquatic Species and Dolphins	Construction Planning must be carried out so that No-construction (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 (AIWTDS+ GC)and TSSC
Construction Stage					

Clearing and grubbing for site Preparation (Terminal Site, Base camp, Construction Camp & Labour camp)	Landscape and Aesthetics	Permission of tree(s) removal from non-forest area -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 ConsultantThe 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. - Compensatory afforestation must be carried out per the Tree Felling permission provisions. 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 guideline. Please refer ECoP 17 Construction Camp Management,	Verification of number of trees felled; Copy of NOC from forest dept.	Contractor once for the construction phase if required	PMU (AIWTDS+ GC)and TSSC

	Loss of topsoil. Loss of natural resources (Earth/soil) in area where the Constrctioncamp is setup	•Top soil (15 cm) would be stripped and kept separately in stockpiles for use in landscaping. • At least 10% of the acquired area for construction purposes must be kept for stockpiling of fertile topsoil •Precautions must be taken while stockpiling. The slope of the stockpile shall not exceed 1:2 (V:H) to retain soil & allow percolation of H_2O 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 •Excavated materials would be preferably used for site filling for land reclamation to construct the terminal	Site verification	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC
Transporting Construction Materials and Haul Road Management	Impacts on air quality and safety	-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	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 (AIWTDS+ GC)and TSSC

		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			
	Impacts on Water Quality	- 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 Neamati Site	Site Reports	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC
	Community Safety due to movement of Constraction Vehicles	- Constraction material shall be stored within the construction area to prevent accessibility issue with the community - Schedule transportation of the constraction material so that heavy vehicles do not cause inconvenience to the local population and people on site ; - Drive vehicles in a considerate manner; - Coordinate with Traffic Police for temporary road diversions, where	Site Reports Complaints form Local people on disturbance	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC

		necessary, and for provision of traffic aids - Notify affected area by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.			
Storage of Construction Material	Potential for waterlogging	-The contractor will ensure that no construction materials like earth, stone, sand, or appendage are disposed of so as not to block the flow of water of any water course and cross drainage channels. -The contactor must not dump any excavated material into the river. -The contractor will take all necessary measures to prevent the blockage of water flow. -The stockpiled material must be prevented from erosion and deposition in the drainage channel from sites where these are stocked for construction.	Complaints of water logging	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC
	Water Pollution from Storage of Construction Material	Run-off from a material stockpile can also contaminate water. To prevent the contamination of the construction material, the following measures must be adopted;	-Site visit Report -Number of sedimentation tanks installed. - Records of surface water quality Monitoring.	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC

		- The quantum of construction material at the Neamati site must be minimal as possible -The runoff from the construction material storage yard must be channelled through peripheral drains -The peripheral drains must be connected to sedimentation tanks (holding tanks excavated in the ground) of adequate capacity All sedimentation tanks and peripheral drains must be cleaned before the monsoon.	-No visible Sedimentation to nearby drainages, nallahs or waterbodies due to civil works		
	Water Pollution from Fuel and Lubricants	- 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) -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.	-Number of Oil interceptors installed. -Records of surface water quality Monitoring. - No visible degradation to nearby drainages, nallahs or waterbodies due to civil works	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC

	Pollution of water bodies from domestic activities	**-Wastewater from domestic activities such as bathing and washing at the camp site must be treated.** -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. -Stagnation of water should not be allowed at any place near the campsite as a precaution against vector-borne disease. Wastewater from the Neamati Worksite An adequate number of toilets must be provided Bio-toilets of adequate capacity must be provided for the workers based on no of users. The supernatant from the Bio-digestor must be discharged into the soak pits.	-Adequate number of toilets as per no of labours - Records of surface water quality Monitoring; -No visible degradation to nearby drainages, nallahs or waterbodies due to civil works	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC

		The Supernatant from the. bio-toilets must be tested at periodic intervals to meet discharge standards **Collection of Food waste and kitchen waste from Construction Camp** -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 In the case of rented accommodation, arrangements must be made with the Municipal corporation for the disposal of the waste. **Collection and Disposal of Food Waste from the Neamati Construction Site** Adequate space must be provided in the Construction Site for the storage of Solid Waste No Solid waste should be discharged into the river Mechanisms of transporting and disposing of the Solid waste to Guwahati must be carried out.			
Construction activities in Waterside	Impact on aquatic life and dolphins	-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)	Preparation of the Dolphin / Aquatic Manal Management Plan	Contractor As per the construction schedule	PMU (AIWTDS+ GC)and TSSC

		.-Noise-reducing devices like mufflers ,enclosures baffles must be fitted with the equipment as much as feasible. -Geo Textile synthetic sheet curtains &turbidity traps must be placed around 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. -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 - All equipment will be adequately maintained to prevent potentially	2. Logs for recording watch dolphins / turtles during the construction 3. Log for aquatic fauna monitoring		

		hazardous or toxic products from leaking or spilling. This includes hydraulic fluid, diesel, gasoline and other petroleum products. -Refer Annexure- 16 for Dolphin Conservation Plan			
	Degradation of water quality due to construction activity	Select a construction methodology that is least disturbing and appropriate for the in-situ soil condition. Schedule construction works to complete the construction work before the onset of the monsoon. Schedule the construction works during the low water level period –ensure that works are completed during the same period before the onset of monsoon. - 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.	(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 during the waterside construction activities	PMU (AIWTDS+ GC)and TSSC
	Water Pollution from Fuel and Lubricants and hazardous waste	- Avoid/minimise storage of fuels, chemicals, and lubricants near the river/water; ensure no spillage - A temporary secured hazardous material handling and waste storage area must be provided at the	- No of spills reported -Field observation -Water quality monitoring reports	Contractor Daily basis during the waterside construction activities	PMU (AIWTDS+ GC)and TSSC

		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. Fuel transfer through decanting is prohibited. The use of a transfer pump with the proper fitting is suggested. -The storage area should be covered. - Dispose of any wastes generated by construction activities as per the guidance presented in Annexure 19 Environment Codes of Practices & other Plans and - 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	**Prevent Dust Generation** -The soil/earth must be transported by covering the haulage vehicles with tarpaulin or any other good quality material.	- Complaints from sensitive receptors. - Quarterly environmental monitoring report for ambient air, noise, water, and soil	Contractor Daily basis during the waterside construction activities	PMU (AIWTDS+ GC)and TSSC

		-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 maintained and would have a valid PUC certificate -Don't allow non-project vehicle access in the work area, limit soil disturbance			

		and prevent access by barricading and security personnel. -Traffic detours and diversions must be designed to minimise bottlenecks and ensure smooth traffic. -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.			
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	-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. -All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement. -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. -No open burning of bitumen or preparation of hot mix is allowed.	- Heavy equipment and machinery with air pollution control devices. - Latest Six-Monthly Compliance Report to ASPCB - Valid Consent to Establish and Consent to Operate. - Certification that vehicles are compliant with Air Act - Quarterly environmental monitoring report for	Contractor Daily basis during the construction activities -Conducting quarterly environmental monitoring	PMU (AIWTDS+ GC)and TSSC

		-No burning of firewood is allowed in the construction camp. The Contractor must make provisions for LPG cylinders. -Compliance with laws, ordinances, codes, rules, regulations, orders, or declarations -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. -The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Valid PUC must be maintained throughout the construction period Monitoring results will also be submitted to PMU Consultant and PIU as per the monitoring plan. -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	ambient air, noise, water and soil		

	Noise pollution leads to inconvenience for the people	The Contractor will confirm the following: - All plants and equipment used in construction (including third-party plants and equipment) must conform to the MoEF&CC/ CPCB noise standards. - 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	- Complaints from sensitive receptors. - Use of silencers in noise-producing equipment and sound barriers.	Contractor Daily basis during the construction activities - Conducting quarterly environmental monitoring	PMU (AIWTDS+ GC)and TSSC

		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 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. - 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 PMU. -The Environmental expert of PMC will be required to inspect regularly to ensure the compliance of EMP.			

	Vibration from the works.	-No explosives should be used in construction activities. -Only mechanical equipment must be used to prevent Chances of damage from vibration.	-Site verification	Contractor During the course of activity as required	PMU (AIWTDS+ GC)and TSSC
	Contamination of Soil	-Ensure all equipment, vehicles and other sources of fuels and lubricants will be collected and contained to avoid soil/ groundwater contamination. -Fuel must be stored in proper bounded and covered areas. -All spills and collected petroleum products must be disposed of in accordance with the provisions mentioned in **Annexure 17-** Emergency Spill Control Procedure -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. -The runoff from the maintenance yard must lead to a peripheral drain and pass through an oil-water separator		Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC
Safety aspects during the execution of works	Community Health Safety risks in Work Zones	The Contractor must ensure that : -The construction zone is hard Barricaded with MS Barricades of a height of 3.0 m. -The construction site must be access controlled, and the workers must be	-Barricading of the worksites -Traffic management Plan construction works, including	Contractor Daily Basis	PMU (AIWTDS+ GC)and TSSC

		provided valid identification cards to allow entry. -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 in the areas. The permission of the Environmental Officer is essential. -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 -Refer **Annexure 23 for details of safety practices for construction phase**	number of permanent signages, barricades and flagmen on the worksite -Number of signages placed at the project location. -Regular reporting of the measures in the Quarterly Report		
	Occupational Health Safety: Personal Safety Measures for Labour	The contractor will provide: -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	-Site-specific OHS Plan. -Equipped first-aid stations. -Medical insurance coverage for workers. -Number of accidents. -Supplies of potable drinking water.	Contractor OHS plan shall be prepqred once and implementation as per the approved plan on a daily basis	PMU (AIWTDS+ GC)and TSSC

		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 and other high-noise-generating operations -Adequate safety measures for workers during the handling of materials at the site are taken up. -All tools, tackle, lifting instruments, and cranes must have valid load	- 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		

		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 -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 -The PIU must carry out an awareness campaign for the Do's and Do nots in construction sites. -Near misses must be recorded and reported on a regular basis • -Fortnightly meetings must be held with employees to make them aware of unsafe acts and practices.	-Record of near misses - Record of fatalities - No of workers' meetings -Labour Law Compliance Report generated through Labour Law Compliance system	Contractor -Daily Basis	PMU (AIWTDS+ GC)and TSSC
Sanitation, Health & Safety	Unhygienic and unsafe living and working condition.	• Hygiene in the camps would be maintained by providing good sanitation and cleaning facilities. • Camp would be well ventilated with adequate provision for illumination,	Site Verification	Contractor Daily Basis	PMU (AIWTDS +GC)and TSSC

		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 from these facilities would be disposed through septic tanks and soak pit • 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: Social Management Plan

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
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	-Regular health check-up of the workers once in a week -Training on communicable diseases.	Contractor Minor health issues are addressed on a daily basis if and when required.	PMU (AIWTDS+GC)and TSSC

		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. -Working hours of labour should not exceed norms as per state factory law -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.			
Labour Influx	-Risk of Gender based violence, STD, HIV/AIDS to local community Increased demand and competition for local social and health services	-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	-Awareness training for applicable regulatory regulations.	Contractor site-specific Labour Influx Management Plan and/or a Workers' Camp Management	PMU (AIWTDS+GC)and TSSC

	-Social conflicts between the local community and the construction migrant workers. -Increased illicit behaviour and crime against women, which is a real threat for Assam where gender-based violence is rampant -Increase competition for jobs and have an impact on wage distribution	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 -The project contractor needs to prepare a site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan. -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		Plan shall be prepared and submitted to PMU once during the construction period - Implementation of approved site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan on a daily basis	

		meet their corporate requirement and legal mandate under the Sexual Harassment at the Workplace Act, 2013. -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. - Awareness camps on HIV/AIDS for both, construction workers and neighbouring villages must be organised at regular intervals by NGOs empanelled with NACO. -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. -In case work schedule extents up till night, it should be ensured that women workers are exempted night shifts.			
Gender Based Violance	There might be a possibility of gender-based violence arising from the inflow of migrant workers/ labours.	- 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	-Regular Training shall be conducted. -IEC material should be displayed at site -Awareness Campaign	Contractor -Once in a month	PMU (AIWTDS+GC)and TSSC

		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. Consultation with women's groups should also be held during construction and operation phases 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	With the inflow of migrant workers and their interaction with the local population near labour camp, health issues among the local community might emerge. Health problems like STIs, HIV/AIDS, Hepatitis B&C, Tobacco chewing, Tuberculosis etc. might spread in the	- 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	- Regular health check-up of the workers - Training on communicable diseases	Contractor community consultation once in a month	PMU (AIWTDS+GC)and TSSC

	area because of this floating population	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. Use of mobile phones shall be banned during driving and construction activities.			

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.	• 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.	• 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				

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
Soil Erosion and management.	• Soil erosion of embankment during heavy rainfall.	• 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	• Surface water pollution. • Siltation and erosion and contamination due to disposal of domestic waste	• Bio digester (12KLD) would be provided to treat the sewage generated. Treated water would be used for horticulture and plantation purpose at the site • 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 • Regular cleaning of toilets	Project requirement	DIWT / AIWCL
5.0 Noise Control				
Noise Pollution	• Noise generation from operation of vehicle, equipment and machinery. • Impact of underwater	• 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	Noise Pollution (Regulation and Control) Rules, 2000	DIWT / AIWCL

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
	noise and risk of ship strikes	• 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.		
6.0 Accidental Risk				
Accident and Incident.	Accidents due to Movement of Vessels and other hazards associated with site	• Ensure all their staff are trained in Emergency Response and Rescue in Inland Water and can act as first responders in the case of accidents/crisis situation • Awareness campaigns in sync with the risk communication strategy proposed in the DRM framework • Development of resilient Ghats/Terminals, procurement and maintenance of latest vessels, and safety equipment	Project requirement	DIWT / AIWCL

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
		• Support activities for post-crisis recovery including additional support to vessel accidents victims and community Adequate illumination should be provided at the site		
7.0 Flora & Fauna				
Biodiversity loss	Loss of Aquatic Fauna including Dolphins and other macrophytes	• 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 • 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	Forest Conservation Act 1980, Wild Life Protection Act, 1972	DIWT / AIWCL

Component	Environmental Attribute and potential impacts	Remedial Measures	Relevant laws/ Contracts	Institutional Responsibility Implementation & Supervision
		• 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.		

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:

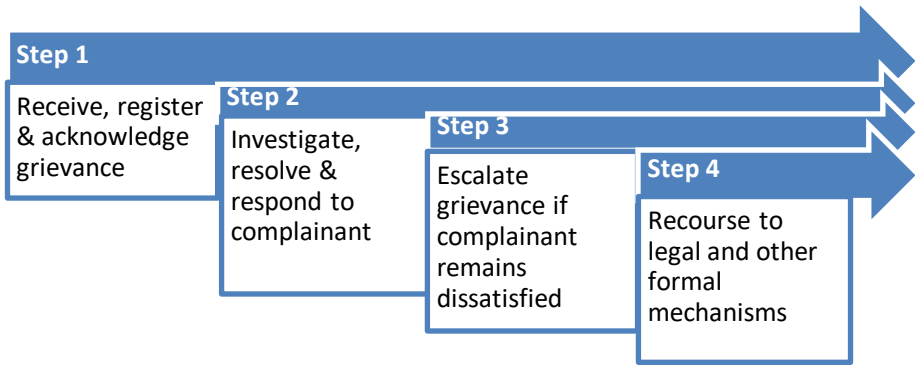


Figure 8.1: Procedure for Grievance Response

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

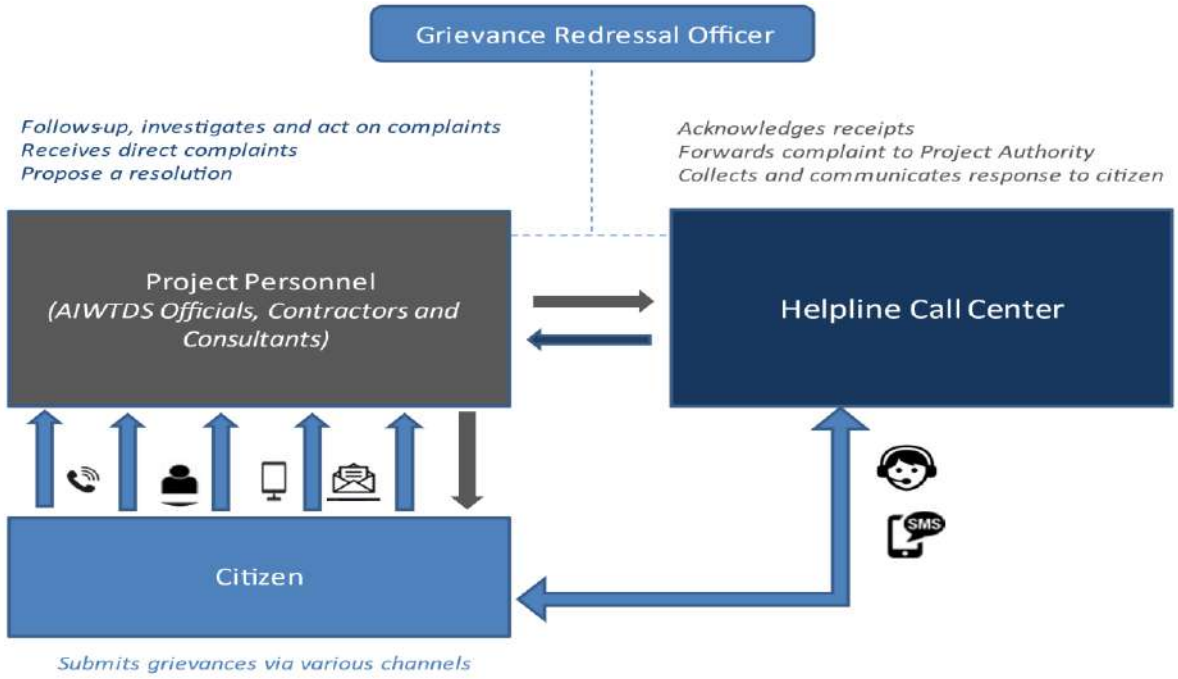
If the complainant rejects the proposed resolution, the Helpline operator will refer the case to the GRO (PMU) within 30 days of its decision. The GRO will facilitate to reach an agreeable resolution and will produce a resolution within 15 working days. If the resolution is accepted by the complainant, 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 PM_{10}, $PM_{2.5}$, NOx, SO_2 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,	Construction- For three seasons in construction phase;	Surface Water Upstream- 2 • Downstream- 2	As per AIWTDS directions	Contractor

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	No. of Samples	Location	Responsibility
		Sulphates, Chlorides.	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 actions will be taken	• Near Project site- 1 Ground water- 2 near the project site		
			Operation For two seasons in operation phase except monsoon			
	Biological parameters	Light penetration, Chlorophyll, Primary Productivity, Phytoplankton's, Zooplanktons	Construction: For three seasons in construction phase	Upstream- 2 Downstream- 2 Near Project site- 1	As per AIWTDS directions	Contractor
			Operation:For two seasons in operation phase except monsoon			
2.	**Sediments**					
		Texture, pH, Sodium,	ConstructionFor three seasons	Upstream- 2		Contractor

