Initial Environmental Examination – Summit Alliance Port Limited

Project Number: 42180-013
Annual Report
December 2014

BAN: Second Public-Private Infrastructure Development Facility (PPIDF II)

Prepared by the Infrastructure Development Company Limited (IDCOL) for the People's Republic of Bangladesh and the Asian Development Bank

CURRENCY EQUIVALENTS
(as of 30 June 2015)

Currency unit	–	taka (Tk)
Tk1.00	=	$0.013
$1.00	=	Tk77.775

NOTES

(i) The fiscal year (FY) of the Government of Bangladesh ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2015 ends on June 2015.

(ii) In this report, "$" refers to US dollars.

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Second Public-Private Infrastructure Development Facility
Loan Number: 3045-BAN

INITIAL ENVIRONMENTAL EXAMINATION

RIVER TERMINAL PROJECT, WEST MUKTERPUR, MUNSHIGONJ

Summit Alliance Port Limited

December 2014

Prepared by

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WEIGHTS AND MEASURES

MW	Mega Watt
kV	Kilo Volt
kW	Kilo Watt
A	Ampere
Hz	Hertz
rm	Running meter
rft	Running feet
ppm	Parts per million
K	Kelvin
C	Celsius

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ABBREVIATIONS

ADB	Asian Development Bank
AQMP	Air Quality Modeling Project
BCAS	Bangladesh Centre for Advanced Studies
BDT	Bangladesh Taka
BEZ	Bio-ecological zones
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BOD	Bio-Chemical Oxygen Demand
BRTC	Bureau of Research Testing and Consultation
BPDB	Bangladesh Power Development Board
BPC	Bangladesh Petroleum Corporation
BWDB	Bangladesh Water Development Board
CFS	Container Freight Station
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DOE	Department of Environment
DSC	Design and Supervision Consultant
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
ECR	Environment Conservation Rules
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
EMP	Environmental Management Plan
ESMU	Environmental and Social Monitoring Unit
FGD	Focus Group Discussions
FC	Fecal Coliform
FCC	Fixed Cargo Cranes
FI	Financial Intermediary
FGD	Focus Group Discussion
GOB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
Ha	Hector
IA	Implementing Agency
ICD	Inland Container Depot
IDCOL	Infrastructure Development Company Limited
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview

MV	Marine Vessel
NGO	Non-Governmental Organization
NO_X	Oxides of Nitrogen
NMT	Non-Motorized Transport
OSHA	Occupational Safety and Health Administration
OHSAS	Occupational Health and Safety Advisory Services
PCBs	Poly-chlorinated biphenyls
PM	Particulate matter
PMO	Project Management Office
PM 10	Particulate Matter with Aerodynamic Diameter ≤10 □m
PM2.5	Particulate Matter with Aerodynamic Diameter ≤2.5 □m
PPA	Power Purchase Agreement
PPM	Parts Per Million
PRIME	Plume Rise Model Enhancement
SO_2	Sulfur di Oxide
SAPL	Summit Alliance Port Limited
SPM	Suspended Particulate Matters
TDS	Total Dissolved Solid
TC	Total Coliform
ToR	Terms of Reference
TEU	Twenty-feet Equivalent Unit
TSS	Total Suspended Solid
WB	World Bank

EXECUTIVE SUMMARY

Summit Alliance Port Limited (SAPL) is in the process to build a river port including an inland container depot at West Muktarpur Village of Panchasar Union under Munshigonj Sadar Upazila, Munshigonj District. The project site is situated in an area of 14.50 acres on the northern bank of the Dhaleshwari River. The project is expected to offer river terminal facility for transportation of intermodal containers to and from the Chittagong Port, as well as Inland Container Depot (ICD) and Container Freight Station (CFS) services for handling and storage of intermodal containers. The total container handling capacity of the project will be 120,000 TEUs annually.

For the financial support to implement the project, SAPL has approached to Infrastructure Development Company Limited (IDCOL). Considering the importance of the project to national economy, IDCOL Board has in principle agreed to extend a term loan facility of USD 10 million. The estimated project cost is USD 35.36 million. The other lenders are Green Delta Capital Limited, Bangladesh and FMO, The Netherlands. IDCOL plans to source the required financing from the fund allocated as ordinary capital resources (OCR) for large infrastructure projects under Public-Private Infrastructure Development Facility-II (PPIDF-II) of Asian Development Bank (ADB).

According to the Environment Conservation Rules, 1997 of Bangladesh Government, industrial projects have been categorized into four classes—Green, Orange A, Orange B and Red. Considering the magnitude of environmental impacts, the Department of Environment (DOE) has awarded the Environmental Clearance Certificate (ECC) in favour of the project by declaring it as a Red Category project. According to the ADB guidelines, the SAPL river port project is assumed to be B Category project, as the environmental impacts of these type of projects are mostly project site specific[1]. In addition, the environmental and social safeguards framework (ESSF) of IDCOL has categorised the Project as High Risk Project.

As a part of environmental compliance, there is a requirement for preparation of an Initial Environmental Examination (IEE) report. In this regard, SAPL has appointed Bangladesh Centre for Advanced Studies (BCAS) to prepare this IEE report following the guidelines of Department of Environment (DOE), Government of Bangladesh (GOB) and Asian Development Bank's (ADB's) Safeguard Policy Statement (SPS, 2009). In addition, relevant general and sector specific guidelines of World Bank Group were also consulted.

Initially, SAPL has considered for three alternative sites. But finally they have selected the current site due to the close proximity to Dhaka-Narayanganj Highway, availability of required draft for the movement of marine vessels and above all favourable baseline environmental and social conditions. The geographical location of the project site is N 23°34′28″ and E 90°30′43″. Based on the nature of land use, it can be said that the project

[1]Based on the information as has been found in
www.adb.org/documents/guidelines/environmental_assessment/environmental_categorization.pdf

area (5 km radius air shed in West Muktarpur Village) is of mixed type landuse. Due to the presence of various types of industries including cement factories, cold storages and some other types of industries at close proximity of the project site has resulted a higher ambient noise level (about 70 dBA). In addition, the movement of marine vessel (like steamer, launch) through the Dhaleswari River have also facilitated the higher noise level at project area. Given the higher ambient noise level, based on the result of noise dispersion model, it may be concluded that the nearest household receptors living approximately 100 meters away from the project site will be exposed to 32-42 dBA which is within the limit set by the DOE. In this regard, the projected baseline noise level has been considered as 85 dBA.

The topography of the project site has been found as flat. The result of Topographic Survey shows that there is no significant difference in contour. The project site is approximately 7.0 m above sea level. The project site is originally owned by Holcim, Bangladesh and they have raised the project site by 1 meter ensuring that level is above the highest flood levels of 1998[2]. No significantly large trees or anything having ecological or archaeological importance have been found in the project site. In construction phase, dust comes from construction activities including traffic movement will be mitigated through regular sprinkling and covering of construction materials and above all enforcing relevant standards. Solid, kitchen and sanitation wastes are to be mitigated through application of 3R principles (as is possible), ensuring disposal of waste to dustbin and landfill (as is designated by local authority) and ensuring application of proper sanitation facility. Noise is a common issue in most of the construction activities, which can be mitigated by application of sound mitigation device and shifting of construction time. Although there are no significant trees, herbs or shrubs in the project site, there would be some impacts on localised flora and fauna, which can be mitigated by application of proper design and above all adopting compensation measures including re-planting/re-introduce them. The scale of visual impacts can be mitigated by adopting fencing all around the project site and accomplishing the construction activities as early as possible. In consideration of nature of construction activities, it can be said that there is limited scope of surface and ground water contamination as no hazardous materials will be used. As mitigation measures, application of mud-tank to manage construction wash water seems to be effective. Accident is general concern for any construction activities, which is to be addressed with ensuring due awareness and providing required personnel protective equipment (PPE) to the workers. So, in brief it can be said that the scale and type of construction activities of the project would be mostly straight-forward having minimal level of complexity. So, no significant and extreme adverse impacts during construction phase of the project is expected.

However, during operation phase the project may result in significant environmental and health safety (EHS) concern. In the following Table a summary of environmental impacts during operation phase and proposed mitigation measures, has been provided.

[2] The flood of 1998 is considered as one of the most devastating floods in the history of floods in Bangladesh as it covered about two-thirds of Bangladesh by affecting 30 million people and caused over 1000 deaths. (source: Shekhar Shah, The World Bank *Coping With Natural Disasters: The 1998 Floods In Bangladesh,* July 1999)

Table: Summary of environmental impacts during operation phase and mitigation measures

Subject area	Potential impacts during operation	Mitigation measures
Air emission	▪ SOx emission from diesel engines ▪ Traffic related air quality impacts ▪ Dust emission during container handling	▪ Use low sulfur containing diesel. ▪ Enforcing health safety aspects for vehicle. ▪ Dust emission during container handling could be reduced by water spraying the unpaved area.
Dredged Materials management	▪ Change of topography ▪ Loss of vegetation	▪ The amount of dredging required for maintenance is expected to be insignificant to affect local aquatic body or adjacent community. ▪ Due to the retaining wall along the entire length of the river front, there is very minimal risk of river bank erosion.
Waste water	▪ Loss of habitat or species due to land intake. ▪ Disturbance or damage to adjacent habitat of species	▪ SAPL will not allow disposal of bilge water near the port without treatment. ▪ In case of necessity, SAPL has to think about water treatment plant.
Solid waste management	▪ Hazards to workers health ▪ Hazards to the adjacent community ▪	▪ Separation of wastes at source. ▪ Provide adequate dustbin facility. ▪ Dispose waste properly regularly.
Hazardous materials and oil management	▪ Effects on soils and geological features. ▪ Ground contamination ▪ Effect on groundwater	▪ Adopting lining ▪ Introduce containment around the oil storage facility ▪ Collect the spill as early as possible ▪ In case of hazardous materials, introduce standard code of practice.
Noise	▪ Hazards to workers health ▪ Hazards to the adjacent community	▪ Ensuring PPE for workers ▪ Adopting silencer/noise barriers ▪ Scheduling of higher noise generating activity preferably at day time
Biodiversity	▪ Hazards to terrestrial flora and fauna ▪ Hazards to aquatic habitats	▪ As the marine vessel operating with this project will move through three same type of river, ballast water will not be an important concern.

SAPL plans to keep back-up generation provision for up to 2MW. In this regard, they will initially procure 2 diesel gen-sets, having a combined capacity of around 1MW, each gen-set having a capacity of around 635 - 650 kVA. In addition, there will be six diesels fueled fork-lifts with capacity from 3 to 10 Ton. So, there is scope of SOx emission. In this regard, an air dispersion modelling was done by using US EPA approved AERMOD Model. The model results show that the concentration level will be within the Ambient Air Quality Standard of the Department of Environment (DOE), as the presence of Sulphur is only 3.5% of the total weight of mass (Source: Bangladesh Petroleum Corporation). Although the noise modelling result depicts a pleasant scenario about noise impact, SAPL has to ensure application of silencer, rock-wool and styrofoam (as are applicable) for better compliance. The loss of flora and fauna and visual impacts can be mitigated by adopting satisfactory landscaping and architectural design. To meet the water demand, two deep tube-wells with a capacity of 2 m^3/hour have already been installed. Based on the capacity and ambient hydrological condition (especially close proximity to river), it may be assumed that the project will not appear as a concern for the aquatic system including the water flow regime. Ground water is not expected to be affected due to requirement of cooling water. Because the water required for full operation will be recycled after radiative cooling and only a limited quantity will be required for make-up purpose.

Lube oil spillage and burned lube oil management seems to be a relevant issue in regard of EHS in operation phase, as lube oil is expected to be used for a number of purposes. In this regard, SAPL has to adopt proper management of spent/burned lube oil and addressing the spillage by the DOE designated vendor, surface water contamination can be prevented.

According to the Seismic Zoning, Munshigonj has fallen into Zone-2[3], requiring adapting adequate measures to address the earthquake. In addition, annual flood is a common phenomenon at project area. But as the project site has been significantly raised by considering the flood level of 1998, it assumes that flood will not appear as a concern for the project. Although the project is expected to have modern equipment and devices, the project itself is labour intensive type. So, while planning, design and construction, SAPL has to consider the issue of occupational health and safety of workers with due importance. Improper attention may result in severe occupational health hazard during operation phase. So, SAPL has to adopt detail Environmental and Health Safety (EHS) guidelines/manual to address the occupational health safety during construction and operation phases in a comprehensive manner. In addition, there will be a detail Disaster Management Plan with focus on fire and earthquake.

The project land has been purchased from Holcim Cement, Bangladesh through willing-seller willing-buyer arrangement, by complying with relevant rules and regulations of Bangladesh Government. As Holcim Cement has initially developed the site for their own industrial use, they did not allow the land to be used by any third party neither in the form of settlement nor any incomer generating activity. In addition, the widening of 750 meters

[3] The implication of Zone 2 has been described in the Chapter 4.

access road does not require any land acquisition as the road is being widened by following the original right of way. As the road has been widened by the Roads and Highways Department (RHD), it can be said that they have followed relevant rules and regulation to replace any unauthorised settlement (if there is any). So, it can be said that there is no issue of involuntary resettlement.

Bangladesh is enriched with cultural diversities. According to International Work Group for Indigenous Affairs (IWGIA), there are about 3 million indigenous people in Bangladesh belonging to 45 ethnic groups (Source: Statistical Year Book, 2012 of IWGIA). But the habitat of no indigenous community has been recorded in Panchasar Union. So, it can be said that SAPL Project has no potentiality to adversely affect the rights of indigenous community. Moreover, it can facilitate them with a scope of job opportunity. Because the project requires involvement of different types of labour (skilled, semi-skilled and un-skilled) at different phases of operation.

As a part of the IEE, public consultation was accomplished. The objective of the consultation process was to share the views of the respondents about the SAPL project. Most of the respondents showed positive response to the Project due to the high demand for a sustainable river terminal with container depot. But they requested to the concerned authority that adequate safety measure about community health safety is to be adopted. In addition, they have requested to think about the employment facility for the local people on a priority basis.

SAPL is considering the environmental and social compliance issues with due importance. For addressing the potential environmental and social adverse impacts, it is suggested to establish an Environmental and Social Monitoring Unit (ESMU) under the organogram of the Project Company. It is the responsibility of the ESMU to implement environmental management plan (EMP) as well as to ensure satisfactory environmental monitoring and compliance on a regular basis according to the approved schedule of the DOE or any other applicable guidelines.

I. INTRODUCTION

1.1 BACKGROUND

Bangladesh is an important economy in Asia requiring higher efficiency in managing export and import of finished products and raw materials. The operations of Chittagong Port, the main hub of country's external trade, include clearance of dry cargo from the port in three forms of transportation viz. road, rail and river ways. However, available data suggest that the share of water transport is decreasing compared to road transport, primarily due to lack of proper infrastructure. But water transportation has the potentiality to reduce on an average about 40 percent of transportation cost, compared to roads or rail transportation. In some research works, it has been claimed that Bangladesh's GDP can grow by more than 1 percent and foreign trade by 20 percent, if the inland water transportation system is made effective, efficient, competitive and free of bureaucratic influence.

Considering the demand of a well-structured river terminal with required cargo handling capacity, Summit Alliance Port Limited (SAPL) has initiated to develop and operate a river terminal at West Muktapur of Munshiganj District on an area of about 14.5 acres of purchased land. The site is just beside the west bank of the Dhaleswari River. The proposed project will be equipped with handling capacity of 120,000 twenty-feet equivalent unit (TEU) annually and a storage capacity of 2,500 TEU.

SAPL has appointed Bangladesh Centre for Advanced studies (BCAS) as an Environmental Consultant to conduct the detail environmental impact assessment. Accordingly, BCAS has carried out the environmental impact assessment by following the relevant rules and regulations as have been discussed in detail in the respective chapter of this initial Environmental Examination (IEE) Report.

1.2 EXTEND OF THE STUDY

Environment Conservation Rules (ECR, 1997) of Bangladesh and Safeguards Policy Statement (SPS), 2009 of ADB require that the environmental impacts of development projects are identified and assessed as part of the planning and design process. Based on the magnitude of potential adverse impacts, mitigation measures are to be planned before starting the implementation of the project. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

1.3 SCOPE OF THE STUDY

The specific objectives of the IEE study are as follows:

- conduct preliminary examination of the environmental consequences of the project;
- describe the existing environmental and social condition of the proposed project site;
- collect detail information about technology, equipment and machinery;
- assess the potential environmental impacts of the proposed river terminal;

- develop an environmental management plan (EMP) detailing mitigation measures, monitoring activities, reporting requirements, institutional responsibilities, and cost estimates to address adverse environmental impacts; and carry out public consultations to document any issues/concerns and to ensure that such concerns are addressed in the project design.

1.4 STUDY METHODOLOGY

It is already mentioned that the IEE has been prepared according to the guidelines of ECR, 1997 of Bangladesh. In addition, it has been tried to make the IEE to be compliant with Safeguards Policy Statement, 2009 and Operation Manual (OM) FI (2013) of Asian Development Bank (ADB).

Field visits were undertaken to assess the baseline physical, biological and social environments. An area within 1.0 km radius around the proposed river terminal has been defined as the study area for collection of baseline data. The data collected from secondary sources including the field study, Internet, Forest Atlas of Bangladesh, Statistical Handbook for Bangladesh, District Maps, National Atlas were also consulted as secondary source.

The methodology for conducting the IEE was fully participatory ensuring participation to the relevant stakeholders. The IEE study used all the information generated through field visit, consultations with the stakeholders and output of primary and secondary sources.

1.5 LIMITATION OF THE IEE STUDY

The IEE study has been conducted within a limited time frame due to the requirement of the project to go into commercial operation by December 2014. However, it has been tried to cover all important environmental, social and occupational health safety impacts and formulate pragmatic recommendations for mitigating any adverse impacts.

While dealing with morphological condition, a study titled ***Morphological Analysis and Hydro-technical Investigation of Major Rivers***[4] was consulted. Based on this study, the downstream of Dhaleswari River is morphologically influenced with feature of reduction of discharge and lack of sediments. Because Dhaleswari flow regime depends on Jamuna catchment and the decreasing trend of required flow in Jamnua is widely observed. However, increased rainfall in the Jamuna catchment may favor the morphological condition of Dhaleswari River.

[4] Centre for Environmental and Geographic Information System (CEGIS), 2013 ***Morphological Analysis and Hydro-technical Investigation of Major Rivers***

1.6 The IEE TEAM

Dr. Moinul Islam Sharif has lead the IEE team. The others members of the team are mentioned in Box 1.1 with their responsibilities.

Box1.1: IEE Team composition

Dr. Moinul Islam Sharif	**EIA Expert**
Dr. M. Eusuf	**Air Dispersion Modeling Expert**
Mr. Khandaker Mainuddin	**Economist**
Mr. Osman Goni Shawkat	**Sociologist**
Mr. Shaker Ali	**Noise Modeling Expert**
Mr. Bakul Mia	**GIS and Mapping Expert**
Mr. Moniruzzaman	**Field Surveyor**
Mr. ZH Khan	**Field Surveyor**
Mr. Sohel	**Data Analyst and SPSS expert**

Photograph 1.1: IEE Team Leader at project site

1. 7 ACKNOWLEDGEMENT

In preparing the IEE, various stakeholders were consulted. It comprises a number of government agencies including Bangladesh Inland Water Transport Authority (BIWTA), Bangladesh Water Transport Corporation (BIWTC), Bangladesh Meteorological Department (BMD), Soil Resource Development Institute (SRDI), Bangladesh Bureau of Statistics (BBS), Bangladesh Water Development Board (BWDB), Department of Agriculture Extension (DAE), Roads and Highways Department (RHD), Fire Service and Civil Defense Office, and Munshigonj Fisheries Office are worth mentioning. In addition, representatives of various class of people and professionals of West Muktarpur have extended required co-operation. In this regard, the IEE Team is grateful to them as well.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 BANGLADESH ENVIRONMENTAL ACT AND RULES

2.1.1 The Environment Conservation Act, 1995 (amendments in 2000 & 2002)

The provisions of the Act authorizes the Director General (DG) of Department of Environment (DOE) to undertake any activity he deems fit and necessary to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The main highlights of the act are:

- Declaration of Ecologically Critical Areas;
- Obtaining Environmental Clearance Certificate;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Regulation of development activities from an environmental perspective;
- Promulgation of standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Promulgation of acceptable limits for discharging and emitting waste; and
- Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment.

2.1.2 Environment Conservation Rules, 1997 (amendments in 2002 and 2003)

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. These Rules provide for, *inter alia*, the following:

- The national Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load;
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities; and
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

Depending upon location, size and severity of pollution loads, projects/activities have been classified in the Environmental Conservation Rules (ECRs) into four categories: Green, Orange A, Orange B and Red.

Implication to the project: According to ECR, 1997 the proposed project of SAPL has been categorized as **Red**.

2.2 PROJECT SPECIFIC RULES AND REGULATIONS OF BANGLADESH GOVERNMENT

2.2.1 The Ports Act, 1908

On 18 December 1908 The Ports Act 1908 has been enacted. There are eight chapters in this act. Under **Chapter V** with title '**Rules for the Safety of Shipping and the Conservation of Ports**' detail environmental and health safety requirements have been imposed in two distinct rules viz. *General Rules and Special Rules*, as are mentioned below.

General Rules

- Injury, buoys, beacons and moorings
- Willfully loosening vessel from moorings
- Improperly discharging ballast
- Graving vessel within prohibited limits
- Boiling pitch on board vessel within prohibited limits
- Drawing spirits by unprotected artificial light
- Warping and Leaving out warp or hawser after sunset
- Discharge of firearms in port
- Penalty on master omitting to take order to extinguish fire

Special Rules

- Moving of vessels without pilot or permission of harbor- master
- Provision of certain vessels with fire extinguishing apparatus

2.2.2 The Inland Shipping Ordinance, 1976

On 21 September 1976 The Inland Shipping Ordinance has been enacted. There are seven chapters in this act. Under **Chapter VA** with title '**Protection of Inland Water from Pollution**' detail environmental and health safety requirements have been imposed through following four clauses:

- No inland ship or a facility plying or operating in or around inland waterways shall be used without registration and sanitation facilities as may be prescribed and no inland ship activity shall be conducted to cause pollution of inland water.
- Every inland ship shall be granted yearly renewable pollution prevention certificate(s) by the surveyor after getting the application along with prescribed fee(s) from the owner or master of the inland ship.
- Every inland ship carrying more than 12 persons including passenger, master, officer and members of the crew of the inland ship, shall have potable water and sanitation system approved by the Department of Shipping.
- The discharge of oily mixture and sewage into inland water is prohibited except when:
    - the inland ship is discharging comminuted and disinfected sewage using a system approved by the Department of Shipping;

- the inland ship has in operation an approved sewage treatment plant or a retention tank of adequate capacity which has been certified by the Department of Shipping;
- the discharging of sewerage, oil or oily mixture into inland water necessary for the purpose of securing the safety of an inland ship or saving life on board;
- the discharge into inland water of oil, oily mixture or sewage resulting from damage to an inland ship or its equipment, provided that all reasonable precautions have been taken after the occurrence of the damage or discovery of the discharge for the purpose of preventing or minimising the discharge;
- the discharge for the purpose of combating specific pollution incidents in order to minimize the damage from pollution, subject to the approval of the Department of Shipping.

In **Chapter VII**: **Miscellaneous,** following aspects have been required-

- the supply of drinking water free of charge for the use of the passengers;
- pollution prevention, sanitary and other measures to be taken on board an inland ship for ensuring cleanliness and convenience of passengers and inland water;
- separate accommodation for women and children;

2.2.3 Rules of Construction Control at Inland Water Way & Adjacent Areas, 2010

This Rules was enacted on 31 March 2010. This Rules is divided into six sections. Among them **Section-3** with title **Clearance Process for Infrastructure Construction** has detailed requirement of *Vertical Clearance and Horizontal Clearance*, while installation of infrastructure in inland water ways or its adjacent areas.

Table 2.1: The summary of the requirement Construction Rules 2010

Type of water way	Depth of water (meter)	Availability period	Required clearance	
			Vertical Clearance (meter)	Horizontal Clearance (meter)
First class	3.6.-3.90	Throughout the year	18.30	76.22
Second class	2.10-2.40	Throughout the year	12.20	76.22
Third class	1.50-1.80	Throughout the year	7.62	30.48
Fourth class	<1.50	During dry season	5.00	20.00

2.2.4 Standing Order for Salvage of Sunken or Capsized Vessel, 2011

The Standing Order for Salvage of Sunken or Capsized Vessel was introduced on 8 May 2011. It has mainly focused on during-accident and after-accident scenario in inland water ways. Accordingly, this Order has detailed responsibility of 25 agencies/institutes comprising both government and local government.

2.2.5 National River Protection Commission Act, 2013

On 22 July 2013 The National River Protection Commission Act, 2013 was adopted with a view to primarily address illegal encroachment, environmental pollution, proper maintenance issues in a more structured manner. The Act has defined National River Protection Commission. In addition, it has also described the organogram, responsibilities and reporting responsibilities as well. scenario in inland water ways. Accordingly, this Act has detailed responsibility of 25 agencies/institutes comprising both government and local government.

Implication to the project: SAPL has confirmed that they are committed to comply with these national regulatory requirements. BIWTA has awarded the required clearance in favor of SAPL the NOC based on complying with the requirement of Rules of Construction Control at Inland Water Way and Adjacent Areas, 2010 as has been provided in Appendix–4. In responding the vertical and horizontal clearance related obligation, SAPL has constructed the jetty 227 meters away from the Muktarpur Bridge. The container vessels vertical height will comply with the requirement of vertical clearance of 18 meters. As the draft of Dhaleswari River is much higher (about 17 m), the type of water way in the case of SAPL will be First class according to Table 2.1.

2.3 SAFEGUARDS POLICY AND GUIDELINES OF ASIAN DEVELOPMENT BANK

Aaccording to the ADB SPS, 2009 and Operational Manual F1/BP (2013), ADB will carry out project screening and categorization at the earliest stage of project preparation, when sufficient information is available for this purpose. Screening and categorization is undertaken to:

- reflect the significance of potential impacts or risks that a project might present;
- identify the level of assessment and institutional resources required for the safeguard measures;
- determine disclosure requirements.

The process of determining a project's environment category is to prepare a Rapid Environmental Assessment (REA). REA requires the completion of the environmental categorization form prior to the project initiation. REA uses sector-specific screening checklist, taking into account the type, size, and location of the proposed project; sensitivity and vulnerability of environmental resources in project area; and the potential for the project to cause significant adverse environmental impacts. A project is classified as one of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. Categories are as follows:

Category A: A proposed project is classified as category A, if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. For a Category A

project, an environmental impact assessment (EIA), including an environmental management plan (EMP), is required.

Category B: A proposed project is classified as category B, if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

Category C: A proposed project is classified as category C, if it is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.

Category FI: A proposed project is classified as category FI, if it involves the investment of ADB funds to, or through, a financial intermediary (FI).

ADB has adopted public Communication Policy in 2005. Thereafter it has been revised in 2011. The fundamental features of this Policy are:

Proactive disclosure ADB shall proactively share its knowledge and information about its work, as well as its opinions, with stakeholders and the public.

Presumption in favor of disclosure The policy is based on a presumption in favor of disclosure.

Right to access and impart information and ideas ADB recognizes the right of people to seek, receive, and impart information and ideas about ADB-assisted activities.

Country ownership ADB recognizes the importance of country ownership of the activities it supports in its DMCs.

Limited exceptions Full disclosure is not always possible. For example, ADB needs to explore ideas, share information, hold frank discussions internally and with its members, and consider the special requirements of its non-sovereign operations.

Right to appeal The policy recognizes the right of those requesting information to a two stage appeals process when they believe that ADB has denied their request in violation of its policy.

Relation to other policies The policy establishes the disclosure requirements for documents that ADB produces or requires to be produced.

In accordance with the requirements under the Safeguard Policy Statement, ADB shall post on its website the following documents submitted by the borrower and/or client:

- a draft environmental impact assessment (EIA) report for an environment category A project, at least 120 days before Board consideration;
- a draft environmental assessment and review framework, where applicable, before appraisal;
- the final EIA or initial environmental examination (IEE), upon receipt by ADB;
- a new or updated EIA or IEE, and a corrective action plan, if any, prepared during project implementation, upon receipt by ADB; and
- the environmental monitoring reports, upon receipt by ADB.

Implication to the project: The proposed project seems to be categorised as **B** in regard of environmental safeguards. But in consideration of involuntary resettlement (IR) and indigenous peoples (IP) aspects, it seems to be categorized as **C**.

2.4 ENVIRONMENTAL AND SOCIAL SAFEGUARDS FRAMEWORK OF IDCOL

IDCOL has adopted an Environmental and Social Safeguards Framework[5] (ESSF) in 2011, which is to be complied with all projects to be funded by the Public-Private infrastructure Development Facility of ADB. In the ESSF, it is mentioned that "Since IDCOL is an FI, ADB requirements for Category FI shall be applicable for development of the ESSF and ADB's environmental assessment process shall be applicable to each sub-project for project processing under the ESSF".

According to the environmental categorization of ESSF, the Project has been categorised as Moderate Risk Project requiring significant compliance safeguards. For a Moderate Risk Project, there is requirement of conducting detail environmental impact assessment and submitting the environmental clearance certificate to IDCOL as is to be issued by the DOE before loan disbursement. But in regard of Social categorization, the Project has been categorised as Low Risk Project both for Indigenous People (IP) and Involuntary Resettlement (IR) perspectives. So, there is no requirement of adopting indigenous peoples development framework (IPDF), indigenous peoples development plan (IPDP), resettlement framework (RF) and resettlement plan (RP).

Implication to the project: The proposed project seems to be categorised as **High Risk** in regard of environmental safeguards. But in consideration of involuntary resettlement and indigenous peoples (IP) aspects, it seems to be categorized as **Low Risk**.

2.5 COMPLIANCE STATUS

On 26 November 2014 (Appendix-3), the project has been awarded the Environmental Clearance Certificate (ECC) by the DOE. In addition, IDCOL has found the project satisfactorily compliant in respect of the requirement of ESSF. Above all, to meet the safeguards requirement of ADB, this IEE has been prepared, which tries to depict the scenario of responsiveness of SAPL on the requirements of ADB from safeguards point of view. In addition, the EMP has tried to reflect the commitment of SAPL in regard of E&S issues especially during operation phase. The major terms and condition of ECC area as follows:

- The proposed EMP is to be properly implemented.
- Domestic effluent is to be managed by septic tank and soak pit.
- Proper fire-fighting system is to be arranged
- Required personal protective equipment/devices are to be made available and easy accessible at project site.
- Fruit bearing and wood producing trees are to be planted.
- The nose level of the project is to be in compliant with Noise Control Rules, 2006.

[5] http://www.idcol.org/Download/ESSF_Final.pdf

III. DESCRIPTION OF THE PROPOSED PROJECT

3.1 PROJECT RATIONALE

The key rationale of the project include:

Earlier issuance of Bill of Lading (B/L): Since the proposed river terminal (RT) will have the capacity to issue B/L, this will enable the exporters to collect their revenue earlier than would otherwise be possible if they had to issue the B/L from the Chittagong Port (2/3 days later).

Greater certainty regarding time for transportation: While under ideal circumstances, the transportation by rail, road and river should take similar amount of time, only the RT provides actual certainty regarding the timeline as road transportation faces issues in the form of poor quality roads, traffic congestion, etc. and rail freight faces issues such as uprooted rail tracks, shortage of required type of cargo carrying boogie, etc.

Reduced disruptions: Transportation vide road and rail often faces disruptions in the form of political activities such as strikes and blockades, which would not affect the RT operations.

Better transportation mode for delicate items: River transportation would be likely to reduce the risk of damage to delicate cargo as opposed to road transportation, which is particularly hazardous owing to the condition of certain roads and highways, and rail transportation, which is also results higher level of risk and uncertainty than river transportation.

Increased security: Both road and rail transportation have been repeatedly targeted and face significant risks of pilferage and hijacking, as opposed to river transportation which is much safer.

River transportation is cheaper mode of transport: Inland water transport is one of the oldest modes for economically efficient and environmentally sustainable transport system of the country. Inland waterway is a critical component of the Bangladesh transport system in view of the floods, which regularly affect the country and disrupt the other two surface transport modes (road and rail).

Reduced pressure on Chittagong Port: The river terminal with its 120,000 TEU handling capacity will help to reduce the cargo processing load on the Chittagong Port.

Reduction in traffic pressure on road routes: Since the river terminal will offer the option for river transportation, it will help ease the traffic pressure caused by road transportation.

Job Creation: The project is expected to create around 240 jobs during the operational phase.

Skill Development: With more RTs expected to come into operations within the next few years, the skills acquired by the employees of SAPL are likely to enable them to receive more employment opportunities. Also, when current employees leave and new ones join, they will be trained with the necessary skills.

Capacity Constraints: The two facilities of the project (river terminal and inland container depot) of the Project would be necessary as required cargo handling capacity in the country

continues to grow. In fact, if the growth in actual container movement for 2014 remains the same as it was in 2013, given SAPL's current handling capacity, it would be challenging to cope with the growth.

3. 2 PROJECT SITE

3.2.1 Location and area of project site

The project site is located on a 14.5 acres of land on the northern bank of Dhaleshwari River. It is under the jurisdiction of West Muktarpur Village of Panchsar Union, Munshigonj Upazila in Munshigonj District. The satellite image of the project site is shown in Figure 3.1. The geographical coordinates of the plot is N 23°34′28″ and E 90°30′43″.

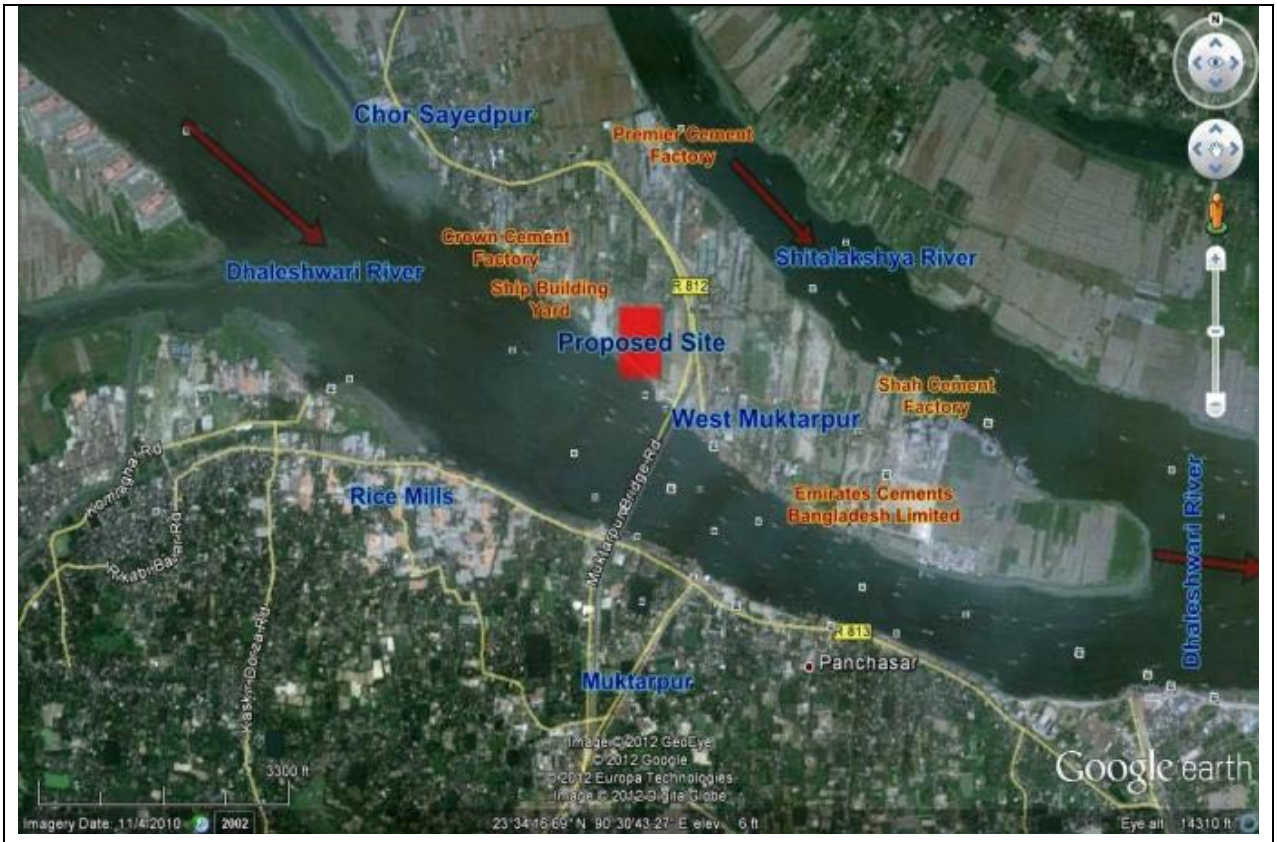


Figure 3.1: Satellite image of project site with adjacent major infrastructures

The proposed project site was earlier owned by the renowned cement manufacturing company Holcim. With a view to set up an industrial unit, Holcim has developed the land, including raising it above flood level and constructing embankment along the riverbank. Subsequently, Bangladesh Government used the land as temporary accommodation for construction workers and engineers during construction of the Muktarpur Bridge (across Dhaleswari River), which is about 110 m from the project site[6]. Thereafter, SAPL has bought the land from Holcim to establish the proposed project.

[6] In respect of the northern end of the Muktarpur Bridge (source: Google Earth)

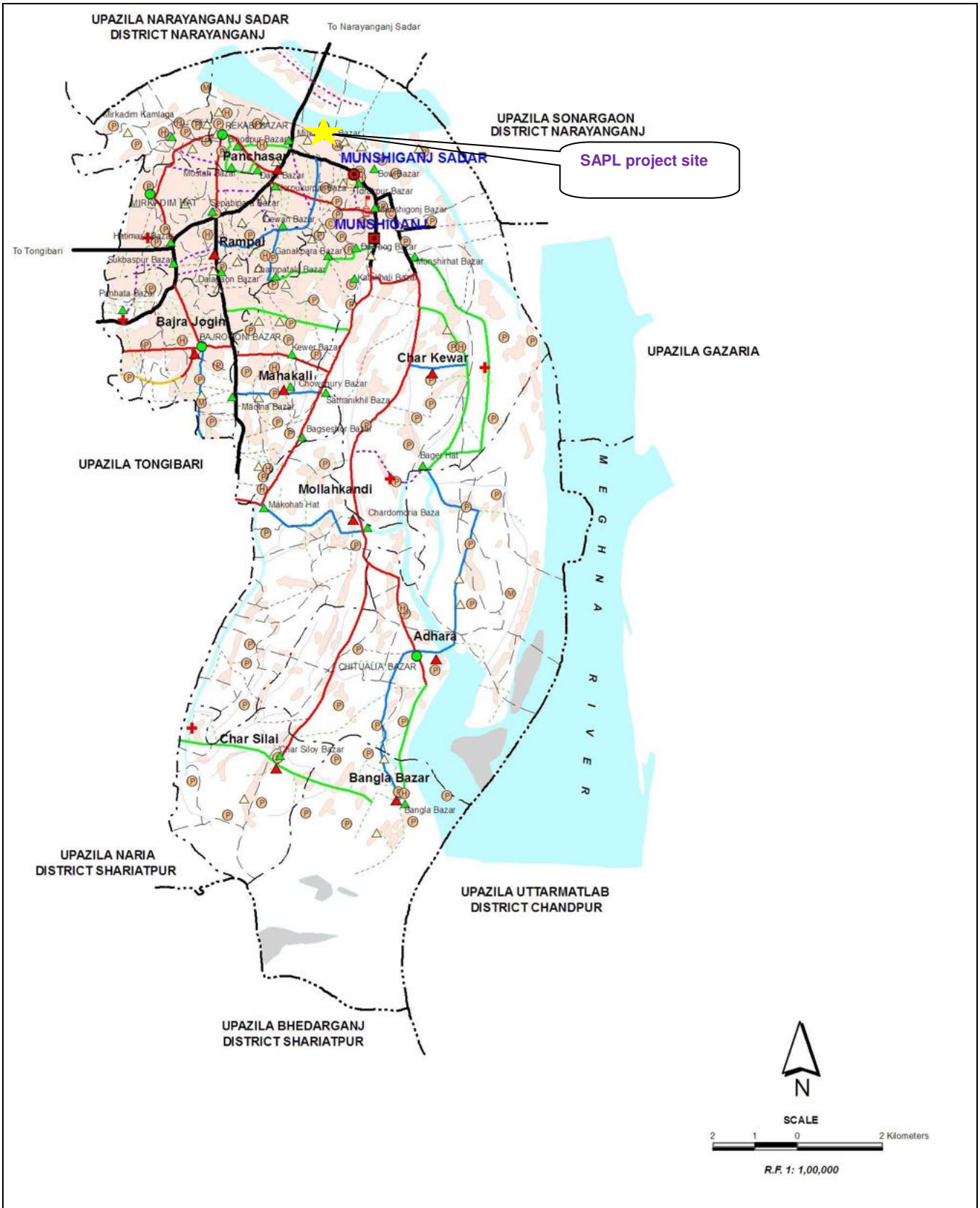


Figure 3.2: Location of SAPL project site in respect of Munshigonj Upazila[7]

[7] The location of SAPL project site in respect of Munshigonj Upazila has been provided with legend in Appendix-6

The project site has been found to be a suitable site for the project due to a number of factors as have been mentioned in Box 3.1.

Box 3.1: Salient advantages of the project site

- **Close proximity to one of the most important national rivers (Dhaleswari River)**
- **The record of limited river erosion along the bank of Dhaleswari River**
- **No issue of land acquisition**
- **Absence of involuntary resettlement issue.**
- **Limited requirement of land development**
- **Easy accessibility to primary distributor (national highway) and secondary thoroughfare**
- **The project area is basically an industrial offering the in-built backward and forward linkage facility**

3.2.2 Landuse Pattern

It is observed that surrounding areas of the project site is occupied by residential areas[8]. But there is also significant trend of industrialization in the project area. There are cement manufacturing plants, match factory and several cold storage. So, the landuse of the project area can be defined as of mixed type. The percentage of land use pattern of in the project area (1 km radious air shed around the project site) is as follows:

Table 3.1: Percentage of landuse in the project area (I km radious airshed)

Landuse	Area (Sq. KMs)	Percentage
Agriculture	0.259884	6.7
Barren Land and Vegetation	0.334644	8.7
Industry	0.630857	16.4
Project Site	0.049046	1.2
Roads	0.076692	2.0
Settlements	0.56743	14.0
Water body (part of River Dhaleswari)	1.914655	49.9

In addition, a landuse map (with 1 km radious air shed) is also available as Appendix-10.

[8] Especially northern and eastern sides of the project site.

Photograph 3.1: SAPL project site with surrounding areas and infrastructures (close view)

3.2.3 Accessibility to the Project Site

To connect the project site with Dhaka-Munshigonj District Road, there is an access road with about 6.3 m width and 0.75 km long. But to widen the width as about 11 m, SAPL has leased it from the Bangladesh Bridge Authority (BBA) for 25 years. The improvement of the access road is being funded by SAPL but the construction is being undertaken by Bangladesh Bridge Authority. Some salient features of the access road improvement are:

- The elevation of the access road shall be at a minimum 1 meter;
- Road lighting shall be required;
- Road markings and signs shall be provided in accordance with the requirements of
- Bangladesh Road and Highways Department and Local Government Engineering Department.

Photograph 3.2: 11 m wide access road

Photograph 3.3: Entry of access road

Photograph 3.4: A long view of access road

3.3 PROJECT FACILITIES

3.3.1 Project Components

SAPL has engaged Seaport Innovations Limited, Denmark for design, engineering and procurement of the project. According to their Master Plan (Annex-7), the basic project components are mentioned in Box 3.2.

Box 3.2: Basic project components

1.	**Jetty**	**12.**	**PABX, CCTV and electric line**
2A.	**C.F.S. shed**	**13.**	**Workshop**
2B.	**C.F.S. shed extension**	**14.**	**Reference block**
3.	**Admin, account, custom and others**	**15.**	**Light post and watch tower**
4.	**Septic tank**	**16.**	**Fire water line**
5.	**Power Station**	**17.**	**Damage container repair yard**
6A.	**Import shed**	**18.**	**Import container yard**
6B.	**Import shed**	**19.**	**Export container yard**
7A.	**Export Parking**	**20.**	**R.C.C drain**
8.	**Scanning facility**	**21.**	**Reefer empty yard**
9.	**Weight bridge area**	**22.**	**Labour toilet**
10.	**Main office building**	**23.**	**Electric LT. line**
11.	**Electric HT. line**	**24.**	**Crane cable**
		25.	**Ansar &quay worker building**

N.B. The serial no. of the aforesaid project components have followed the same as Master Plan

3.3.2 Key Facilities in Detail

To understand the environmental, social and health safety impacts of the project, it is required to have sufficient orientation about the technical aspects of key components. In Table 3.2 the brief description of key project components have been provided.

Table 3.2: Key facilities

Facility	Basic information
Yard	The storage yard for the River Terminal is divided into separate stacks for import, export, reefers, empties, etc. The master plan drawing shows that the initial plan is to have 3 stacks of containers for import with a total of 312 (116+104+92) Terminal Ground Slots (TGSs) and to have one (01) stack of containers for export with up to 102 TGS. In addition, there is one (01) stack available for future development, with a capacity of 100 TGSs. There is reefer block with 20 plugging points, covering an area of 732 sq. m.
Jetty	The River Terminal has a jetty of 1752 sq. m (80m x 21.9m). The jetty may be extended up to another 102.3m if required.
CFS Export Shed	The CFS (Container Freight Station) export shed has an area of 2323.2 sq. m (52.8m x 44m). It has an area of 2323.2 sq.m. for further expansion.

Facility	Basic information
Main Office Building	The major components of main office building are in Annex-19
CFS Import Shed	There are two sheds for import, one 732 sq. m (40m x 18.3m) and the other 1647 sq. m (90m x 18.3m).
Power station	The power station covers an area of 171 sq. m (19m x 9m) with capacity of 2 MW
Scanning facility	There is a scanning facility just beside the CFS export shed, which covers an area of 768.6 sq.m (63m x 12.2m).
Security arrangement	The Ansar and Quay quarter building has an area of 522 sq. m.
Scanning and Weighbridge	As per the layout plan of SAPL, the weighbridge is located near the scanning facility, which covers an area of 45 sq.m. The scanning facility of the RT covers an area of 768.6 sqm., which is located beside the weighbridge, at the west of CFS Export Shed.
Terminal Equipment and Operations office	There is a designated area for damaged container repairing and workshop. There is also designated areas for import and export truck parking, which covers an area of 2.05 acres of land.
Embankment	The embankment of the river is covered with a layer of concrete and equipped with some obstacles (stones).
Workshop Shed and Substation	The workshop shed of the river terminal is being constructed using pre-fabricated steel structure, supplied by Iron built Building Manufacturer and Construction Ltd., while the substation building is of RCC (Reinforced Concrete Cement) structure. The overall construction progress is approximately 95%, which is likely to be completed by the 1st week of December 2014.
Water supply	To meet the required water demand, SAPL has already set up two deep tube-wells with a capacity of 2 m^3/hour each and a water reservoir tank.
Boundary wall	The project site is surrounded by a 12 feet high wall all around along with 3 (three) feet high barbed wire on the wall. All works associated with the boundary wall have been completed.
Miscellaneous	the Project has other facilities i.e. reefer yard and reefer block (with 20 plugging points), septic tank, workshop (167 Sqm.), six light posts and watch towers, fire water line, PABX, CCTV and electric line, damaged container repair yard, RCC drain; crane cable etc.

3.3.2 Major Equipment

The list of tentative major equipment is made available at Table 3.3.

Table 3.3: List of major equipment

Item	Qty.	Brand	Country of Origin
Fixed Column Crane	2	Liebherr	Austria
Laden Reach Stacker	2	Kalmar	Finland
10 tons High Mast Fork Lift	1	TCM	Japan
5 Tons Low Mast Diesel operated Fork Lift	1		
3 Tons Low Mast Diesel operated Fork Lift	4		
3 Tons Low Mast Battery operated Fork Lift	1		
Prime Mover	10	Ashok Leyland	India
Trailers	10	CIMC	China

3.3.3 Back-up Generation Unit

SAPL plans to keep back-up generation provision for up to 2MW. In this regard, SAPL has initially procured 2 (Two) diesel fueled gen-sets of 600kVA and 650kVA, with a combined capacity of 1MW . The technical specification of gen-set is available in Appendix-26. The gen-sets to produce the remaining 1 MW is expected to be available by April 2015.

3.3.4 Inland Container Vessels

SAPL plans to procure 5 vessels, one of which is already in their fleet, namely SAPL-1 (formerly known as Shun Yuan 15) and in addition to this, two vessels will be leased during first quarter of 2015 and the remaining vessels will be procured locally. The dimensions of the inland container vessels have been limited by the port authority and BIWTA in view of the navigability of the river channels and maneuverability of the vessel in inland waters. The length is limited to the range of 70-80m, the width up to 15m and the maximum draft up to 4m. As a result, the owners have to look for vessels with customized specifications to meet the navigational requirements, either on the shipyards for newly built vessels or on the spot market for second-hand vessels. SAPL-1 was built in August 1999. Its length, width and depth are 79.80m, 13.00m and 5.40 m respectively. The engine capacity of this marine vessel is 1,500 HP.

Photographs 3.5-3.8: SAPL-1 from different perspectives

The technical fitness of SAPL has been certified by **RINA** (Appendix-5). RINA is non-governmental classification society, which was founded in Genoa in 1861 under the name *REGISTRO ITALIANO NAVALE*, by the *Associazione della Mutua Assicurazione Marittima* (Mutual Marine Insurance Association). Since its inception, Registro Italiano Navale has been an instrument of support for economic development in the areas where it operates. Over 150 years later, the role of RINA has not changed but it has expanded to meet the needs of a constantly evolving international economy.

RINA establishes and maintains technical standards for the construction and operation of ships and offshore structures. The society also validates that construction is according to these standards and carry out regular surveys in service to ensure compliance with the standards. Due to its stringent compliance process, globally RINA has become a trusted name in assessing technical fitness of marine vessel.

3.3.4 Dredging Requirement

The project will require about 90,000 m^3 dredging[9] to start commercial operation. In addition, there will be requirement of maintenance dredging. Although the requirement of maintenance dredging is yet to determine, based on the scale of the project and bathymetric condition of Dhaleswari River, it can be assumed that requirement of maintenance dredging will be of limited quantity.

[9] FMO, 2014. ***Due Diligence Report of SAPL River Port Project***.



Photographs 3.9-3.11 (left to right direction): Dredging and disposal of dredged material

Through the photographs 3.9-3.11, we can get an idea about the dredging activity and disposal arrangement of dredged material of SAPL project. The dredged material is being used for land-fill purpose to an adjacent piece of land owned by SAPL.

3.3.5 Import and Export Handling Products

SAPL's export handling products is expected to include Readymade Garments (RMG), jute, potato, traditional textile, leather products, ceramics, etc. On the other hand, import handling products could be raw cotton, poultry feed, pill, fertilizer, bitumen, waste paper, etc.

Photograph 3.12: Progress of yard development

Photograph 3.13: Progress of admin building

Photograph 3.14: Progress of import shed

Photograph 3.15: A view of drainage system

3.4 IMPLEMENTATION PLAN

SAPL is targeting to complete all construction and procurement works to start commercial operation by January 2015. The following Table 3.4 provides a timeline of completion for the key activities of the Project as notified by SAPL.

Table 3.4: Tentative project implementation schedule

Particulars	Specific Activities	Nov'14	Dec'14	Jan'15
Land Development	Flat soiling and Herring bond			
	Paver Block			
Admin Building Construction	5th and 6thFloor column, beam and slab casting			
	5th and 6th Floor B/W, Plaster, Lintel, False Slab, Grill filling			
	4th, 5th and 6th floor tiles, Thai aluminum, door fitting &inside painting			
	De-mobilization and site hand- over			
Other Civil Works	Export Shed Construction			
Electrical Works	Connections for Administrative Building			
	Air-cooler			
	Reefer panel			
	Substation			
Other Development Works	Dredging			
Procurement (and installation and commissioning where applicable)	Fixed Column Cranes			
	Prime-movers and trailers			
	Reach Stacker			
	Vessels*			
	Gen-sets			

Source: SAPL

*for SAPL – 1 and the first leased vessel. The second leased vessel is expected by March 2015, while the remaining vessels (including replacements for the leased vessels) are expected to be procured from local shipyards by December 2016.