S. No.	Aspects	Parameters to be monitored	Frequency of monitoring	No. of Samples	Location	Responsibility
	Physico-chemical parameters	Potassium, Phosphate, Chlorides, Sulphates, Hg, Pb, Fe, Cu, Zn, Cd	in construction phase Operation-For two seasons in operation phase except monsoon	Downstream-2 Near Project site- 1	As per AIWTDS directions	
	Biological parameters	Benthic Micro-fauna, Benthic Macro-fauna	Construction: For three seasons in construction phase. Operation: For two seasons in operation phase 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 Forthree seasons in construction phase and one season for operation phase. Operation 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
5.	**Soil Quality**	N, P, K and Heavy metals	Construction: 2 samples pre-monsoon season and 2	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
			samples post-monsoon Operation one season during operation phase			
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 terminal, environmental monitoring, training, awareness and technical support for establishment, enhancement measures and environmental guidelines. Environmental budget for Neamati terminal is estimated as Rs. 50.80 lakh for construction stage and the cost of implementing the EMP during the operation phase by DIWT/AIWCL is extimated as Rs. 54.25 Lakh. The detailed break-up of costs for both construction and operation phase are given in **Table-8.5 and 8.6.**

Table 8.5: Summary of Environmental Budget- Construction Stage

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
A.	**Monitoring Measures**			
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
		Construction	192000	Contractor
6	Noise Quality	Pre -Construction	10000	Contractor

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
		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	Contractor
		Decommissioning	8000	Contractor
	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

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
6	Camp operation; Waste disposal; Natural resource conservation; Housekeeping.	Camp staff (once every quarter)	2,00,000	Contractor
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	Construction	-	The cost is integrated as part of the civil work cost

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
	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			
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 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	Construction	-	The cost is integrated as part of the civil work cost
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,	Construction	-	The cost is integrated as part of the civil work cost

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
	unloading, lead, lift, shifting, transportation etc. and as per specification in IRC SP 55: 2001			
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	Construction	-	The cost is integrated as part of the civil work cost

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
	and dry waste. The bio-digester toilets shall be mounted on skids and shall not require any creation of permanent structure so that 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

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
14	Environment, Health & Safety Engineer/Supervisor having Bachelors in Env Science / Management/ B. Tech (Env Eng.)	Construction	0	The Manpower Cost is integrated into the cost of the Civil Works
15	Diploma in Central Labour Institute / Regional Labour Institute (Mandatory)	Construction	0	The Manpower Cost is integrated into the cost of the Civil Works
	River bank protection through plantation (Erosion management)	Construction	200000	Contractor
	Subtotal (C)		**200000**	
D	**PIU EMP Implementation cost**			
1	EMP Supervision Cost	Construction	2,40,000	PIU/AIWTDS Cost
2	Equipment	Construction	1,50,000	PIU /AIWTDSCost
	Sub Total (D)		**3,90,000**	
	Total (A+B+C+D)		**4839000**	
E	**Contingency (@5% of (A+B+C+D)**		**2,41,950**	
	Total (A+B+C+D+E)		**50,80,950**	

EMP Implementation Cost to TSSC 400000
EMP Implementation Cost toPIU/AIWTDS 3,90,000
EMP Implementation Cost to Contractor 40,49,000

Table 8.6: Summary of Environmental Budget (Operation Phase)

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
A.	**Monitoring Measures**			
1	Water Quality Monitoring	Operation	2,00,000	AIWCL/DIWT
2	Biological Monitoring	Operation	12,50,000	AIWCL/DIWT
3	Sediments: Physico Chemical	Operation	2,50,000	AIWCL/DIWT
4	Sediments: Biological	Operation	2,50,000	AIWCL/DIWT
5	Ambient Air Quality	Operation	1,20,000	AIWCL/DIWT
6	Noise Quality	Operation	2,25,000	AIWCL/DIWT
8	Groundwater	Operation	-	Civil works contract
	Subtotal (A)		**22,95,000**	
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 (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	2,50,000	AIWCL/DIWT

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
		for five years)		
	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 while the
	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
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 /	Operation	50,000	AIWCL/DIWT

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
	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			
	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	AIWCL/DIWT
	River bank protection through plantation (Erosion management)	Operation	200000	AIWCL/DIWT
	Subtotal (C)		**14,80,000**	
D	**PIU EMP Implementation cost**			

S. No.	Particulars	Stages	Cost (INR)	Costs Covered By
	EMP Supervision Cost	Construction	9,00,000	AIWCL/DIWT Cost
	Sub Total (D)		**9,00,000**	
	Total (A+B+C+D+E)		**5425000**	
F	**Contingency @ 5% of (A+B+C+D)**		**271250**	
	Total (A+B+C+D+E+F)		**5696250**	

EMP Implementation Cost to AIWCL/DIWT **Rs.5425000/-**

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-8.7.**

Table 8.7: Estimated Cost for SMP

Item of SMP	Duration	Estimated costs (Rs.) lakh
Training for contractor staff on labour laws such as: Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996; The Indian Factories Act, 1948 and State Rules; The Bonded Labour System (Abolition) Act, 1976; The Workmen's Compensation Act, 1923; The Contract Labour (Regulation & Abolition) Act, 1970 and Rules;	Actual, before and during the project implementation time	15.0

Item of SMP	Duration	Estimated costs (Rs.) lakh
The Child Labour (Prohibition and Regulation) Act, 1986; Public Liability and Insurance Act, 1991 etc. The new labour Act like The Code on Social Security, 2020 and The Code on Wages, 2019, etc.		
Social safeguards training including training of staff on GRM, contractor's code of conduct, SEA/SH, GBV training (SEA and SH)	Actual, before and during the project implementation time	15.0
Environmental and Health and Safety Officer and Social Development Specialist hired by contractor, for on-site supervision	Actual during the project implementation	15.0
Total (Rs.)		**45.0**

There are 06 (six) squatters noticed during ESIA study at Neamati. The compensation for the squatters shall be estimated by the DLLPC and compensated as per Assam Direct Land Purchase Policy 2022.

8.7 IMPLEMENTATION OF EMP &SPM

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 identity 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 8.8: Environmental & Social Management Cell (ESMC) Detail

Designation in EMC	Number	Qualification	Exposure/ Experience	Roles/Responsibilities
Environmental Expert	1	M.E./ M.Tech / M. Sc. (Environmental	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	5 years of working Experience	Overall Safety Compliance and monitoring

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. The Project shall engage an agency for conducting third party monitoring, budget for the same 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).

Neamati is the most important terminal for the residents of Majuli travelling to Jorhat. The Neamati Ghat also serves as the entry point to Majuli, the largest river island in the world. The ghat is not only of importance to Jorhat but also to several neighbouring towns and villages in upper Assam. On an average about 1000 passengers travel to and from from Neamati to Kamalabari and Neamati to Aphalamukh Terminal. During the peak tourist and festival season, more than 5000-6000 passengers use these ferry services to reach Majuli, the cultural capital of Assam from this terminal. The existing terminal caters to both passengers, two wheelers and four-wheeler vehicles. However, the existing conditions of the terminal needs to be upgraded owing to the importance of the terminal for the locals, tourists and at the same time making it safe for passengers with adequate amenities. The pontoon shall receive Ro-Pax and catamaran vessels of capacity 100-150 passengers along with two wheelers.

The cost of the project is estimated to be INR 67.4 crores for the development of Neamati terminal. The proposed project will have positive impact on social and economic improvement of the region by overall improvement in living standard. Employment generation of this sector will also increase considerably; a number of other indirect and intangible benefits may also flow from the increase in economic activity, including

development of tourism and water sports, conservation of biodiversity, and sectoral development with a growth in related services

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 Project activities at Neamati shall take place in a sensitive ecological hotspot of dolphins and other aquatic species which might have impacts on this habitat. It is thus considered Category A from the environment point of view. Project involves private land acquisition and also livelihood impact of 06 no of squatters, for which the proposed construction at Neamati shall be considered as Category A. The anticipated impacts are both positive and negative but will be significant.

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.

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 terminal, environmental monitoring, training, awareness and technical support for establishment, enhancement measures and environmental guidelines. Environmental budget for Neamati terminal is estimated as Rs. 50.80 lakh for construction stage and the cost of implementing the EMP during the operation phase by DIWT/AIWCL is extimated as Rs. 54.25 Lakh

The estimated costs for various activities for social management under the project is Rs.45 lakh.

TSSC for the Project along with GC shall provide requisite support to AIWTDS and Contractor for implementimg 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/ Third-Party Monitoring Consultant 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 the proposed Assam Inland Water Transport Project project is likely to entail certain environmental impacts due to the proposed intervention at Neamati. 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.

Component	Social Attribute and potential impacts	Remedial Measure	Monitoring Indicators	Institutional Responsibility	
				Implementation & Frequency	Supervision
1.2 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	-Regular health check-up of the workers once in a week -Training on communicable diseases.	Contractor Minor health issues are addressed on a daily basis if and when required.	PMU (AIWTDS+GC)and TSSC

		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. -Working hours of labour should not exceed norms as per state factory law -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.			
Labour Influx	-Risk of Gender based violence, STD, HIV/AIDS to local community Increased demand and competition for local social and	-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	-Awareness training for applicable regulatory regulations.	Contractor site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan shall be prepared and submitted to PMU once during	PMU (AIWTDS+GC)and TSSC

	health services -Social conflicts between the local community and the construction migrant workers. -Increased illicit behaviour and crime against women, which is a real threat for Assam where gender-based violence is rampant -Increase competition for jobs and have an impact on wage distribution	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 -The project contractor needs to prepare a site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan. -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 mandate under the Sexual		the construction period - Implementation of approved site-specific Labour Influx Management Plan and/or a Workers' Camp Management Plan on a daily basis	

		Harassment at the Workplace Act, 2013. -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. - Awareness camps on HIV/AIDS for both, construction workers and neighbouring villages must be organised at regular intervals by NGOs empanelled with NACO. -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. -In case work schedule extents up till night, it should be ensured that women workers are exempted night shifts.			
Gender Based Violance	There might be a possibility of gender-based violence arising from the inflow of migrant workers/ labours.	- 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	-Regular Training shall be conducted. -IEC material should be displayed at site -Awareness Campaign	Contractor -Once in a month	PMU (AIWTDS+GC)and TSSC

		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. Consultation with women's groups should also be held during construction and operation phases 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	With the inflow of migrant workers and their interaction with the local population near labour camp, health issues among the local community might emerge. Health problems like STIs, HIV/AIDS, Hepatitis B&C, Tobacco chewing, Tuberculosis etc. might spread in the	- 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	- Regular health check-up of the workers - Training on communicable diseases	Contractor community consultation once in a month	PMU (AIWTDS+GC)and TSSC

	area because of this floating population	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. Use of mobile phones shall be banned during driving and construction activities.			

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-digestor 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-digestor 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-digestor 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.

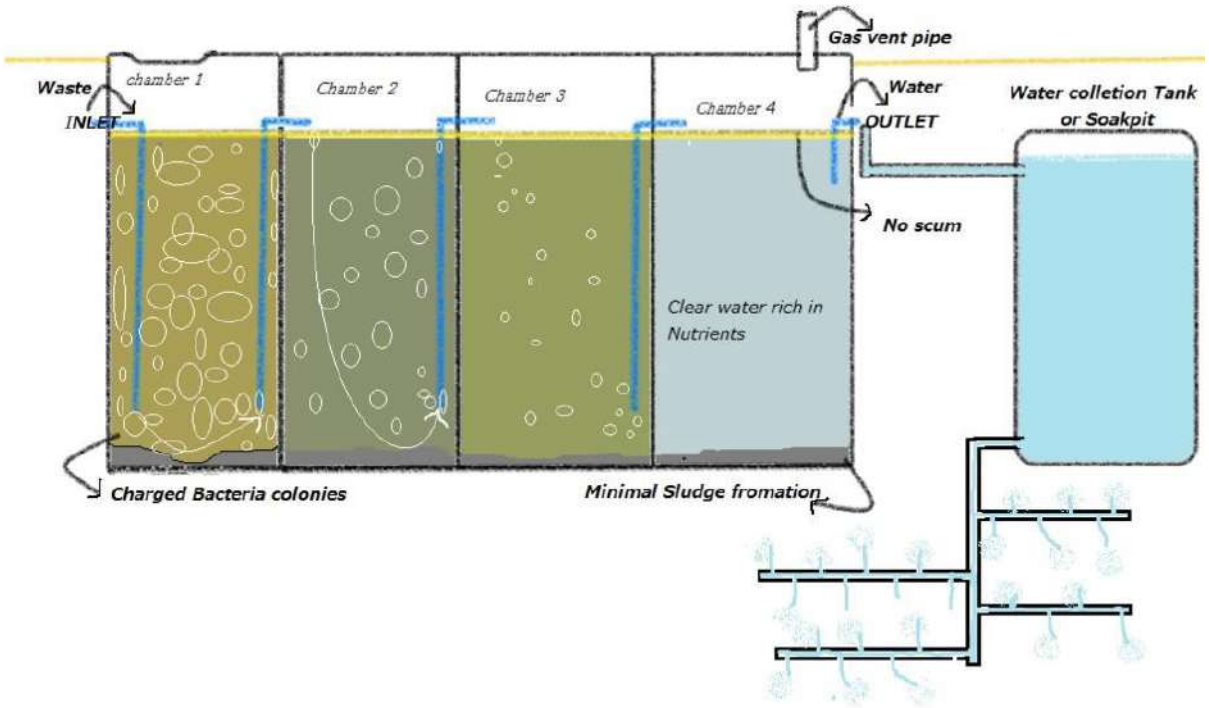


Figure 1.1: Schematic of biobank sourced from DRDO

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.

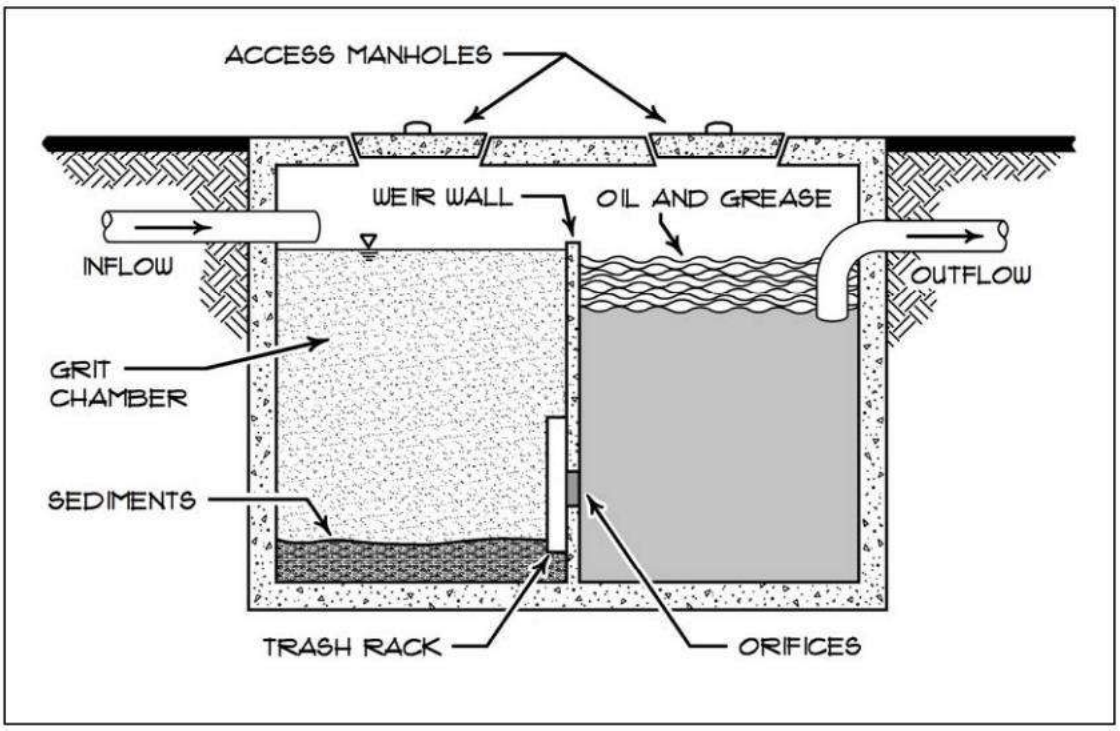


Figure 1.2: Schematic of Oil/Grit Separator

Annexure - 2

Land Related Document

পঞ্জীভুক্ত নম্বৰ - ৭৬৮ /৯৭ Registered No.-768/97

অসম ৰাজপত্ৰ

THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্ৰাপ্ত কৰ্ত্তৃত্বৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

নং 178 দিশপুৰ, শুক্ৰবাৰ, 11 মার্চ, 2022, 20 ফাগুন 1943 (শক)

No. 178 Dispur, Friday, 11th March, 2022, 20th Phalguna, 1943 (S. E.)

GOVERNMENT OF ASSAM
ORDERS BY THE GOVERNOR
REVENUE & DISASTER MANAGEMENT (L. R.) DEPARTMENT

NOTIFICATION

The 7th March, 2022

No.RLA.177/2021/3.- In pursuance to Cabinet decision dated 12/01/2022 taken on the additional item No.15, vide file No. WR(G).123/2020 of Water Resources Department, Assam, the Governor of Assam is pleased to order "Land acquisition through Direct Purchase by way of negotiated settlement for all Departments in the State of Assam" as enunciated in the enclosed document in Annexure-I. It will come into force with effect from the date of publication of the Notification in the Assam Gazette and will remain in operation till such time as the State Government may consider fit and proper. The Government reserves the right to make any amendment to the same from time to time.

Annexure-I

Land acquisition through Direct Purchase by way of negotiated settlement for public purpose of all Departments in the State of Assam.

1) The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Act, 2013 enacted by the Government of India came into force with effect from 1st January, 2014, repealing the Land Acquisition Act, 1894. It includes provisions for Rehabilitation and Resettlement (R&R) of project affected families and persons in addition to the compensation for acquisition of land. The Government of Assam framedthe Assam RFCTLARR Rules, 2015 under the RFCTLARR Act, 2013 with a number of sequential compulsory processes, involvement of a number of bodies as well as statutory waiting time between different processes. Acquisition of land as per the procedures laid down in the said Act and Rules takes considerable time from issuance of Notification to taking over possession of land.
2) Adopting the policy of Direct Purchase will not only fast track the process of land procurement but also will simplify the process. This will provide the opportunity to the land losers to negotiate on the cost of their land they will be paid, which will result in less litigation from the land owners.

3) Steps and features of Direct Purchase procedure:
   (i) Step 1: The Requiring Department shall finalize the minimum extent of land required for the public purpose and submit requisition to the concerned Deputy Commissioner/Collector in **Form-A**.