IV. ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1 TOPOGRAPHY, SOIL AND GEOLOGY

Topography is a configuration of a land surface including its relief and contours, the distribution of mountains and valleys, the patterns of rivers, and all other natural features that produce the landscape. Although Bangladesh is a small country, it has considerable topographic diversity. There are three distinctive natural features in Bangladesh:

- a broad alluvial plain subject to frequent flooding;
- a slightly elevated relatively older plain;
- a small hill region drained by fast flowing rivers.

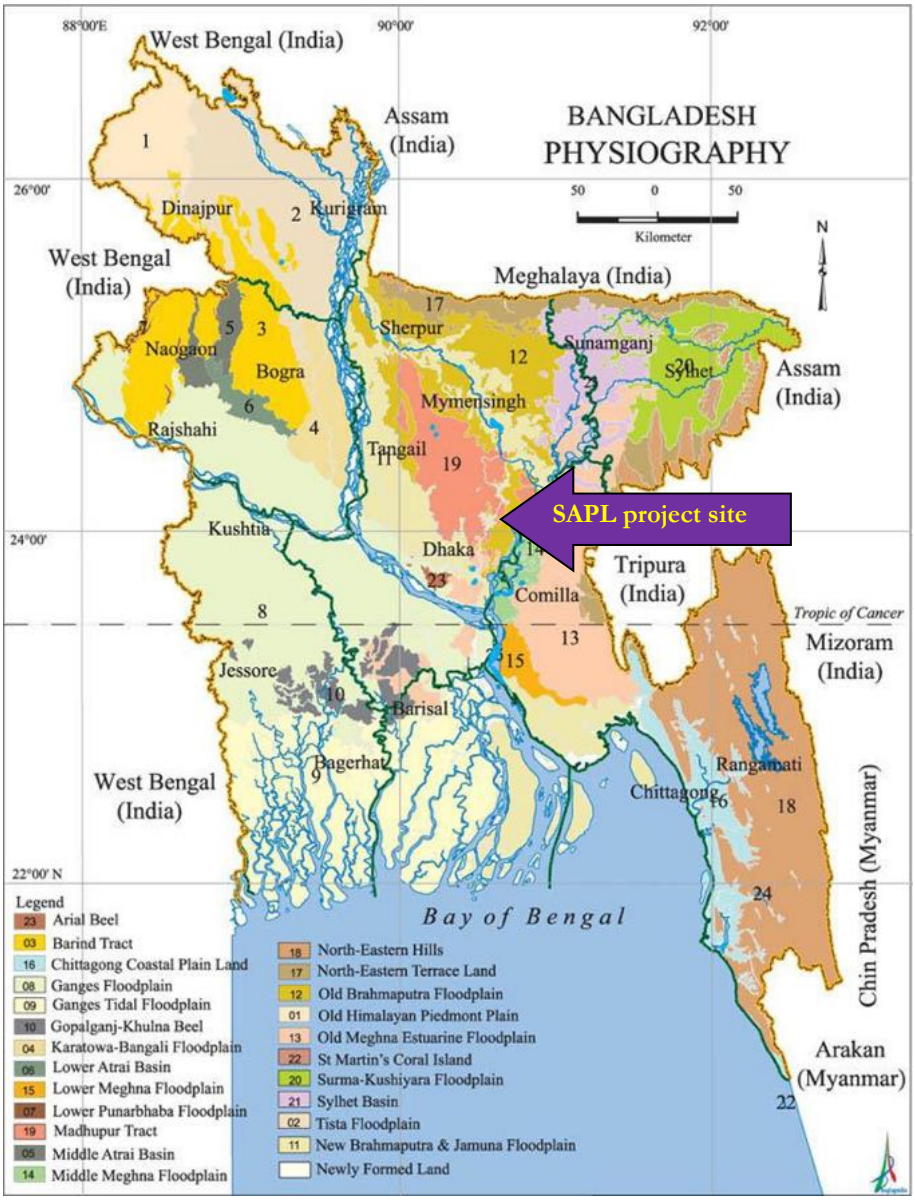


Figure 4.1: Physiographical Map of Bangladesh[10]

[10] Source: http://en.banglapedia.org/index.php?title=File:Physiography.jpg date 11/09/2014

Based on the aforesaid classification, the topography of Munshigonj has been fallen into the Northern and Eastern Piedmont Plains Tract under the Pleistocene Terrace. It can also be categorised as part of the Old Brahmaputra-Meghna Floodplain. This region comprises of the area of Brahmaputra sediments. It has a complex relief of broad and narrow ridges, inter-ridge depressions, partially in filled cut-off channels and basins. This area is occupied by permeable silt loam to silty clay loam soils on the ridges and impermeable clays in the basins which are neutral to slightly acidic in reaction. General soil types include predominantly Grey Floodplain soils. Organic matter content is low in ridges and moderate in basins. The soil structure is assumed to have satisfactory load bearing capacity as is suitable for the project. In addition, the stability of topographic pattern has made the site a better choice for complex type of construction having significant vibration and momentum.

4.2 METEOROLOGY

Temperature, precipitation, humidity and wind speed are the basic element of meteorological condition. For recording the data of these elements Bangladesh Meteorological Department has set-up meteorological stations in different districts of the country. In case of Munshigonj, the Meteorological Station (MS) of Dhaka is considered as reference. The data of temperature, precipitation, humidity and wind speed as recorded in MS of Dhaka over the year 2007-12 are presented as follows with their implication to the Project.

4.2.1 Precipitation

According to the data of monthly average rainfall for a period of 2007-2012 as has been provided in Annex-21, most of the precipitation has been observed in 3 months (Jun, July and August). Precipitation is hardly observed in November, December and January. The maximum rainfall has been observed in July 2007 (753 mm).

4.2.2 Relative Humidity

As humidity of air has close relationship with precipitation pattern, the maximum level of humidity has been observed in June, July, august and September (reference: Annex-22). The highest humidity has been recorded as 84% in July 2007 whereas the lowest was 52% in February 2012.

4.2.3 Ambient Air Temperature

Monthly maximum and minimum air temperature for a period of 2007-2012 have been provided in Annex-24 and Annex-25 mm respectively. Accordingly, the highest temperature has been observed as 39.6^0C in 2009, whereas the lowest temperature was 8.2^0C in 2011.

4.2.4 Wind Speed and Direction

The weather in Bangladesh is largely governed by the monsoon. The prevailing wind directions are from South to South East during the months of April through September. After taking easterly direction for a while the wind turns to the northerly and north easterly directions, the later prevail from November to January. During the months of February and March winds turn via westerly direction back to the Southerly to south Easterly. Monthly prevailing wind speed of Dhaka for the period of 2007-2012 are presented in Annex-23. Based on the data, it is

observed that the highest wind speed was 9.6 knot in October 2008. But the lowest wind speed was 2.0 knot which has been observed in October 2011 and 2012.

In the following four Figures 4.2-4.5, direction of wind movement has been presented in a graphical manner, which is known as 'Wind Rose'.

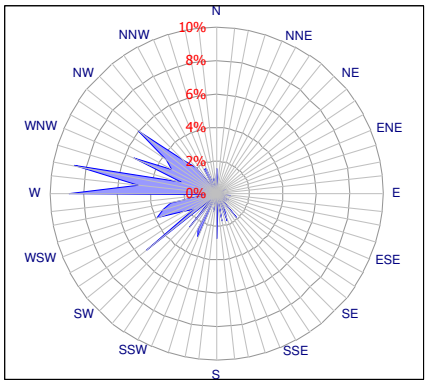


Figure 4.2: Wind rose diagram for the month of January-March 2012

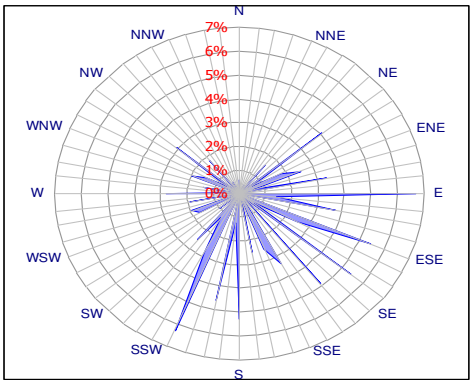


Figure 4.3: Wind rose diagram for the month of April-June 2012

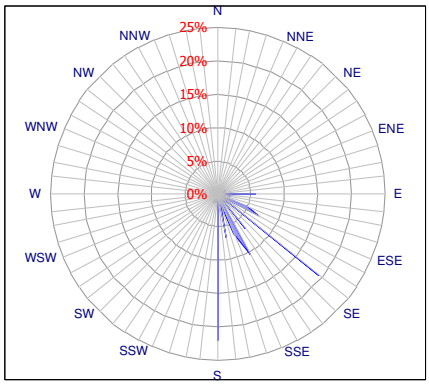


Figure 4.4: Wind rose diagram for the month of July-September 2012

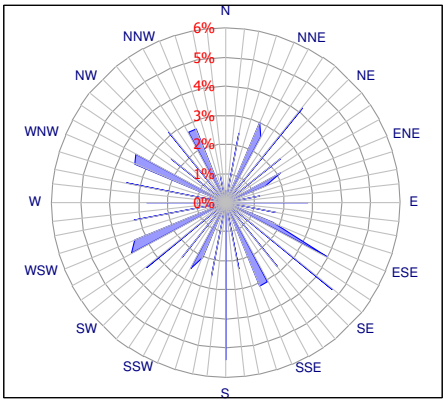


Figure 4.5: Wind rose diagram for the month of October-December 2012

The basis of these four wind roses is the average direction of wind movement in 2012. In January-March, wind blew mostly from the West and North-West direction. In April-June, the dominating wind direction were East and South, South-West. But in July, its direction were East and the South; and in October, wind blew practically from all directions. Based on these wind roses, it can be said that the speed and direction of ambient wind has limited scope to disperse of air pollutants to the adjacent locality.

4.3 AIR QUALITY

BCAS has conducted a 24 hours continuous air quality monitoring in the project area. The monitoring period was 27-29 August 2014. The result of the air quality collected is shown in Table 4.1.

Table 4.1: Ambient air quality of the project area

Description of data collection point	Distance from the centre	Ambient Air Pollution Concentration ($\mu g/m^3$)				
		$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
Northern side of the site **N 23^0 34' 31.05" E 90^0 30' 40.85"**	100m	46.2 (24 hours)	219.1 (24 hours)	13.6 (24 hours)	6.9 Annually	5.4 (8 hours)
Western side of the site **N 23^0 34' 30.58" E 90^0 30' 46.68"**	150m	52.6 (24 hours)	251.3 (24 hours)	12.7 (24 hours)	6.6 Annually	4.7 (8 hours)
Southern side of the site **N 23^0 34' 21.68" E 90^0 30' 45.95"**	120m	41.4 (24 hours)	262.5 (24 hours)	15.8 (24 hours)	6.9 Annually	4.7 (8 hours)
Eastern side of the site **N 23^0 34' 22.54" E 90^0 30' 40.17"**	185m	45.2 (24 hours)	273.5 (24 hours)	17.9 (24 hours)	6.8 Annually	5.1 (8 hours)
Method of analysis		Gravimetric	Gravimetric	West-Geake	Jacob and Hochheiser	Indicator Tube
Test Duration (Hours)		24	24	Annually	Annually	24
Bangladesh (DoE) Standard for ambient Air		65	150	365	100	10000
WHO /World Bank Standard		25	50	20		NF

Table 4.1 shows that the ambient air quality in terms of PM10 and SPM is higher than the National Ambient Air Quality Standard (NAAQS). But the concentration of NOx and SO_2 are significantly less than the acceptable limit, which means that there is reasonable buffer/assimilation capacity to absorb air pollutants to a certain extent.

4.4 IMPACT OF METEOROLOGICAL CONDITIONS

The meteorological parameters especially precipitation and air temperature are the key drivers to directly influencing the navigation on inland waterways as well as operation of a river port. These parameters determine the water supply and the water temperature in the navigable river sections and infrastructure of river port close to the river side. The changes, especially in the water supply, will alter the occurrence of extreme hydrological conditions and thus will indirectly change the navigability of waterways and affect the port operation. In addition, wind may also appear as a matter of significant concern as has been detailed in Table 4.2.

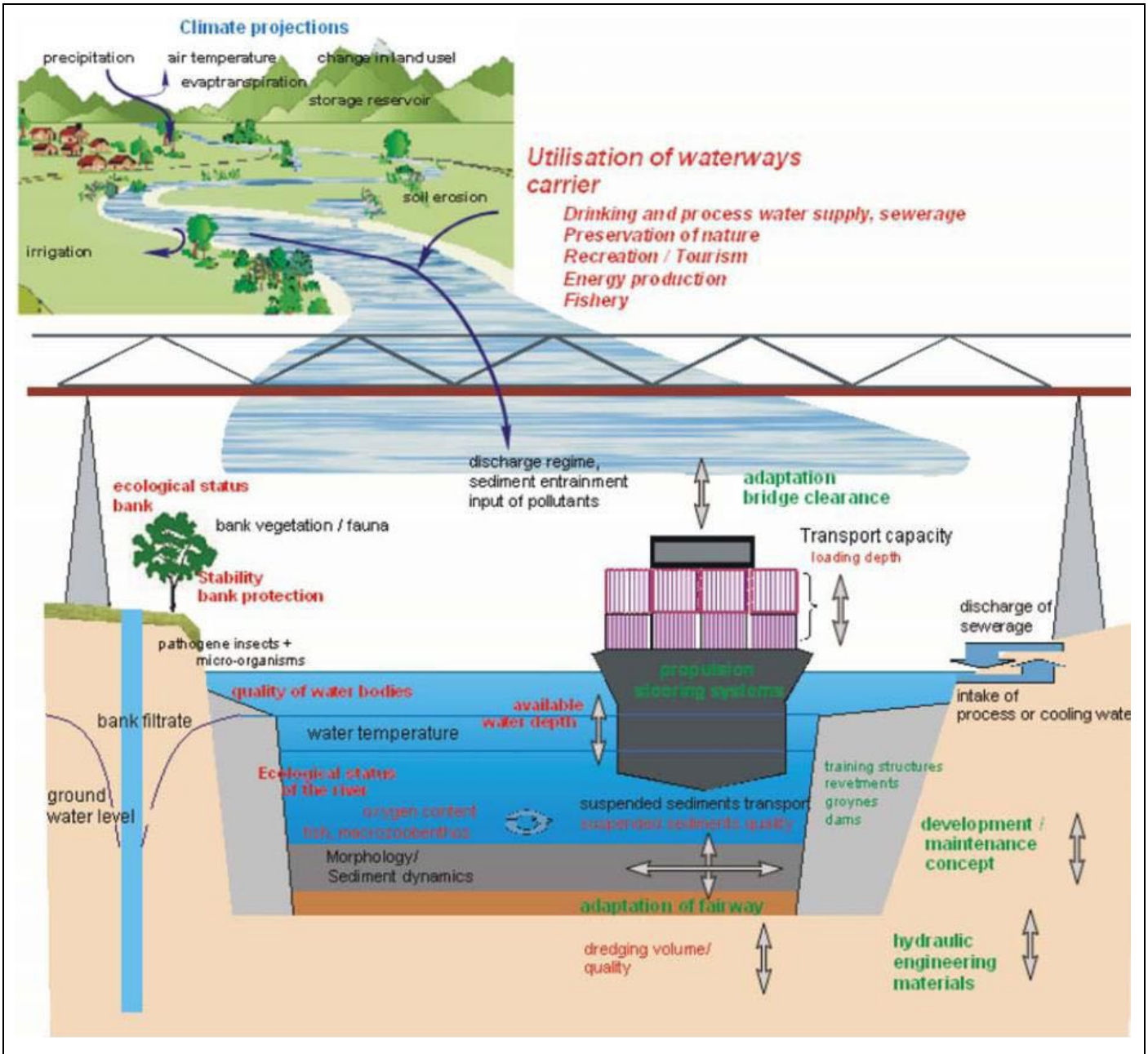


Figure 4.6: Links between drivers of change and potential impacts on inland navigation[11]

[11] Source: http://www.pianc.org/downloads/envicom/envicom-free-tg3.pdf date 11/09/2014

Table 4.2: Tentative impact of hydro-meteorological parameters to a river port

Meteorological parameters	Category	Impacts on inland navigation and port operation
Precipitation	▪ High rainfall and extreme high rainfall resulting flood.	▪ Increased water level and ▪ Loss of expected velocity ▪ Changes in the sedimentation process ▪ Difficulty in maneuver ▪ Difficulty in loading and unloading ▪ Increased loads on structures ▪ Affect the regularity of port
Temperature	Air, surface and water temperature, including maximum and minimum, first occurrence of season, heat index, cooling or heating degree days.	▪ Stresses on vehicle and port components and infrastructures ▪ Adverse impact on perishable cargoes
Wind	Higher wind velocity and extreme high wind velocity taking the shape of Cyclone and Tornado	▪ Higher wind velocity adversely affects the movement of marine vessel and operation of the port. ▪ Due to cyclone and tornado there could be significant damage to marine vessel and port operation (Annex-32).

4.5 AMBIENT NOISE QUALITY

Table 4.3 shows the maximum and minimum noise level at different monitoring points in the project site. Based on the data it assumes that the ambient noise level of the project site is high with a range of 51-72 dBA. The detail data of hourly noise monitoring is available at Appendix–20. The main cause of high ambient noise level is the vehicular movement through Dhaka-Muktarpur Road and movement of marine vessel through Dhaleswari River.

Table 4.3: Noise level at different locations in project site at different time (hourly)

Period	Noise level at River side (southern side) (dBA)		Noise level at Northern side (dBA)		Noise level at Gate side (eastern side) (dBA)		Noise level at Central point (dBA)	
	Max	Min	Max	Min	Max	Min	Max	Min
Day time[12]	68	52	69	52	64	51	72	56
Night time	65	53	63	51	57	50	66	52

[12] Assuming Day time as 6 a.m. to 6 p.m. and Night time as 6 p.m. to 6 a.m.

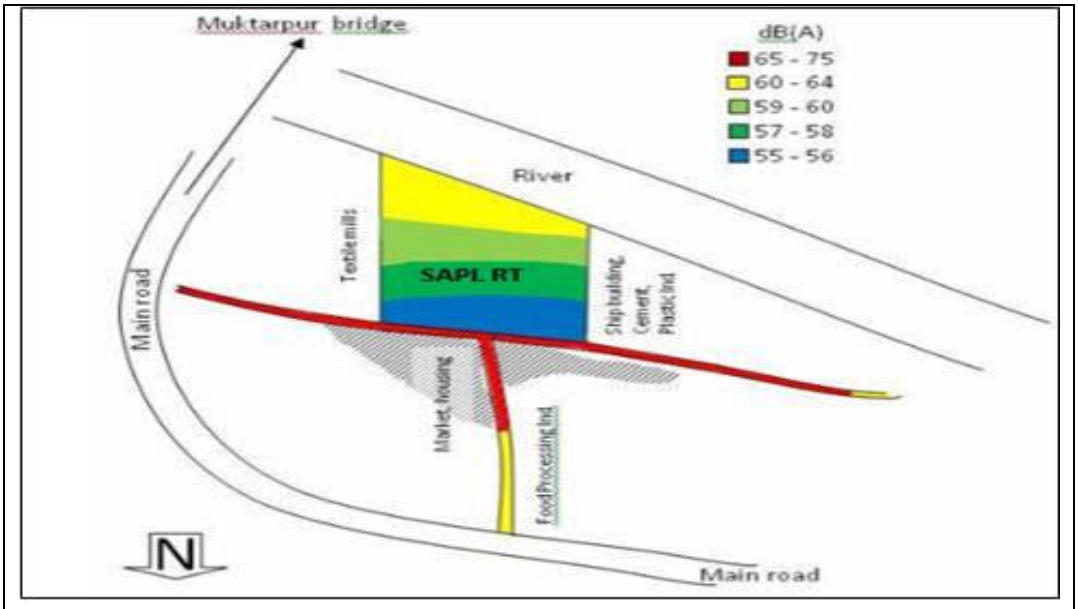


Figure 4.7: Base noise level mapping at the site and the neighboring service road

4.6 SEISMICITY

In Bangladesh National Building Code 1993, Bangladesh has classified three seismic zones in Bangladesh as is shown in Figure 4.8, where Zone-I has the most severe and Zone-III has the least impact based on seismic coefficient. The seismic coefficient for zone I, II and III are 0.08 g, 0.05g and 0.04g respectively.

The SAPL project area falls in Zone-II, which means that there is considerable risk of earthquake and associated hazard. SAPL has informed that they have considered the concern of seismicity with due attention. Accordingly, jetty and associated infrastructures have been considered in consideration of 6 Richter scale. In case of other construction activities, they have complied with the requirement of Bangladesh National Building Code 2006.

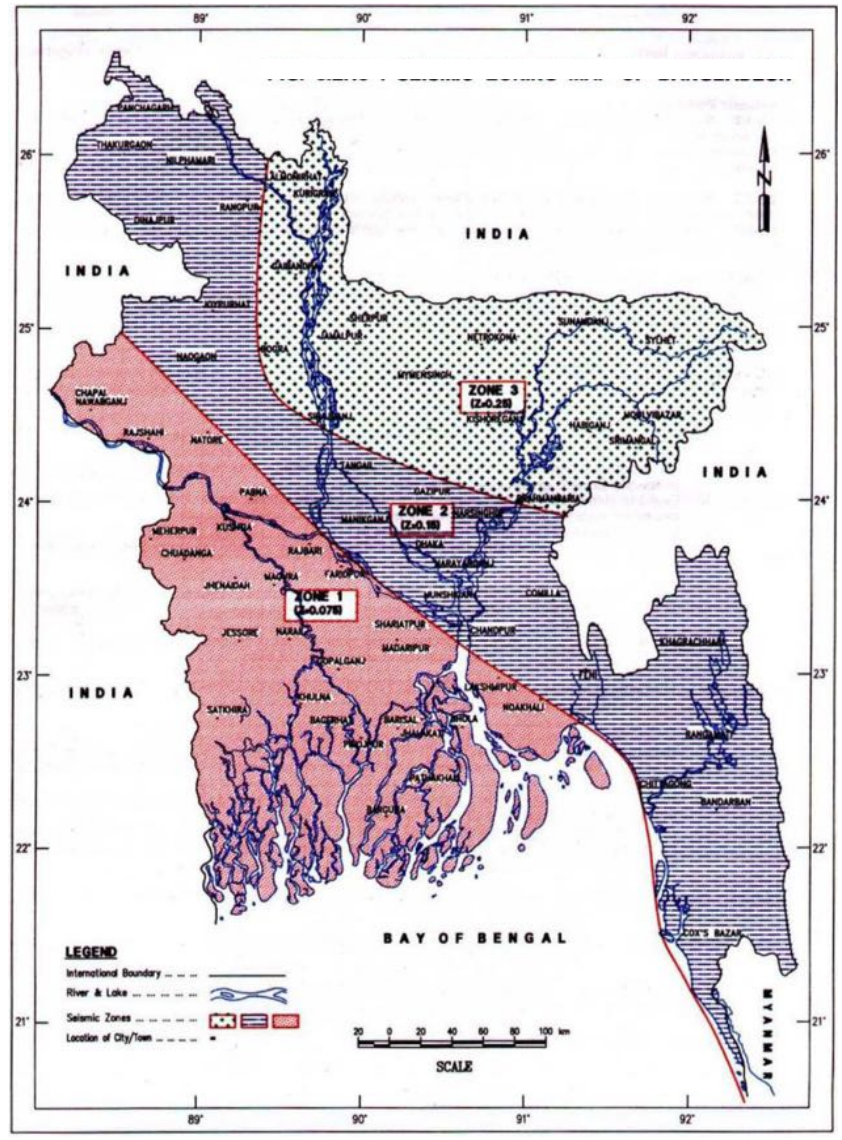


Figure 4.8: Seismic zoning in Bangladesh[13]

4.7 HYDROLOGY

There are two broad components of hydrology-surface water and ground water. In the following sections the quality of surface and ground water is discussed in consideration of some specific parameters.

[13] Source: Bangladesh National Building Code, 1993

Surface Water Quality

The Dhaleshwari River is the most important surface water source in the project area. Water was collected from the river and analyzed in the laboratory of Adroit Environment Consultants Limited (AECL). Table 4.4 shows the concentration of various aspects.

Table 4.4: Water quality of Dhaleshwari River

Parameter	Concentration
pH	6.21
Total Dissolved Solids (TDS)	104 mg/l
Total Suspended Solids (TSS)	34 mg/l
Total Ammonia as NH_3	0.48 mg/l
Sulfate	17.7 mg/l
Sulfide	0.01 mg/l
Phosphate	0.13 mg/l
Nitrate	0.70 mg/l
Nitrite	0.05 mg/l
Lead (Pb)	0.05 mg/l
Cadmium (Cd)	0.01 mg/l
Chromium (Cr)	0.01 mg/l
BOD_5	1.40 mg/l
COD	6.00 mg/l
Total Coliform (TC)	7,650 cfu/100 ml
Fecal Coliform (FC)	4,050 cfu/100 ml

Source: AECL Lab (sample collected on 25.08. 2014)

Ground Water

To assess the ground water quality, sample was collected from a deep tube-well at the project area and it was analysed in the laboratory of AECL. Table 4.5 shows the concentration of various aspects.

Table 4.5: Water quality of a deep tube well

Parameter	Value/concentration
pH at 26.9°C	7.1
TDS	90.0 mg/l
Iron	0.8 mg/l
Alkalinity	78.0 mg/l
Hardness	68.0 mg/l
Chloride	16.4 mg/l
TSS	4.8 mg/l
COD	11.7
BOD	5.5
Arsenic	0.050
Conductivity	696

Source: AECL Lab (sample collected on 25.08. 2014)

4.8 BATHYMETRIC CONDITION

Bangladesh Inland Water Transport Authority (BIWTA) has conducted a Bathymetric Survey in November 2014. The survey report and its enlarged portion are available as Appendix 23 and 24 respectively. Based on the this survey, it can be said that the highest draft of Dhaleswari River along the Muktarpur Bridge channel is about 17 m and the available draft at SAPL site is 2-3 meter, which is sufficient for the proposed project purpose. As the survey was conducted in dry season (winter), the draft will be much higher during rainy season. So, it may be said that there is sufficient draft in Dhaleswari River for the project purpose.

According to ***A Study of Sedimentation in the Brahmaputra-Jamuna Flood Plain*** as has been prepared in 1995 by ISPAN[14], the Dhaleswari River is one of the major left-bank distributaries of the Jamuna River. The mean annual discharge of the river in 1987 was about 600 m^3/S, representing about 4% of Jamuna's total discharge. Total quantity of sediment was 533 mg/L and total dissolved solid was 97 mg/l.

4.9 FLORA AND FAUNA

Some aquatic and terrestrial flora and fauna as have been noted at project area, are mentioned in the following Table 4.6.

Table 4.6: Available flora and fauna at project area

Habitat	Flora		Fauna	
	Local Name	**Scientific Name**	**Local Name**	**Scientific Name**
Aquatic	Helencha	*Enhydro fluctuans*	Kolabang	*Rana tigrina*
	Kalmi	*Ipomoea aquatica*	Guishap	*Varanus bengalensis*
	Kochuripana	*Eichorina crassipes*	Pancowri	*Phalacrocorax carto*
	Shapla	*Nymphaea nouchali*	Kanibok	*Ardeola grayii*
Terrestrial	Durba gash	*Cynodon dactylon*	Toad	*Bufo melanostictus*
	Telakachu	*Coccinea cordifolia*	bull frog	*Rang tigrina*
	Babla	*Acacia nilotica*	Water snake	*Enhydris enhydris*
	Akanda	*Calotropis procera*	Dora sap	*Xenochrophis piscator*
	Shishu	*Dalbergia sissoo*	House sparrow	*Passer domestica*

[14] ISPAN means ***Irrigation Support Project for Asia and The Near East***

Photograph 4.1: Trees and shrubs (terrestrial) as are available at project area

Photograph 4.2: Trees and shrubs (terrestrial) as are available at project site

Fish is still reasonably available in the project area. The fishes include catfishes (Magur and Shing[15]), major carps (Katla, Rui and Mrigal), minor carps (Puti), other (Tengra, Boal, Mola, Taki, Shol). Also prawn, particularly the popular small prawns, locally known as Ichha are available significantly. The common types of reptiles are found in the area including water snake, house lizard, soft-shell, turtle etc.

Photograph 4.3 : Common fishes in the project area

[15] Local name of the fishes

Threatened Flora and Fauna

Floral and faunal species that exist as threatened (endangered, critically endangered, etc.) condition are known as threatened species. There are specific criteria to declare a species as threatened. A total of 54 freshwater fish and 147 inland wildlife species are threatened species in Bangladesh (IUCN, 2000a; 2000b; 2000c; 2000d; 2002). No threatened floral species has been identified in project area. Among the terrestrial fauna, Rat Snake (*Coluber Mucosus*) and Common Wolf Snake (*Lycodon Aulicus*) has been declared as vulnerable species, where as Yellow Monitor Lizard (*Varanus Salvator*), and Fishing cat (*Prionailurus Bengalensis*) has been defined as endangered species. In case of aquatic fauna, Ganges River Dolphin (*Platanista Gangetica*) has been found as endangered (Source: IUCN Red Book of Bangladesh).

4. 10 PROTECTED AREAS & ECOLOGICALLY CRITICAL AREA

Protected Area

Protect Area (PA) refers to an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means i.e., PA is predominantly a natural area established and managed in perpetuity, through legal or customary regimes, primarily to conserve their natural resources (IUCN, 1990). No PA exists at project area.

Ecologically Critical Area

Ecologically Critical Area (ECA) is an environmental protection zone, defined by the Government of Bangladesh under the Bangladesh Environment Conservation Act, 1995, where ecosystem is considered to be threatened to reach a critical state. No ECA exists at or near project area.

4.11 SOCIAL ASPECTS

Involuntary Resettlement

It is already said that the project site is a purchased land of SAPL from Holcim, Bangladesh through '*willing-seller willing-buyer*' arrangement. Based on the observation from site visit and information from secondary source, Holcim developed the site for their own industrial expansion purpose. So, they did not allow any squatter or informal economic activity to be developed on this site, resulting the site free from the issue of involuntary resettlement (IR).

However, SAPL management is committed to comply with social safeguards. They have identified 7 informal tents of ***Bede*** community as have been shown in Photographs 4.4 and 4.5. *Bede* is a nomadic ethnic group of Bangladesh. They are regarded as 'Water Gypsy' or 'River Gypsy'[16]. The *Bede* traditionally lives, travels, and earns living on the river. They do not live at a particular place and move from place to place, rather than settling down in one location. They change living places so many times a year for earning their livelihood.[17]

[16] A.K.M. Maksud, 2006. ***The Nomadic Bede Community and Their Mobile School Program***

[17] Halder Supravat, 2012 ***Bede Community of Bangladesh: A Socio Legal Study***

The temporary tents of these seven *Bede* households are at a reasonable distance away from the project site and currently the project does not result any adverse impact to them. But there is moderate scope that they might need to shift their tents in course of time, when the project will be operational. But based on the nomadic attitude, it is a question that whether these *Bede* will stay till the operation of the project. However, being socially responsive, SAPL has committed that they would give reasonable financial compensation to them to transfer their tents through 'up-front' arrangement. So, that they might not feel any financial inconvenience during the process of relocation to response the future necessity.

Photograph 4.4 and 4.5: Informal tents and some of the informal settlers

Indigenous People

Based on the primary observation and secondary source, there is yet any indigenous habitat at West Muktarpur. So, the project is not sensitive on indigenous people associated safeguards.

Socio-economic Condition

The socio-economic condition of the most of the villagers of West Muktarpur is assumed to be middle to lower middle class. Due to the availability of industries, there is employment opportunities for them. In addition of serving in various industries, a significant number of villagers are engaged in different agricultural activities. There is no structured health care facility in this locality. For health care, they are dependent on Upazila Health Center, Munshigonj. There is satisfactory electrification facility. Tube-well is the major source of drinking water. In case of institutional facility, there are two mosques and a primary school.

4.12 VULNERABILITY TO CLIMATE CHANGE AND NATURAL CALAMITY

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions, or in the distribution of weather around the average conditions (i.e., more or fewer extreme weather events). Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Certain human activities have also been identified as significant causes of recent climate change, often referred to as "global warming". In general, the major impacts of climate changes are:

- Sea Level rise
- Intrusion of salinity in ground water
- Changing rain and snow patterns
- Droughts
- Higher Temperature and more heat waves
- Stronger storms
- Warmer oceans

Consequence of Climate Change Impact on the Project

In the following sections, the various consequences of climate change impact in relevant to the Project are discussed:

Sea level rise and intrusion of salinity: It is assumed that due to the impact of climate change sea level will rise significantly resulting intrusion of salinity, which means the level of water of the Bay of Bengal will rise. But due to geographical position, the project site is in an advantageous position (Figure 4.10). However, due to close proximity of Dhaleswari River recurring flood could be a matter of concern. To address the flood issue, the project site has been raised about 1 meter above the flood level of 1998. In addition, the issue of salinity intrusion in groundwater has not yet taken any concern raising situation in West Muktarpur (Figure 4.13).

Increase of cyclone: As a consequence of climate change, there is possibility of increasing intensity and frequency of cyclone. In case of cyclonic impact, it has fallen under the category of low risk area (Figure 4.11). However, for better safety SAPL is expected to consider the cyclone data of Munshigonj district and adjacent areas for last 50 years

Drought: In terms of drought, no significant concern is assumed for the Project. Because it requires only $2m^3$ of water per day. So, depletion of water table seems not to be an alarming issue for the sustainability of the project. Based on the aforesaid discussion, it can be said that the adverse impact of climate change and general trend of natural calamity will not adversely affect the project.

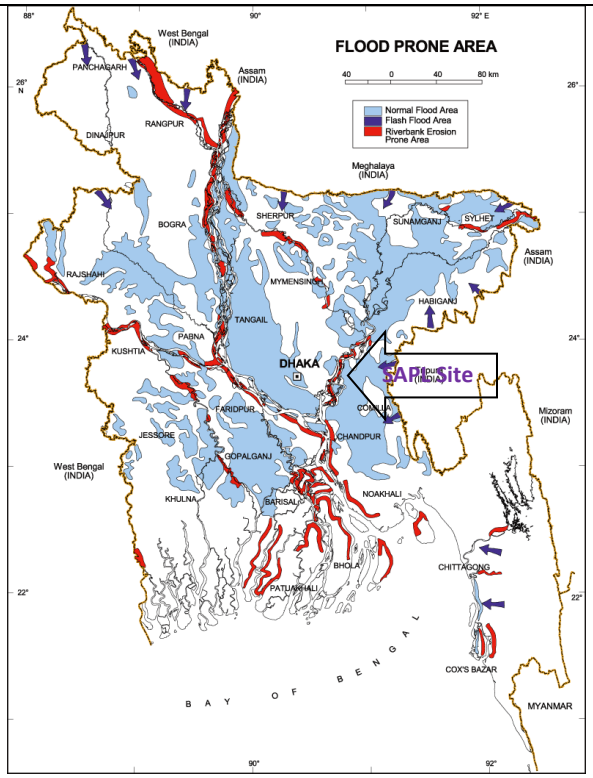


Figure 4.10: Flood prone area in Bangladesh[18]

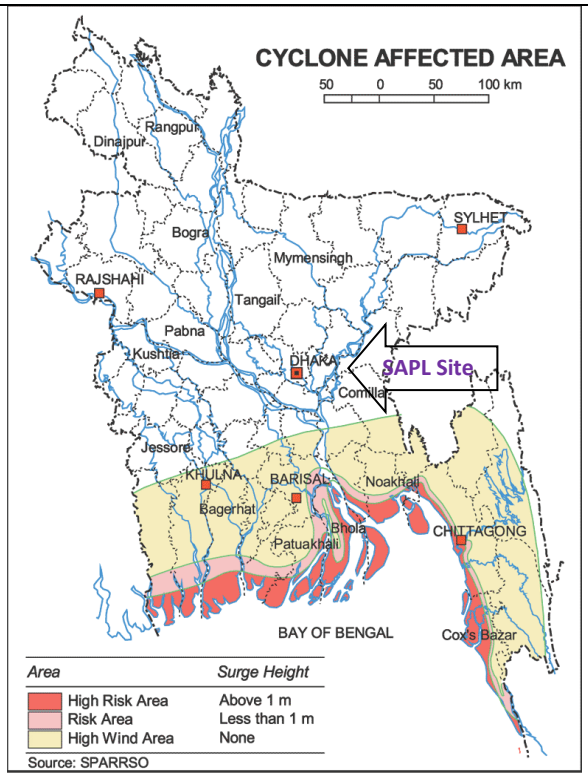


Figure 4.11: Cyclone affected area in Bangladesh

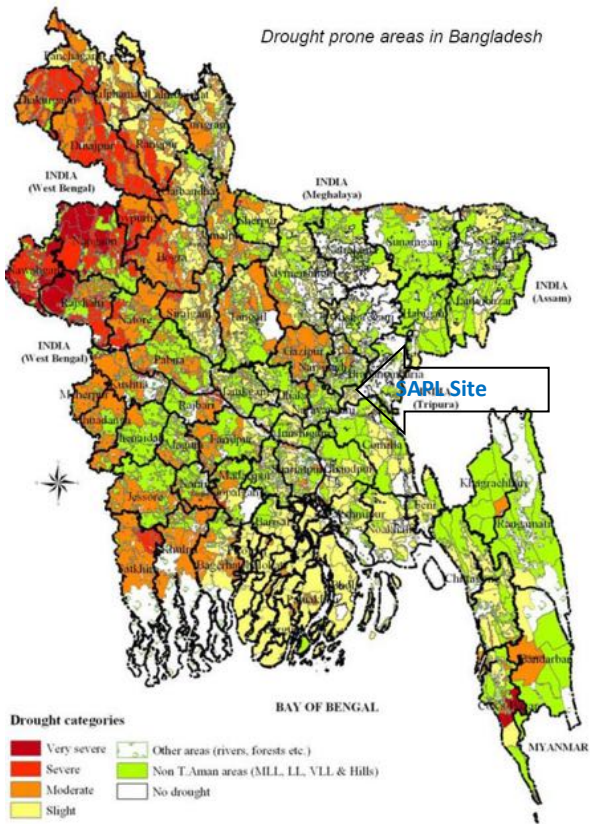


Figure 4.12: Drought prone area in Bangladesh[19]

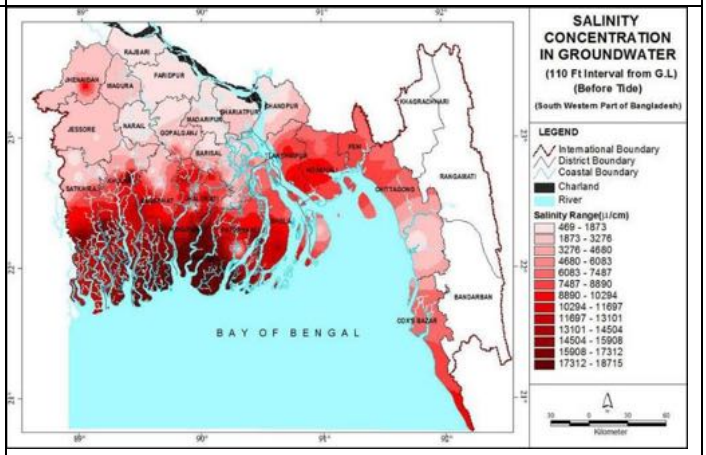


Figure 4.13: Salinity intrusion in groundwater

[18] Source: http://www.poribesh.com/Maps/Flood.htm date 11/09/2014

[19] Source: Climate Change Cell, 2006. ***Climate Variability and Change in Bangladesh***

V. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 ENVIRONMENTAL IMPACTS

A rapid environmental assessment (REA) has been conducted to assess the tentative major environmental impact of the project (Annex-1). However, the detail environmental impacts of the project in three different phases (construction, operation and de-commissioning) have been discussed in the following sections.

5. 2 ENVIRONMENTAL IMPACTS DURING CONSTRUCTION PHASE

A list of important activities during the construction phase of the project is provided in Box 5.1.

Box 5.1: Major activities during construction phase

- **Mobilization of equipment, materials and personnel;**
- **Piling and bank protection works**
- **Construction of embankment and yard facilities;**
- **Construction of drainage facilities;**
- **Construction of internal roads;**
- **Construction of buildings and related civil facilities; and**
- **Electro-mechanical works**

The major environmental impacts during construction phase and proposed mitigation measures are discussed in Table 5.1.

Table 5.1: Major environmental impacts and proposed mitigation measures during construction

Type of impact	Scale of impact	Causes of the impact	Proposed mitigation measures
Impact on topography	Moderate[20]	▪ 1.5m land filling ▪ Cutting of some small trees and vegetation, shrubs, herbs etc.	▪ The land filling was conducted by sand supplied by third party ▪ No requirement to cut any big tree
Impact on micro-climate	Low	▪ The project is too small in scale to adversely affect the micro-climate	▪ No mitigation measure is required
Impact on air quality	Moderate	▪ Emission of CO, NOx, SOx from the heavy trucks and earth moving equipment	▪ Application of equipment having satisfactory condition
	High	▪ Civil works including transportation of	▪ Periodic watering of stockpiles

[20] To assess the scale of adverse impacts, three scale of intensity has been selected. They are **Low**, **Moderate** and **High**

Type of impact	Scale of impact	Causes of the impact	Proposed mitigation measures
		construction equipment and materials will result in dust emission	▪ Limiting speed of vehicular travel ▪ Using water sprays during the loading and unloading of materials ▪ Sweeping and/or water flushing of the entrances to construction zones ▪ Construction materials should be properly covered while hauled and stored
Impact on noise level	High	▪ Movement of vehicles for transportation of construction equipment and materials ▪ Civil works including stone crush, piling etc.	▪ Application of PPE including ear plug, ear muffler ▪ Concentrating the major noise generating construction work at day time ▪ Rotation of workers exposed in higher noise
Impact on surface and ground water quality	Moderate	▪ Contamination to water bodies may result due to oil spilling during construction activities and/or surface runoff from the construction site to the nearby water body. ▪ Spent lubricating oil will be generated during the construction period from the heavy construction equipment like the tractors, piling equipment and cranes.	▪ The spent oil should be collected and put into drums and sold to outside contractors. ▪ There should be application of liner (as required)
Impact on Ecology	Low	▪ Based on the scale and intensity of the construction phase of the project, it is assumed that the project will not result any significant threat to the ambient ecology.	▪ No mitigation measure is recommended.
Impact on occupational health safety	Moderate	▪ Some construction activities like embankment, jetty etc. require adequate attention on occupational health safety	▪ Ensuring adequate awareness ▪ Adopting proper PPE at an adequate standard with sufficient quantity. ▪ Regularly conducting 'tool-box' meeting for workers;
Impact on community safety	Moderate	▪ Being close proximity to neighborhood, the issue of community safety is important for this project.	▪ Adequate attention and rationale safety measures are to be adopted to minimize the risk of

Type of impact	Scale of impact	Causes of the impact	Proposed mitigation measures
			health hazard of the community.
Impact of human waste	Moderate	▪ As most of the workers are from the local area and no accommodation facilities were provided, the requirement of an elaborate sewerage disposal system was not required.	▪ Sanitary latrines and soak pits were installed by considering a wastewater generation rate of 50 litres per capita per day for about 100 workers.
Impact of construction and domestic waste	High	▪ Project construction activities will result in generation of inert solid wastes, including lumber, excess concrete, metal and glass scrap, and empty containers.	▪ Separation of wastes at sources ▪ Proper temporary storage of waste and debris, ▪ Good housekeeping of work areas. No part of this construction waste should be mixed with the domestic solid waste. ▪ Separation of saleable solid waste through screening process and dispose to the secondary users ▪ The insignificant waste shall be disposed in a safe manner.

5.3 ENVIRONMENTAL IMPACTS DURING OPERATION PHASE

According to the ***IFC EHS Guidelines for Ports, Harbors and Terminals*****,** the typical environmental issues related to operation phase of the proposed project operations include the following major environmental impacts (Box 5.2).

Box 5.2: Major environmental impacts of a river terminal project

- **Dredged materials management**
- **Air emission**
- **General waste reception**
- **Waste water**
- **Solid waste management**
- **Hazardous materials and oil management Noise**
- **Biodiversity**

5.3.1 Dredged Materials Management

In general, river terminal project associates with dredging activities both in construction and operation phases. Construction and maintenance dredging, and dredge-spoil disposal, may affect habitats and pose a significant hazard to human health and the environment, particularly if the sediments are contaminated by historical deposition and accumulation of hazardous materials, whether due to on- site or off-site activities. As mitigation measures, the basic recommendations are:

Dredge Planning Activities

- Dredging should only be conducted based on the necessity of new infrastructure or port navigation access.
- Prior to dredging, materials should be evaluated for their physical, chemical, biological and engineering properties.

Dredging

- Excavation and dredging methods should be selected to minimize suspension of sediments, minimize destruction of benthic habitat, increase the accuracy of the operation, and maintain the density of the dredge material, especially if the dredge material includes contaminated areas. There are several dredging methods which are commonly used depending on the depth of the sediments and environmental concerns such as the need to minimize sediment suspension and increase dredging accuracy.
- Areas sensitive for marine life such as feeding, breeding, calving and spawning areas should be identified.

Disposal of Dredged Materials

- Dredged material should be analyzed in order to select appropriate disposal options (e.g. land reclamation, open water discharge, or contained disposal). Beneficial reuse of uncontaminated, dredged material should be considered (e.g. for wetland creation or enhancements, habitat restoration, or creation of public access / recreational facilities).

Photograph 5.1: Barge carrying dredge materails

The proposed project has required dredging for raising the level of the height of the project site about 1.5 m and maintenance dredging to ensure the required draft for the expected marine vessel. In case of land filling, the dredging was accomplished by third party sand supplier, who has carried the landfill sand by diesel fuelled barge. On the other hand, for maintenance dredging, SAPL has engaged Bangladesh Inland Water Transport Authority (BIWTA). For dredging BIWTA will use Cutter-Suction technology. As SAPL has already constructed a retaining wall along the entire length of the river front, there is insignificant risk of river erosion. In addition, it is assumed that the sedimentation will be too minimal to appear as concern.

According to ***Guidelines for Dredging***[21], maintenance dredging is required basically for following basic reasons:

i. In adequate depth and width of channels

ii. Allow temporary spoil sites near the river

iii. Discharge dredge spoils into the rivers

iv. In adequate attention to minimise erosion in the catchments.

In consideration of the aforesaid four reasons of requiring maintenance dredging, it can be said that SAPL projects is in an advantageous position. Because there is sufficient draft and width of channels. No dredge spoils were found to discharge in the river. In addition, due to the embankment and associated retention wall, the possibility of erosion of river bank has been minimised significantly. In addition, the size of the proposed marine vessel is also limited (with capacity of only 140 TEU) to affect the topographic feature of river.

So, we may conclude that the project is not expected to significantly affect the adjacent locality as well as aquatic community through dredging.

[21] Environmental Protection Authority (Victoria of Australia), 2001. ***Guidelines for Dredging***

5.3.2 Air Emission

The most significant sources of air pollutants from river terminal operation includes combustion emissions from marine vessels' (MV) propulsion and auxiliary engines and boilers, mainly consisting of SO_2, NO_X, CO and CO_2, PM, and VOC, followed by combustion source emissions from vehicles and land- based engines and boilers contributing similar pollutants. VOC may also be emitted from fuel storage and transfer. Storage and handling of dry bulk cargo, as well as loading and unloading vehicle traffic may also contribute to PM emissions.

During operation of the project, the potential sources of air pollution are:

- diesel fueled vehicles (trucks) carrying goods to and from the container terminal,
- container handling equipment (e.g., Cranes, Reach Stacker and Forklifts) which are mostly run by diesel engines port (2000 kVA capacity) for electricity supply at the terminal.
- Diesel generators
- Diesel storage tank

Table 5.2 shows the various equipment which will be in operation and will be considered in assessing the impact on air quality using the air dispersion modeling.

Table 5.2: Various items with their quantities and operation

Item	Quantity
No. of Barges	4 /day
Container handling capacity	1,20,000 TEU /year
Trucks (100 kW, diesel fueled)	325 /day
Crane (FCC) (195 kW, diesel engine operated)	2
Reach stacker (257kW, diesel engine operated)	1
Fork lift-5t (64.7 kW, diesel engine operated)	1
Fork lift-3t (battery operated)	2
Diesel generator(2000 kVA)	1
Fuel storage tank	2000 litres

Source: SAPL

Air Dispersion Modelling

The salient features and findings of air dispersion modelling is described as follows:

a. Model Selection

AERMOD model, version 09292, has been selected for this study as it is currently the preferred model to USEPA (www.epa.gov/scram001/7thconf/aermod_mep.pdf). AERMOD is a steady-state plume model. In the stable boundary layer (SBL), the concentration distribution is assumed to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is assumed to be Gaussian, but the vertical distribution is

described with a bi-Gaussian probability density function (p.d.f.).

b. Modeling Methodology

Set up: AERMOD was used with the following setup:

- A model domain of 7.5 km by 7.5 km centered on the stack (0.0, 0.0) and 500m grid spacing's using Cartesian Co-ordinates.
- Assumption of no terrain as the site surrounding the proposed plant is essentially flat with no hilly areas.
- Surface roughness lengths between 0.1m and 0.3m depending on the seasons were used to account for the primary flows of concern across relatively flat areas.
- Building wake effects were not included as the heights of the nearest buildings were not sufficient to influence emissions.

Data Requirement: All meteorological stations used to collect data for dispersion modeling purposes must use an anemometer that has a stall speed of 0.5 m/s or less. For the AERMOD dispersion model, two meteorological files (surface file and profile file) are needed.

Box 5.3: List of meteorological parameters required for the surface file

H	sensible heat flux (W/m2)
u*	surface friction velocity (m/s)
w*	convective velocity scale (m/s)
VPTG	vertical potential temperature gradient in the 500 m layer above PBL
Zic	height of convectively-generated boundary layer (m)
Zim	height of mechanically-generated boundary layer (m)
L	Monin-Obukhov length (m)
zo	surface roughness length (m)
Bo	Bowen ratio
r	Albedo
Ws	wind speed (m/s)
Wd	wind direction (degrees)
zref	reference height for Ws and Wd (m)
temp	temperature (K)
ztemp	reference height for temp (m)

Box 5.4: List of meteorological parameters required for the profile file

height	measurement height (m)
top	1, if this is the last (highest) level for this hour, or 0 otherwise
WDnn	wind direction at the current level (degrees)
WSnn	wind speed at the current level (m/s)
TTnn	temperature at the current level (°C)
SAnn	F2 (degrees)
SWnn	Fw (m/s)

The data files (both) should include hourly average values for the above parameters. Wind speed, wind direction, ambient temperature, cloud cover, solar radiation, pressure, relative humidity and precipitation rate can be directly measured, but other parameters need to be determined indirectly using other meteorological parameters with empirical formulae.

Preparation of meteorological data: Surface characteristics in the form of albedo, surface roughness and Bowen ratio are standard values depending on the season. Standard meteorological observations (wind speed, wind direction, temperature, and cloud cover) for the site have been procured from the Bangladesh Meteorological Department (BMD) and are used to calculate the PBL parameters: friction velocity (u*), Monin-Obukhov length (L), convective velocity scale (w*), temperature scale (*), mixing height (z i), and surface heat flux (H) These parameters are then used to calculate vertical profiles of wind speed (u), lateral and vertical turbulent fluctuations (v, w), potential temperature gradient (d/dz) (www.weblakes.com/guides/aermod/sec3/3_1_4.html). *Meteorological data period:* 1st December 2011 – 30 November 2012.

c. Baseline Air Quality data

The measured baseline data collected in August 2014 is shown in Table 5.3

Table 5.3: Measured baseline concentrations of pollutants

Pollutant	Background concentration (μg/m^3)
NO2	6.90
CO	5.40
PM10	219.10
SO2	15.80

d. Modeling Results

Maximum 50 values for SOx, NO_X, PM10 and CO are presented in Tables 5.4 and Table 5.5 shows the combined ground level concentrations as percentage of Bangladesh standards.