   (ii) Step 2: A District Level Land Purchase Committee (DLLPC) under the chairmanship of the Deputy Commissioner is to be constituted for direct purchase of land as well as fixation of market value etc. The DLLPC will comprise of the following persons:
   - Deputy Commissioner …….Chairman
   - Additional Deputy Commissioner (Revenue) …….Member Secretary
   - Representative of the Requisitioning Deptt……. Member
   - Revenue Circle Officer……Member
   - Sub-Registrar …….. Member
   - Representative of the other concerned assessing Department……. Member

   (iii) Step 3: Concerned Revenue Circle Officer and the representative of the Requisitioning Deptt. will conduct joint inspection of the requisite land. The area of land and immovable properties attached to it will be measured and mapped.
   (iv) Step 4: General Notice will be issued by the District Level Land Purchase Committee (DLLPC) to the land owners regarding proposed purchase of the land.
   (v) Step 5: A list may be prepared for those land owners who may agree to sell the land after ascertaining the actual owner of the land, if necessary, by conducting field enquiry. Willingness of the land owners shall be obtained in writing in**Form-B**.

(vi) Step 6: The list shall be published inviting objections, if any, regarding interest and ownership of the land, etc. For receiving objections from the land owners, a waiting period of 1 (one) month shall be given.

(vii) Step 7: DLLPC will prepare the valuation of land and assets. The Requiring Department may also define a few typical immovable assets of different categories and fix the guidance price through appropriate authority. This price of the assets attached to the land may be calculated on pro-rata basis on typical immovable assets mentioned above.

(viii) Step 8: The valuation of the land and assets, if any thereon, the particulars of the land, name of owners, etc. shall be prepared.

(ix) Step 9: The Direct Purchase price shall be higher on the compensation calculated as per provisions of section 26to 30 & First Schedule of the RFCTLARR Act, 2013 with multiplier of market rate of land defined through the Govt. Notification No.RLA.300/2013/Pt-II/7dated 22/12/2014. The resettlement & rehabilitation benefit shall be deemed included in it.

(x) Step 10: On completion of the statutory waiting period specified in step 6, the DLLPC will inform the respective land owners, who are interested or not raising any objections for negotiation.

(xi) Step 11: Pre-informed negotiation(s) with the respective land owners will be carried out by DLLPC.

(xii) Step12: The settlement reached in the negotiation shall be recorded as Agreement through**Form-C** and **Form –D**for land owners and for interested persons other than the land owners, if any, respectively. An undertaking (in Form-B) may be signed by the land owners declaring that they will not claim for payment of higher compensation in any court of law or any other forum and shall abide by the sale agreement finalized in the DLLPC. The land owners and other interested persons have to provide their electronic transfer details through electronic transfer Mandate Form.

(xiii) Step 13: The District Collector/ Deputy Commissioner may requisition necessary funds from the Requiring Department.

(xiv) Step 14: The Deputy Commissioner/District Collector shall make an award according to the terms of such agreement. Possession of the land is taken through paying the negotiated price directly to the land owners or persons interested other than the land owners, if any, through electronic transfer to their respective bank accounts.

(xv) Step 15: The list of the willing rightful land owners so prepared may be communicated to the concerned Sub-Registry office for registration of Conveyance Deed. The Stamp duty in the Indian Stamp Act, 1899 will be exempted in respect of instrument executed by or on behalf of, or in favour of Government.

(xvi) Step 16: The concerned Deputy Commissioner will transfer the land in favour of the Requiring Department and make necessary changes/corrections in the land records.

(xvii) Step 17: In the event of any owner refusing to sell the land or any of the owners having objected or not interested with the direct purchase through negotiation, the respective land may be acquired through land acquisition process of the RFCTLARR Act, 2013 and the rules framed thereunder.

4) The cost of Direct Purchase and process of Direct Purchase shall be borne by the Requisitioning Department.

5) The Direct Purchase method will be all encompassing and inclusive of all compensation and Resettlement and Rehabilitation (R&R) benefits, as specified inthe RFCTLARR Act, 2013 or in R&R benefits of Multilateral Development Banks for Titleholders. The purchase price of land shall be fixed based on negotiations and mutual consent and hence, no separate R&R benefits shall be payable to the land owners.

6) The formats for application and other requisite Forms are enclosed as Annexure-2. The procedure for calculating the Direct Purchase price of land, and other properties attached with it is provided in Annexure-3.

Annexure 2:

Requisite Forms for Direct Purchase process

Form-A

Requisition for Land Acquisition

No. : _____ Date_____

From : Name
Designation of the Requiring body

To : The Deputy commissioner/ District Collector

The undersigned is in requirement of ……acre (s) of land for ……. ……project/ purpose and the details are furnished in Appendix 1 and 2, along with two copies of trace maps showing the full/ parts of lands required.

It is certified that the required land will be demarcated on the field and all further necessary information and assistance will be provided on the date/ time appointed/ stipulated by you.

The requisite price for direct purchase finalized through negotiation will be deposited in your office as and when required.

Enclosure: Appendix 1 and 2 & two copies of trace Maps.

Yours faithfully,

Requiring body

Memo No._____ Date_____

Copy to:

1. The Secretary to the Govt. of Assam, Revenue & Disaster Management Department, forinformation.

Requiring body

Appendix 1 to Form-A

Requisition for Land

(i) Name of District.....

(ii) Name of the Project .....

(iii) Details of requisition of land .....

District ..... **Revenue Circle** .....

Sl.	Village/ Ward	Mouza	Rural/ Urban	Patta No.	Dag no.	Area to be acquired	Boundaries			
							N	S	E	W

(iv) Total area under requisition (Acres) .....

(v) Are any religious structure, graveyard or tomb etc. proposed for acquisition? (Yes/ No).....

(vi) If yes, reasons for such inclusion of religious structures.

_____

_____

_____

_____

_____

Requiring body

Appendix 2 to Form-A

Certificate with requisition for land

Name of the Project_____

(1) Certified that the project for which the land is required has been administratively approved vide Department letter No:_____dated _____ for direct purchase through negotiation with the land owners.

(2) The estimated cost of the project is of Rs._____and necessary budget has been sanctioned and funds are available towards cost of acquisition through direct purchase.

(3) The Department undertakes to pay full amount of award by the District Level Land Purchase Committee (DLLPC), Rehabilitation and Resettlement Authority/ High Court/ Supreme Court, and as and when asked to do so by the Deputy Commissioner/ Appropriate Government.

Requiring body

Form-B-1

For land owners.

Undertaking to be signed by the person(s) interested before the DLLPC

I/We, Sri/Smti. ..... S/o,W/o, D/o ..... owner /owners/ of the land in Dag No. ..... Patta no. ..... of ..... village .....Mouza ..... Revenue Circle ..... District, here by agree for the voluntary sale through consent my/our land to the Collector for the purpose of .....

I/We Solemnly affirm that I/we, am/are the absolute owner/owners of the land mentioned above and the land is not encumbered. The sale consideration payable for this land maybe paid to me/may be paid to .....

I/We / am/are agreeable to the payment of all inclusive of sale consideration of land, things attached to land including perceived livelihood loss/equivalent costs for Rehabilitation and Resettlement etc., agreed to in the District Level Negotiation Committee/DLLPC.

I/We hereby declare that I/we will not claim for payment of higher consideration in any court of law or in any other forum/authority and I/we shall abide by the sale agreement finalized in the District Level Negotiation Committee.

Signature and Name of the land owners

Date:

Attestation of Deputy Commissioner/Authorized Representative

Name and Designation:

Date:

Form-B-II

Undertaking to be signed by persons interested other than land owners

I/We, Sri/Smti. ……S/o,W/o,D/o …….. are persons interested in the land in Dag No. ……Patta no …….. of ……..village ……..Mouza ……Revenue Circle …….. District.

I/We enclose document …….. in support of my / our claim as an interested person in the said land.

I/We hereby agree for receiving the R & R benefits in the lump sum as per provisions.

I/We hereby declare that I/we will not claim for payment of higher consideration in any court of law or in any other forum/authority and I/ we shall abide by the amount finalized in the District Level Negotiation Committee/DLLPC.

Signature and Name of the interested persons

Date:

Form-C

Agreement with land owners

An Agreement made this _____ day of _____ 20 ____ between _____ here in after called the 'owner'(which expression shall unless repugnant to the context or meaning thereof include his/her heirs, executors) and the Requisitioning Agency represented by _____hereinafter called the 'Requisitioning Agency', on the other part and recommended by Negotiation Committee.

AND WHEREAS the right, title and interest of the owner /owners in the following land/lands hereinafter called the said land/lands is/are as specified below:

Persons being the absolute owner/owners of the property or having an interest therein capable of leading ownership ultimately hereinafter mentioned and hereby conveyed in the following shares, this is to say:

(1)_____S/D/W of _____ share_____

(2)_____S/D/W of _____ share_____

(3)_____S/D/W of _____ share_____

AND WHEREAS the owner and the Requisitioning Agency agreed for payment of compensation at _____ as a lump-sum deal for an extent of covering ……..acres land in _____ Dag No _____ Patta No _____ of Village/ward _____ of _____ Mouza/Municipality/Municipal Corporation _____Sub-Division _____District. The lump-sum deal represents the market value of the land including value of any immovable property/assets attached to the said land and value of standing tree and crops, solatiumetc., under the Act and over and above of these, as applicable, there may be incentive of direct purchase which also includes more than the Rehabilitation and Resettlement costs as per Schedule under the Act and also apportion the same among themselves as hereinafter provided.

AND WHEREAS the owners have no intention to raise any dispute regarding the contents and manner of this Agreement and the owners have no intention of making a reference to any court or authority,as far as the compensation, contents and manner of the Agreement are concerned.

Signature of the land owners

1.

2.

3.

Signature o Requisitioning Agency

Attested by Member Secretary
District Level Land Purchase Committee

Form-D

Agreement with persons interested other than the land owners

An Agreement made this _____ day of _____ 20 ____ between _____ one part 'persons interested' (which expression shall unless repugnant to the context or meaning thereof include their successors and assignees) and the Requisitioning Agency represented by _____hereinafter called the 'Requisitioning Agency', on the other part and recommended by Negotiation Committee.

AND WHEREAS the right, title and interest of the owner /owners in the following land/lands hereinafter called the said land/lands is/are as specified below:

Whereas land/lands are held by the interested party/parties named hereinabove under the owners with respective terms and nature of interest:

(1)_____S/D/W of _____ Definite Terms and nature of interest_____

(2)_____S/D/W of _____ Definite Terms and nature of interest_____

(3)_____S/D/W of _____ Definite Terms and nature of interest_____

AND WHEREAS the interested party and the Requisitioning Agency agreed for payment of compensation at _____ as a lump-sum deal for an extent of covering acres _____ in Dag No _____ Patta No _____ of Village /ward _____ of _____ Mouza/Municipality/Municipal Corporationof _____ Sub-Division _____District. The lump-sum deal represents the Rehabilitation and Resettlement benefits as per the provisions.

AND WHEREAS the interested parties have no intention to raise any dispute regarding the contents and manner of this Agreement and the owner/persons interested have no intention of making a reference to any court or authority,as far as the compensation, contents and manner of the Agreement are concerned.

Signature of the persons interested

1.

2.

3.

Signature of Requisitioning Agency

Attested by Member Secretary
District Level Land Purchase Committee

Annexure-3

Calculation of Direct Purchase Price

The compensation of Land Acquisition as per Section 26 to 30 of the RFCTLARR Act, 2013 is shown below:

1. Section 26 of RFCTLARR Act, 2013:
   a) The base rate of land [Sub-section (1)] of Section 26 of the RFCTLARR Act, 2013 will be determined by the highest value among:
      - The market value, if any, specified in the Indian Stamp Act, 1899 for the registration of Sale deeds or agreements to sell, as the case may be, in the area, where the land is situated;
      - The average sale price of similar type of land situated in the nearest village or nearest vicinity area; and
      - Consented amount of compensation as agreed upon under sub-section (2) of section 2 of the RFCTLARR Act, 2013 in case of acquisition of lands for private companies or for public private partnership projects.
   b) The market value of land shall be multiplied by a factor [Sub-section (2) of section 26 of the RFCTLARR Act, 2013], of i) 1.00 (one) for land of urban areas or, ii) 1.5 (one and a half) if the radial distance of the land is up to 10 km from the nearest urban area or, iii) 2.00 (two) if the radial distance of the land is beyond 10 km from nearest urban area (Ref Notification No.RLA.300/2013/Pt-II/7 dated 22/12/2014 of the Govt. of Assam).

2. Section 29 of the RFCTLARR Act, 2013:
   a) Market value of building and other immovable property and assets attached to the land will be calculated by the competent Engineer or any other specialist in the relevant field [Ref. sub-section (1) of section 29].
   b) Value of trees and plants attached to the land will be calculated by the experienced persons in the field of agriculture, forestry, horticulture, sericulture or any other relevant field, as the case may be [Ref. sub-section (2) of section 29].

3. Section 30 of the RFCTLARR Act, 2013 :
   a) A Solatium @ 100% on the value of land, immovable assets attached to the land and standing crops will be added to determine the total compensation [Ref. sub-section (1) of section 30 of the RFCTLARR Act, 2013].
   b) Individual awards detailing the particulars of compensation and details of payment of compensation as specified in the First Schedule of the RFCTLARR Act, 2013 will be issued [Ref. sub-section (2) of section 30 of the RFCTLARR Act, 2013]
   c) The land value defined u/s 26 of the RFCTLARR Act, 2013 will also attract an amount calculated @ 12% per annum for the period commencing on and from the date of notification till the date of award [Ref. sub-section (3) of Section 30 of the RFCTLARR Act, 2013]

4. Simple valuation of immovable assets attached to the land :
To facilitate quicker and simpler valuation on immovable assets on the land to be acquired, a few typical speculations of different categories of all possible immovable assets, attached to land may be defined. The guidance price of these typical assets may be prepared and vetted through appropriate authority. The valuation of immovable assets attached to the land will be calculated on pro- rata basis of the guidance price, without depreciation, of the respective assets.

5. Direct purchase price:
The land owners will get an incentive of 25%, inclusive of R&R benefits, on the compensation calculated as per provisions of Section 26 to 30 and First Schedule of the Act, as he has readily agreed to be a part of the project.

The Price of Direct Purchase (DP) will be: -

$$DP = 1.25 \times \{2 \times [(R \times M \times A) + (B+O)] + [0.12 \times Y \times (R \times A)]\}$$

Where :
R is the base rate of land
M is the Multiplication factor
A is the affected area
B is the market value of Buildings
O is the value of all immovable assets & standing crops
Y is the year from the date of notification to award of compensation

The Direct Purchase method will be all encompassing and inclusive of all compensation and R&R benefits, as specified in the RFCTLARR Act, 2013 or in R&R benefits of MDBs for Titleholders. The purchase price of land shall be fixed based on negotiations and mutual consent, hence no separate rehabilitation and resettlement benefits shall be payable to the landowners.

AVINASH JOSHI,
Principal Secretary to the Government of Assam,
Revenue & D. M. Department.

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Extraordinary Gazette No. 355 - 50 + 10 - 11 - 03 - 2022. (visit at– dpns.assam.gov.in)

Annexure – 2 (F)

Minutes of the consultation held on 19th July with the Pattadars and Possessors/Squaters.

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:+91361-2526421

No.AIWTDS/ **Dated:19/07/2023**

Minutes of meeting held on 19th July 2023 at 35 no. Gaon Panchayat Office premises

A general meeting was held with Mr. Sajib Das, ACS, Circle Officer of West Revenue Circle, Jorhat; Mr. Raju Dutta, GP President of 35 no GP; Mr. Achinta Dutta, Gaon Pradhan of 35 no GP; Ms. Porikroma Borah, GP Secretary of 35 no GP; Mr. Ashim Kr. Boruah, Junior Engineer of IWT; Mr. Dwijen Saikia, Supervisor Kanungo of L A Branch, DC Office; Mr. Amulya Kalita, Supervisor Kanungo of Jorhat West Circle; Mr. KK Gogoi, Lat Mandal of Jorhat West Circle, Mr. Mina Ram Sarmah, Land Revenue Assistant of LA Branch and between AIWTDS Officials (Kajoree Chetia, Social Development Expert of Guwahati and Mousumi Duwarah, Social Development Expert of Jorhat) and available Pattadars of the land and Possessors of the shops at Neamati Ghat on 19th July, 2023 in the 35 no Gaon Panchayat Office premises regarding settlement of issues on land acquisition of Neamati Ghat for construction of Neamati terminal.

The meeting started with a general introduction of the Revenue Officials and AIWTDS Social Team with the Four Pattadars and Six Possessors that were present in the meeting. It was followed by a general discussion upon the importance of the terminal construction at Neamati Ghat.

After discussion amongst the members present, the following issues were noted:

Sl. No.	Discussion/ Decision
1.	While 9 Pattadars are given in the L A estimate provided by Jorhat DC Office, Pattadars for 4 Dag Numbers were only present. Instead of the original Pattadars mentioned in the L A estimate, their descendants (sons and grandsons) represented the original Pattadars as they are no more alive.
2.	The available documents carried by the descendants proving their lineage and connection with their original Pattadars were duly checked by the LA branch officials and found to be authentic in presence of Circle Officer and all other Officials present.
3	The Six possessors mentioned in the LA Estimate were present and also duly checked by aforementioned Officials.
4.	Of Six Possessors, two Possessors viz. Kunju Hazarika and Horulora Das in the LA Estimate have expressed certain discrepancies in their names mentioned in the L A Estimate. • In case of Kunju Hazarika, she claims her name in the identification document is Jumi Hazarika and her pet name is actually Kunju which by mistake was given when the Revenue officials visited. • In case of Horulora Das, the error is regarding one letter only and he claims his name in the identification document is Sarulora Das. Both of them were advised by the Revenue Officials to get affidavit done to prove the same.
5	Revenue officials informed the Social team of the Society that one Pattadar could not come to the meeting due to some unavoidable circumstances and he was informed by the officials to visit the Circle Office later as per his convenience.
6.	In the end of the meeting the Social team of the Society requested the Pattadars and L A estimate team to try to reach out the rest of the Pattadars who were not present in the meeting at the earliest.

After the meeting, the Social Team along with Mr. Ashim Kr. Boruah, Junior Engineer of IWT visited the Office of the Deputy Commissioner, Jorhat to meet Ms. Sultana Akhtara Ahmed, ACS, Additional Deputy Commissioner, Jorhat to provide her an overview of the meeting held at 35 no Gaon Panchayat Office premises and to request her to take necessary steps from her end to expedite the process of land acquisition at Neamati Ghat.