Table 5.4: Project highest concentration

Pollutant	highest concentration (μg/m^3)
NOx	1.58
CO	1.81
SOx	12.62
PM10	0.08

Table 5.5: Ground level concentrations

Pollutant	Averaging Period	Air Quality Standard ($\mu g/m^3$)	Baseline Concentrations ($\mu g/m^3$)	Model Prediction Values ($\mu g/m^3$)	Combined Values ($\mu g/m^3$)	Bangladesh Standards ($\mu g/m^3$)
NOx	24 hours	100	6.9	1.58	8.48	150.00
SOx	24 hours	365	15.8	12.62	28.48	120.00
CO	8 hours	10,000	5.4	1.81	7.21	10.00
PM10	24 hours	150	219.1	0.08	219.18	150.00

The above results show that during operation phase of the proposed project, the concentration of NOx, SOx and CO would be within the Bangladesh standards. But the concentration of PM 10 would be much higher than the acceptable limit. The reason is the high baseline concentration of PM10 due to the large number of industries in the area especially the cement industry and series of traditional brick kilns in close proximity to the project area as have been shown in Photographs 5.2 and 5.3 respectively.

Photograph 5.2: Cement factory adjacent to the project site

Photograph 5.3: Strip of brick kilns opposite of the project site

5.3.3 Waste Water

Water effluents associated with river terminal activities may include storm-water and sewage from operations, as well as sewage, ballast-water (e.g. from oil tankers), bilge water, and vessel cleaning wastewater from ships. In addition, there will be re-fueling of MV. Sewage and wastewater generating from MV usually contains high levels of BOD and Coliform bacteria, with trace concentrations of constituents such as pharmaceuticals, and typically low pH levels. Wash water may contain residues such as oil. Pollutants in bilge water contain elevated levels of BOD, COD, dissolved solids, oil, and other chemicals that accumulate as the result of routine operations. In case of a river port project, the general sources of waste water and their potential mitigation/management measures are depicted in Table 5.6.

Table 5.6: Sources of waste water and tentative management measures for a river port

Sources of wastewater	Management/mitigation measures
Port sewage and stormwater	▪ Avoiding installation of storm drainage catch basins that discharge directly into surface waters, using containment basins in areas with a high risk of accidental releases of oil or hazardous materials, and oil / grit or oil / water separators in all runoff collection areas; ▪ Installing filter mechanisms (e.g. draining swabs, filter berms, drainage inlet protection, sediment traps and sediment basins) to prevent sediment and particulates from reaching the surface water.
MV waste water	▪ Oily waste and wastewater should be collected in barges, vehicles, or central collection systems and storage tanks; ▪ The capacity of oily waste collection should be established based on applicable MARPOL provisions; ▪ Wastewater with noxious chemicals from bulk tank cleaning should be collected through appropriate onsite or off-site treatment prior to discharge.

Source: IFC EHS Guidelines for Ports, Harbors and Terminals

Because of small-scale operation (initially 1 or 2 vessels, and 5 vessels at the peak of its operation) and absence of passenger vessels, the volume of sewage, ballast water, bilge water, and vessel-cleaning wastewater from the barges to be used for shipment of cargo/ container at the proposed project would be small. Besides, there will be separate system for disposal of storm-water and sewage from the river terminal operations. However, improper disposal of ship waste/ wastewater may lead to pollution. Hence proper management of ship and terminal waste/ wastewater is of utmost importance for prevention of environmental pollution, particularly water pollution.

In case of addressing sanitary waste water, SAPL has informed that they will arrange septic tank with soak pit facility with a capacity required for 100 persons.

5.3.4 Waste Management

The type and amount of solid and liquid wastes associated with river port operations may vary significantly depending on the nature of port operations and the types of MVs serviced. Wastes originating at the port may include inert solid waste from cargo packaging and from administrative offices, as well as hazardous or potentially hazardous waste associated with vehicle maintenance operations (e.g. used lubricating oils and engine degreasing solvents). Wastes originating from MV may include oily inert materials such as food packaging, and food waste.

During operation phase, the solid wastes of the project include oil filter, air filter, scrap tires, batteries, other wastes of maintenance workshop and from kitchen and Project personnel daily uses. Improper disposal of solid waste may interrupt the drainage system as well as may pollute the surface water body. To manage the solid waste properly, SAPL has to confirm the compliance of good house-keeping policy and procedure. Personnel should be trained accordingly. Two separate waste bins should be placed to collect the daily waste as organic and inorganic. All plastic materials would be sold to DOE enlisted secondary users for recycling. Biodegradable waste could be compost and later use as fertilizer.

SAPL has been found to consider the waste management issue with due importance. They have introduced a number of dustbins including the approach of separating the waste at source. SAPL has to adopt a sustainable **Waste Management Guidelines** and ensures its proper implementation. In this regard, they may consider Table 5.7 as a reference.

Table 5.7: Sources of waste and tentative management measures for a river port

Sources of wastes	Management measures
General Waste Reception	▪ Terminal facilities should provide adequate means of receiving and managing effluents and wastes to meet its own needs and those of visiting MV and for which the terminal is designed to service. ▪ Terminal waste reception facilities should provide adequate capacity to receive terminal and MV generated wastes including appropriately sized and located receptacles, and the capacity to deal with seasonal fluctuations.
MV Wastes	▪ Information should be available for MV captains to identify solid waste reception facilities and acceptable handling procedures at ports; ▪ Discharge of solid waste from vessels should be prohibited while in port in accordance with MARPOL and national regulations.

Source: IFC EHS Guidelines for Ports, Harbors and Terminals

5.3.5 Hazardous Material and Oil Management

Hazardous materials at terminal include large volumes of hazardous cargo, as well as oil and fuels and hazardous substances used in port activities including vessel, vehicle, and grounds maintenance. Spills may occur due to accidents, equipment failure, or improper operating procedures during cargo transfer or fueling, and involve crude oils, refined products or residual fuels, liquid substances, and substances in packaged form. In Table 5.8, the major aspects of hazardous material and oil, and tentative mitigation/management have been reflected.

Table 5.8: Major aspects and tentative measures to manage hazardous material and oil

Aspect	Tentative mitigation/management measures
Spill prevention	▪ Oil and chemical-handling facilities should be located with consideration of natural drainage systems and environmentally-sensitive areas; ▪ There should be secondary containment for above ground liquid storage tanks and tanker truck loading and unloading areas; ▪ Hazardous materials storage and handling facilities should be constructed away from active traffic and protect storage areas from vehicle accidents. Covered and ventilated temporary storage areas should be provided for leaking hazardous cargo and designed to facilitate collection of leaks and spills; ▪ Identifies areas within the port that are sensitive to spills and releases of hazardous materials and locations of any water intakes (e.g. cooling water for shore-based industries);

Aspect	Tentative mitigation/management measures
Spill control planning	▪ Outlines responsibility for managing spills, releases, and other pollution incidents, including reporting and alerting mechanisms to ensure any spillage is reported promptly to the Port Authorities and personnel are informed to take appropriate action; ▪ Includes provision of specialized oil spill response equipment (e.g. containment booms, recovery devices, and oil recovery or dispersant application vessels); ▪ Includes training of response personnel in deployment of equipment, and testing of the contingency plan through regular reporting and alerting exercises and less frequent deployment of the specialized spill response equipment.
Dangerous goods handling	▪ Establishment of segregated and access-controlled storage areas with the means to collect or contain accidental releases; ▪ Requesting Dangerous Goods Manifests for hazardous materials whether in transit, loading or unloading to and from ships, including proper shipping (technical) name, hazard class, United Nations number, and packing group; ▪ Training staff in relevant aspects of dangerous goods management including screening and acceptance of dangerous goods at the port; ▪ Emergency response procedures specific to dangerous goods.

Source: IFC EHS Guidelines for Ports, Harbors and Terminals

The proposed project has been designed keeping in mind the fast-growing RGM sector which has high volumes of both import and export. The river terminal is not likely to handle any hazardous material. Besides, fueling operations will not be carried out at the terminal (it will be handled at Chittagong), and there will be no fuel storage facility at the proposed river terminal for fueling of the container vessels. This will significantly reduce the risk of oil spills and related hazards.

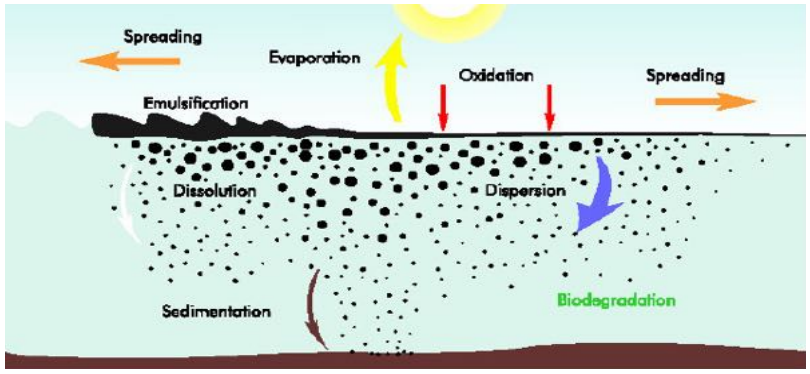


Figure 5.1: Weathering of a marine oil spill (ITOPF, 2004-1)

The regular fuel handling will be the diesel used in the power generation. The diesel storage tank capacity is estimated to be 2000 liter. There are potentials of leakage from this diesel storage tank therefore there is a need to install a containment tank having a capacity of 1.5 times the maximum storage capacity. In case of spill oil, the separated oil will be collected in drums and sold to DOE approved recyclers. SAPL has informed that they will not procure poly-chlorinated biphenyls (PCBs) transformer oil. Pure hydrocarbon mineral oil will be used for transformers, current transformers, potential transformers and capacitors under the project which will not have any adverse environmental impacts. However, there is requirement of management of different types of oil and fuel used in different maintenance activities. In this regard, SAPL may consider Table 5.8 as reference.

5.3.6 Noise Pollution

During the operation phase, noise will be generated due to the operation of the generators, pumps, engines of boats and ships, cranes for handling of goods, cargo and shipment vehicles. Noise will also be generated from the warehouse, repair and maintenance block, service area, goods loading and unloading points. Activities like container handling, container stacking, periodic dredging, vehicle movement on internal road, etc. will also contribute to increasing ambient noise levels. However, the main effect on the environmental noise level will be from increased transportation of goods entering and leaving the port. The bulk cargo is anticipated to be moved by truck which could result in movement of 325 trucks per day during the full operational phase of the river terminal (source: SAPL).

The level of noise generated by the operation of port machinery and transportation vehicles is usually within 70~95 dB(A). The noise level varies depending on the condition of operation. Table 5.9 shows the major sources of noise at 1m distance from the equipment.

Table 5.9: List of proposed equipment to be used during operation phase

Equipment	**Noise Level** dB(A)	**Quantity**
Forklift truck	70	10
Container crane	85	2
Container reach-stacker	80	2
Gen-set in canopy	75	1
Traffic (Truck)	75	325

Source: SAPL

The project site is located in an industrial area having the higher ambient noise level (about 70 dBA). However to assess the impact of the noise generated from the project, noise impact modelling has been conducted as is detailed in the following sections.

Noise Impacts and modeling

The noise modeling is based upon the method documented by the International Energy Agency. It is a simple model which assumes spherical spreading from a point source either in free space (spherical) or over a reflective plane (hemi-spherical). For this case, spherical spreading has been used because sound wave is propagating uniformly in all directions and the crests and troughs of the sound waves can be pictured as spheres centered on the source location. The total noise from each turbine is logarithmically added according to the formulae given below:

L_A, = $10\log_{10}$ ($^{10LA/10}$) dBA

Where: LA = Sound Source 1 (i.e. SAPLRT)

The model presents a 'worst-case scenario' as it does not take into account factors which would reduce noise propagation, such as:

- Uneven topography
- Large obstructions in the propagation path, e.g. barriers etc
- Refraction of noise, e.g. due to atmospheric effects such as temperature inversion

- Wind speed or direction effects
- The baseline noise level is conservatively assumed to be 85 dB at 1m distance from the equipment.

Box 5.5: Mathematical formula for the noise model

Formulae:

$$L_P = L_W - 10Log_{10}(2m^2) - ar$$

$$L_P = L_W - 10Log_{10}(4m^2) - ar$$

Where: **r** the distance from source to receiver;
a the absorption due to the atmosphere (dB/m), which is the most commonly used as 0.005dB/m;
L_W the sound power level of the turbine; and
Lp the output sound power level of the turbine at different radius away from the source

Graphic User Interface (GUI) software was built based upon the model using MATLAB programming language for enhancement in calculation and analysis. The noise dispersion pattern in the project area is shown in Figure 5.2. The distance between consecutive concentric circles represents a distance of 50 meters. The nearest household receptors within 100 meter radius will be exposed to 32 to 42 dBA which is within the acceptable limits set by the DOE.

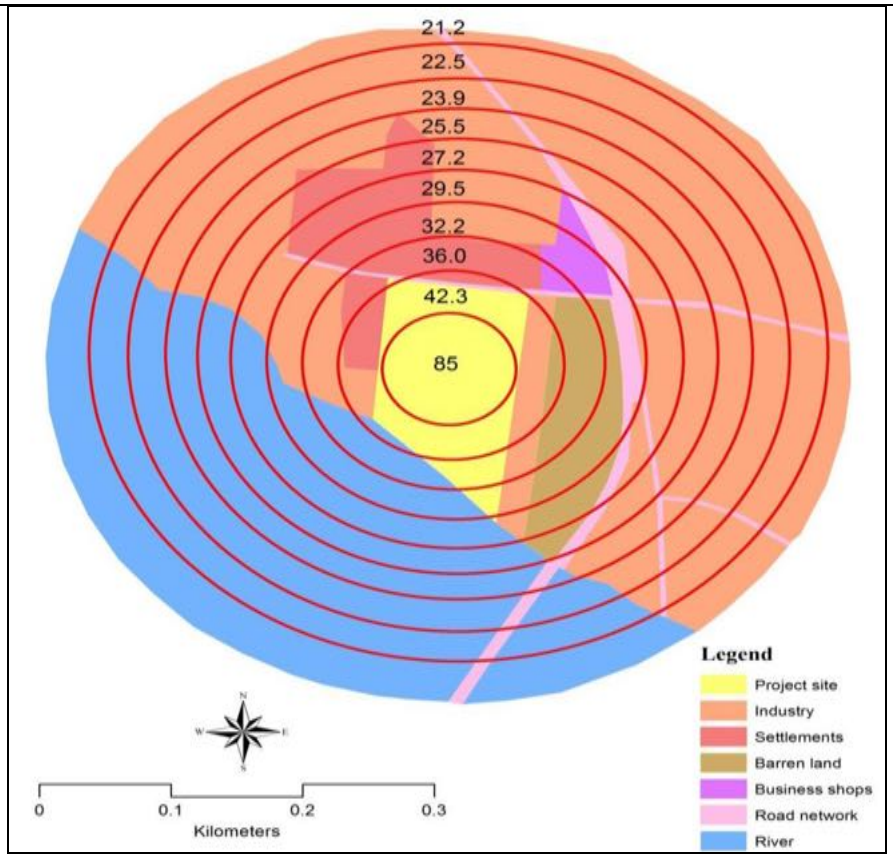


Figure 5.2: The map showing predicted noise level in dBA within a radius of 500m

Noise Modeling Results

At 85 dBA noise input (for each engine), the predicted noise output is as follows (Table 5.10).

Table 5.10: The predicted noise level at different distance from source

Radius (m)	1	50	100	150	200	250	300	350	400	450
Predicted Output Noise level in dBA	85	42.3	36.0	32.2	29.5	27.3	25.5	23.9	22.5	21.2

The noise standard of IFC and Bangladesh Government is mentioned in the Table 5.11.

Table 5.11: Noise standards of IFC and DOE, Bangladesh

Standard	Zone	Day time dBA	Night time dBA
IFC , 2007	Residential, institutional, educational	55	45
	Industrial, commercial	70	70
Bangladesh ECR, 1997	Mixed area	60	50
	Commercial	70	60
	Industrial	75	70

The combined result of noise modelling is depicted in Table 5.12

Table 5.12: The combined noise levels at various distances from the project site

Location	Distance from the Source (m)	Night dB(A)			Day dB(A)		
		Baseline	Source Sound (estimated from simulation)	Combined effect	Baseline	Source Sound (estimated from simulation)	Combined effect
Project site (east boundary point)	105	41.2	29.33	42.75	47.06	29.33	48.46
North side of the port	223	37.3	18.91	38.57	43.76	18.91	44.93
South side of the port	208	41.3	28.07	42.74	48.23	18.07	49.48
East side of the port	207	42.4	37.60	44.04	49.65	25.90	50.06
West side of the port	175	37.5	26.23	38.91	37.41	26.23	38.82

Based on the Table 5.12, the proposed project will have a negligible impact on the noise environment at the nearest sensitive receptors. Such an increase is considered to be negligible and is complying with IFC guidelines and DOE standards. The model presents a 'worst-case scenario' as it does not take into account the normal abatement techniques to be used. But for better compliance, SAPL has to confirm application of required measures to address noise issue in a more comprehensive manner.

5.3.7 Biodiversity

Construction and maintenance dredging, disposal of dredge spoil, construction of piers, wharves, breakwaters, and other water-side structures, and erosion may lead to short and long term impacts on aquatic and shoreline habitats. Direct impacts may include the physical removal or covering of river bed, or land- side habitat, in addition to changes to water flow patterns and related sedimentation rates and patterns, while indirect impacts may result from changes to water quality from sediment suspension or discharges of storm water and wastewater. Additionally, the discharge of ballast water and sediment from marine vessels (MV)s during port operations may result in the introduction of invasive aquatic species. Recommended measures to prevent and control these impacts include the following:

- Potential impacts to shoreline vegetation, wetlands, fisheries, bird life, and other sensitive aquatic and near- shore habitat habitats during port construction and operation should be fully assessed with special consideration for areas of high biodiversity value or those required for the survival of critically endangered or endangered flora and fauna;
- The depth of the port should be considered at the design phase in terms of habitat destruction and the amount and nature of dredging required.

In case of the proposed project, the ballast water of MVs will be discharged and pumped in the rivers Dhaleswari, Meghna and Karnaphuli. The salient features of aquatic biodiversity of these three rivers are almost same. So, no transfer of special species of one river will be transferred to another river, resulting insignificant impact to aquatic habitats. In case of bilge water, SAPL has to ensure that no MV approaching to their port, can discharge the bilge water in the river without treatment. In case of maintenance dredging there is scope to affect aquatic biodiversity. But as the maintenance dredging of this project is assumed to be limited in the jetty from due to the satisfactory natural draft of Dhaleswari River, the scale and intensity of maintenance dredging can be expected too limited to affect biodiversity.

5.3.8 Traffic Safety

Due to the close proximity of residential area, traffic safety is one of the most important concerns during operation phase. So, SAPL has to adopt required measure. In this regard they are suggested to follow the following five principles of neighborhood traffic strategy.

Engagement: to involve community representative in traffic safety strategy

Education: it includes awareness raising about how to respond in case of various options

Engineering: speed hump, traffic barriers, change of road surface etc. includes engineering measures.

Enforcement: defining specific speed limit and restricting hazardous driving behavior fall under the principles of enforcement. In case of 30 km/h speed, the risk of fatal accident I sonly 5% where as in case of 50 km/hr the risk of fatal accident is about 55%[22].

Evaluation: regularly evaluate the accident record, status of effectiveness of adopted measures and overall co-operation from respective community.

[22] Debbie Rawson, 2013. ***Neighborhood Traffic Safety Strategy***

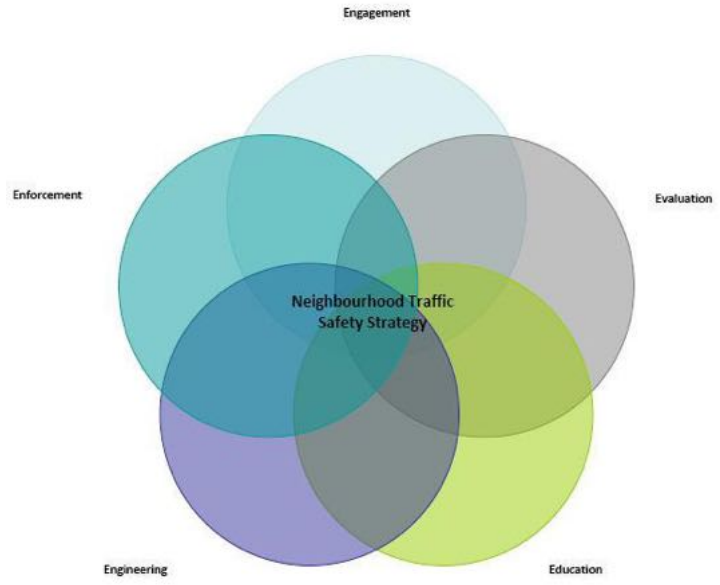
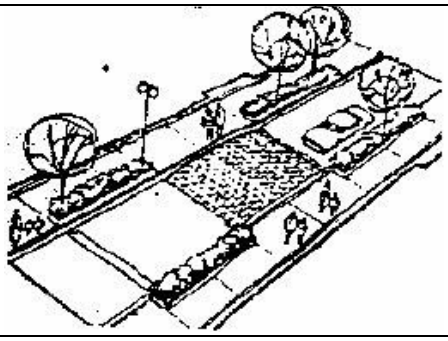
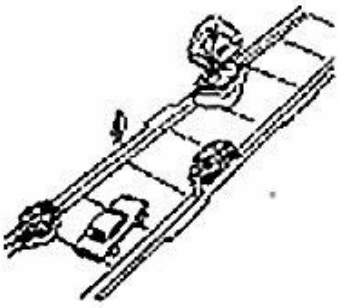
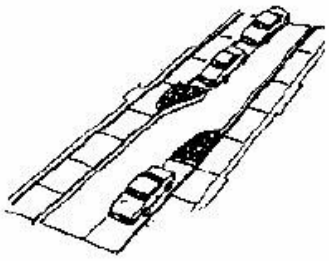
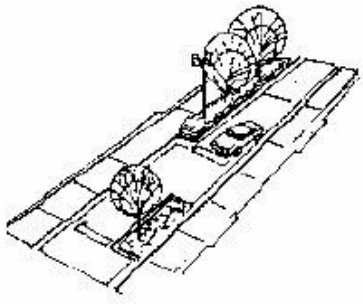
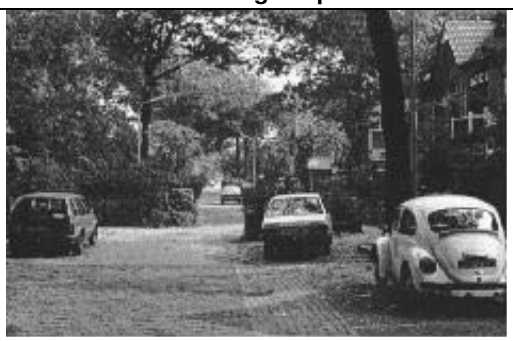
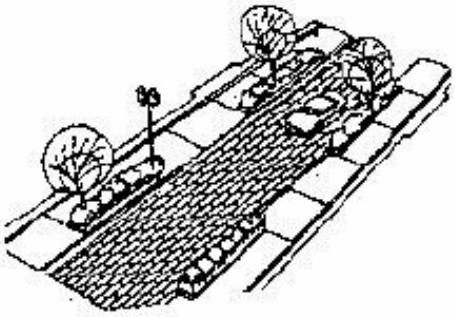
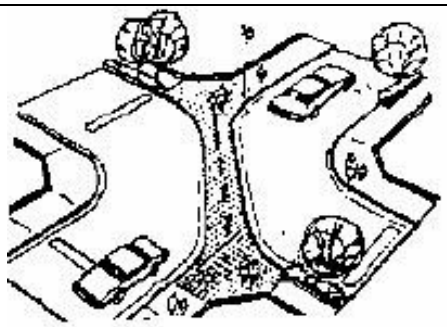


Figure 5.3: Neighborhood Traffic Safety Strategy[23]

In ***Residential Street Standards & Neighborhood Traffic Control: A Survey of Cities' Practices and Public Officials' Attitudes***, Eran Ben-Joseph of Institute of Urban and Regional Planning, University of California at Berkeley has suggested following measures to address the neighborhood traffic safety issues.

a. Speed Hump	
	
Application of *speed hump*	Concept of *speed hump*
b. Pinch points in movement	
	
Application of *pinch points in movement*	Concept of *pinch points in movement*

[23] Debbie Rawson, 2013. ***Neighborhood Traffic Safety Strategy***

c. Shift in pavement	
	
Application of *shift in movement*	Concept of *shift in movement*
d. Pavement narrowing	
	
Application of *pavement narrowing*	Concept of *pavement narrowing*
e. Change in pavement material	
	
Application of *change in pavement material*	Concept of *change in pavement material*
f. Traffic diverters/barriers	
	
Application of *traffic diverters*	Concept of *traffic diverters*

5.4 ENVIRONMENTAL IMPACTS DURING DECOMMISSIONING PHASE

The major environmental impacts during post-operation or decommissioning phase of a river port are noise and vibration; solid waste generation and leakage of spent lube-oil and other raw materials; dust generation; and risk of human health and property. As the demolition workers are likely to lead to significant deterioration of the acoustic environment, carrying out the demolition work at day time can be a mitigation measure. In case of waste and leakage of spent lube-oil and other raw materials, SAPL has to make sure proper collection and disposal. To address the dust generation due to demolition work, watering in bare area can be an option. For mitigating the risk of human health and property damage, vehicles as are to be used in demolition work, have to be operated with due importance.

5.5 BENEFICIAL IMPACTS AND ENHANCEMENT

During construction phase, the project has created job opportunities for skilled, semi-skilled an un-skilled workers. In addition to this, the construction site has been found to attract small traders, who supply various consumables to workers.

The most important positive impact of the project would be to transport export and import products within a limited time. The other important positive impacts of the project operation will be employment for about 240 skilled and semi-skilled workforce.

Due to demolition work, there will be temporary employment opportunity for local people as well as outside expert. SAPL will earn salvage value by selling the scrap materials. In addition, the project site can be used as an industrial estate for a new industrial venture because it would be enriched with the basic utilities and infrastructures.

5.6 OCCUPATIONAL HEALTH AND SAFETY IMPACTS

Occupational health and safety risks and mitigation measures during construction, operations are similar to those of other large industrial facilities. According to EHS Guidelines of IFC, the major occupational health and safety issues relevant with the project include exposure to electro-magnetic field, fire and explosion hazards and general safety. Possible response on these aspects are presented in Table 5.13.

Table 5.13: SAPL's expected response on major occupational health safety aspects

Aspect	Proposed mitigation/management measures
Exposure to electro- magnetic field	In a port, the workers have a high exposure to electro-magnetic field (EMF) than the general public due to working in proximity to electric power generators, equipment and connecting high-voltage transmission lines. SAPL has planned to provide earthling network around the generator room. Mesh system is expected to be used as safety measure.
Fire and explosion hazards	The daily activities of port include store, transfer and use large quantities of fuels; therefore, careful handling is necessary to mitigate fire and explosion risks. To avoid the risk of fire and explosion hazard, SAPLRT has to arrange sufficient number of fire protection equipment like buckets, fire extinguishers, fire water tank should be provided for emergency needs. At the site, the safety and emergency manual should be accessible to all employees.

Aspect	Proposed mitigation/management measures
General safety	To reduce the risk of general accidents, SAPL has planned to provide personal protective equipment like safety gloves, helmet, mufflers etc. during construction period and during the maintenance work while the port is in operation

As there will be a significant number of workers in the project, SAPL has to adopt a detail **Environment and Health Safety (EHS) Guidelines/Standards.** In this regard, they can follow international best practices of similar type of business (like IFC EHS Guidelines) or can adopt a customized one. And this EHS Guidelines is to be practiced from the beginning of commercial operation.

5.5 COMMUNITY HEALTH AND SAFETY IMPACTS

Occupational health and safety risks and mitigation measures during construction, operations are similar to those of other large industrial facilities. According to EHS Guidelines of IFC, the major community health safety issues include the following aspects (Table 5.14).

Table 5.14: Major community health safety aspects for a river port

Aspects	**Proposed mitigation/management measures**
Marine Safety	Port operators have certain key responsibilities necessary for the safe operation of ships ranging from passenger safety to the safe access and maneuvering of chemicals and oil transporting ships inside the harbor and port areas. Port operators should therefore implement a Safety Management System (SMS) able to effectively identify and correct unsafe conditions.
Security	Port operators should have a clear understanding of their responsibilities, including international legal and technical obligations to provide security to passengers, crews, and personnel in port.
Visual impact	Permanent and temporary installations and ships can result in visual changes to the landscape. So, the port operators should be careful that illumination and lighting do not appear as threat to the adjoining communities.

In addition of considering the aforesaid three major aspects, SAPL has to ensure adequate response on traffic safety issues as has already been discussed in earlier section. In this regard, SAPL has to adopt a detail **Traffic Safety Management Plan**, which is to be followed from the beginning of commercial operation.

VI. ANALYSIS OF ALTERNATIVES

6.1 'NO PROJECT' ALTERNATIVE

From physical and environmental points of view, the 'do-nothing' is preferable to any project implementation, since it would avoid creation of any of the adverse impacts associated with the project. But the 'without project alternative' is not acceptable since this will strongly reduce the potential for socio-economic development of the country. In spite of having greater potentiality, the industrial growth is retarded mainly due to timely transportation from the production point to port and extra transport cost. River port is the easiest way to carry the goods from Chittagong port to Dhaka and Dhaka to Chittagong. Considering these aspects, it is concluded that the 'No Project' alternative is not a pragmatic option. The potential alternatives in relevant to the project is considered based on two major aspects-technology, site. These aspects are detailed in the following sections.

6.2 ANALYSIS OF ALTERNATIVES IN TECHNOLOGY

6.2.1 General Design and Planning

In case of design and planning of the project, SAPL has been found to try to adopt the advanced design and planning. Accordingly, they have engaged Seaport Innovations Limited (SIL), Denmark. SIL is globally a familiar name in port planning and design.

6.2.2 Detail Design

SAPL has been found significantly responsive about the satisfactory detail of project components. For example, the approach of the design for RCC jetty is according to the technical standards for port-stand harbor facilities in Japan – The Overseas Coastal Area Development Institute in Japan (OCDI). The design of RCC jetty i.e. open type pier with vertical RCC piles has been made by analyzing the rigid frame composed of the piles and the super-structure (Appendix-13).

6.2.3 Equipment and Machineries

Based on technical specifications as has been provided in chapter 3, it can be said that SAPL has been observed to use/install the machineries/logistics coming from reliable brands like ABB, Liebherr.

6.3 ANALYSIS OF SITE ALTERNATIVES

6.3.1 Major Parameters for a River Port Project Site

Analysis of site alternatives facilitates to identify potential project locations and provide comparative cost, effectiveness, and risk assessments of each site to a baseline; this baseline is typically the proposed operating system. In identification of project site for a River port terminal depot, some major parameters are taken into consideration as are depicted in Box 6.1.

Box 6.1: Major parameters for a river port site

- availability of river navigation in terms of adequate draft throughout the year
- adequate river front space for the river port,
- sufficient infrastructure facility (electricity, telecommunication, etc).
- presence of adequate parking spaces and accessibility through road
- environmental and social suitability

6.3.2 Comparison among the Alternative Sites

Comparison in respect of location and area

In addition of the proposed site, SAPL has initially shortlisted two other sites. The physical and geographical location and available land area of these three sites are mentioned in Table 6.1.

Table 6.1: Comparison of sites with respect to location and area

Site	Physical Location			Geographic location		Area in acre
	Mouza	Union/Upazila	Ward	Latitude	Longitude	
Proposed site	West Mukterpur	Panchasar	8	23°34′28.15″ N	90°30′43″ E	14.5
Site-1	West Mukterpur	Panchasar	8	23^0 34' 26.09" N	90°30' 50.23"E	7.5
Site-2	Madanpur	Narayangonj Sadar	12	23^0 34'. 26.33" N	90°31'57.78"E	12

Figure 6.1: Satellite image of proposed sites and two alternative sites

Comparison in respect of topography and other relevant features

The three short-listed sites are compared (Table 6.2) as follows in respect of topographical and other relevant features.

Table 6.2: Comparison of sites with respect to topography and associated features

Location	Topography and associated features
Proposed site	▪ The site is basically a plain terrain. ▪ The site has been found almost developed for industry ▪ The overall shape of the site is rectangular making it more suitable for a river port container terminal ▪ The site is situated on the offshore land of Dhaleswari River. ▪ Road connectivity from Dhaka to project is satisfactory ▪ There is no land acquisition or involuntary resettlement issue ▪ Close proximity to settlements
Alternative Site-1	▪ The site has moderate irregular terrain. ▪ The site requires about 5-6 feet land filling. ▪ The overall shape of the site is rectangular making it more suitable for a river port container terminal. ▪ Wide vacant land close to the Shitalkkha River ▪ Ship movement and container handling activities can be done easily ▪ River and road connectivity is good ▪ Open space around the project site creates an option for parking truck and lorry ▪ There is no land acquisition or involuntary resettlement issue ▪ Significantly far away from settlements
Alternative Site-2	▪ The site has moderate irregular terrain ▪ There are some natural wetlands in the site ▪ The site requires about 5-7 feet land filling ▪ This site is not near to the river for freight handling ▪ This site is not suitable for the river port container depot ▪ Open space around the project site creates an option for parking truck and lorry ▪ There is no land acquisition or involuntary resettlement issue ▪ Significantly far away from settlements

Comparison in respect of distance from major infrastructures

While selecting a site for river terminal project, distance from major infrastructure is important consideration. In the following Table 6.3, the sites are compared based on distance from some important infrastructures.

Table 6.3: Comparison of sites with respect to distance from major infrastructure

Major Infrastructure	Approximate distance in km		
	Proposed site	Site-1	Site-2
Upazila office of Munshigonj	2.0	5	6
PDB office	2.0	3	4
BIWTA office	3.0	6.0	7
LGED office	4.0	2.0	3.75
Hospital and clinic	3	5	6
Fire service	1.25	4	5
Union parisad	4.25	5.25	6.0

Source: BCAS field representative through local information

Comparison in respect of valuation

Land price is dependent on a number of factors. Among this factors accessibility to the site and proximity to major infrastructure are two major factors. Similarly the land rate was found to vary from site to site. The price of road side land is high than the river side land. The location of the proposed project is covered both the road and river, therefore the price is comparatively high and suitable for the river port terminal. The other two sites also suitable and the location is riverside which price is less than proposed site but it is not prepared land, it would take time. BCAS team discussed the local people for sites evaluation. Based on the secondary information, the price of per decimal land of proposed site, and alternative sites 1 and 2 are Tk. 500,000, 450,000 and 400,000 respectively.

Although the proposed site is located in close proximity to settlement and the price of land is reasonably higher than the other two alternatives, it has been selected for the five major reasons as are mentioned in Box 6.2.

Box 6.2: Major reasons of selecting the proposed site

- Close proximity to the riverside
- No significant land filling requirement
- Easy accessibility to major thoroughfare (Dhaka-Narayanganj Highway)
- Availability of major infrastructures at a reasonably short distance
- The large size of available land (14.5 acres)

VII. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

7.1 STAKEHOLDER CONSULTATION

Stakeholder consultation forms an important part of the IEE study. The main objective of the consultation process is to apprise the local inhabitants about the proposed Project and to seek their opinion regarding the tentative impacts. It is a fundamental principle of any environmental assessment study. The inclusion of the feedback of public consultation helps to ensure that the decision making process is equitable and fair and leads to more informed choice and better environmental outcomes. The findings from the public consultations carried out as a part the IEE study were utilized in the development of the EMP, especially in identifying the significant impacts of the proposed project and developing the corresponding mitigation measures.

The objectives of the consultations were as follows:

- disseminate information about the project to the stakeholders;
- have a better understanding of existing environmental conditions;
- aware stakeholders to contribute meaningfully to in different phases of project;

7.2 DESCRIPTION OF THE STAKEHOLDER CONSULTATION PROCESS

In conducting the IEE, a number of stakeholders consultation were conducted. In the following sections theses consultations are discussed with outcome.

7.2.1 Focus Group Discussion with Affected Communities

As a part of focus group discussion with affected communities, on 10 August 2014 there were consultations with fishermen, farmers and day laborers living in adjacent to the project site. In addition, there were consultations with female respondents as well. During this consultation, it has been tried to ensure the presence of all classes of people as has been documented in the following sections:

Outcome:

The major findings of large public consultation are:

- local people are aware about the proposed river terminal project;
- they are expecting employment during the construction and operation phases of the project;
- people seem afraid about by noise and dust emitted by vehicles during the construction period and also the same coming from different types of loading and unloading activities during operation phase.
- The health safety in relevant to traffic movement appear to be a major concern for the community
- The unplanned movement of marine vessel could be a threat for fishermen
- The cleaning of marine vessels in improper way may result in a concern to the adjacent community
- Inadequate attention about the scope of oil spillage may result adverse outcome to the community.

7.2.2 Consultation with Government Officials

As part of consultation with government officials, on 11 August 2014 the IEE Team has consulted with Mrs. Saraban Tahura, Thana Nirbahi Officer, Munshigonj Sadar Upazila, , Mr. ABM Momtaj Uddin, Assistant Director, Civil Defense, Munshigonj, Mr. Abul Kashem, Deputy Chief Personnel Manager, Bangladesh Inland Water Transport Corporation, Munshigonj, Mr. Rais Uddin Pathan, Fisheries Office, Munshigonj.

Outcome:

The major findings of consultation with government officials are:

- The ambient air quality is already a concern raising situation due to the presence of cement manufacturing plants and fixed chimney based kilns (FCK). So, SAPL has to think to mitigate the source of any air pollutant due to the project activities ;
- Due to the close proximity of a dense neighborhood (West Mukterpur), movement of vehicles like trucks, lorries may result in health safety hazard;
- The use of diesel and lube oil, and installation of high voltage electrification facilities, the project seem to be vulnerable to fire hazard;
- The scope of oil spillage and improper waste management (river port and marine vessels), will threaten the aquatic habitat;
- Vessel size should be fixed in consideration of jetty front width, river draft, nearest bridge height, span to span difference and harboring capacity etc.
- Civil Defense Department will provide the required firefighting training to SAPL staff;

7.2.3 Consultation with Local Elites

As part of consultation with local elites, on 12 August 2014 there was consultation with Dr. Ramgopal Dutta, Mr. Ikbal Hossain, Managing Director, Azmeri Enterprise, Mr. Akhter Hossain Khan, General Manager, ideal textile Mills Limited and Mr. Khokon Mia, Councilor, Panchasar Union.

Outcome:

The major findings of consultation with government officials are:

- There should be job opportunities for the local people on a priority basis ;
- SAPL is to think for establishing a health care facility for the community (clinic/hospital).
- Adequate health safety is to be ensure in relevant to traffic movement.
- This project offers an opportunity to income generate for the community and it will also facilitate to increase the price of land and associated facilities (tangible/intangible)
- Local community will provide all sorts of required facilities for the project

7.2.4 Large Public Consultation

On 23 August 2014, a large public consultation was arranged at project premise. There were 64 participants in this consultation. The detail list of participant is provided in Annex 41.

Outcome:

The major findings of large public consultation are:

- According to the participants, air pollution (from cement industries and rice mills) and water pollution (from industrial effluent) are already major concerns in the area; noise pollution

from project activities and incremental road and river traffic movement of water transport can be added concerns.

- Possible adverse impact of the project as identified by the participants include increased traffic congestion, possible increase in road accidents, increased ship movement in the river, and adverse impact on fishermen.
- The project sponsors will offer job opportunities for local people depending on qualification and requirement.
- Some participants raised the issue of possible interference of the proposed project in getting easy access to the river for different domestic purposes (e.g. washing, bathing).
- Project activities (e.g., movement of material and equipment) are carried out following a schedule such that it causes minimum impact on movement of people and vehicles.
- Some financial support in local infrastructure like schools, religious institutions and so on.
- Workers behavior is to be strictly monitored to avoid any social nuisance.
- Participants have expected that employment opportunities will be generated during construction and operational phases of the project

Table 7.1: Summary of findings of consultation and response of SAPL

Main theme	**Suggestions/findings of consultation**	**Response of SAPL**
Employment	To engage local people during construction and operation phases on priority basis	SAPL will try to engage local people on priority basis.
Environmental impact	Air pollution and noise impacts need to be properly mitigated	Based on the result of air dispersion modeling and noise modeling, required mitigation measures will be adopted.
Social support	Financial support in local schools, library, etc.	SAPL considers social support issue as a part of corporate social responsibility
	Workers behavior needs to be monitored to ensure social compliance.	SAPL will introduce code of conduct for all level of officials and workers and will strictly ensure its implementation, to avoid any social non-compliance.
Health safety	Due to the close proximity of a densely populated area, there is issue of health hazard due to traffic movement.	SAPL will adopt required mitigation measures including signage, speed control, scheduling and overall awareness.

VIII. GRIEVANCE REDRESS MECHANISM

8.1 GRIEVANCE REDRESS MECHANISM

The objective of a grievance redress mechanism is to ensure all comments and complaints from any project stakeholders, including local/regional authorities, residents of nearby residential areas, employees and other interested parties, are acknowledged and responded to within a reasonable timeframe.

SAPL will accept all comments and complaints associated with the project. The comments and complaints will be summarized and listed in a Complaints/Comments Log Book. Any person or organization may send comments and/or complaints in person or via post, email or facsimile using the contact information.

All comments and complaints will be responded to either verbally or in writing, in accordance with preferred method of communication specified by the complaint in the Comments and Complaints Form. All grievances will be registered and acknowledged within 5 days and responded to within 20 working days. SAPL will keep a grievance log and report on grievance management, as part of half-yearly project progress reports, available at SAPL website www. saplbd.com and on request at the project office

8.2 STAKEHOLDERS ENGAGEMENT PLAN

SAPL stakeholder's engagement will take place in a variety of contexts, and using a range of vehicles. Against this background, engagement will include consultation, joint planning, capacity building, partnerships, community-based monitoring and reporting. Table 8.1 presents the scope and duration of existing and planned stakeholder engagement initiatives.

Table 8.1: Stakeholder engagement plan

Engagement vehicle	Stakeholders Involved	Engagement Tools	Duration of Initiatives	Frequency of structured meeting/ consultation
Public liaison Committee	All stakeholders in the project impacted (direct and indirect) area	Interaction between Stakeholder Liaison Officer, and representatives of stakeholders.	Life time of the project	Half-yearly
Community Development Plan	Communities in the project impacted area	Stakeholder Liaison Officer	Life time of the project	Half-yearly
Community Health Safety Plan	Communities in the project impacted area	Stakeholder Liaison Officer	Life time of the project	Quarterly
Corporate Communication Programme	All stakeholders	Corporate Communication Manger	Life time of the project	Half-yearly
Grievance Management Mechanism	Directly/indirectly affected stakeholders	Stakeholder Liaison Officer Corporate Communication Manager, and representatives of stakeholders.	Life time of the project	Quarterly

8.3 RESOURCES AND RESPONSIBILITIES

To ensure proper caring on grievances raised by stakeholders the resource and responsibilities to be allocated in two levels as are mentioned in the following sections:

8.3.1 Port Level Resource and Responsibilities

SAPL will engage dedicated persons to play the role of Stakeholder's Liaison Officer at port site. He will have the overall responsibility for handling the consultation and information disclosure process, including:

- Organization of consultation process,
- Communication with identified stakeholder groups
- Collecting and processing comments/complaints,
- Responding to any such comments and complaints, and
- Depending on the nature of a comment/complaint, some comments/complaints will be provided to the appropriate person in the company for a response.

8.3.2 Corporate Level Resource and Responsibilities

A senior representative of SAPL management will ensure that all sorts of grievances irrespective of internal or external are redressed with due attention. He is expected to review the findings/observations forwarded to port level and who will be responsible for implementing the decisions.

8.4 REPORTING

There is requirement of two tiers reporting as are discussed briefly in the following section.

8.4.1 Internal Reporting

Local reporting relevant to the stakeholder's engagement will be undertaken under the Corporate Communication Programme. At a corporate level, stakeholder's engagement will be reported in Annual Reports and in other relevant corporate documentation. Management reporting on the stakeholder's engagement will take place through the Stakeholder's Liaison Officer. The Corporate Communication Manager will receive a quarterly report on engagement activities.

8.4.2 External Reporting

External Reporting means the reporting requirement for external client including funding agency, government and other regulatory bodies and so on. SAPL will provide Stakeholders Engagement Report to them according to the requirement. Corporate Communication Manager is expected to manage the external reporting requirement coming from any interested party.

8.4.3 Grievance Reporting Mechanism

Grievance Log Book

A Grievance Log Book will be made available at project office, where internal stakeholders can place their grievance in detail in writing.

Grievance Log Box

A Grievance Log Box will be erected at the entrance of the project, where any affected party can place his grievance in a confidential manner. For their convenience Grievance Form will be made available at the entrance of the project. A sample Grievance Form is shown in Annex-42.

Electronic Facility

In addition, the affected person can also put grievance through e-mail and cellular phone. In this regard, the respective official is Mr. Abdul Hakim, Chief Operation Officer, SAPL. His email: hakim@saplbd.com and cell no.: 01971422505.

8.4.5 Disclosure

The draft IEE has been disclosed in IDCOL's website. However, important EHS related information/documents is to be uploaded on the SAPL's corporate website www.sapl.com and a copy is to be kept at the port for public review.

IX. ENVIRONMENTAL MANAGEMENT PLAN

9.1 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) of the project is to record the environmental impacts resulting from the project activities and to ensure implementation of the "mitigation measures" identified earlier in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operation phase of the project.

The EMP has to clearly mention:

- the measures to be taken during both construction and operation phases of the Project to eliminate or offset adverse environmental impacts or to reduce them to acceptable levels;
- the actions needed to implement these measures;
- a monitoring plan to assess the effectiveness of the mitigation measures employed.

SAPL will be responsible for implementing and monitoring EMP. Environmental management and monitoring activities of the proposed container depot Project could be divided into management and monitoring during:

- Construction phase
- Operation phase
- Decommissioning phase

9.1.1 Construction Phase

The environmental management plan should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring a regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected. The environmental management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- generation and disposal of sewage, solid waste and construction waste;
- increased traffic;
- generation of dust (particulate matter);
- Pollution of water;
- generation of noise.

The environmental management should also focus on enhancing the possible beneficial impacts arising from employment of local workforce for construction works. Table 9.1 summarizes the potentially significant environmental impacts associated with the construction phase, mitigation measures and institutional responsibility.

Table 9.1: Potential impacts and mitigation measures at construction phase

Project Activity	Potential Impacts	Mitigation Measures
Influx of workers	Generation of sewage and solid waste	▪ Construction of sanitary latrines and septic tank system ▪ Erecting "no litter" sign, provision of waste bins/cans, where appropriate ▪ Waste minimization, recycle and reuse (as required) ▪ Proper disposal of solid waste
	Possible spread of disease from workers	▪ Clean bill of health a condition for employment ▪ Regular medical monitoring of workers
Transportation of equipment, materials and personnel; storage of materials	Deterioration of air quality from increased vehicular movement, affecting people in the surrounding areas	▪ Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards and IFC EHS Guidelines (where applicable)
	Wind-blown dust from material (e.g. fine aggregate) storage areas	▪ Watering the access road ▪ Sprinkling and covering stock piles ▪ Covering top of trucks carrying materials to the site and carrying construction debris away from the site
Site clearance	Topographic change by cutting existing trees, shrubs, herbs, and filling land	▪ Adopt such type design as is required minimum cutting of trees, shrubs, herbs, and low-land filling ▪ Use waste shrubs, herbs as organic fertilizers ▪ Adopt required measures to prevent waste shrubs, herbs as fuel to cook or for any localized burning purpose.
Noise from construction equipment operations and maintenance	Noise could exceed the allowable limit and result in hearing loss	▪ Avoiding, as much as possible, construction equipment producing excessive noise ▪ Avoiding prolonged exposure to noise by workers ▪ Follow construction scheduling to avoid evening and nighttime disruption
Dust during construction and exhaust gases from construction machinery and vehicles	Increased SPM, PM 2.5, PM 10, NO_x, SO_x levels at construction sites, and surrounding areas	▪ Try to avoid using equipment such as stone crushers at site, which produces significant amount of particulate matter ▪ Immediate use of construction spoils as filling materials ▪ Immediate disposal/sale of excavated materials ▪ Continuous watering of bare areas
Fires, explosion and other accidents	Risk of human health and property damage	▪ Use of personal protective equipment during construction and maintenance. Prepare and implement safety and emergency manual. ▪ Regular inspection of lines for faults prone to accidents. ▪ Provision of fire protection equipment. ▪ Provision of Lightening arrestors

9.1.2 Operation Phase

SAPL is responsible for overall environmental management during operation phase of the Project. In this regard it is expected that they will establish Environmental and Social Monitoring Unit (ESMU) for ensuring effective environmental and social compliances.

The environmental management during the operation phase should be primarily focused on addressing the following issues:

- emission from the vessels and crane
- generation of noise from the equipment
- pollution of water
- waste generation
- Occupational and community health safety

Table 9.2 summarizes the potentially significant environmental impacts during operation phase, the measures needed to eliminate or offset adverse impacts and institutional responsibility.

Table 9.2: Potential impacts and mitigation measures at operation phase

Aspect	Potential Impacts	Mitigation Measures
Electrocution	Electro-magnetic wave or electrical interference, which may result in occupational health risk.	▪ All equipment should be grounded earthing with mesh system. ▪ to sub-station should be connected by HT cable & substation site is away from the settlement. ▪ No house is located in the immediate vicinity of the site.
Dredging	Effect on aquatic habitat and adjacent community	▪ To plan and adopt such technology as could result minimum impact to the aquatic habitat and adjacent community.
Bilge Water	Effect on aquatic habitat and adjacent community	▪ To enforce that no MV inbound and outbound to the project will be allowed to dispose bilge water without treatment facility.
Hazardous materials and oil spillage	Enhance the risk of occupational health safety	▪ SAPL has to practice standard code of conduct about hazardous material handling. ▪ Spill kits will be available to contain any accidental release of hazardous materials. ▪ All hazardous materials will be provided with secondary containment. ▪ Sell the spill oil only to DOE designate vendors.
Solid waste	Enhance the risk of occupational health safety	▪ Apply the waste hierarchy and reduce, reuse or recycle wastes wherever possible. ▪ Segregate wastes by types and provide appropriate waste containers for the storage of all waste streams. ▪ Provide a specific area for the storage of solid hazardous wastes (i.e. batteries, fluorescent lighting tubes, used oil filters, aerosol cans etc.). ▪ Prohibit the burning of wastes. ▪ Arrange a waste removal contract and schedule at least weekly waste collections to prevent the build-up of waste materials.
Sanitary waste	Enhance the risk of occupational health safety	▪ Provision of an appropriate number of toilets and hand-washing points. ▪ Provision of on-site treatment of sanitary wastes. ▪ Training on sanitation practices.

Occupational Health and safety	Risk of human health and property damage	▪ All necessary safety equipment should be provided. ▪ Arrange regular health safety drill. ▪ Introduce Occupational health safety manual
Fires, explosion and other accidents	Risk of human health and property damage	▪ Use of personal protective equipment during operation and maintenance. ▪ Prepare and implement safety and emergency manual. ▪ Regular inspection of lines for faults prone to accidents. ▪ Provision of fire protection equipment ▪ Provision of Lightening arrestors
Domestic wastewater and sewage	BOD, fecal coliform contamination in groundwater and surface water	▪ Need to provide septic tank with soak pit for treatment of sewage.

9.1.3 Decommissioning Phase

SAPL is fully responsible for overall environmental management during post-operation phase or decommissioning phase of the Project. Table 9.3 summarizes the potentially significant environmental impacts during decommissioning phase, the measures needed to eliminate or offset adverse impacts and institutional responsibility.