Mousumi Duwarah

Social Development Expert

Jorhat Division, AIWTDS

Memo No: Dated: 19/07/2023

Copy to:

1. The Deputy Commissioner, Jorhat, for information and necessary action
2. The Director, Inland Water Transport Assam, Ulubari, Guwahati-7 for information

Annexure – 2 (G)

Letter of communication from Jorhat Deputy Commissioner Office stating presence of claimants

LA/1351/2023-LAQ-JRT

I/63242/2023

GOVT. OF ASSAM
OFFICE OF THE DISTRICT COMMISSIONER, JORHAT
(LAND ACQUISITION BRANCH)

No: E 80743 Dated Jorhat the 29th July, 2023

To,

The State Project Director,
Assam Inland Water Transport Development Society

Sub:- Regarding construction of passenger ferry terminal at Nimati Ferry Ghat at Village Kumargaon under Hezari Mouza of Jorhat West Revenue Circle in the District of Jorhat.

Sir,

With reference to the subject cited above, I have the honor to inform you that regarding construction of passenger ferry terminal at Nimati Ferry Ghat in Village Kumargaon under Hezari Mouza of Jorhat West Revenue Circle, Land Acquisition estimate is already submitted to you vide this office letter no. JRA.129/2022/ dated 21/06/2023. In this regard as per report submitted by the Circle Officer, Jorhat West Revenue Circle vide letter no. JWC.6/2017/893 dated 25/07/2023, it is to bring your kind notice that pattadars of 5 numbers of dag have already communicated and process is already initiated to communicate with the pattadars of rest 4 numbers of dag out of total the 9 numbers of dag which falls under the proposed acquisition (copy enclosed).

This is for your kind information and necessary action.

Enclo: As stated above

Yours faithfully,

Signed by Sultana Akhtara Ahmed
Date: 29-07-2023 10:15:52

Addl. Deputy Commissioner (LA)
Jorhat

Memo No: E 80743 -A Dated Jorhat the 29th July, 2023

Copy to:

PA to DC, Jorhat for kind appraisal of the Deputy Commissioner.

(e-Signed)
Addl. Deputy Commissioner (LA)
Jorhat

অসম চৰকাৰ

চক্ৰ বিষয়াৰ কাৰ্য্যালয় :::::::::::::পশ্চিম বাজহ চক্ৰ যোৰহাট

নং জে ডব্লিউ ৰি ৩/২০২২/৮৯৩   দিনাংক ২৫-০৭-২০২৩

প্ৰতি,

মাননীয় উপায়ুক্ত মহোদয়,
যোৰহাট।

বিষয়:- নিমাতী ঘাট ফেৰী টাৰ্মিনেল সন্দৰ্ভত প্ৰতিবেদন দাখিল।

মহোদয়,

ওপৰোক্ত বিষয় সন্দৰ্ভত আপোনাক সন্মান সহকাৰে জনাওঁ যে, নিমাতী ঘাট ফেৰী টাৰ্মিনেলৰ বাবে অধিগ্ৰহন কৰা জমিৰ পট্টাদ্বাৰ গনৰ সবিশেষ সন্দৰ্ভত সংশ্লিষ্ট লাট মণ্ডলৰ দ্বাৰা এক প্ৰতিবেদন লোৱা হয়। প্ৰতিবেদন মৰ্মে দেখা যায় যে, অধিগ্ৰহন কৰা জমিৰ ৯ টা পৰিয়ালৰ ভিতৰত ৫ টা পৰিয়ালৰ সবিশেষ পোৱা হৈছে। বাকী ৪ টা পৰিয়ালৰ বিতং তথ্যৰ বাবে সকলো পক্ষৰ পৰা যোগাযোগ কৰি থকা হৈছে। যিহেতু উক্ত চাৰিটা পৰিয়ালৰ লোক সকল যোৰহাট/ গোলাঘাট জিলাৰ বিভিন্ন ঠাইত বসবাস কৰি আছে। ইতিমধ্যে বিচাৰি পোৱা পট্টাদ্বাৰ সকলৰ সবিশেষ তলত দিয়া ধৰণে উল্লেখ কৰা হল-

১) প্ৰদীপ শইকীয়া-	মোবাইল নং- ৯১০১৫৬২৬২৩ ,	পট্টা নং- ২৭ দাগ নং- ২১৭
২) তৰুন বৰুৱা-	মোবাইল নং- ৭০৩৫২১৬৮৫৪ ,	পট্টা নং- ৮৭ দাগ নং ২৬০
৩) সুৰজিত শইকীয়া ,	মোবাইল নং- ৯৮৫৪৩১৫১৭৬	পট্টা নং- ৭৮ দাগ নং ২৬২
৪) দেৱ দত্ত,	মোবাইল নং- ৯৩৯৫২৩১৭৩২	পট্টা নং- ১৫ দাগ নং ২৬৩
৫) বুলু দত্ত –	মোবাইল নং- ৮৪৭১৯২৬৮১২	পট্টা নং-৫৩ দাগ নং ২৬৪

মহোদয়ৰ জ্ঞাতাৰ্থে ও বিহিতাৰ্থে প্ৰেৰণ কৰা হল।

ভৱদীয়,

সংলগ্ন- লাট মণ্ডলৰ প্ৰতিবেদন।

চক্ৰ বিষয়া
যোৰহাট পশ্চিম বাজহ চক্ৰ
যোৰহাট

প্ৰতি -

উপ- সঞ্চালক, পশুপালন আৰু প. চি., যোৰহাট —।

বিষয় : নিজস্ব খাট গোৰী চৰাখানাৰ সন্দৰ্ভত :

মহোদয় -

উপৰোক্ত বিষয়ৰ অধিগ্ৰহণ কৰিব প্ৰথম [illegible] ৫টা পৰিয়ালৰ [illegible] ৫টা পৰিয়ালৰ আবেদন পোৱা হৈছে। তাৰে ৪টা পৰিয়ালৰ [illegible] যোগা- যোগ কৰিব পৰা হৈছে। যিহেতু এই [illegible] পৰিয়ালৰ লোক অসম যোৰহাট/গোলাঘাট জিলাৰ [illegible] ব্যৱস্থা কৰি আছে। উক্ত পৰিয়ালৰ [illegible] আবেদন [illegible] [illegible] হ'ল।

[illegible] পৰিয়ালৰ তালিকা আবেদন -

১। প্ৰদীপ চহৰীয়া - 9101562623 - 27 P.P. - 217 Dag

২। [illegible] - 7035216854 - 87 P.P. - 260 Dag

৩। [illegible] চহৰীয়া - 9354315176 - 78 P.P. - 262 Dag

৪। [illegible] - 9395231782 - 15 [illegible] 263 Dag

৫। [illegible] - 6471926812 - 53 Bsha - 264 Dag

[illegible] (স্বাঃ)
25/9/26

Scanned with CamScanner

Annexure – 2 (H)

Letter requesting Bank Details for transfer of the amount for the acquisition of land for Neamati Pattadars and Possessors

I/237310/2023

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:+91361-2526421

Ref. No.: E 80743 **Dated Guwahati the 1st Aug.2023**
Guwahati

From: State Project director
Assam Inland Water Transport Development Society, Ulubari

To: The Deputy Commissioner
Jorhat

Sub: Requesting to Provide Bank Details for Transfer of the amount allotted for the Acquisition of land for Neamati Pattadars and Possessors

Ref: Letter no..: JRA.6129/2022/ dated 21/06/2023

JWC.6/2017/893 dated 25/07/2023

Sir/Madam

Kind attention is invited for the cited subject and reference; in this regard I would like to request you to kindly provide the bank details of your esteemed office for further disbursement of the fund allotted against the Land Acquisition estimate (as enclosed) of **Rs. 1,28,98,881.88 (Rupees One Crore Twenty Eight Lakh Ninety Eight Hundred Eight Hundred Eighty One and Eighty Eight Paisa only)** to the **Pattadars and Possessors** of the land for the construction of Neamati passenger ferry terminal at Neamati ferry ghat in village Kumargaon under Hezari Mouza of Jorhat West Rrevenue Circle.

This is for favour of your kind information and necessary action.

Signed by Gaurav Upadhyay
Date: 01-08-2023 18:24:43

Shri Gaurav Upadhyay, IPS
State Project Director, AIWTDS

Copy to:

1. The Director, IWT & Additional State Project Director, AIWTDS, for information
2. The Circle Officer, West Revenue Circle for information.
3. The Executive Engineer, IWT Department, Jorhat Division, for information.

I/237310/2023

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

1a.	**Name of the village**		
1b.	Panchayat		
1c.	Development Block		
1d.	Tehsil		
1e.	District		
2a.	Personal Details	House No	
2b.	Name of the family Head		
2c.	Gender	Male	Female
2d.	Religion & Caste		
2e.	Higher caste/OBC/SC/ST		
2f.	Vulnerability status	BPL/ Women headed/SC/ST/ Disabled/other	
2g.	Occupation of the family Head		
3	Family Constellation		

S No.	**Name**	**Status/ Relation**	**Age (yrs.)**	**Education**	**Occupation**	**Monthly Income**

4a.	Family assets							
4b.	Land owned (area in Acres)							
4c.	Type of house	Pucca		Kutcha		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 c overage			
x	Are there any unique Cultural/tourism centres in the village?			
y	Number of religious centres			
	~~Temples/mosques/churches/ gurudwaras~~/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 • 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	
	Name and signature of the PRA team	

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:**

S. No.	Name of the Participants	Designation / Occupation	Mobile No	Signature

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: • 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.	• 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	• Two (02) number bridges are proposed in the vicinity of the project and taken into consideration to avoid any conflicts of interest?	• It was assured that the upcoming bridges and the proposed terminals will not affect each other.
	• River development program under smart city project between Kachari Ghat and DC bunglow having a length of	• 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	• What will be the length of the stairs from terminal platform to pontoons?	• The length of the stairs will vary as per location.
Mr Mridul K Das (Executive Engineer) Pollution Control Board	• 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?	• It was clarified that appropriate measures will be taken to control any kind of pollution.
Mr P K Das (Member AIWTDS)	• Consultation meetings, surveys etc. shall be done in coordination and involvement of respective administration and prominent stakeholders.	• Suggestions will be followed.
Dr Abhinandan Saikia (TISS Guwahati)	• 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.	• 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	• Compensation for land acquisition and livelihood	• Impacts if any occurred will be treated as per project norms.
Mr Nabin Sarma, Social Development Expert, AIWTDS	• Approach about the labour influx and gender based inequality & violence during construction phase?	• 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:

The meeting started with a welcome note by Commodore Sri K.C. Choudhury, Honorary Advisor, Assam Inland Water Transport Development Society welcoming aII 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.

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.

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.

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.

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)
Mr. N. Bhattacharjee **Member Umananda Devalaya**	• 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.

	diesel genset just for pumping water. • 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	• 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	• 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	• Appreciated the Aapda Mitra training for the local youths and suggested to avail such trainings	
Mr. Subhram Goswamai Senior Consultant, PWC (APART Project)	• Provision for transport of agriculture and allied products at reduced freight charges	

Shri Ankur Jain, (IPS) **State Project Director, AIWTDS**	• 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**	• 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:

The meeting started with a welcome note by Commodore Sri K.C. Choudhury, Honorary Advisor, Assam Inland Water Transport Development Society welcoming aII the participants in the Stakeholder's meet.

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.

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.

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.

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) Guijan (Tinsukia), Disangmukh (Sivsagar), Ghagor (Lakhimpur), Matmora (Lakhimpur), Kacharighat (Dhubri), Aphalamukh (Majuli) and Neamati (Jorhat), two Slipways at Dikhowmukh (Sivsagar) and Dhubri along with seting 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

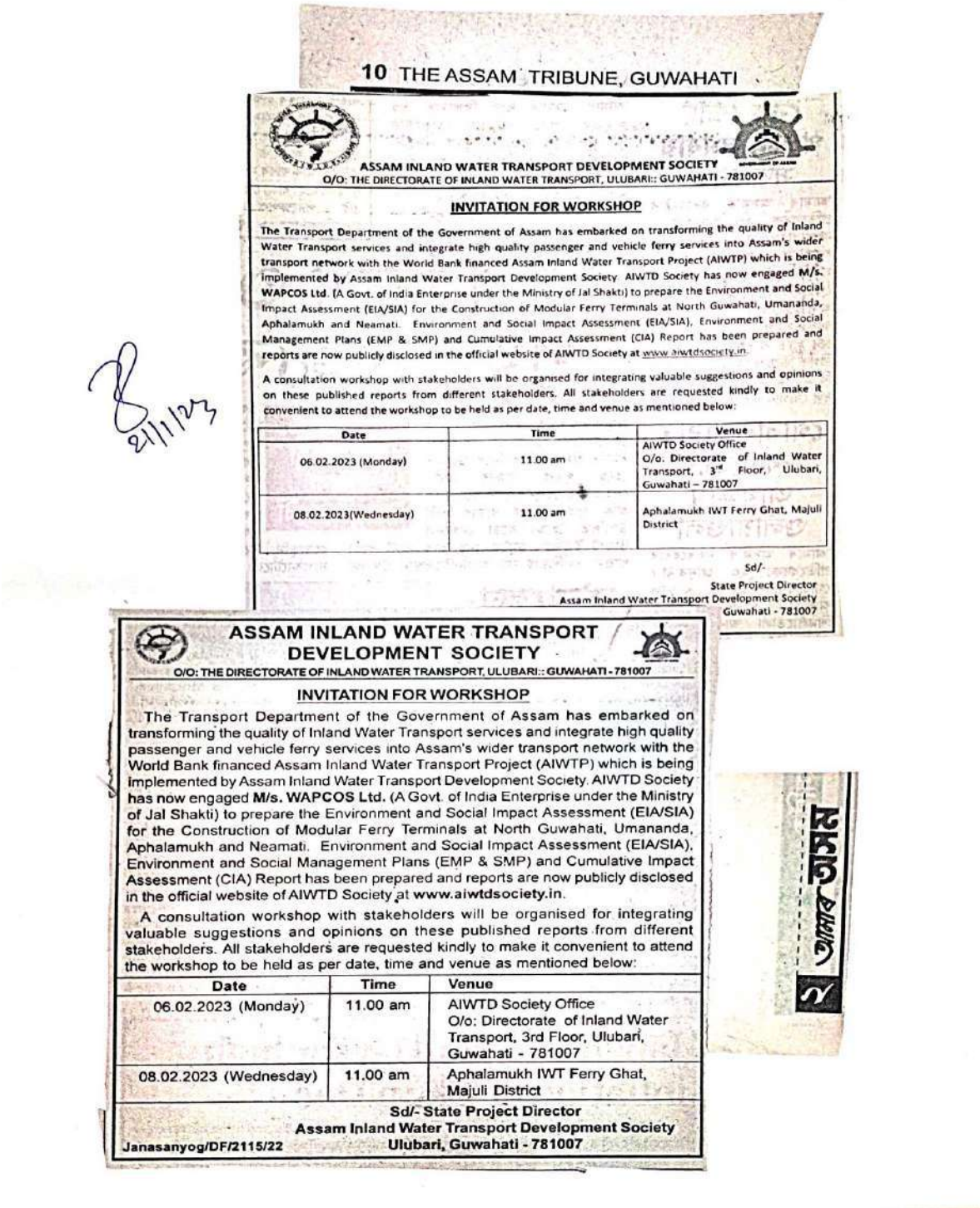
STAKEHOLDER CONSULTATION OF
ASSAM INLAND WATER TRANSPORT PROJECT ON
ENVIRONMENTAL AND SOCIAL SAFEGUARDS STUDIES AND CUMILIATIVE IMPACT ASSESSMENT (CIA) STUDIES

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, 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
Guwahati - 781007

21/1/23

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

INVITATION FOR WORKSHOP

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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

Meeting Schedule

STAKEHOLDER CONSULTATION OF ASSAM INLAND WATER TRANSPORT PROJECT ON ENVIRONMENTAL AND SOCIAL SAFEGUARDS STUDIES AND CUMILIATIVE 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' meetings and existing site conditions at Neamati

Photographs of Stakeholders Consultation

Aphlamukh and Neamati (08.02.2023)

North Guwahati and Umananda (06.02.2023)

PHOTOGRAPHS FGDs AND SITE CONDITIONS

NEAMATI

Neamati Ghat	
	
Approach road condition	**Approach road to Terminal**
	
Available Safety Jackets	**Interaction with commuters**
	
Interaction with commuters	**Interaction with general goods stall owner**

Interaction with IWT officials

Temporary commercial sheds at Neamati terminal

Roadside vendors with temporary sheds

IWT Ferry Ticket Counter

Existing Condition of Toilets

Annexure - 6

Environmental Monitoring Report- Soil

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Analysis	SS-260422-55	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 SN1
Sample Quantity : 2.0 Kg
Analysis Duration : 30.03.2022 to 25.04.2022

TEST RESULTS

S. No.	PARAMETERTS		TEST METHOD	RESULT	UNIT
1.	pH (1:5 suspension)		IS:2720(Part-26)	7.41	-
2.	Electrical Conductivity @25^{O}C (1:1suspension.)		IS:2720(Part-21)	492	µS/cm
3.	Calcium (as Ca)		STP/SOIL	1986	mg/kg
4.	Magnesium (as Mg)		STP/SOIL	383	mg/kg
5.	Sodium (as Na)		STP/SOIL	231	mg/kg
6.	Available Potassium (as K)		STP/SOIL	324	mg/kg
7.	Salinity @25^{O}C (1:1suspension.)		STP/SOIL	271	µS/cm
8.	Organic Matter		STP/SOIL	0.84	% by mass
9.	Sodium Absorption Ratio		STP/SOIL	0.46	-
10.	Nitrogen		STP/SOIL	0.103	% by mass
11.	Available Phosphorus (as P_2O_5)		STP/SOIL	148	mg/kg
12.	Bulk Density		STP/SOIL	1.26	gm /cc
13.	Organic Carbon		STP/SOIL	0.49	% by mass
14.	Particle Size Distribution	a. Sand	STP/SOIL	59.4	% by mass
		b. Clay	STP/SOIL	18.2	% by mass
		c. Silt	STP/SOIL	22.4	% by mass
15.	Exchangeable Sodium Percentage		STP/SOIL	4.16	% by mass

Notes: -

1. The results given above are related to the tested sample, as received & mentioned parameters. The customer asked for the above tests only.
2. Responsibility of the Laboratory is limited to the invoiced amount only.
3. This test report will not be generated again, either wholly or in part, without prior written permission of the laboratory.
4. This test report will not be used for any publicity/legal purpose.
5. The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer.