Table 9.3: Potential impacts and mitigation measures at decommissioning phase

Project Activity	Potential Impacts	Mitigation Measures
The demolition works will lead to significant deterioration of the acoustic environment.	Noise and Vibration	▪ Demolition work is to be carried out only at day time
Demolition of the proposed project will result in generation of solid waste and leakage of spent lube oil and other raw materials.	Solid waste generation and leakage of spent lube oil and other raw materials.	▪ The waste is to be collected and disposed properly.
Some dust will be generated during demolition works of the proposed.	Dust generation	▪ Continuous watering of bare areas
During decommissioning movement of trucks carrying heavy demolition equipment and demolished materials will cause adverse impacts.	Risk of human health and property damage	▪ Vehicle is to be operated with proper care

9.2 INSTITUTIONAL ARRANGEMENT

9.2.1 Environmental and Social Monitoring Unit

SAPL is in principal obligated to relevant national and international environmental and social compliances and standards. It has informed that it will try to maintain all relevant compliances during construction and operational phases. In doing so, it has planned to form Environmental and Social Monitoring Unit (ESMU). The primary responsibilities of ESMU includes as follows:

- ensure environmental and social safeguard compliances;
- coordinate environmental monitoring process;
- act as liaison with the public, local organizations and government;
- ensure and supervise record keeping, data storage for follow-up actions;
- monitor hazardous materials storage and handling;
- Monitor EMP implementation and compliance status;
- promote environmental awareness and safety measures; and
- prepare environmental management and periodic monitoring reports for stakeholders

9.2.2 Composition of ESMU

The ESMU will be based on three tiers operational mechanism. It will be led by Head of Operation of the Container Terminal River Port. Head of Operation will serve as General Manager (Planning, Administration and Safeguard Compliance). Under his guidance there will be one Compliance Manager, who will be supported by two Compliance Officers. One Compliance Officer will be responsible for all sorts of environmental aspects and standards and another one will be assigned to maintain social and occupational health and safety aspects and standards.

Consulting services will be mobilized as necessary to assist in initial operations, to ensure that the ESMU will be self-sufficient for EMP implementation, submission of progress reports, and preparation of environmental assessment for subsequent construction works. Additional third-party services may be employed by the SAPL as necessary. Qualified and experienced construction contractor will be responsible for implementation of mitigation measures during the construction phase.

To look after the EHS aspects during the Construction Phase, SAPL has already deployed an EHS Officer having Master Degree in Environmental Engineering. Based on the performance, he will be extended for the Operation Phase or a new EHS Officer will be recruited. The major responsibilities of the EHS Officer are as follows:

- Monitor the environmental, health, safety, fire protection and emergency response matters;
- Ensure the compliance of the Department of Environment;
- Ensure the compliance of other external stakeholders;
- Monitor the implementation of the EMP;
- Develop standard operational procedure (SOP) for EHS aspects;
- Conduct safety inspections; provide safety training to promote a safe working environment for the employees.

9.2.3 Capacity Building of ESMU

Training is an integral part of a preventive strategy. Environmental and disaster management training will be required to ensure proper implementation of effective environmental management and monitoring plan; and disaster management plan. However, training could be organized by ESMU involving relevant staff. As a trainer, competent Consultant can be outsourced. Important training under the spectrum of ESMU needs to include:

- Training on fire-fighting;
- Training on environmental regulations and standards;
- Staff training on environmental monitoring;
- Training on environmental health and safety measure.

9.3 ENVIRONMENTAL MONITORING

9.3.1 Objectives of Environmental Monitoring

The prime objectives of environmental monitoring are:

- assess the effectiveness of proposed mitigation measures by comparing monitoring result with baseline data/environmental standards;
- determine project compliance with regulatory requirements;
- adopt remedial action and further mitigation measures if found to be necessary.

9.3.2 Environmental Monitoring Parameters and Schedule

Environmental monitoring requires set of parameters that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality. A list of possible parameters to be tested, sample number and sampling frequency are given in Table 9.4.

Table 9.4: Monitoring parameters and frequency of monitoring during trial run

Key parameters to be monitored: (1) Ambient Air Quality			
location	**frequency**	**parameter**	**submission**
At Project site, residential/institutional/commercial areas within 500m outside from project boundary (4 locations)	Once during trial run	PM 10, SOx, NOx and CO	Submit to respective stakeholders including DOE and IDCOL.
Key parameters to be monitored: (2) Noise			
location	**frequency**	**parameter**	**submission**
At four corners of Project boundary, residential/institutional /commercial areas within 100m and 300m outside from port boundary	Hourly basis for 24 hours during trial run	Limits in dBA	Submit to respective stakeholders including DOE and IDCOL.

Table 9.5: Monitoring parameters and frequency of monitoring during operation phase

Key parameters to be monitored: (1) Ambient Air Quality			
location	**frequency**	**parameter**	**submission**
At Project site, residential /institutional /commercial areas within 500m outside from project boundary	Bi-annual basis	PM10, Pm 2.5, SOx, NOx and CO	Submit to respective stakeholders including IDCOL.
Key parameters to be monitored: (2a) Surface Water			
location	**frequency**	**parameter**	**submission**
Project site at West Muktarpur, Munshigonj	Bi-annual basis in each year (pre-monsoon and post-monsoon)	pH, Temperature, DO, BOD, COD, TDS,TSS, Oil and grease	Submit to respective stakeholders including IDCOL.
Key parameters to be monitored: (2b) Ground Water			
location	**frequency**	**parameter**	**submission**
Project site at West Muktarpur, Munshigonj	Bi-annual basis in every year (pre-monsoon and post-monsoon)	pH, Temperature, DO, BOD, COD, TDS, Oil and grease	Submit to respective stakeholders including IDCOL.
Key parameters to be monitored: (3) Noise			
location	**frequency**	**parameter**	**submission**
At four corners of Project boundary, residential/institutional /commercial areas within 100m and 300m outside from project boundary	Quarterly	Limits in dBA	Submit to respective stakeholders including IDCOL.

9.3.3 Environmental Monitoring and Management Budget

Environmental monitoring is conducted to compare the change between baseline condition and after project scenario, by testing some environmental parameters of air, water and noise and in case of necessity soil is tested. ESMU is fully responsible for environmental monitoring as well as implementation of environmental management plan. As testing environmental parameters required sophisticated instruments, it is suggested that ESMU should outsource consulting firm for testing and analyzing environmental parameters. But it will have to be equipped with required instruments gradually by purchasing required instruments.However, a tentative environmental monitoring budget has been proposed in Table 9.6. Laboratory analysis fees considered as per monitoring fees format of DOE/private laboratories.

Table 9.6: An annual tentative budget for environmental monitoring (Operation Phase)

Activity	Units	Total Cost (Tk.)
Fire-fighting and suppression equipment, training and annual fire safety drill	1 site	150,000
Cost of occupational health and safety equipment	1 site	125,000
Quarterly test of ambient air quality (SPM, SOx, NOx)		75,000
Half yearly test of surface water (pH, Temperature, DO, BOD, COD, TDS, Oil and grease)		75,000
Half yearly test of ground water (pH, Temperature, DO, BOD, COD, TDS, Oil and grease)		75,000
Quarterly noise monitoring		25,000
Environmental Safeguards Training	lump sum	125,000
ESMU Staff's annual salary (3 persons)	lump sum	800,000
Sub Total in Tk.		**14,50,000**
Contingency (10 %)		145,000
Total in BDT		**15,95,000**
Note: (Considering USD 1 = Tk. 80.0)		**USD 19937.5**

9.3.4 Environmental Monitoring and Management Reporting

As a part of environmental and social compliances, SAPLRT authority will submit quarterly EHS compliance report of the Project to IDCOL. This report will contain the analysis of testing various environmental parameters during monitoring phase. It will also describe in detail about the status of implementation of environmental management plan. IDCOL will monitor the EHS compliance half-yearly. Based on the findings of half-yearly monitoring, IDCOL will submit annual EHS monitoring report to ADB.

In case of reporting, SAPL compliance with the following documents are to be prioritized:

a) EMP of this IEE
b) Traffic Safety Management Plan
c) EHS Guidelines/Standards
d) Emergency Response Plan

The schedule of reporting the monitoring arrangement has been presented in the following Table 9.7.

Table 9.7: Reporting schedule

Reporting entity	Frequency of Report	Entity to whom the report will be submitted
SAPL	Quarterly EHS Compliance Report	IDCOL
IDCOL	Annual ESDDR Report based on the findings of half-yearly monitoring of the River Terminal Container Port	ADB

X. EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

10.1 EMERGENCY RESPONSE

The initial response to an incident is a critical step in the overall emergency response. Like all other Industries and installations, River Terminal Container Depot facilities must have adequate measures against accidents or incidents to meet the emergency. The purpose of having an Emergency Response Plan (ERP) is to:

- Assist personnel in determining the appropriate response to emergencies.
- Provide personnel with established procedures and guidelines.
- Notify the appropriate Company Emergency Response Team personnel and regulatory/ Govt. agencies.
- Manage public and media relations.
- Notify the next-to-kin of accident victims.
- Minimize the effects that disruptive events can have on company operations by reducing recovery times and costs.
- Respond to immediate requirements to safeguard the subtending environment and community.

10.2 IDENTIFICATION OF EMERGENCIES

There are three tiers of hazard-emergency, crisis and disaster. For a river terminal project, the potential emergencies[25], crisis[26] and disastrous[27] incident are mentioned in the following Table 10.1.

Table 10.1: Major hazards in a river port project (generic)

EMERGENCIES	CRISIS	DISASTERS
Storm, temporary loss of utilities e.g. power, gas	Floods, River erosion, Building damage	Major flood, Major storm, Building loss
Tremor	Major tremor with minor/localised infrastructure damage.	Earthquake with major infrastructure damage
Local building Fires	Residential and Reserve fire threats.	Major fire
Bulk storage spills, toxic gas leaks, explosions or fires.	Food contamination, Loss of plant or equipment, Substantial property damage and disruption.	Loss of property and service
Traffic hazard	Major accident, Localised toxic liquid spill or gas release.	Multiple motor vehicle accident, Major Toxic liquid spill or gas release.
Act of violence towards port staff and/or properties.	Civil or personal threat.	Terrorism, bomb
Infrastructure disruption:	Infrastructure failure: e.g.	Substantial Infrastructure failure

[25] An **emergency** is a situation that poses an immediate risk to health, life, property, or environment. Most emergencies require urgent intervention to prevent a worsening of the situation, although in some situations, mitigation may not be possible and agencies may only be able to offer palliative care for the aftermath

[26] A **crisis** is any event that is, or is expected to lead to, an unstable and dangerous situation affecting an individual, group, community, or whole society.

[27] A **disaster** is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

EMERGENCIES	CRISIS	DISASTERS
e.g. road damage, drain blockage.	road collapse, drain blockage and flooding.	
Minor disruption to Information Technology Service.	Moderate and deliberate interference to Information Technology Service.	Substantial and long term interference to Information Technology Service due to malicious or terrorist act.

Source: Emergency Response plan, Port Adelaide

10.3 STEPS IN EMERGENCY RESPONSE

In general emergency response process includes a six-steps of response actions as are illustrated in Table 10.2.

Table 10.2: Basic steps of emergency response

Step	Required action
Determining hazard	▪ Determine the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards. ▪ Determine potential hazards stemming from local conditions such as extreme weather events, etc. and ensure that the initial response team is aware of these conditions.
Determining cause and effect	▪ Determine the source/cause of the event resulting to the emergency and prevent further losses.
Assessment	▪ Conduct an assessment of the incident site for any further information on hazards or remedies.
Redress	▪ Initiate redress procedures.
Documentation and reporting	▪ Report the incidence its nature cause impact applied redress procedures and any further assistance required etc. to the appropriate company, government and/or land owner.
Remedial/corrective actions	▪ Take appropriate steps with respect to hazards to wildlife, other resources and addressing public and media concerns and issues, as applicable. Response priorities are to protect human lives, property and the environment.

10.4 APPROACHES TO EMERGENCY RESPONSE

For this project, emergency response systems should be in place to deal with dangerous goods uncontrolled releases of dust and gaseous emission, natural calamities fires burns and injuries. There are to be trained emergency response teams, specific contingency plans and incidence specific equipment packages in place to cope with these types of emergencies. In case of an emergency incident, immediate action must be taken to mitigate the impacts. In order to minimize the possibility of injury, it is important that emergency responders follow a specific sequence of actions as stepped out in the preceding paragraphs. All accidents and near-miss incidents shall be investigated to determine what caused the problem and what action is required to prevent a recurrence. Employees required to perform investigations shall be trained in accident investigation techniques. The incident/accident investigation should be a fact-finding exercise rather than faultfinding. The investigations will focus on collection of evidence to find out the "root cause" of the incident. The recommendations of the investigation report are implemented in phases. In this chapter basically an indicative and basic aspects have been discussed in regard of emergency response. However, for proper safety, SAPL has to adopt project specific detailed **Emergency Response Plan** (ERP) from the starting of commercial operation.

XI. RECOMMENDATION AND CONCLUSION

The environmental impact of the proposed river terminal project has been assessed according to ADB and DOE guidelines. The IEE has been prepared through identifying the potential impacts, assessing them and recommending possible mitigation and enhancing measures for negative and positive impacts, respectively. While impact assessment, minimal negative environmental impacts on location, planning, design, construction and operation are anticipated, mostly during construction and operation of the project. Proper maintenance of the machineries could reduce the emission of air pollutants.

Based on the environmental assessment and surveys conducted for the project, associated potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the measures as stated in the IEE. Adequate provisions should be made in the project to cover the environmental mitigation and monitoring requirements, and their associated costs. The possible environmental impacts caused by the operation of the project may be the noise of marine vessels and operational equipment. In addition, there is issue of limited SOx emission due to diesel fouled operational devices like crane and health safety of the community due to trucks, lorries and covered van. Since it is understood that the project proponent (SAPL) is committed to take necessary steps to address any environmental problems, the selected location seems to be acceptable for the proposed project.

The findings of this IEE suggests that the project involves some environmental impacts (mostly localized in nature) to which further careful attention should be given in the operation and maintenance of the Project in order to minimize/mitigate and offset the adverse effects. The possible negative impacts are not severe, and the adverse impacts if duly addressed, as stated in the EMP, could be minimized without much effort, though they would require attention and positive commitment from the plant management.

Due to the site specific nature of potential adverse impacts, the project is assumed to be categorized as B. Hence, the necessity of conducting detail study by EIA can be avoided.

The location of project is environmentally in an advantageous condition as has already been mentioned. However, adequate and effective pollution prevention, abatement and control measure, proper and careful operation and maintenance, regular and effective environmental monitoring with adequate staff and budgetary provision, and reporting to DOE and ADB should be ensured.

Appendix 1: Rapid Environmental Assessment Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: **Bangladesh/ Loan no. 3045-BAN/ 2nd Public Private Infrastructure Development Facilities/Construction and Operation of a River Terminal Project by Summit Alliance Port Limited**

Sector Division: **Port**

Screening Questions	Yes	No	Remarks
A. PROJECT SITING **IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?**			
▪ **CULTURAL HERITAGE SITE**		√	The proposed project site of Summit Alliance Port Limited (SAPL) comprising an area of about 14.50 acres of land, is located in West Muktarpur under the jurisdiction of Munshiganj Sadar Upazila, of Munshiganj District on the bank of the Dhaleshwari River. The project will offer river terminal facility for transportation of intermodal containers to and from the Chittagong Port, as well as Inland Container Depot (ICD) and Container Freight Station (CFS) services for handling and storage of intermodal containers. The total container handling capacity of the project will be 120,000 twenty-foot equivalent unit (TEU) annually. There is no significant cultural heritage site in the project area according to local respondents.
▪ **PROTECTED AREA**		√	In the project area, no protected area has been reported.
▪ **WETLAND**	√		The project site is located on the bank of the Dhaleswari River.
▪ **MANGROVE**		√	The main mangrove forest in Bangladesh named The Sundarbans is about 180 kilometers away (approximate aerial distance from Google Earth) from the project site.
▪ **ESTUARINE**		√	Neither estuarine, nor buffer zone of protected area are located at adjoining areas of project site.
▪ **BUFFER ZONE OF PROTECTED AREA**		√	

Screening Questions	Yes	No	Remarks
▪ **SPECIAL AREA FOR PROTECTING BIODIVERSITY**		√	Strip of 10 km. outside the Sundarbans Reserved Forest, Sea Front of Cox's Bazar and Teknaf, St Martin's Island, Sonadia Island, Hakaluki Haor, Marjat Baor and Gulshan Lake have been declared as ecologically critical area (ECA) by the Bangladesh Government28 with an aim to protect sensible biodiversity. Among these ECAs, the closest ECA is Gulshan Lake, which is about 30 km away from the project site (approximate aerial distance from Google Earth). So, it can be concluded that the project does not associate with the issue of adversely affecting any ECA.
B. POTENTIAL ENVIRONMENTAL IMPACTS**WILL THE PROJECT CAUSE…**			
▪ encroachment on precious ecology resulting in loss or damage to fisheries and fragile coastal habitats such as coral reefs, mangroves, and seagrass beds?		√	The project is not associated with any coastal or sea related adverse impacts. But due to the close proximity of the Dhaleswari River, there is scope to be associated with impact in relevant to fishery. But based on the primary experience (site visit) and secondary information, it concludes that the location of the project site is not suitable for fishing purpose. So, there is no adverse fishing relevant issue in regard of the project.
▪ short-term increase in turbidity and sunlight penetration as well as changes in sediment pattern and flows at dredging site?		√	From Geo-morphological point of view, the Dhaleswari River is in an advantageous position. Due to the satisfactory draft and limited variation in wave, there is no alarming sedimentation record in relevant to this river. This advantage has facilitated significant industrial growth along this river bank. In consideration of the scale of the project and geo-morphological condition of the river, it may be summarized that the requirement of dredging would be too insignificant to raise concern for aquatic habitat.
▪ removal and disturbance of aquatic flora and fauna at dredging site?		√	
▪ deterioration of water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		√	During construction phase, the use of chemicals was not observed. In addition, due to local workers, there was no workers shed within the project area resulting depletion of water quality.
▪ alteration of bottom surface and modifications to bathymetry, causing changes in tidal bore, river circulation, species diversity, and salinity?		√	The project is too small to result any impact on the bathymetric condition of the Dhaleswari River.
▪ changes in sediment pattern and littoral drift that may cause beach erosion of neighboring areas?		√	The project has no relevance with beach erosion. But there is scope of river bank erosion, which has been managed through concrete embankment.
▪ modification of terrestrial habitat by upland disposal of dredged material or covering of potential archaeological sites with dredge spoil?		√	Due to the project activities, the adverse impact to the terrestrial habitat and archeological sites is not predicted.
▪ short-term air quality degradation due to dredging-related operations?		√	The scale of dredging is too limited to raise short term-air quality degradation.
▪ noise and vibration due to blasting and other civil works?	√		During construction phase, there will be generation of noise and dust. In this regard, required mitigation measures need to be adopted. In case of SAPL project, most of the critical noise generating activities have been accomplished during day time.

[28] Source: *Third National Report (submitted by Bangladesh),* 2005

Screening Questions	Yes	No	Remarks
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	√		The project has no relevancy with radiological hazards. But there is risk of occupational hazard during construction and operation phases of the project. In this regard, SAPL has to adopt required safety measures to minimize the risk of chemical, biological or even general health hazards.
▪ dislocation or involuntary resettlement of people?		√	SAPL has purchased the land from well-known cement manufacturer named Holcim by following the rules and regulations of Bangladesh Government. Holcim did not allow any unauthorized settlement or economic activity in this land. In this regard, they erected boundary wall in most of the areas of the land. As then there had been no residential occupancy or any income generating activity related to the sites, there would not be any physical or economic displacement of people due to the project intervention.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	Based on the type and scale of activities of the project, it assumes that the project will not associate with any gender, class or caste related disparity. In addition, it seems to have insignificant opportunity to adversely affect the Indigenous Peoples. Moreover, it could facilitate for a better quality of life through efficient service and new job opportunities irrespective of caste and gender.
▪ other social concerns relating to inconveniences in living conditions in the project areas?		√	Based on the IEE, it can be said that if EMP is properly implemented, there is insignificant scope fort the project to raise social concern in regard of noise, waste and air emission.
▪ social conflicts if construction depletes local fishery resources on which communities depend for subsistence?		√	The issue has not been found relevant to the project.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations (such as STI's and HIV/AIDS)?		√	During construction phase, SAPL has arranged satisfactory sanitation facility. As most of the workers came from adjacent community there was no significant workers' shed having potentiality to raise concern in regard of various types of wastes and prevailing social norms.
▪ social concerns relating to local inconveniences associated with port operation (e.g. increased volume of port traffic, greater risk of accidents, communicable disease transmission)?	√		Due to the access road coming through a locality, there is greater risk of accidents for the local community. In this regard, SAPL has to adopt required awareness measures and scheduling of truck especially at night shift (as much as is possible). Due to the efficient operation of the project, it is expected that there would be insignificant scope for the drivers and workers to affect local social pattern through ant anti-social activity and promote communicable disease.
▪ deterioration of water quality due to ship (e.g. ballast water, oil waste, lubricant and fuel spills, sewage) and waterfront industry discharges?		√	As the marine vessel operating in this project will move through three same type of river Dhaleswari, Meghna and Karnaphuli, ballast water will not be an important concern. In case of managing bilge water, SAPL has confirmed that they would not allow any disposal of bilge water to the river from any ship.

Screening Questions	Yes	No	Remarks
▪ increased noise and air pollution resulting from airborne emissions (e.g. gas, smoke, fumes) from maneuvering and berthing ships and the waterfront industry?	√		Due to the project operation, there would be add noise and airborne emission. But based on the findings of air dispersion and noise quality modelling, it can be said that the noise and air emission would remain within the acceptable limit. There is an issue with the air emission of marine vessels (MVs). But SAPL has informed that their MVs would be in a good operating condition resulting effective burning of fuels and generating low air emission.
▪ large population increase during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	The project deals with moderate type construction work. So, there is minimal scope of population influx and raising associated social problems. In case of SAPL project, most of the workers are from local community.
▪ social conflicts especially when workers from other areas are hired?		√	Based on the required scale of construction and operation work of SAPL project, it assumes that there is no need to hire workers from other regions of the country for this project. The work force of the adjacent areas seems to be adequate to meet the demand.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	√		During movement of various types of vehicles, there is an issue of traffic safety specially carrying heavy machineries during construction phase. In this regard, SAPL has to adopt required safety measure. In addition, satisfactory traffic management plan is to be adopted to minimize the scope of traffic congestion during operation phase.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	√		The project is located in a village named West Muktarpur. Residential area has been observed at close vicinity of the project site. So, to minimize risk of health hazard during construction, operation and decommissioning phases, SAPL has to adopt required mitigation measures.

Appendix 2: Checklist for Preliminary Climate Risk Screening

Country/Project Title: Bangladesh/ Loan no. 3045-BAN/ 2nd Public Private Infrastructure Development Facilities/Construction and Operation of a River Terminal Project by Summit Alliance Port Limited

Sector: Port

Screening Questions		Score	Remarks[29]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	1	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium

Other Comments:

Prepared by: Raihan Uddin Ahmed, Environmental Specialist, IDCOL

[29] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Appendix 3: Environmental Clearance Certificate

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ অধিদপ্তর
মুন্সীগঞ্জ জেলা কার্যালয়
হাসপাতাল রোড, পঞ্চসার, মুন্সীগঞ্জ
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স্মারক নং- ৩০.৫৯.৫৬.৪.২৪.২৪০৭১৩/ছাড়-০৪

তারিখ ঃ ১২/০৮/১৪২১ বঙ্গাঃ / ২৬/১১/২০১৪ খ্রিঃ

জনাব এস এ জে রিজভী
ব্যবস্থাপনা পরিচালক
সামিট এ্যালায়েন্স পোর্ট লিমিটেড
সামিট সেন্টার, ৮ম তলা,
১৮ কাওরান বাজার, ঢাকা-১২১৫।

বিষয় ঃ পরিবেশগত ছাড়পত্র।

সূত্র ঃ ক) অবস্থানগত ছাড়পত্রের স্মারক নং-৩০.৫৯.৫৬.৪.২৪.২৪০৭১৩/ছাড়-০৭, তারিখ: ২৬/১১/২০১৩খ্রিঃ
খ) অত্র দপ্তরের স্মারক নং-৩০.৫৯.৫৬.৪.২৪.২৪০৭১৩/প্রশাঃ-১১৭, তারিখ: ০৮/০৭/২০১৪খ্রিঃ
গ) পরিবেশগত ছাড়পত্র সংক্রান্ত আপনার ১৪/০৭/২০১৪ খ্রিঃ তারিখের আবেদনপত্র।

উপর্যুক্ত বিষয় ও সূত্রের পরিপ্রেক্ষিতে পরিবেশগত ছাড়পত্র কমিটি কর্তৃক আপনার আবেদনপত্র ও সংশ্লিষ্ট কাগজপত্র পর্যালোচনান্তে এবং **সদর দপ্তরের পরিবেশগত ছাড়পত্র বিষয়ক কমিটির ৩৮০তম সভায় গৃহীত সিদ্ধান্ত "ক/২৯" মোতাবেক** পশ্চিম মুক্তারপুর, পঞ্চসার, মুন্সীগঞ্জ; ঠিকানায় **ইনল্যান্ড কন্টেইনার টার্মিনাল (ICT) নির্মাণের জন্য "সামিট এ্যালায়েন্স পোর্ট লিমিটেড"**-এর অনুকূলে পরিবেশগত ব্যবস্থাপনা নিশ্চিতকরণসহ নিম্নলিখিত শর্তে পরিবেশগত ছাড়পত্র প্রদান করা হলোঃ