Checked by **Authorized Signatory**

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Analysis	SS-260422-56	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 SN2
Sample Quantity : 2.0 Kg
Analysis Duration : 30.03.2022 to 25.04.2022

TEST RESULTS

S. No.	PARAMETERTS		TEST METHOD	RESULT	UNIT
1.	pH (1:5 suspension)		IS:2720(Part-26)	7.89	-
2.	Electrical Conductivity @25^{O}C (1:1suspension.)		IS:2720(Part-21)	512	µS/cm
3.	Calcium (as Ca)		STP/SOIL	2086	mg/kg
4.	Magnesium (as Mg)		STP/SOIL	338	mg/kg
5.	Sodium (as Na)		STP/SOIL	247	mg/kg
6.	Available Potassium (as K)		STP/SOIL	316	mg/kg
7.	Salinity @25^{O}C (1:1suspension.)		STP/SOIL	287	µS/cm
8.	Organic Matter		STP/SOIL	1.08	% by mass
9.	Sodium Absorption Ratio		STP/SOIL	0.52	-
10.	Nitrogen		STP/SOIL	0.107	% by mass
11.	Available Phosphorus (as P_2O_5)		STP/SOIL	135	mg/kg
12.	Bulk Density		STP/SOIL	1.19	gm /cc
13.	Organic Carbon		STP/SOIL	0.63	% by mass
14.	Particle Size Distribution	a. Sand	STP/SOIL	60.3	% by mass
		b. Clay	STP/SOIL	19.7	% by mass
		c. Silt	STP/SOIL	20.0	% by mass
15.	Exchangeable Sodium Percentage		STP/SOIL	4.61	% by mass

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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Annexure - 7

Environmental Monitoring Report- Water

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Water Sample	W-300322-020	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 (WN1)
Analysis Duration	:	30/03/2022 to 25/04/2022

TEST RESULTS

S. No.	Parameter	Test Method	Results	Units
1.	pH	IS:3025(Part-11)	6.85	-
2.	Colour	IS:3025(Part-4)	<5.0	Hazen
3.	Electrical Conductivity	IS-3025(P-14)	216	µS/cm
4.	Turbidity	IS-3025(P-10)	<1.0	NTU
5.	Total Hardness (as CaCO3)	IS:3025(Part-21)	62.0	mg/l
6.	Fluoride (as F)	APHA 22nd edit	<0.10	mg/l
7.	Dissolve Oxygen	IS:3025(Part-38)	6.5	mg/l
8.	Chloride (as Cl)	IS:3025(Part-32)	76.0	mg/l
9.	Calcium (as Ca)	IS: 3025 (P- 40)	12.0	mg/l
10.	BOD (3 days at 27^0C)	IS-3025 (P-44)	<2.0	mg/l
11.	Nitrate (as NO_3)	IS: 3025 (P- 34)	5.0	mg/l
12.	Total Dissolved Solid	IS:3025(Part-16)	140	mg/l
13.	Sulphate (as SO_4)	IS: 3025 (P- 24)	11.0	mg/l
14.	Magnesium (as Mg)	IS: 3025 (P-46)	7.8	mg/l
15.	Phosphate (as P)	IS-3025(P-31)	<0.05	mg/l
16.	Sodium (as Na)	IS-3025(P-45)	4.0	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 22nd 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)	0.13	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: -

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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Authorized Signatory

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Water Sample	W-300322-021	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 (WN2)
Analysis Duration : 30/03/2022 to 25/04/2022

TEST RESULTS

S. No.	Parameter	Test Method	Results	Units
1.	pH	IS:3025(Part-11)	6.92	-
2.	Colour	IS:3025(Part-4)	<5.0	Hazen
3.	Electrical Conductivity	IS-3025(P-14)	224	µS/cm
4.	Turbidity	IS-3025(P-10)	<1.0	NTU
5.	Total Hardness (as CaCO3)	IS:3025(Part-21)	64.0	mg/l
6.	Fluoride (as F)	APHA 22nd edit	<0.10	mg/l
7.	Dissolve Oxygen	IS:3025(Part-38)	6.4	mg/l
8.	Chloride (as Cl)	IS:3025(Part-32)	80.0	mg/l
9.	Calcium (as Ca)	IS: 3025 (P- 40)	12.5	mg/l
10.	BOD (3 days at 27^0C)	IS-3025 (P-44)	<2.0	mg/l
11.	Nitrate (as NO_3)	IS: 3025 (P- 34)	5.0	mg/l
12.	Total Dissolved Solid	IS:3025(Part-16)	140	mg/l
13.	Sulphate (as SO_4)	IS: 3025 (P- 24)	11.0	mg/l
14.	Magnesium (as Mg)	IS: 3025 (P-46)	8.0	mg/l
15.	Phosphate (as P)	IS-3025(P-31)	<0.05	mg/l
16.	Sodium (as Na)	IS-3025(P-45)	3.5	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 22nd 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)	0.11	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)	0.13	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.
2. Responsibility of the Laboratory is limited to the invoiced amount only.
3. This test report will not be generated again, either wholly or in part, without prior written permission of the laboratory.
4. This test report will not be used for any publicity/legal purpose.
5. The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer.

Checked by

Authorized Signatory

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Water Sample	W-300322-022	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 (WN3)
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)	292	µS/cm
4.	Turbidity	IS-3025(P-10)	<1.0	NTU
5.	Total Hardness (as CaCO3)	IS:3025(Part-21)	76.0	mg/l
6.	Fluoride (as F)	APHA 22nd edit	<0.10	mg/l
7.	Dissolve Oxygen	IS:3025(Part-38)	6.3	mg/l
8.	Chloride (as Cl)	IS:3025(Part-32)	88.0	mg/l
9.	Calcium (as Ca)	IS: 3025 (P- 40)	15.5	mg/l
10.	BOD (3 days at 27^0C)	IS-3025 (P-44)	<2.0	mg/l
11.	Nitrate (as NO_3)	IS: 3025 (P- 34)	6.0	mg/l
12.	Total Dissolved Solid	IS:3025(Part-16)	190	mg/l
13.	Sulphate (as SO_4)	IS: 3025 (P- 24)	13.5	mg/l
14.	Magnesium (as Mg)	IS: 3025 (P-46)	9.0	mg/l
15.	Phosphate (as P)	IS-3025(P-31)	<0.05	mg/l
16.	Sodium (as Na)	IS-3025(P-45)	4.8	mg/l
17.	Potassium (as K)	IS-3025(P-45)	1.4	mg/l
18.	COD (as O_2)	IS-3025 (P-38)	6.0	mg/l
19.	Residual Sodium Carbonate	APHA 22nd 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)	0.13	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)	0.11	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.
2. Responsibility of the Laboratory is limited to the invoiced amount only.
3. This test report will not be generated again, either wholly or in part, without prior written permission of the laboratory.
4. This test report will not be used for any publicity/legal purpose.
5. The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer.

Checked by

Authorized Signatory

NOIDA TESTING LABORATORIES

Laboratory : GT-20, Sector-117, Noida Gautam Budh Nagar - 201301

Branch Office :

HARIDWAR | RUDRAPUR | CHANDIGARH | DEHRADUN | PUNE

E. : *noida.laboratory@gmail.com, info@noidalabs.com* ***W.:*** *www. noidalabs.com*

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 hexaalent 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_6H_5OH), 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 25^0C, mhos, max	-	-	-	1000×10^{-6}	2250×10^{-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/2022-23/1570
Report Date : 15.01.2023
Sample Description : Ambient Air
Sampling Location : (AAQ-14) Neamati Ghat
Sample No. : MSKGL/ED/2022-23/09/02049-02056

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

ANALYSIS RESULT

SL.N0.	Date of Monitoring	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	Benzene (µg/m³)	Benzo(a) pyrene (ng/m³)
1	04.08.2022	58.1	36.3	6.4	17.8	0.50	22.7	11.3	<0.01	<5.0	<1.0	<4.2	<0.5
2	07.08.2022	60.3	33.5	6.9	19.3	0.54	23.5	11.7	<0.01	<5.0	<1.0	<4.2	<0.5
3	11.08.2022	48.7	28.6	<6.0	15.7	0.44	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	14.08.2022	52.5	27.6	<6.0	16.4	0.52	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
5	19.08.2022	61.3	30.7	7.2	22.3	0.74	24.1	12.0	0.01	<5.0	<1.0	<4.2	<0.5
6	23.08.2022	59.2	34.8	6.8	18.7	0.68	23.5	11.8	<0.01	<5.0	<1.0	<4.2	<0.5
7	27.08.2022	55.0	26.2	<6.0	16.1	0.54	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	31.08.2022	64.1	35.6	<6.0	17.4	0.78	<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, 3rd Edn. By James P. Lodge (Method-417)**	**Air Sampling, 3rd 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

For Mitra S.K. Pvt. Ltd.

Report Prepared By :

Authorized Signatory

- *The results relate only to the item(s) tested.*
- *This Test Report shall not be reproduced except in full, without the permission of Mitra S.K. Private Limited.*

TEST REPORT

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

Report No. : MSK/GHY/2022-23/1571
Report Date : 15.01.2023
Sample Description : Ambient Air
Sampling Location : (AAQ-14) Neamati Ghat
Sample No. : MSKGL/ED/2022-23/09/02057-02064

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

ANALYSIS RESULT

SL.N0.	Date of Monitoring	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	Benzene (µg/m³)	Benzo(a) pyrene (ng/m³)
1	04.08.2022	53.1	33.2	6.5	20.3	0.44	21.5	10.7	<0.01	<5.0	<1.0	<4.2	<0.5
2	07.08.2022	48.7	27.1	<6.0	15.3	0.38	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
3	11.08.2022	45.4	26.7	<6.0	14.7	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
4	14.08.2022	52.7	27.7	6.2	19.6	0.42	20.9	10.5	<0.01	<5.0	<1.0	<4.2	<0.5
5	19.08.2022	55.1	27.6	6.8	21.7	0.46	23.1	11.6	<0.01	<5.0	<1.0	<4.2	<0.5
6	23.08.2022	52.5	30.9	<6.0	18.9	0.50	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
7	27.08.2022	47.6	22.7	<6.0	15.3	0.36	<20.0	<10.0	<0.01	<5.0	<1.0	<4.2	<0.5
8	31.08.2022	45.1	25.1	<6.0	14.8	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, 3rd Edn. By James P. Lodge (Method-417)**	**Air Sampling, 3rd 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.*
- *This Test Report shall not be reproduced except in full, without the permission of Mitra S.K. Private Limited.*

TEST REPORT

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

Report No. : MSK/GHY/2022-23/1572
Report Date : 15.01.2023
Sample Description : Ambient Air
Sampling Location : (AAQ-14) Neamati Ghat
Sample No. : MSKGL/ED/2022-23/09/02065-02072

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

ANALYSIS RESULT

SL.N0.	Date of Monitoring	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	CO (mg/m³)	O_3 (µg/m³)	NH_3 (µg/m³)	Pb (µg/m³)	Ni (ng/m³)	As (ng/m³)	Benzene (µg/m³)	Benzo(a) pyrene (ng/m³)
1	04.08.2022	73.1	45.7	7.4	23.1	0.72	24.3	12.1	0.02	<5.0	<1.0	<4.2	<0.5
2	07.08.2022	70.4	39.1	6.9	21.5	0.68	22.5	11.3	0.01	<5.0	<1.0	<4.2	<0.5
3	11.08.2022	76.2	44.8	7.8	25.4	0.76	26.3	13.1	0.02	<5.0	<1.0	<4.2	<0.5
4	14.08.2022	67.5	35.5	<6.0	19.6	0.68	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
5	19.08.2022	66.7	33.4	<6.0	18.3	0.62	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
6	23.08.2022	75.1	44.2	7.6	24.7	0.74	24.1	12.0	0.02	<5.0	<1.0	<4.2	<0.5
7	27.08.2022	69.3	33.0	6.8	20.5	0.70	<20.0	<10.0	0.01	<5.0	<1.0	<4.2	<0.5
8	31.08.2022	70.4	39.1	<6.0	21.3	0.72	22.8	11.4	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, 3rd Edn. By James P. Lodge (Method-417)	Air Sampling, 3rd 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

For Mitra S.K. Pvt. Ltd.

Report Prepared By :

Authorized Signatory

- *The results relate only to the item(s) tested.*
- *This Test Report shall not be reproduced except in full, without the permission of Mitra S.K. Private Limited.*

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/m3)	60	60
Particulate Matter PM 10 (µg/m3)	100	100
Sulphur Dioxide (as SO2) (µg/m3)	80	80
Oxides of Nitrogen (as NO2) (µg/m3)	80	80
Carbon Monoxide (as CO), (mg/m3)	02	02
Ozone (as O3) (µg/m3)	100	100
Lead (as Pb) (µg/m3)	1.0	1.0
Ammonia (as NH3) (µg/m3)	400	400
Benzene (as C6H6) (µg/m3)	05	05
Benzo (O) Pyrene (as BaP) (ng/m3)	01	01
Arsenic (as As) (ng/m3)	06	06
Nickel (as Ni) (ng/m3)	20	20

Annexure - 11

Noise Quality Report

Date: 08.08.2022

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

Location	N-N1	N-N2	N-N3
6-7 AM	43	42	43
7-8 AM	45	44	44
8-9 AM	45	46	47
9-10 AM	47	45	47
10-11 AM	47	46	46
11-12 Noon	48	47	48
12 noon – 1 PM	47	47	48
1-2 PM	47	47	46
2-3 PM	48	48	47
3-4 PM	49	48	49
4-5 PM	48	49	49
5-6 PM	47	47	48
6-7 PM	46	46	48
7-8 PM	45	46	45
8-9 PM	45	43	44

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 Neamati site

Checklist of plant species recorded from Neamati site

Botanical name	Local name	Family	Habitat	IUCN Status	Division
Acacia nilotica (L.) Delile	Babool	Fabaceae	Tree	LC	Dicot
Achyranthes aspera L.	Chaff-flower	Amaranthaceae	Herb	-	Dicot
Ageratum houstonianum Mill.	Blueweed	Asteraceae	Herb	-	Dicot
Albizia procera (Roxb.) Benth.	Safed siris	Mimosaceae	Tree	LC	Dicot
Albizia saman (Jacq.) Merr.	Rain tree	Mimosaceae	Tree	-	Dicot
Allantodia aspera (Blume) Ching	Dhekiasak	Athyriaceae	Herb	-	Dicot
Alstonia scholaris (L.) R. Br.	Devil's tree	Apocynaceae.	Tree	LC	Dicot
Alternanthera sessilis (L.) R.Br. ex DC.	Sessile joyweed-	Amaranthaceae	Herb	LC	Dicot
Amaranthus spinosus L.	Pigweed	Amaranthaceae	Herb	-	Dicot
Argemone mexicana L.	Satyanashi	Papaveraceae	Herb	-	Dicot
Artocarpus heterophyllus Lam.	Kothal	Moraceae	Tree	-	Dicot
Bambusa arundinacea (Retz.) Willd.	Bara bans	Poaceae	Bamboo	-	Monocot
Bambusa balcooa Roxb.	Bholuka bah	Poaceae	Bamboo	-	Monocot
Bauhinia vahlii Wight & Arn.	Malu creeper	Caesalpiniaceae	Climber	-	Dicot
Bauhinia variegata L.	Kanchan	Fabaceae	Tree	LC	Dicot
Boerhaavia diffusa L.	Punarnava	Nyctaginaceae	Shrub	-	Dicot
Bombax ceiba L.	Semal	Malvacea	Tree	LC	Dicot
Callistemon lanceolatus (Sm.) Sweet	Bottlebrush	Myrtaceae	Tree	-	Dicot
Calotropis gigantea	Madar	Apocynaceae	Shrub	-	Monocot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
(L.) Dryand.					
Carica papaya L.	Papaya	Caricaceae	Shrub	DD	Dicot
Cascabela thevetia (L.) Lippold	Pila kaner	Apocynaceae	Shrub	LC	Dicot
Cassia fistula L.	Sonaru	Caesalpiniaceae	Tree	LC	Dicot
Catharanthus roseus (L.) G.Don	Sadabahar	Apocynaceae	Herb	-	Dicot
Citrus limon (L.) Osbeck	Lemon	Rutaceae	Shrub	LC	Dicot
Clerodendrum glandulosum Lindl.	Nephaphu	Verbenaceae	Shrub	-	Dicot
Colocasia esculenta (L.) Schott	kachu	Araceae	Herb	LC	Dicot
Commelina benghalensis L.	wandering jew	Commelinaceae	Herb	LC	Monocot
Convolvulus arvensis L.	Bindweed	Convolvulaceae	Herb	-	Dicot
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	Safada	Myrtaceae	Tree	LC	Dicot
Cyanthillium cinereum (L.) H.Rob.	Sahadevi	Asteraceae	Herb	-	Dicot
Cymbopogon martini (Roxb.) W.Watson	Rosha grass	Poaceae	Grass	-	Monocot
Cyperus cyperoides (L.) Kuntze	Flat Sedge	Cyperaceae	Grass	LC	Monocot
Cynodon dactylon (L.) Pers.	Dub	Poaceae	Grass	-	Monocot
Cyperus rotundus L.	Coco-grass	Cyperaceae	Grass	LC	Monocot
Dalbergia sissoo DC.	Sheesam	Fabaceae	Tree	LC	Dicot
Datura metel L.	Dhatura	Solanaceae	Shrub	-	Dicot
Delonix regia (Hook.) Raf.	Gulmohar	Fabaceae	Tree	LC	Dicot
Dendrocalamus strictus (Roxb.) Nees	Bijuli	Poaceae	Bamboo	-	Monocot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
Desmodium triflorum (L.) DC.	-	Fabaceae	Herb	LC	Dicot
Digitaria ciliaris (Retz.) Koeler	Crabgrass	Poaceae	Grass	-	Monocot
Digitaria sanguinalis (L.) Scop.	Crabgrass	Poaceae	Grass	LC	Monocot
Dioscorea bulbifera L.	Air yam	Dioscoreaceae	Climber	-	Dicot
Diplazium esculentum (Retz.) Sw.	Dhekiasak	Athyriaceae	Herb	LC	Dicot
Echinochloa colona (L.) Link	Jungle ricegrass	Poaceae	Grass	LC	Monocot
Eclipta alba (L.) Hassk.	Kehraj	Asteraceae	Herb	LC	Dicot
Eclipta prostrata (L.) L.	Bhringraj	Asteraceae	Herb	LC	Dicot
Eragrostis amabilis (L.) Wight & Arn.	Feather lovegrass	Poaceae	Grass	-	Monocot
Euphorbia hirta L.	Asthma Weed	Euphorbiaceae	Herb	-	Dicot
Ficus benghalensis L.	Badh	Moraceae	Tree	-	Dicot
Ficus religiosa L.	Peepal	Moraceae	Tree	-	Dicot
Fimbristylis dichotoma (L.) Vahl	Fringe-rush	Cyperaceae	Grass	LC	Monocot
Glinus lotoides L.	Damascisa	Molluginaceae	Herb	LC	Dicot
Gomphrena globosa L.	Globe amaranth	Amaranthaceae	Herb	-	Dicot
Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.	Kher/Sauri	Poaceae	Grass	-	Monocot
Hibiscus elatus Sw.	Majagua	Malvaceae	Tree	LC	Dicot
Hibiscus rosa-sinensis L.	Hibiscus	Malvaceae	Shrub	-	Dicot
Ipomoea carnea Jacq.	Besharam	Convolvulaceae	Shrub	-	Dicot
Isodon ternifolius (D.D on) Kudô	-	Lamiaceae	Shrub	-	Dicot
Ipomoea indica	Blue morning	Convolvulaceae	Climber	DD	Dicot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
(Burm.) Merr.	glory				
Jasminum nervosum Lour.	Wild Kund	Oleaceae	Shrub	-	Dicot
Lantana camara L.	Lantana	Verbenaceae	Shrub	-	Dicot
Leptopus cordifolius Decne.	-	Euphorbiaceae	Shrub	-	Dicot
Leucas aspera (Willd.) Link	Thumbai	Lamiaceae	Herb	-	Dicot
Mallotus pallidus (Airy Shaw) Airy Shaw	Raini	Euphorbiaceae	Tree	-	Dicot
Mangifera indica L.	Aam	Anacardiaceae	Tree	DD	Dicot
Mazus pumilus var. delavayi (Bonati) T.L. Chin ex D.Y. Hong	Mazus	Scrophulariaceae	Herb	-	Dicot
Melia azedarach L.	Chinaberry tree	Meliaceae	Tree	LC	Dicot
Melilotus indicus (L.) All.	Sweetclover	Papilionaceae	Herb	-	Dicot
Mesua ferrea L.	Nahar	Calophyllaceae	Tree	-	Dicot
Mikania micrantha Kunth	-	Asteraceae	Herb	-	Dicot
Mimosa pudica L.	Lazvanti	Mimosaceae	Herb	LC	Dicot
Moringa oleifera Lam.	Sahjan	Moringaceae	Tree	LC	Dicot
Musa × *paradisiaca* L.	Kala	Musaceae	Shrub	-	Dicot
Neolamarckia cadamba (Roxb.) Bosser	Kadam	Rubiaceae	Tree	-	Dicot
Ocimum sanctum L.	Tulsi	Lamiaceae	Shrub	-	Dicot
Oldenlandia diffusa (Willd.) Roxb.	Bonjaluk	Rubiaceae	Herb	LC	Dicot
Oroxylum indicum (L.) Kurz	Bhatghila	Bignoniaceae	Tree	-	Dicot
Oxalis corniculata L.	Sorutengacha	Oxalidaceae	Herb	-	Dicot
Panicum paludosum Roxb.	-	Poaceae	Grass	-	Monocot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
Parthenium hysterophorus L.	Gajar ghas	Asteraceae	Shrub	-	Dicot
Paspalum dilatatum Poir.	Dallis grass	Poaceae	Grass	-	Monocot
Perilla frutescens (L.) Britton	Beefsteak	Lamiaceae	Herb	LC	Dicot
Persicaria barbata (L.) H.Hara	Field sedge	Polygonaceae	Grass	LC	Monocot
Phoenix sylvestris (L.) Roxb	Wild date palm	Arecaceae	Tree	-	Monocot
Phyla nodiflora (L.) Greene	Frog fruit	Verbenaceae	Herb	LC	Dicot
Plantago major L.	Buckhorn	Plantaginaceae	Herb	LC	Dicot
Poa annua L.	-	Poaceae	Grass	LC	Monocot
Polygonum hydropiper L.	Marsh pepper	Polygonaceae	Herb	LC	Dicot
Polygonum microcephalum D. Don	Modhusuleng	Polygonaceae	Herb	-	Dicot
Portulaca oleracea L.	Malbhugkhutora	Portulacaceae	Herb	LC	Dicot
Pongamia pinnata (L.) Pierre	Karanja	Fabaceae	Tree	LC	Dicot
Psidium guajava L.	Amrud	Myrtaceae	Tree	LC	Dicot
Ranunculus sceleratus L.	Buttercup	Ranunculaceae	Herb	LC	Dicot
Ricinus communis L.	Arandi	Euphorbiaceae	Shrub	LC	Dicot
Saccharum bengalense Retz.	Munj	Poaceae	Grass	-	Monocot
Saccharum spontaneum L.	Wild sugarcane	Poaceae	Grass	LC	Monocot
Saraca asoca (Roxb.) Willd.	Ashok	Fabaceae	Tree	VU	Dicot
Sesamum indicum L.	Benne	Pedaliaceae	Herb	-	Dicot
Setaria verticillata (L.) P.Beauv.	Bristly foxtail	Poaceae	Grass	-	Monocot

Botanical name	Local name	Family	Habitat	IUCN Status	Division
Shorea robusta Gaertn.	Sal	Depterocarpaceae	Tree	LC	Dicot
Sida acuta Burm.f.	Teaweed	Malvaceae	Herb	-	Dicot
Smilax zeylanica L.	Tikonibaruah	Smilacaceae	Climber	-	Dicot
Solanum americanum Mill.	Bhakuritita	Solanaceae	Shrub	-	Dicot
Solanum erianthum D. Don	Mullein nightshade	Solanaceae	Shrub	-	Dicot
Solidago gigantea Aiton	Giant goldenrod	Asteraceae	Herb	-	Dicot
Stellaria media (L.) Vill.	Morolia	Caryophyllacee	Herb	-	Dicot
Stenotaphrum secundatum (Walter) Kuntze	Buffalo turf	Poaceae	Grass	LC	Dicot
Syzygium cumini (L.) Skeels	Borjamu	Myrtaceae	Tree	LC	Dicot
Syzygium fruticosum DC.	Bon Jamu	Myrtaceae	Tree	-	Dicot
Tamarindus indica L.	Imli	Fabaceae	Tree	LC	Dicot
Tectona grandis L.f.	Teak	Verbencaeae	Tree	-	Dicot
Tridax procumbens (L.) L.	Coatbuttons	Asteraceae	Herb	-	Dicot
Ziziphus jujuba Mill.	Bogori	Rhamnaceae	Tree	LC	Dicot

Annexure - 14

Photographs of common plant species observed during the study

PHOTOGRAPHS OF COMMON PLANT SPECIES OBSERVED DURING FLORISTIC SURVEY (NEAMATI TERMINAL)

Albizia species

Musa paradisiaca

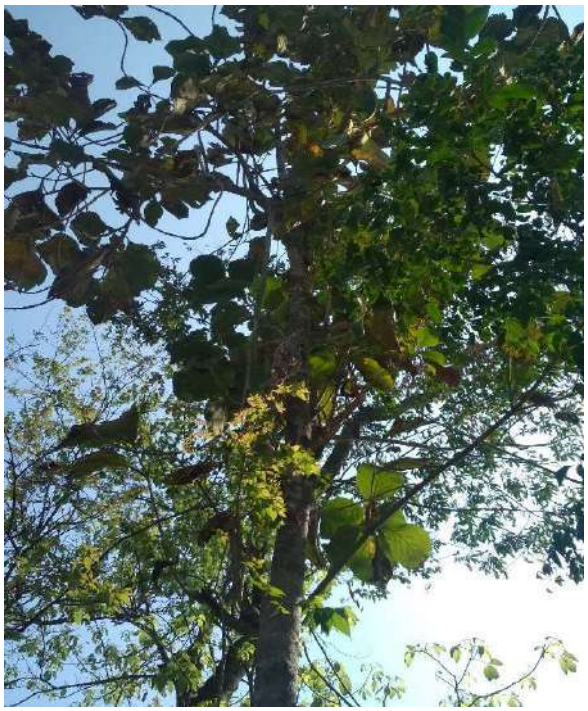
Delonix regia

Calotropis gigantean

Euphorbia hirta

Argemone Mexicana

Bambusa arundinacea

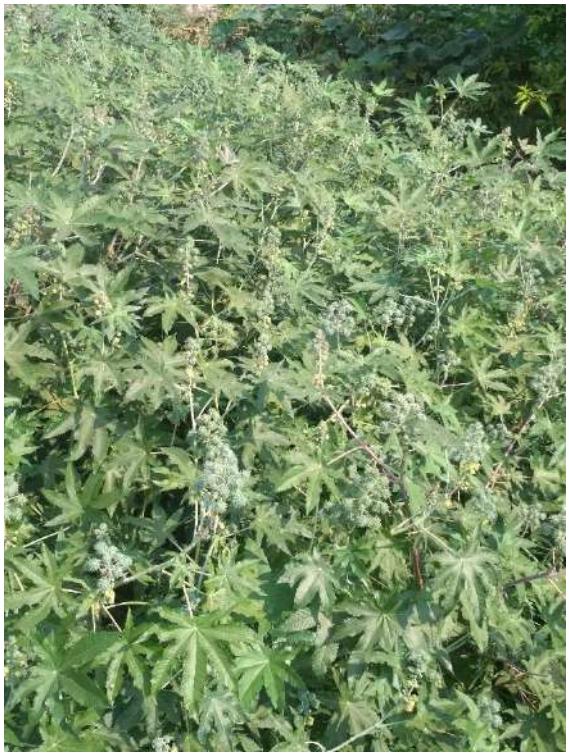


Shorea robusta

Ipomoea carnea

Bauhinia species

Datura metel



Ricinus communis

Solanum americanum

Bombax ceiba

Artocarpus heterophyllus

Lantana camara

Phoenix sylvestris

Ziziphus jujuba

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.

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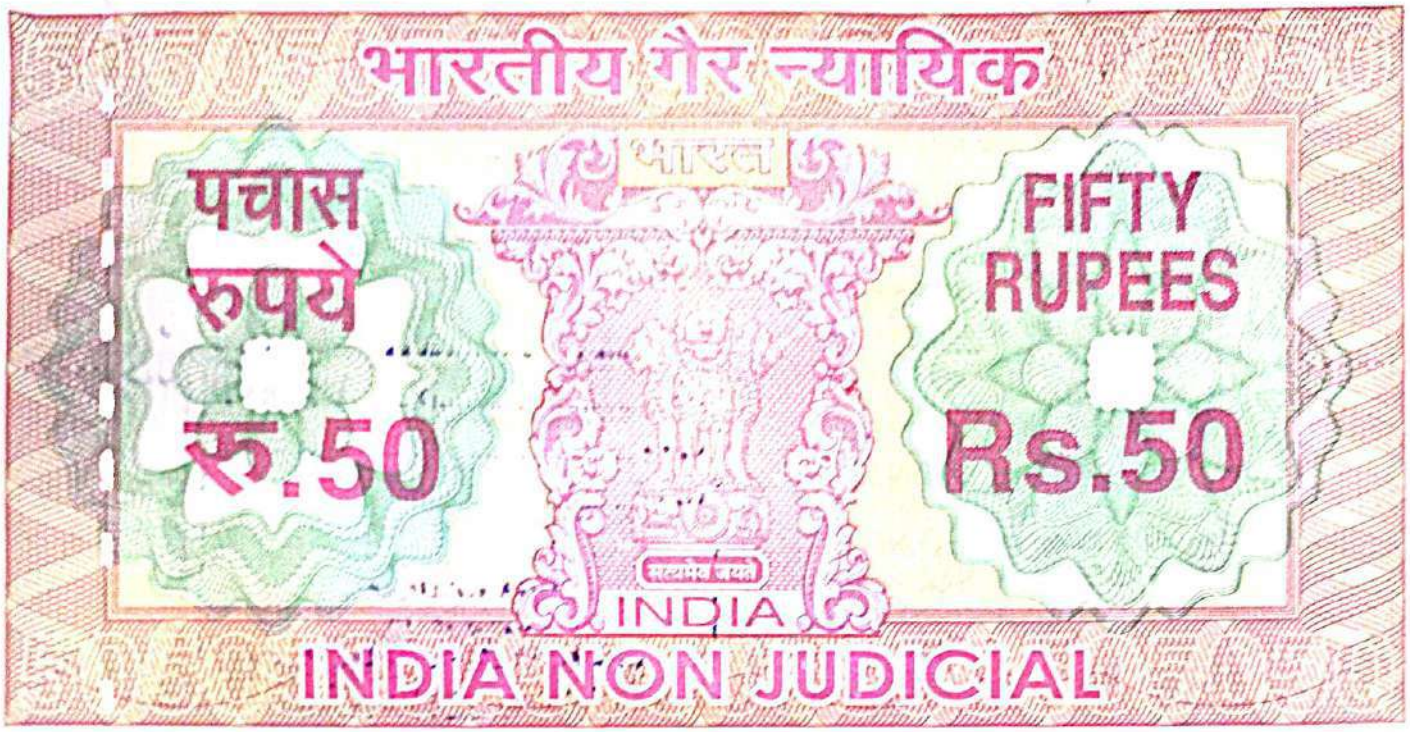

असम ASSAM L 620994

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:

a. The Parties agree to work together and co-operate in good faith and to fully participate in achieving the objective of this MOU;
b. None of the services, financing or resources set out in clauses 4 or 5 shall be deemed to be a commitment of funds; and
c. 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:

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

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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.

Contd.....

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.

Contd.....

Assam State Commission For Women ★ Bellola, Guwahati-28 ★ Date

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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.

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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.

Partha Pegu

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)

Dr. Preety Hasa Deka.

SIGNATURE

Member Secretary
Assam State Commission for Women

MEMBER SECRETARY
Assam State Commission for Women
Rehabari Guwahati-28

Official Use

Annexure - 16

Dolphin Conservation Plan

Dolphin Conservation Plan

1. Introduction

The Gangetic dolphin is found in Ganges-Brahmaputra-Meghna and Karnaphuli River systems of India, Nepal and Bangladesh (Anderson 1878, Kasuya & Haque 1972, Jones 1982, Mohan 1989, Reeves & Brownell 1989, Shrestha 1989 and Reeves et al. 1993). In the nineteenth century, the dolphins were plentiful in the entire distributional range (Sinha & Sharma 2003), however, the range and abundance of this species has sharply declined in the last 100 years (Reeves & Leatherwood 1995) and the IUCN correspondingly revised its threatened status from Vulnerable (Klinowska 1991) to Endangered (IUCN 1996). It is estimated that currently there are less than 2000 individuals of this subspecies globally.

In comparison to the Ganges River system, little research on dolphins has been undertaken in the Brahmaputra River system of Assam in India. Choudhury (1997) mentioned the distribution of the species in both the Brahmaputra and Barak River systems of Assam. Mohan et. al. (1997) investigated the population of dolphins in the Brahmaputra and confirmed the existence of the species in Brahmaputra mainstream, Kulsi and Subansiri River. Mohan et. al. (1998) also documented one residential dolphin population in the Kulsi River, near Guwahati. Biswas & Baruah (2000) investigated the habitat ecology of the Gangetic dolphin in the Brahmaputra river stretch within Eastern Assam and Bairagi (1999) reported the impact of the oil bait fishery on the dolphins of Brahmaputra River. Wakid (2005) assessed the population status and distribution pattern of dolphin population in the entire Brahmaputra river system and conducted detailed ecological investigations on the dolphins in Eastern Assam. In Assam till three decades ago, the Gangetic dolphin was one of the most commonly sighted aquatic mega-fauna in the Brahmaputra River system. However, due to increasing anthropogenic pressures, the overall population of the species has been declining and they have been extirpated from most of the major tributaries of the Brahmaputra and are now restricted to pockets in the Brahmaputra mainstream.

Gangetic dolphins feed on small fishes like *Mystus sps*., *Barbus sps*., *Channa sp*., *Puntius sp*., *Xenentodon cancila* etc. Prey availability and water depth in the area were found to be limiting factors for the occurrence of species. They prefer deep water areas and pools, with at least 4 m depth. Habitat selection by dolphins is a complex and dynamic function of food requirement, mate availability, avoidance from predators and competitors, and ability to move between habitat patches. The distribution, abundance, and diversity of prey species are one of the most important factors that influence the dolphins' choice of habitat. Habitat fragmentation due to the construction of dams and barrages at upper reaches of the river Brahmaputra has also led to loss of connectivity and thereby decrease in their abundance and population structure. They are also highly vulnerable to poaching and accidental killing.

A comprehensive dolphin survey by Wakid (2005) confirmed the existence of Ganges River dolphins in only three rivers in Assam – a. the Brahmaputra mainstream, b. Kulsi River, and c. the Subansiri River. As a part of this report , 'Protection of endangered

Ganges River dolphins in the Brahmaputra River, Assam, India' by Abdul Wakid, an extensive survey was conducted in the entire 1044 km of dolphin inhabited sections of the Brahmaputra River from the Assam-Arunachal Pradesh border to India-Bangladesh border. The best estimate of 264 dolphins in the entire Brahmaputra River system was recorded, with 80.3% occurring in the Brahmaputra mainstream, 11% in the Kulsi River and 8.7% in the Subansiri River. Dolphin encounter rate in the Brahmaputra was 0.24 dolphin/km, in the Kulsi was 0.40 dolphin/km and in the Subansiri it was 0.24 dolphin/km. Based on high abundance, potential for protection and possibilities for dolphin eco-tourism, eight river sections were identified as potential protected areas and community-based conservation areas. These includes 5 in the Brahmaputra River, 2 in the Kulsi and 1 protected area in the Subansari river.

As a part of the EIA study, a survey was earlier 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.

For the next set of AIWTD interventions i.e. construction of modular terminals at North Guwahati, Umananda, Neamati and Aphalamukh, M/S WAPCOS was appointed by the Project for conducting the safeguard assessments. As a part of this assignment, WAPCOS has assigned the Zoological Survey of India (ZSI) for conducting Aquatic Biodiversity study with especial emphasis on dolphins in the Brahmaputra river which is a part of the ESIA report and the suggested mitigation measures are part of the site specific ESMPs for the 4 modular terminals. Besides '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 is also reviewed the mitigation measures to be undertaken during the time of construction and operation of the proposed construction of modular terminals under the Project.

2. Mitigation Measures

Based on the available literature and recommendations made under the different studies conducted under the Project, the following mitigation measures are now proposed for both construction and operation phases of the modular terminals to be constructed under the Project.

2.1 **Mitigation Measures during Construction Phase**

- Relevant information (e.g. encounter with vulnerable species during engineering work) shall be shared with the State Environment and Forest Department and concerned local/ regional biodiversity experts. The Project team shall liaise with relevant departments for formation of emergency rescue team comprising representatives of the forest, environment, bio-diversity experts, IWT representative for dealing with any emergency e.g. accidental trap of dolphins at site, injury etc.
- Emergency Contact numbers of the expert committee shall be displayed at site.
- Anti-poaching measures during the construction phase should be strengthened to check for any violation of existing regulations. Awareness campaign to be made among the workers to aware them on the endangered and other important species.
- Construction vehicles must be operated at safe speed to avoid collision with wildlife. Training should be provided for the vehicle operators and warning signs should be installed at site.
- Change of geology and topography should be kept minimum.
- Avoid constructing labour camps and construction yards near the river banks.
- To minimize any negative impacts, noisy operations should be avoided during breeding season of the dolphins (March-June)
- River flow should not be blocked at all times for free movement of dolphins.
- Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left.
- All activities that increase soil erosion or contribute to nutrients and pollutants to water need be minimized both onsite and off-site by using measures such as silt curtain.
- Construction activities should be carried out in close supervision of the dolphin ecologist appointed by the Contractor.
- Construction works should be avoided or kept minimum in vicinity of the dolphins favorable microhabitats (downstream of shallow areas/sandbars, tributary junctions)
- Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, movement of sediment and influx of soil/silt etc. should be avoided to keep the favorable depth range.
- In case rare birds of prey are observed near the construction area, the construction work will be avoided during their breeding season.
- Before construction of piers the construction site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts.
- All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna.

- One of the threats to bird and turtle habitat is conversion of the river edges from natural soft embankments into hard concrete embankments. Therefore, the natural bank slope needs to be preserved and location of the piers should avoid such areas. No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.
- All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification of the migrating routes of dolphins and birds, exact locations of turtle nesting grounds, etc. and confirmation of the same from local biodiversity experts, institutions working in this area.

2.2 Mitigation Measures during Operation Phase

- For conservation of dolphin, instruction should be given to all vessels' operators and all employee and staff that dolphins or any other endangered species should not be harmed due to any reason.
- Instruction should be given to vessel operators for maintaining a safe distance and speed if dolphins are spotted, in case of accidental injury to dolphins it should be reported immediately to terminal authority for informing the emergency rescue team.
- Vessel operators should be instructed for not using sharp lights and sounds as they may disturb the aquatic fauna.
- Provision for propeller guards should be provided for all the vessels to minimize the propeller inflicted injuries and scars.
- Regulation of vessel speed in Dolphin habited area.
- Sub-surface aquatic disposal is required, minimum one meter below the water surface. Careful mapping of sensitive areas directly affected by the dredge;
- Preventative maintenance of equipment to mitigate negative environmental impacts such as leakages and spillages
- The mess size of the iron wire to be used to fix the boulders below the steps at Ghats close to the water line or river edge should be four inches instead of eight inches.
- Any plantation if required, species identification should be done carefully with local people, experts natural amphibious/aquatic grasses of riparian zone of the river grow which should not be disturbed.
- There should be minimum or no noise under the water during implementation of the project.
- If any mechanized boat is used during implementation of the project, the same may have provision for propeller guards.

3. Gangetic Dolphin and Underwater Noise Impacts Management Plan during Construction and Operation Period

3.1 Underwater Noise Monitoring:

Underwater noise monitoring shall be carried out by using hydrophones at the critical locations where the dolphins have been spotted. A hydrophone is used to identify underwater noise levels by using piezoelectric transducer that generated electricity when subjected to pressure changes in a denser medium than air such as water. This shall aid in understanding the baseline noise levels at the critical locations to carry out noise modelling in the future scenario. The major sources of underwater noise shall include the existing vessels during construction phase along with construction equipment such as dredger and motorized pumps. During the construction phase the underwater noise contributors shall include new vessels and dredgers used to maintain the least available depth.

3.1.1 Measures for Avoidance and Mitigation of Noise Impacts on Aquatic Ecology

- Vessel speed should be restricted to 2.7 knots in VSDS. Hooting should also be prohibited in sanctuary areas (if any)
- Vessel should be fitted with the dolphin reflectors.
- Usage of non-toxic and non-Tributyltin (TBT) containing anti-fouling paints for painting vessel.
- Provision of propeller guards with vessel to minimize injury to the aquatic fauna
- Barge/vessel movement will be restricted to the designate route only to minimize noise disturbance of Aquatic life.
- If any aquatic mammal spotted, then the measures should be taken to push it away through sirens/signals and creating noise signals.
- If any accident of aquatic mammal occurs, then that should be reported to AIWTDS/IWT for rescue action through emergency rescue team comprising wildlife and forest department officials.
- All vessels should follow proper disposal mechanism for managing their liquid and solid wastes. No vessel should discharge the liquid and solid waste in the river. All waste should be discharged at vessel repair facility only. AIWTDS should develop the stringent norms to be followed by vessel operators and should develop the system of penalizing based on polluters pay principle in case the standards are not met or violated.
- Material having potential to generate the dust like sand stone aggregates should be transported under covered conditions to minimize dust generation and its settlement on river surface.
- Provision of oil water interceptors with the bilge tank to separate oil prior discharge of bilge water into river.
- The proposed oil spill control and management plan **(Annexure 17**) should be effectively communicated for any emergency situations.
- Crew of the vessel carrying especially oil should be competent and experienced so as they can prevent the accidents to happen as much as possible.
- Regular maintenance of vessels engine and propellers.

- River training works should be carried out at the bank locations which are prone to erosion to minimize sedimentation & impact on water quality & aquatic organisms
- Adequate depth to be maintained to prevent grounding under low flow conditions. Information on available depths should be conveyed to the navigators through online systems by AIWTDS. River Information System being developed by AIWTDS will serve this purpose.
- Maintaining flood plains & riparian corridors wherever possible and limit potential damage to the navigation channel.
- Restricting the project activities in breeding and spawning ground of the fisheries which are majorly the bends in the meandering river.
- A possible solution to the impact caused by the project during the construction and operation phase of the project is to provide dolphin deterrent devices (ADD) on the terminals and vessels. A deterrent device is a mechanical audio signal generating instrument which can generate ultrasonic signals to keep the dolphins away from the activity area. ADD is a device with a low intensity (source level: < 150 dB re 1 µPa at 1 m) and emits signal in the middle to high frequencies (2.5 – 10 kHz) with higher harmonic frequencies (up to 160 – 180 kHz).
- Modern design vessels having low draught say 2 m instead of 2.5 m for equal payload should be procured by IWAI for transportation. Modern vessel- better technology vessels or with retrofits with quieting techniques to reduce further the noise generation (specifically cavitation's noise).
- Regular patrol and inspections should be carried out to monitor the activities in waterway. Also, regular monitoring of environmental attributes as proposed in environment planning plan of this should be carried out for the waterway to keep track of the condition of the environmental attributes.
- The navigation channel should maintain a minimum distance of 100m horizontally and 500m either side along the river at the confluence point of major tributaries with river Brahmaputra.

4. Enhancement Measures:

Support for promoting fish productivity through setting up or supporting existing fish nurseries. Also providing training and awareness support through reputed institutes or experts like Central Inland Fishery Research Institute (CIFRI) for better fishing techniques. Provision of supporting studies for conservation and safety of dolphins should be made during the course of the Project for documenting the best practices as well as updating the conservation/management plan.

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Annexure – 17

Emergency Oil Spill Control Procedure

EMERGENCY OIL SPILL CONTROL PROCEDURE

Oil tankers are only one source of oil spills. According to the United States Coast Guard, 35.7% of the volume of oil spilled in the United States from 1991 to 2004 came from tank vessels (ships/barges), 27.6% from facilities and other non-vessels, 19.9% from non-tank vessels, and 9.3% from pipelines; 7.4% from mystery spills. On the other hand, only 5% of the actual spills came from oil tankers, while 51.8% came from other kinds of vessels. The following effects can occur due to oil spills.

More persistent and viscous oils (i.e. heavy fuels) cause more impact to birds, mammals and shorelines than do lighter oils.

Spills of light oils (e.g., diesel) and crude oil cause higher impacts in the water column (on fish, shellfish and plankton) than equal volume spills of heavy fuels or gasoline, because heavy fuels are not easily entrained into the water column (requiring high turbulence to do so), and gasoline is much more volatile and so results in lower water column toxicity than the light fuels and crude oils.

Impacts vary considerably and primarily by the sensitivity of the environment oiled and the density of vulnerable organisms in those locations oiled.

Impacts vary by season of the year because densities of vulnerable organisms vary from season to season. Seasonal patterns of organisms vary considerably, such that overall impact risk varies less as a composite for all resources combined than for individual organism groups. Spillage Assessment criteria is given in **Table-1.**

Table-1 Spillage Assessment

Appearance	Film thickness (mm)	Quantity Spread (L/ha)
Barely visible	0.0000380	0.37
Silvery sheen	0.0000760	0.73
First trace of colour	0.0001500	1.50
Bright bands of colour	0.0003000	2.90
Colours begin to dull	0.0010000	9.70
Colours are much darker	0.0020000	19.50

**Source: International Safety Guide for Oil Tankers & Terminals (ISGOTT)*

Oil Spill Clean Up measures

By observing the thickness of the film of oil and its appearance on the surface of the water, it is possible to estimate the quantity of oil spilled. If the surface area of the spill is also known, the total volume of the oil can be calculated.

Cleanup and recovery from an oil spill is difficult and depends upon many factors, including the type of oil spilled, the temperature of the water (affecting evaporation and biodegradation), and the types of shorelines and beaches involved.

Methods for cleaning up include:

- Use of microorganisms or biological agents to break down or remove oil; such as the bacteria Alcanivorax.
- Oleophilic, hydrophobic chemical, containing no bacteria, which chemically and physically bonds to both soluble and insoluble hydrocarbons. The bioremediation accelerator acts as a herding agent in water and on the surface, floating molecules to the surface of the water, including soluble such as phenols and BTEX, forming gel-like agglomerations. Undetectable levels of hydrocarbons can be obtained in produced water and manageable water columns. By over spraying sheen with bioremediation accelerator, sheen is eliminated within minutes. Controlled burning can effectively reduce the amount of oil in water, if done properly. But it can only be done in low wind and can cause air pollution.
- A dispersant is either a non-surface active polymer or a surface-active substance added to a suspension, usually a colloid, to improve the separation of particles and to prevent settling or clumping. They may rapidly disperse large amounts of certain oil types from the water surface by transferring it into the water column. They will cause the oil slick to break up and form water-soluble micelles that are rapidly diluted. The oil is then effectively spread throughout a larger volume of water than the surface from where the oil was dispersed. They can also delay the formation of persistent oil-in-water emulsions. However, laboratory experiments showed that dispersants increased toxic hydrocarbon levels in fish by a factor of up to 100 and may kill fish eggs. Dispersed oil droplets infiltrate into deeper water and can lethally contaminate coral. Research indicates that some dispersants are toxic to corals.
- Dredging for oils dispersed with detergents and other oils denser than water.
- Skimming requires calm waters at all times during the process.
- Solidifying solidifiers are composed of dry hydrophobic polymers that both adsorb and absorb. They clean up oil spills by changing the physical state of spilled oil from liquid to a semi-solid or a rubber-like material that floats on water. Solidifiers are insoluble in water, therefore the removal of the solidified oil is easy and the oil will not leach out. Solidifiers have been proven to be relatively non-toxic to aquatic and wild life and have been proven to suppress harmful vapours commonly associated with hydrocarbons such as Benzene, Xylene, Methyl Ethyl, Acetone and Naphtha.

- Vacuum and centrifuge oil can be sucked up along with the water, and then a centrifuge can be used to separate the oil from the water - allowing a tanker to be filled with near pure oil. Usually, the water is returned to the river, making the process more efficient, but allowing small amounts of oil to go back as well. This issue has hampered the use of centrifuges due to a United States regulation limiting the amount of oil in water returned to the river.

Equipment used includes:

- Booms: large floating barriers that round up oil and lift the oil off the water
- Skimmers: skim the oil
- Sorbents: large absorbents that absorb oil
- Chemical and biological agents: helps to break down the oil
- Vacuums: remove oil from beaches and water surface

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

Pollution Control Board, Assam, Guwahati

A. List of Authorized Recyclers in Assam of Used oil and waste oil (Schedule-IV, Sl-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, Sl-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.	The Contractor shall • 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
		• 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	The Contractor shall • 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	The Contractor shall • 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
		• 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	The Contractor shall • 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.	The Contractor shall • 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.	The Contractor shall • 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	The Contractor Shall • 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
		• 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	Groundwater at shallow depths is contaminated with arsenic and hence not suitable for drinking purposes. Depletion and pollution of groundwater resources	The Contractor Shall • 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	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	The Contractor shall • 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
		drainage system to avoid drainage congestion • 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	• 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	The Contractor shall • 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	The Contractor shall • 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 • 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	• 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 gullying.	The Contractor shall • 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 • 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	• 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.	The Contractor shall • 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	The Contractor shall • 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

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		Vibration Management
ECoP 10: Air Quality Management		
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall • 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.	The Contractor shall • 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	• 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	The Contractor shall • 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.	The Contractor shall • 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

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		sirens
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment	The Contractor shall • 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.	The Contractor shall • 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.

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		• 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,.	The Contractor shall • 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	The Contractor shall • 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	The Contractor shall • 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	• 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	The Contractor shall • 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
		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	The Contractor shall • follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management
	Filling of ponds for site preparation will impact the fishes.	The Contractor shall • 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	The Contractor shall • 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	The Contractor shall • follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management
	Filling of ponds for site preparation will impact the fishes.	The Contractor shall • 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
		• 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	The Contractor shall • 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: • 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		

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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.	The Contractor shall • 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	The Contractor shall • 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	The Contractor shall • 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.

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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.	Contractor shall provide the following facilities in the campsites • 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	The Contractor shall • 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,

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		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. • 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	The Contractor shall • 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	The Contractor shall • 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 repellant sprays during monsoon.

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		• 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	The Contractor shall • 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.	• 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 (contactor 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.

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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	The Contractor shall • 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	The Contractor shall • 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

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	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.	hazards in the work areas, • 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	The Contractor shall • 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	• 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	The Contractor shall provide the following facilities in the campsites to improve health and hygienicconditions as mentioned in ECoP 17 Construction Camp Management • 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.

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		• 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	The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community • 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.	The Contractor shall • 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 coveredsheds. This soil shall be used for green belt plantation.Lower layers of excavated soil shall be re-used within the site for filling purpose, constructionofapproach & internal roads & railway link. If any extra soil is remained, then that should bedisposed 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 besegregated into recyclable and non-recyclable waste. Recyclable waste shall be stored in thecovered area and shall be sold to authorized vendors regularly. Non-recyclable waste shall bedisposed at approved debris site in covered vehicles.

4. Municipal Waste

Municipal waste will be generated from labour camp. Dustbins for recyclable and no recyclable waste shall be provided in labour camp area. Recyclable waste shall be sold toauthorized 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 onenvironment. Concept of reduce, re-use and recycle shall be followed at site. The rejectedwaste should be disposed in a secured manner. Thus a site should be identified for disposal ofthe rejected waste.

4.1Selection 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 belocated away from water body and disposal site should be lined properly to preventinfiltration 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 siteselected.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 asper law as required for renting/leasing for the particular land for the sand deposition. DC officewill annually assess the rent for the land and claim fund from the PMU to disburse to thelessees.

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 recordof 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 / WasteMaterial

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 onlywith 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 affectedarea 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 withinand 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 the 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 winddirection 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 atthe debris disposal siteMaterial should be disposed through covered vehicles onlyNo 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 shouldbe maintained along with the area of disposal site, type & quantity of material disposed dailyand 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 belowand 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 upto the satisfactory level of site engineer

4.5 Penalties

Stringent action & penalties should be imposed off on contractor for dumping of materials in

locations other than the pre-identified locations. Grievance Readressal mechanism should be inplace 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 ofthe construction and labour camp for keeping the health & Safety of workers and impacts of setting upsuch camps on the local community in consideration while developing and establishing such camp. Thisplan is prepared in reference to the Workers accommodation: processes and standards (A guidance noteby IFC and EBRD). The plan aims to promote “safe and healthy working conditions, and to protect andpromote 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 500mshall 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 barricadingClean Water FacilityClean kitchen area with provision of clean fuel like LPGClean Living Facilities for WorkersSanitation FacilitiesWaste Management FacilitiesRest area for workers atconstruction siteAdequate Illumination & ventilationSafe access road is required at camps Health Care FacilitiesCrèche Facility & Play SchoolFire-fighting FacilityEmergency 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 workersshould 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 onlyand 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 animalsinto the site. Entry gate should be provided at the site and labour camp which should beguarded by security guard. All workers should be issued ID cards and entry of outsiders shall bemaintained in the register at the gate. Board should be displayed at the site and the labourcamp, the name of project, capacity of project, authority carrying our projects, restriction of entrywithout authorization, no smoking zone and associated risks. Plant operation shall be restrictedto 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 fordrinking water provided for workers shall be carried out on monthly basis. Water dispensersshould be cleaned on monthly basis. Adequate water per person should be provided at site fordrinking, 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 andany 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 wasteshould be daily cleaned and disposed off. Water storage facility at kitchen should be coveredand cleaned on monthly basis. Kitchen area should be away from washing, toilets and bathingarea.

Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparationtables are also equipped with a smooth durable washable surface. Lastly, in order to enableeasy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixturesare not built into the floor, and all cupboards and other fixtures and all walls and ceilings have asmooth 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 eachworkers and each bed should be at least 1 m apart from another. Double deck bedding shouldbe avoided, in case provided, adequate fire-fighting facility should be provided. Bed linen shouldbe washed regularly and should be applied with repellent and disinfectants so as to manage thediseases caused due to pests. Facilities for storage of personal belongings for workers shouldbe 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 systemshould be ensured in construction camps.

3.6 Sanitation Facilities

Construction camps shall be provided with sanitary latrines and urinals. Toilets provided shouldhave running water availability all the time. Bathing, washing & cleaning areas shall be providedat the site for construction labour. Washing and bathing places shall be kept in clean anddrained condition. Adequate nos. of bathing & toilet facility should be provided at site and shouldnot 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 andsoak pits shall be provided at site for disposal of the sewage generated.The toilets should becleaned on daily basis. These tanks should be evacuated through authorized vendors if

filledand at the time of closure. Pest management should be carried out at the camps if the area isinfected by any pests. Adequate lighting should be ensured in camp area especially duringnight 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 andnon-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 inEMP. 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 than3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space providedshall 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 pet 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 emergencypersonnel, 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. Workersshall have access to adequate preventive measures such as contraception (condoms inparticular) and mosquito nets.

3.12Crèche Facility & Play School

Crèche facility and play school should be constructed at the site temporarily so as children ofconstruction 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 enteractive work areas.

3.13 Fire-Fighting facilities

Fire-fighting facility such as sand filled buckets and potable fire-extinguishers shall be providedat labour camps and at site. Fire-extinguishers shall be provided as per NBC norms. Personneltrained in handling fire fighting equipment should be available at the site. Fire evacuation planshould be displayed at the site and should be communicated to all the workers and other staff atcamp site.

3.14 Emergency AssemblyArea

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 sit 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 be 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 teamleader
- No animal (wild or domestic or bird) shall be harmed by any construction worker in anycondition 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 wellilluminated to maintain minimum illumination level of 200 lux. Personnel working shall obtainpermit to work from the team leader prior carrying out any work in night time and the record ofsuch working shall be maintained in register. Any accidents, if occurs at site during night timeworking shall be immediately reported and recorded. Penalty shall be imposed on the contractorfor the accident. Analysis shall be carried out to find the reason for such accidents for futurelearning.

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 bemaintained.

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 readressal 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. Securityguards should allow only authorized personnel to the campsite. Guards should be availableduring both morning and night time. Guard should allow entry of workers to the site only beseeing the ID cards. Guard should report if any unusual or unfair practise happening at site andnearby area. Guards should be trained to handle emergency situations like fire fighting andshould 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

RISK ASSESSMENT FOR NEAMATI TERMINAL

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. In the past, the Dhubri ferry tragedy of 30th April 2012 on river Brahmaputra that resulted in loss of over 250 lives, let to the awakening of threat of increased passenger boat accidents in various states.

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 this is a facility based on operation of passenger vehicle in a waterway, suitable treatment has been extended based on the specific case and situation

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

- The passenger ferry terminal would cater to a multi modal vehicle type system.
- The 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.
- The facility would be designed as per the hydro-geomorphology of the region as well as with bank erosion protection.
- Neamati has been considered as category-2 under soil erosion during the technical assessment study for preparation of DPR. This implies moderate erosion potential as per the DPR. The riverbank at the terminal site locations

experiencing moderate erosion is grouped under this category. The time history satellite images show moderate shift of riverbank at terminal sites due to bank erosion. For these terminal sites, riverbank protection is both technically and economically viable. Due to the moderated stability in the riverbank, either a flexible or fixed terminal operation facility will be considered as a suitable solution.

- In terms of traffic categorisation, Neamati has been considered under Category Ro Pax vessels with four and two wheelers with foot passengers.
    - Under this category, the ferry terminals shall be planned with consideration of safe and efficient movement of the four and two-wheeler vehicles and 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. The access ramp shall be planned in straight line for the easy movement of the four wheelers. In such situation where there is a constraint for planning the straight access ramp, curved access shall be planned with safe turning radius provisions.
- The 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 to be implemented for erosion prose site.
- The passenger ferry service would also house a suitable weather station for alerts and warnings as and when required.
- The 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.
- The passenger terminal is based on flexible and mobile options for riverine infrastructure.

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 shall as per the IS and NBC 2016.
- The buildings are 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 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.

DISASTER MANAGEMENT PLAN

Terminal

Prevention Plan

- Timely weather predictions displayed on website, advisory through RIS, notices 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 6. 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.
- 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
- Vehicles are properly stowed/parked and secured on the Ro-Ro / Ro-Pax vessel for the intended passage.
- The terminal is provided with adequate safety equipment 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 to ensure that the loading of the vessel is done in accordance with the approved trim and stability booklet of the vessel. No over loading 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 so as 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

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 8. Assess liabilities if any

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 listed below:

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 the 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.
- 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 and the like.
- 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.

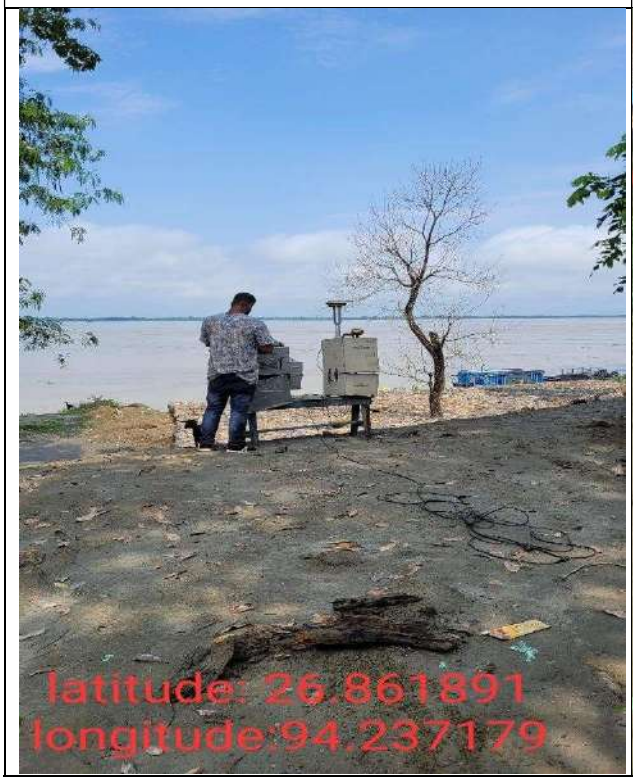
Terminal Security Rules, to be observed by all visitors passengers:

- 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

Annexure - 21

Environment Monitoring Photographs

Environmental Monitoring Photographs- Neamati terminal



Annexure - 22

Safety Practices During Construction

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.

Annexure - 23

Slope Stability Report by IIT-G & Gabion Mattress design calculation

Program : D-Geo Stability
Version : 18.2.2.32619
Company : Royal HaskoningDHV

========== BEGINNING OF DATA ==========

Calculation model : Bishop
Default shear strength : C phi

LAYER BOUNDARIES

Boundary no.	Co-ordinates [m]					
8 - X -	-120.00	-76.26	-67.38	-37.43	-36.44	-21.92
8 - Y -	-8.93	-8.41	-8.27	6.71	6.70	6.71
8 - X -	-20.93	-6.68	5.48	16.91	17.90	32.43
8 - Y -	6.71	-0.41	1.00	6.70	6.70	6.70
8 - X -	33.43	43.80	52.75	60.07	120.00	
8 - Y -	6.70	1.52	3.52	3.81	3.81	
7 - X -	-120.00	-76.26	-67.38	-37.43	-36.44	-36.44
7 - Y -	-8.93	-8.41	-8.27	6.71	6.70	6.33
7 - X -	-21.92	-21.92	-20.93	-6.68	5.48	16.91
7 - Y -	6.33	6.71	6.71	-0.41	1.00	6.70
7 - X -	17.90	32.43	33.43	43.80	52.75	60.07
7 - Y -	6.70	6.70	6.70	1.52	3.52	3.81
7 - X -	120.00					
7 - Y -	3.81					
6 - X -	-120.00	-76.26	-67.38	-37.43	-36.44	-36.44
6 - Y -	-8.93	-8.41	-8.27	6.71	6.70	6.33
6 - X -	-21.92	-21.92	-20.93	-6.68	5.48	16.91
6 - Y -	6.33	6.71	6.71	-0.41	1.00	6.70
6 - X -	17.90	17.90	32.43	32.43	33.43	43.80
6 - Y -	6.70	6.33	6.33	6.70	6.70	1.52
6 - X -	52.75	60.07	120.00			
6 - Y -	3.52	3.81	3.81			
5 - X -	-120.00	-76.26	-76.26	-67.24	-38.06	-20.30
5 - Y -	-8.93	-8.41	-8.91	-8.77	5.83	5.83
5 - X -	-6.78	5.65	17.01	33.29	43.73	52.75
5 - Y -	-0.93	0.51	6.20	6.20	0.98	3.02
5 - X -	52.75	60.07	120.00			
5 - Y -	3.52	3.81	3.81			
4 - X -	-120.00	-76.26	-76.26	-67.24	-6.57	15.15
4 - Y -	-8.93	-8.41	-8.91	-8.77	-6.03	-4.47
4 - X -	43.73	52.75	52.75	60.07	120.00	
4 - Y -	0.98	3.02	3.52	3.81	3.81	
3 - X -	-120.00	-66.93	-6.15	15.53	52.95	120.00
3 - Y -	-11.02	-11.02	-8.19	-6.67	1.47	1.93
2 - X -	-120.00	-66.86	-5.79	15.96	53.13	120.00
2 - Y -	-12.93	-12.77	-10.03	-8.87	-0.50	-0.50
1 - X -	-120.00	120.00				
1 - Y -	-21.00	-21.00				

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0 - X -	-120.00 120.00
0 - Y -	-50.00 -50.00

PL-LINES

Pl-line no.	Co-ordinates [m]
1 - X -	-120.00 120.00
1 - Y -	5.03 5.03

Unit weight of water used for calculation: 9.81 [kN/m3]
The groundwater level is determined by Pl-line number 1

SOIL PROPERTIES

Layer no.	Material name
8	Concrete
7	Concrete
6	Reno Mattress
5	Core Fill
4	Loose Silty Sand
3	Med to Den Silty Sand
2	Med to Den Silty Sand
1	Den Silty Sand

Layer number	Gam usat [kN/m3]	Gam sat [kN/m3]	Pl-line top	Pl-line bottom
8	24.00	25.00	1	1
7	24.00	25.00	1	1
6	20.00	21.00	1	1
5	20.00	21.00	1	1
4	18.00	19.00	1	1
3	18.50	19.50	1	1
2	18.50	19.50	1	1
1	19.00	20.00	1	-

Layer number	Cohesion [kN/m2]	Phi [degrees]	Dilatancy [degrees]	S [-]	POP [kN/m2]	m [-]
8	250.00	42.00	12.00	-	-	-
7	250.00	42.00	12.00	-	-	-
6	15.00	44.00	14.00	-	-	-
5	15.00	42.00	12.00	-	-	-
4	0.00	30.00	0.00	-	-	-
3	0.00	34.00	4.00	-	-	-
2	0.00	34.00	4.00	-	-	-
1	0.00	38.00	8.00	-	-	-

Layer number	Su top [kN/m2]	Su bot. [kN/m2]	Su grad. [kN/m2/m]	POP top [kN/m2]	POP bot. [kN/m2]	Gamma LEM [-]
8	-	-	-	-	-	-
7	-	-	-	-	-	-
6	-	-	-	-	-	-
5	-	-	-	-	-	-
4	-	-	-	-	-	-
3	-	-	-	-	-	-
2	-	-	-	-	-	-
1	-	-	-	-	-	-

CENTER POINT GRID AND TANGENT LINES

X co-ordinate grid left : -65.00 [m]
X co-ordinate grid right : 50.00 [m]
Number of grid points in X - direction : 15

Y co-ordinate grid bottom : 7.18 [m]
Y co-ordinate grid top : 41.69 [m]
Number of grid points in Y - direction : 8

Y co-ordinate tangent smallest circle : -9.30 [m]
Y co-ordinate tangent biggest circle : -31.30 [m]
Number of circles per grid point : 15

No fixed points input.

Total number of center points in the grid: 120
Total number of slip circles in the grid : 1800

UNIFORM LOAD

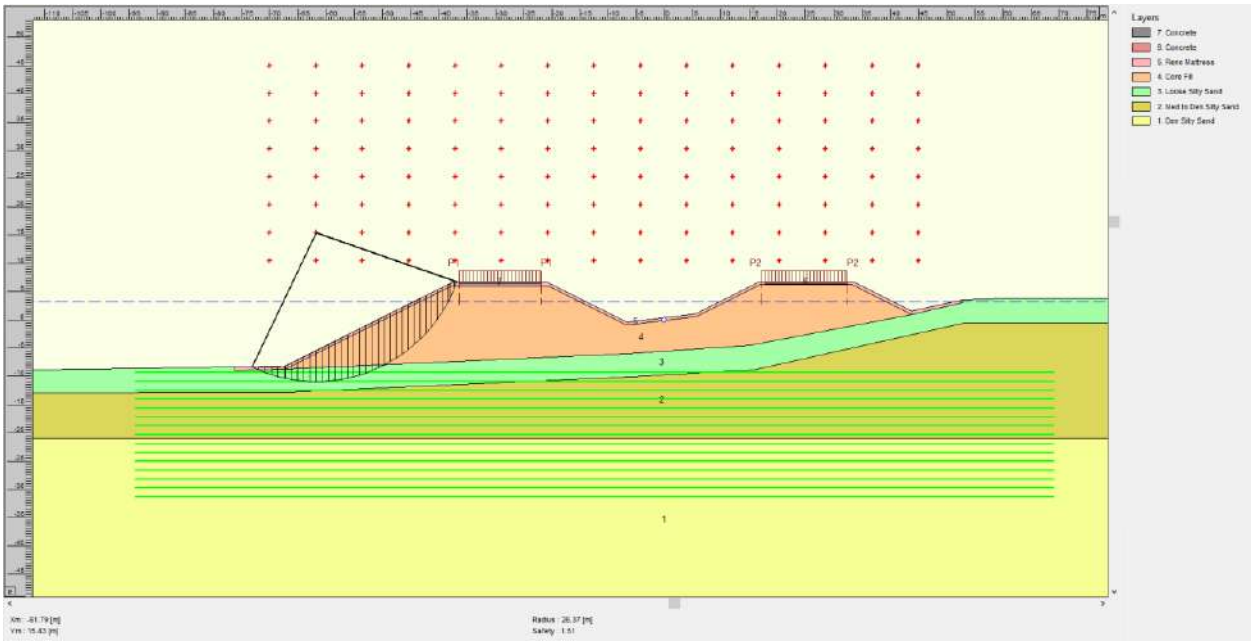
Uniform load number	Magnitude [kN/m]	X start [m]	X end [m]	Distrib. degrees	Load Type
1	10.00	-36.44	-21.92	0.00	Permanent
2	10.00	17.20	32.43	0.00	Permanent

EARTHQUAKE

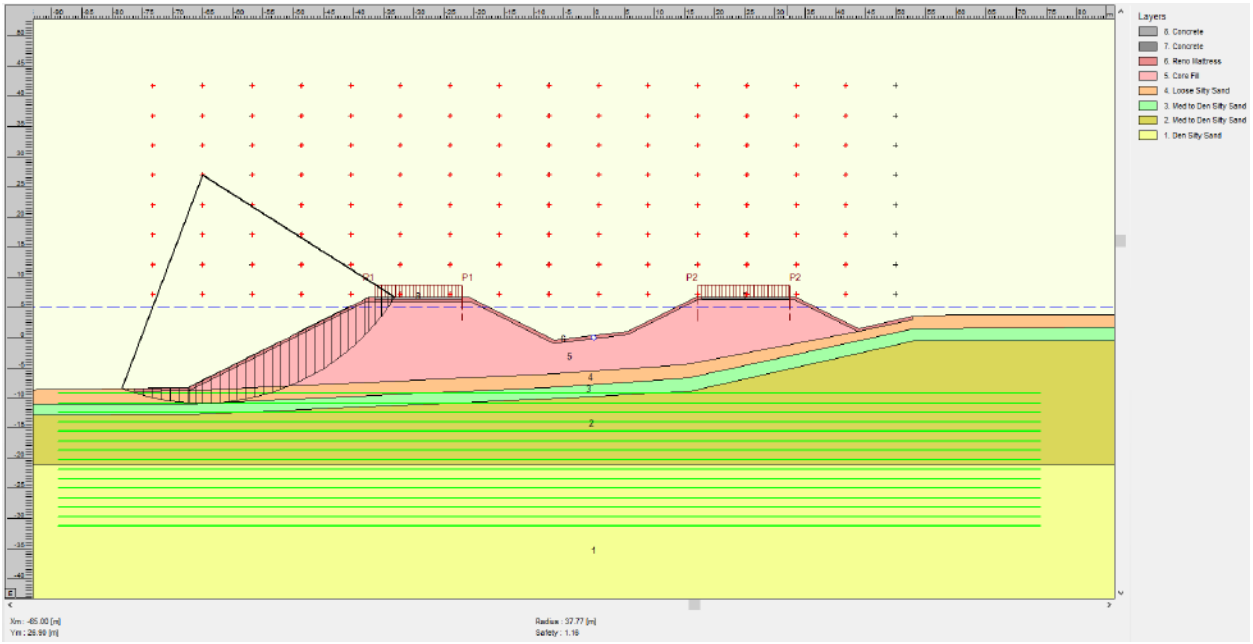
Horizontal factor [g]	Vertical factor [g]	free water coefficient [-]
0.1200	0.0600	0.0000

********** The input has been tested, and is correct. **********
****

Static Case: **FoS ~ 1.51**



Seismic Case: **FoS ~ 1.16**



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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: Neamati, Guwahati
REFERENCE SECTION:
DATE 7/9/2022
REVISION: R0

CALCULATION OF SCOUR DEPTH

INPUTS

				Note:
1	Design Discharge =	= 64619.00	cumecs	*Given*
2	Maximum Velocity as per H.F.L	= 6.00	m/s	*Given*
3	Silt Factor	= 0.80		*Assumed fine sand from IRC 78*
4	Level of H.F.L	= 87.72	m	*Given*
5	LWL	= 81.13	m	*Given*
6	Unit weight of rock fills, Y_S	= 26.00	kN/m^3	

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

DEPTH OF SCOUR BELOW H.F.L. (D) **= 0.473*(Q/f)$^{1/3}$**

Where,

Q=Discharge
f=Silt factor

Hence,Depth of scour below HFL D= 0.473*(Q/f)$^{1/3}$ **20.45 m**

MAXIMUM DEPTH OF SCOUR (Dmax)

1	Scour Depth below H.F.L.(Dmax)	=1.5 * D	
		30.67 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.)	
		24.07 m	

SHAPE AND SIZE OF APRON

3	Length of Launching Apron	=1.5 * maximum scour depth below bottom of gabion mattress (L.W.L.)	
		36.11 m	
	Provide Launching Apron of length	**37.00 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 [39]

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

Maximum velocity = 6.00 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:-

$$\tau_b = K_1 K_b Y_w Y S_f$$

Where

τ_b = Design shear stress (kN/m^2)

Y_w = Unit weight of water (kN/m^3)

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 cofficient . Ranges from 1.05 to 2.0

Bend cofficient 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	
Y_w	= 9.81	kN/m^3
Maximum depth of water on revetment, Y	= 6.60	m

Note:

Straight stretch

Sloped surface

Assumed

Therefore,

Design shear stress , τ_b = 0.10 kN/m^2

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

τ_{All} = **TRUE** kN/m^2

τ_{All} > τ_b

Hence, **SAFE**

Resulting levels obtained referring Inputs

High Flood Level = 87.72 m

Deepest Scour level = H.F.L. - Scour depth below H.F.L.

57.05 m

HFL 87.72 m

L.W.L. 81.13 m

MSL 57.05 m

Provided length of Launching Apron **37.00 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 transalational layer of fabric placed between the underlined sol 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 grannullar filters .

Further,

Considering MoRTH Section 700, IRC 59 Page 28.

Geoxtile Type-1 is well suited for placement beneth 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 Properties	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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Annexure- 24

Ship Liquid Waste Quantification

Statement for Vessel Lubricant oil waste for Neamati Aphalamukh Kamalabari Route									
S.no.	**Type of vessel**	**No. of units (in running condition)**	**Mobil oil(in L)**	**Diesel Generator oil(in L)**	**Hydraulic oil(in L)**	**Gear oil(in L)**	**Total Lubricants consumption(in L)**	**Wastage of Lubricant oil(Assuming 85% of total consumption)(in L)**	**Remarks**
		A	**B**	**C**	**D**	**E**	**F=A*(B+C+D+E)**	**G=85% of F**	
1	Catamaran	2	55	14	2	7	156	132.6	Oil change after running for 300 hrs or 1 month
2	RPL	1	60	24	2	7	93	79.05	Oil change after running for 500 hrs or 3 months
3	Ropex	4	60	24	2	7	372	316.2	Oil change after running for 500 hrs or 3 months
						Total wastage (after every 3 months)		**793.05**	
						Total wastage(per year)		**3172.2**	

Quantity of Waste oil/Liquid Effluent		
Density of oil	900	Kg/cum
Mass of oil	1320	Kg
Volume of oil	1.47	cum

Waste Oil Storage tank Dimension				
S.No.	**L(m)**	**B(m)**	**H(m)**	**Volume(cum)**
1	**1.2**	**1.2**	**1.2**	**1.728**

Figure: Storage Tank

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