শর্তসমূহ ঃ

১. প্রতিষ্ঠানটির কোনো কর্মকান্ড ও উৎপাদন প্রক্রিয়া দ্বারা কোনভাবেই পরিবেশ দূষণ করা যাবে না।
২. প্রতিষ্ঠানটিতে সৃষ্ট সকল বর্জ্য পরিকল্পিত উপায়ে সংগ্রহ অথবা পরিশোধন পূর্বক তা স্বাস্থ্য ও পরিবেশসম্মতভাবে অপসারণের ব্যবস্থা নিশ্চিত করতে হবে।
৩. প্রতিষ্ঠানটির বিরুদ্ধে ভবিষ্যতে পরিবেশ দূষণমূলক কোনো অভিযোগ উত্থাপিত ও তা প্রমাণিত হলে অত্র দপ্তরের নির্দেশিত নিয়ন্ত্রণ/সংশোধনমূলক ব্যবস্থাদি (স্থানান্তর/কার্যক্রম বন্ধসহ) গ্রহণ করতে হবে।
৪. বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫ (সংশোধিত ২০১০) এবং পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭ (সংশোধিত ২০০২) এর সকল বিধিবিধান পালন করতে হবে।
৫. কোন অবস্থাতেই সরকারী রেকর্ডে চিহ্নিত নদী তীরের খাস জমি কিংবা জলাভূমি অবৈধভাবে দখল কিংবা ভরাট করা যাবে না।
৬. **এ ছাড়পত্র কেবলমাত্র ইনল্যান্ড কন্টেইনার টার্মিনাল নির্মাণের জন্য প্রযোজ্য হবে। প্রকল্পের জায়গা সম্প্রসারণ, কার্যক্রম বা তৎসংশ্লিষ্ট কোন প্রকার পরিবর্তণের জন্য পরিবেশ অধিদপ্তরের পূর্বানুমতি/ছড়পত্রের প্রয়োজন হবে।**
৭. **ইআইএ প্রতিবেদনে উল্লেখিত সকল মিটিগেশন মেজার্স সার্বক্ষণিক কার্যকরীভাবে চালু রাখতে হবে।**
৮. **প্রকল্পের কার্যক্রমের মাধ্যমে সৃষ্ট কঠিন বর্জ্য পরিকল্পিত উপায়ে সংগ্রহপূর্বক পরিবেশসম্মতভাবে নিরাপদ অপসারণ অথবা পুনঃব্যবহারের ব্যবস্থা করতে হবে।**
৯. **ডমেস্টিক কাজে সৃষ্ট তরল বর্জ্য যথোপযুক্ত সেপটিক ট্যাংক ও সোক পিটের মাধ্যমে নির্গমণ করতে হবে।**
১০. **ফ্লোর ওয়াশিং কাজে সৃষ্ট তরল বর্জ্য কোন ক্রমেই সরাসরি নিজস্ব সীমানার বাইরে নিক্ষেপ করা যাবে না। এ ধরণের তরল বর্জ্য যথোপযুক্ত টেলিং ট্যাংকে রেখে সেপটিক ট্যাংক ও সোক পিটের মাধ্যমে নির্গমণ করতে হবে।**
১১. **প্রকল্পের কার্যক্রমের মাধ্যমে সৃষ্ট শব্দ নিয়ন্ত্রণের জন্য যথাযথ ব্যবস্থাদি সর্বদা কার্যকর রাখাতে হবে এবং শব্দের মানমাত্রা পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭ (সংশোধনীসহ) এর মধ্যে থাকতে হবে।**

(অপর পৃষ্ঠায় দ্রষ্টব্য)

১২. অগ্নি নির্বাপনকল্পে প্রকল্পে যথোপযুক্ত ব্যবস্থাদি যথাঃ ফায়ার এক্সিট, ফোমিং কম্পাউন্ডসহ ফায়ার হাইড্রেন্ট, ইমারজেন্সী লাইট স্থাপন, ভূ-গর্ভস্থ বা ভূ-উপরিস্থ জলাধারে সর্বদা পর্যাপ্ত পানি সংরক্ষণ ইত্যাদি ব্যবস্থা সার্বক্ষণিক কার্যকরী রাখতে হবে।

১৩. প্রকল্পে কর্মরত শ্রমিকদের পেশাগত স্বাস্থ্য রক্ষার্থে সকল ব্যবস্থা যথাঃ বুট, নোট মাস্ক, সেফটি গ্লাস, হ্যান্ডগ্লোভস, হ্যালমেট পরিধান ইত্যাদির ব্যবহার সার্বক্ষণিক কার্যকরীভাবে চালু রাখতে হবে।

১৪. প্রকল্পের কার্যক্রমের মাধ্যমে সৃষ্ট শব্দ এবং তরল/বায়বীয় বর্জ্যের নিঃসরণ/নির্গমণ মাত্রা যথাক্রমে শব্দ দূষণ (নিয়ন্ত্রণ) বিধিমালা-২০০৬ এবং পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭ (সংশোধনীসহ) এ বর্ণিত মানমাত্রার মধ্যে হতে হবে।

১৫. বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫ (সংশোধনীসহ) এবং পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭ (সংশোধনীসহ) -এ প্রদত্ত ক্ষমতাবলে উপরিউল্লিখিত শর্তসমূহ Enforce করা হবে।

১৬. নিজস্ব লোকবল ও ইকুইপমেন্টের সমন্বয়ে ইন-হাউজ এনভায়রনমেন্টাল মনিটরিং সিস্টেম গড়ে তুলতে হবে।

১৭. প্রকল্প চত্বরে উপযুক্ত প্রজাতির পর্যাপ্ত সংখ্যক ফলজ ও বনজ গাছ লাগিয়ে সবুজায়ন করতে হবে।

১৮. এই ছাড়পত্র ইস্যুর তারিখ হতে পরবর্তী ১(এক) বৎসরের জন্য বহাল থাকবে এবং মেয়াদ শেষ হবার অন্ততঃ ৩০ (ত্রিশ) দিন পূর্বে নবায়নের জন্য আবেদন করতে হবে। ছাড়পত্র নবায়নের আবেদনের সাথে প্রয়োজনীয় তথ্য-কাগজপত্রসহ প্রকল্পের অনুকূলে হালনাগাদ ফায়ার সার্ভিস ও সিভিল ডিফেন্স অধিদপ্তরের লাইসেন্স দাখিল করতে হবে।

১৯. ছাড়পত্রের মূলকপি কারখানায় সংরক্ষণ করতে হবে। পরিবেশ অধিদপ্তরের এনফোর্সমেন্ট টীম বা কোন কর্মকর্তা কারখানা পরিদর্শনে গেলে তাদেরকে ছাড়পত্র প্রদর্শন ও প্রকল্পের কার্যক্রম পরিদর্শনে সর্বাত্মক সহযোগিতা প্রদান করতে হবে।

২০. এ পর্যায়ে প্রাপ্ত ও পরিবেশিত তথ্যের ভিত্তিতে এ ছাড়পত্র প্রদান করা হলো। পরবর্তীতে কোন তথ্য অসম্পূর্ণ, ত্রুটিপূর্ণ, অসত্য কিংবা গোপন করা হয়েছে মর্মে প্রমাণিত হলে এ ছাড়পত্র বাতিল করা হবে।

২১. **এ ছাড়পত্রের মালিকানা হস্তান্তরযোগ্য নয়। এই ছাড়পত্র জমির মালিকানা নির্ধারণ করে না। জমির মালিকানা দেখার দায়িত্ব পরিবেশ অধিদপ্তরের নয় বিধায় এ ছাড়পত্রের সাথে জমির মালিকানার কোন সম্পর্ক নেই।**

২২. এ ছাড়পত্রের ১নং অনুচ্ছেদ হতে ২১নং অনুচ্ছেদে বর্ণিত শর্তের যে কোনটি ভংগ করলে এ ছাড়পত্র বাতিল বলে গণ্য হবে এবং আপনার প্রতিষ্ঠানের বিরুদ্ধে বাংলাদেশ পরিবেশ সংরক্ষণ আইন ১৯৯৫ (সংশোধনীসহ) ও পরিবেশ সংরক্ষণ বিধিমালা ১৯৯৭ (সংশোধনীসহ) অনুসারে আইনগত ব্যবস্থা গ্রহণ করা হবে।

০২। **এতে যথাযথ কর্তৃপক্ষের অনুমোদন রয়েছে।**

২৬/১১/২০১৪

(নুর আলম)
সহকারী পরিচালক
ফোন : ০২-৭৬২০৭৪২ (অফিস)

স্মারক নং- ৩০.৫৯.৫৬.৪.২৪.২৪০৭১৩/ছাড়-

তারিখ ঃ ১২/০৮/১৪২১ বঙ্গাঃ
২৬/১১/২০১৪ খ্রিঃ

Appendix 4: Clearance of BIWTA

Address :
BIWTA Bhaban
141-43/Motijeel
C/A, Dhaka
Bangladesh

Telex No. : 642787 BIWTA BJ
Fax No. : 880-2-9551072
Grams : AUTHORITY
Phones : 880-2-9556151-55
: 880-2-9555042,
: 9552027, 9552039.

বাংলাদেশ অভ্যন্তরীণ নৌ-পরিবহন কর্তৃপক্ষ

BANGLADESH INLAND WATER TRANSPORT AUTHORITY

নথি নং- ১৮.৭৬৭.০৪৫.০২.০০.০২৪.২০১১/৬৬১ তারিখ ঃ ১৯/০৫/২০১১ ইং।

সচিব
নৌ পরিবহন মন্ত্রনালয়
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বাংলাদেশ সচিবালয়, ঢাকা।

(দৃষ্টি আকর্ষণঃ উপ সচিব (টিএ))

বিষয় ঃ Granting No Objection Centitiate (NOC) for steeing up a Inland River Container Terminal (ICT) & Container Fright Station (CFS).

সূত্র ঃ নৌপম/টিএ/এম-০৭/২০০৯-৪৫ তারিখ ঃ ১৮/০১/১০

উপর্যুক্ত বিষয়ে ও সূত্রে নৌ-পরিবহন মন্ত্রণালয় হতে প্রাপ্ত স্মারকের বিষয়ে নির্দেশক্রমে জানানো যাচ্ছে যে, বাঅনৌপ-কর্তৃপক্ষের সভায় আলোচনার প্রেক্ষিতে নিম্নলিখিত শর্তে এবং সরকারী সংশ্লিষ্ট অন্যান্য মন্ত্রণালয়/বিভাগ/সংস্থার সংশ্লিষ্ট ক্ষেত্রে অনাপত্তি সাপেক্ষে M/S CEMOR Limited কর্তৃক মুন্সিগঞ্জের মুক্তারপুর ব্রীজের পাশে ICT নির্মাণের বিষয়ে অনাপত্তি/মতামত প্রদান করে হলোঃ

(ক) বাংলাদেশ-চীন মৈত্রী সেতু-৩ (মুক্তারপুর ব্রীজ) হতে ধলেশ্বরী নদীর তাটিতে প্রায় ২২৭ মিঃ (৭৪৭ ফুট) দুরে প্রস্তাবিত স্থানে কন্টেইনার জেটি নির্মাণ করতে হবে। কোন অবস্থাতেই এ দূরত্ব হ্রাস করা যাবে না।

(খ) প্রস্তাবিত জেটি ও অন্যান্য স্থাপনা নদীর তীর/ফোরশোর ভূমিতে কোন ক্রমেই নির্মাণ করা যাবে না এবং নৌ-পথে কোনরুপ প্রতিবন্ধকতা সৃষ্টি করা যাবে না।

(গ) জেটি বা স্থাপনা কোনক্রমে M/S Cemcor Ltd. এর জমির বাহিরে (C S Map অনুযায়ী নিজস্ব জমি) নির্মাণ করা যাবে না। প্রয়োজনে ফোরশোরে বেসিন নির্মাণ করে জেটি নির্মাণ করতে হবে।

(ঘ) Port Act-1908, Port Rules-1966 এবং Inland Shipping Ordinance-1976 এর সংশ্লিষ্ট ধারার আলোকে নিম্নবর্ণিত সার্ভিস সমূহের শুল্ক বিআইডব্লিউটিএ বরাবর পরিশোধ করতে হবে।

(১) কনজারভেন্সী ফিস।
(২) পাইলটেজ ফিস।
(৩) বন্দর এলাকায় তীরভূমি ব্যবহার ফি (প্রতি শতাংশ বা অংশ বিশেষ প্রতি বৎসর বা অংশ বিশেষের জন্য)।
(৪) বন্দর এলাকার তীরভূমি সীমানার মধ্যে নির্মিত জেটি, কাঠামো (ষ্ট্রাকচার) ঘর, পাকা জেটি/সিড়ি/ ঘাট/স্লিপওয়ে/পাকা ঘর ইত্যাদি (প্রতি বর্গমিটার বা তার অংশ বিশেষ প্রতি বৎসর বা অংশ বিশেষের জন্য)।
(৫) নদীর স্বাভাবিক গতি ধারার উপর নির্মাণাধীন প্রতিক্রিয়া বাবদ চার্জ (প্রতি বর্গমিটার বা তার অংশ বিশেষ প্রতি বৎসর বা অংশ বিশেষের জন্য)।
(৬) লাইসেন্স প্রদত্ত জেটি/কাঠামো/নির্মাণাদি/তীরভূমি দিয়া মালামাল উঠানামার ল্যাডিং শিপিং চার্জ/থ্রো পোর্ট চার্জ।
(৭) নদীতে পন্টুন, বার্জ, ফ্লাট ইত্যাদি স্থাপনের ফিস।

(ঙ) প্রস্তাবিত অভ্যন্তরীণ কন্টেইনার নৌ-টার্মিনাল নির্মাণের বিষয়টি যথাযথ কর্তৃপক্ষের অনুমোদনের পর M/S Cemcor Ltd. কর্তৃক বাস্তবায়ন শুরুর পূর্বে উহার Lay-out সহ স্থাপনার বিস্তারিত ডিজাইন নক্সা অবশ্যই বাঅনৌপ-কর্তৃপক্ষ হতে অনুমোদন করিয়ে নিতে হবে।

(চ) বাংলাদেশ ব্রীজ অথোরিটির স্মারক নং ৫০.১৪৬.০০০.০০.০০.০৮২.২০১০-১০৫১/৪২২ তারিখ ২৬/১২/২০১০ এর প্রদেয় শর্তগুলো মেনে চলতে হবে।

(ছ) নৌ-পথে ও পরিবেশের ক্ষতি হয় এখন কোন কার্যক্রম গ্রহণ করা যাবে না।

স্বাক্ষরিত
(মো: আবুল বাসার)
সচিব
বাঅনৌপক, ঢাকা।

নথি নং-১৮.৭৬৭.০৪৫.০২.০০.০২৪.২০১১/৬৬১ তারিখ ঃ ১৯/০৫/২০১১ ইং।

অনুলিপিঃ

১। পরিচালক, M/S Cemcor Limited, সুমিট সেন্টার (৭ম তলা), ১৮, কাওরান বাজার, ঢাকা।
২। নথি নং-১৮.৭৬৭.০৪৫.০২.০০.০২৪.২০১১

১৯/৫/১১
সচিব

Appendix 5: RINA Certification of Class

CERTIFICATE OF CLASS

N. 93215-V005-001

RINA No. 93215

IMO number	**9220158**				
Name of ship	**SAPL-1**				
Category	Motorship				
Owner	SUMMIT ALLIANCE PORT LIMITED				
Distinctive number or letters	HPCI			Flag	Panama
Shipyard - place of build	FUJIAN SOUTHEAST SHIPYARD - FUJIAN				
Date of build	24 August 1999			Date of commissioning	24 August 1999
Overall Length	79.80 m	**Gross Tonnage**	**1616** GT	**Net Tonnage**	**855** NT
Length Between Perpendiculars	74.80 m	Moulded Breadth	13.00 m	Depth	5.40 m
Number of main engines	1	Total power	1103 kW		

THIS IS TO CERTIFY that the above ship has been surveyed in accordance with the Classification Rules and, on the basis of the survey report submitted, has been assigned the class (*)

C ± container ship ; special navigation

based on the freeboard indicated in the Load Line Certificate

with additional Class notations: ---

This certificate is valid until: **09 July 2019**

The validity may be extended at RINA SERVICES S.p.A.'s decision where allowed by the Rules.

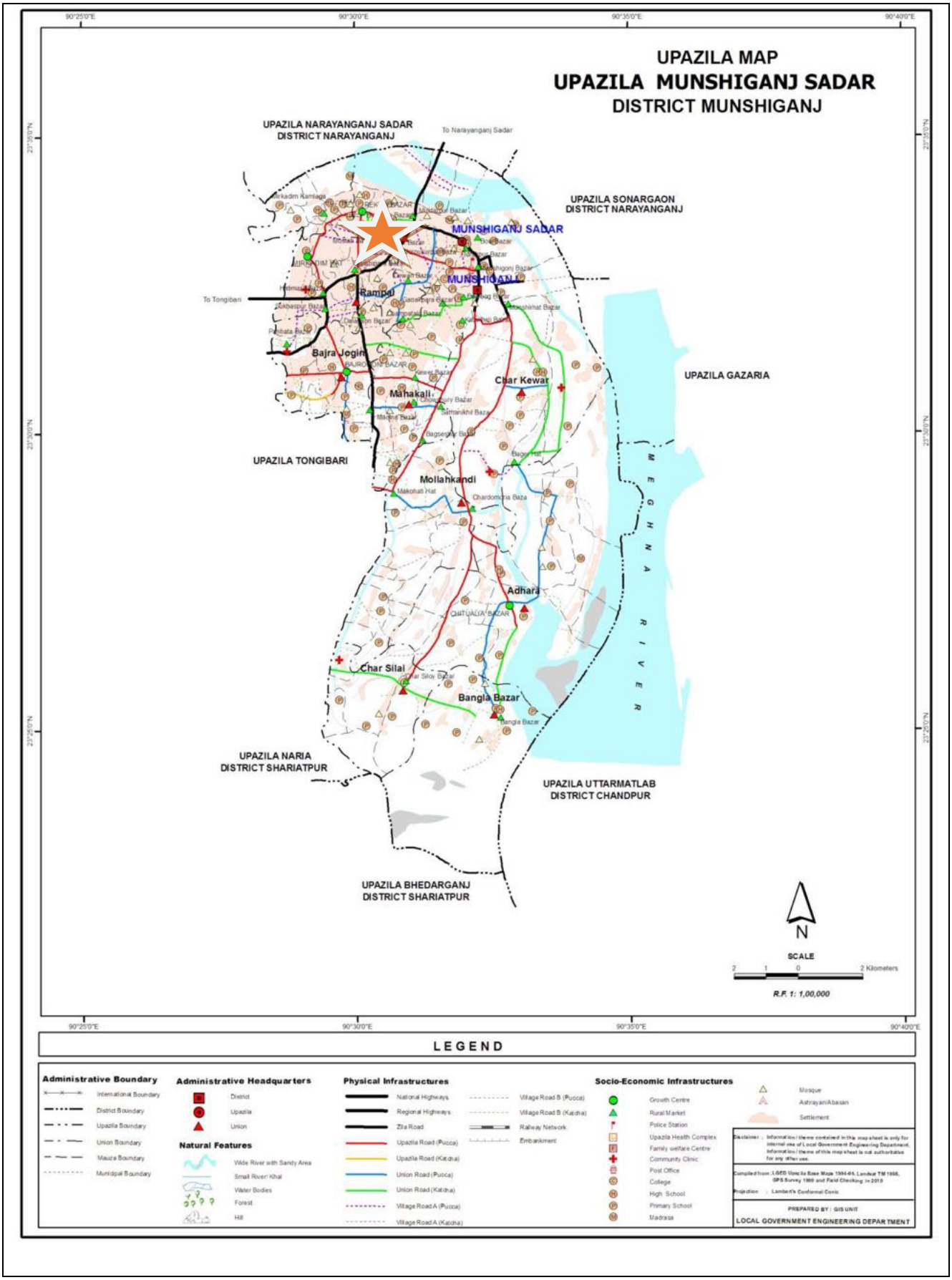
This certificate will be invalidated whenever the requirements of the Rules are not complied with.

Issued at: SHANGHAI

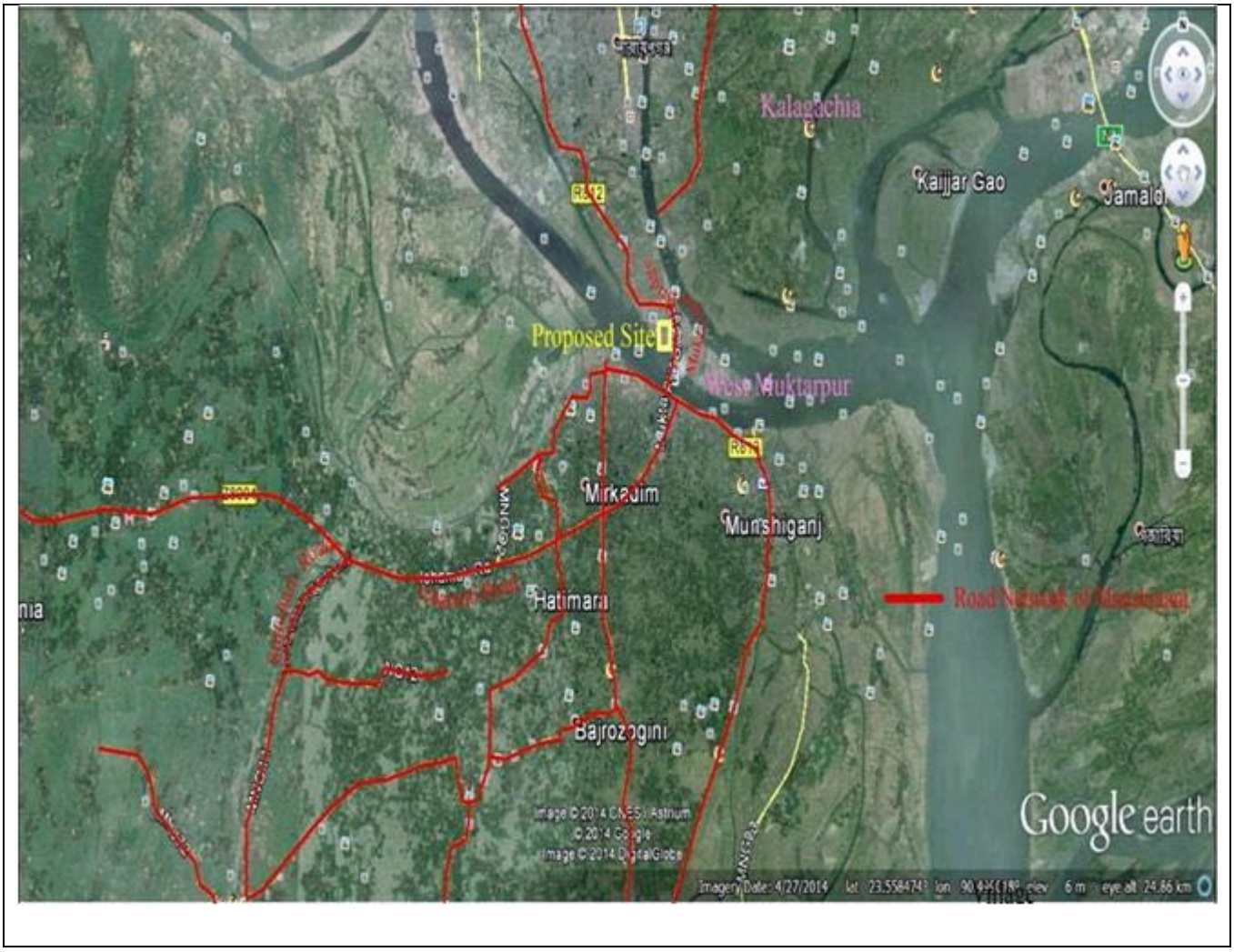
on: 14 October 2014

RINA SERVICES S.p.A.

Appendix 6: Location of project site in respect to Munshigonj Upazila (with legend)

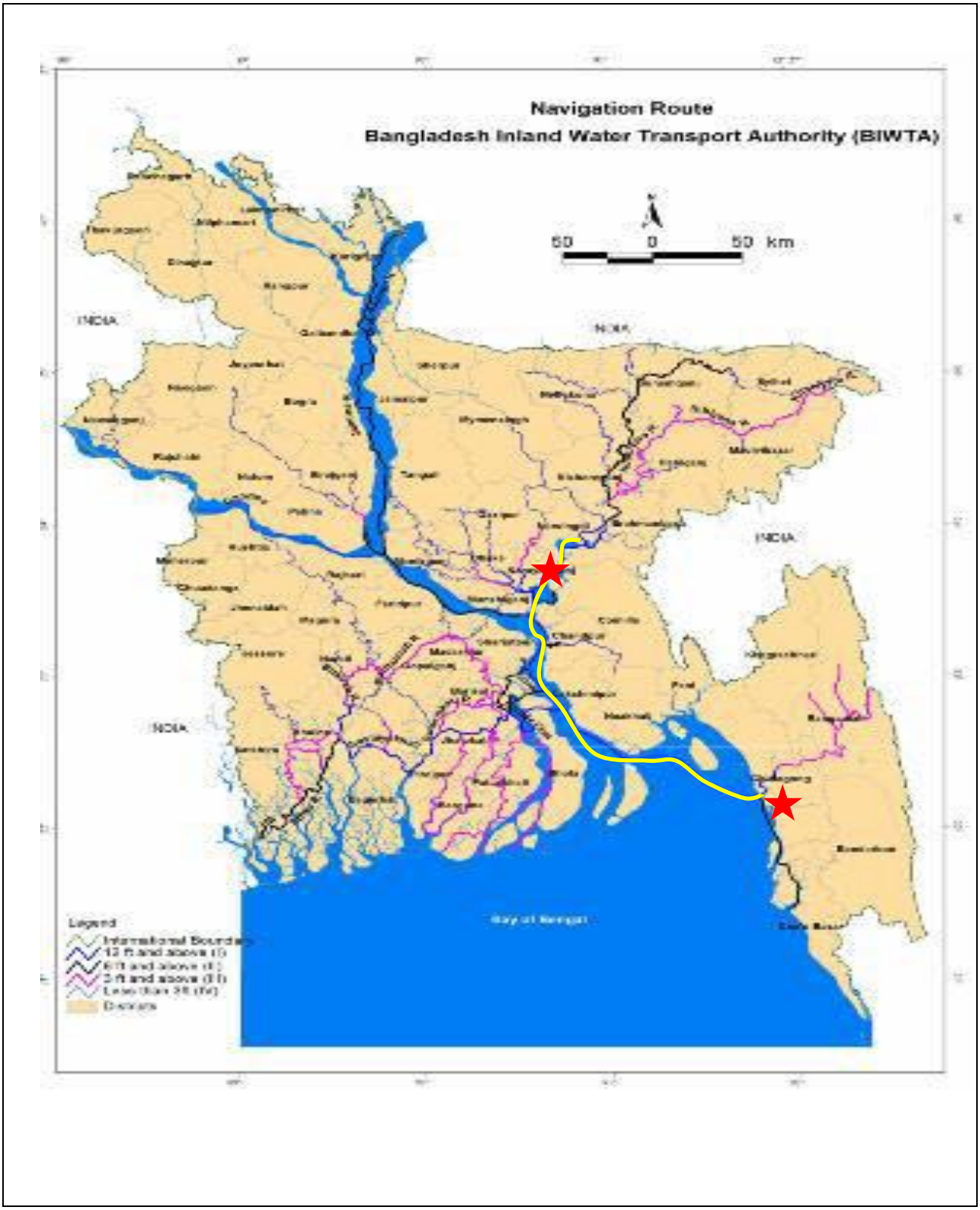


Appendix 7: Google image of project site with adjoining areas (long view)

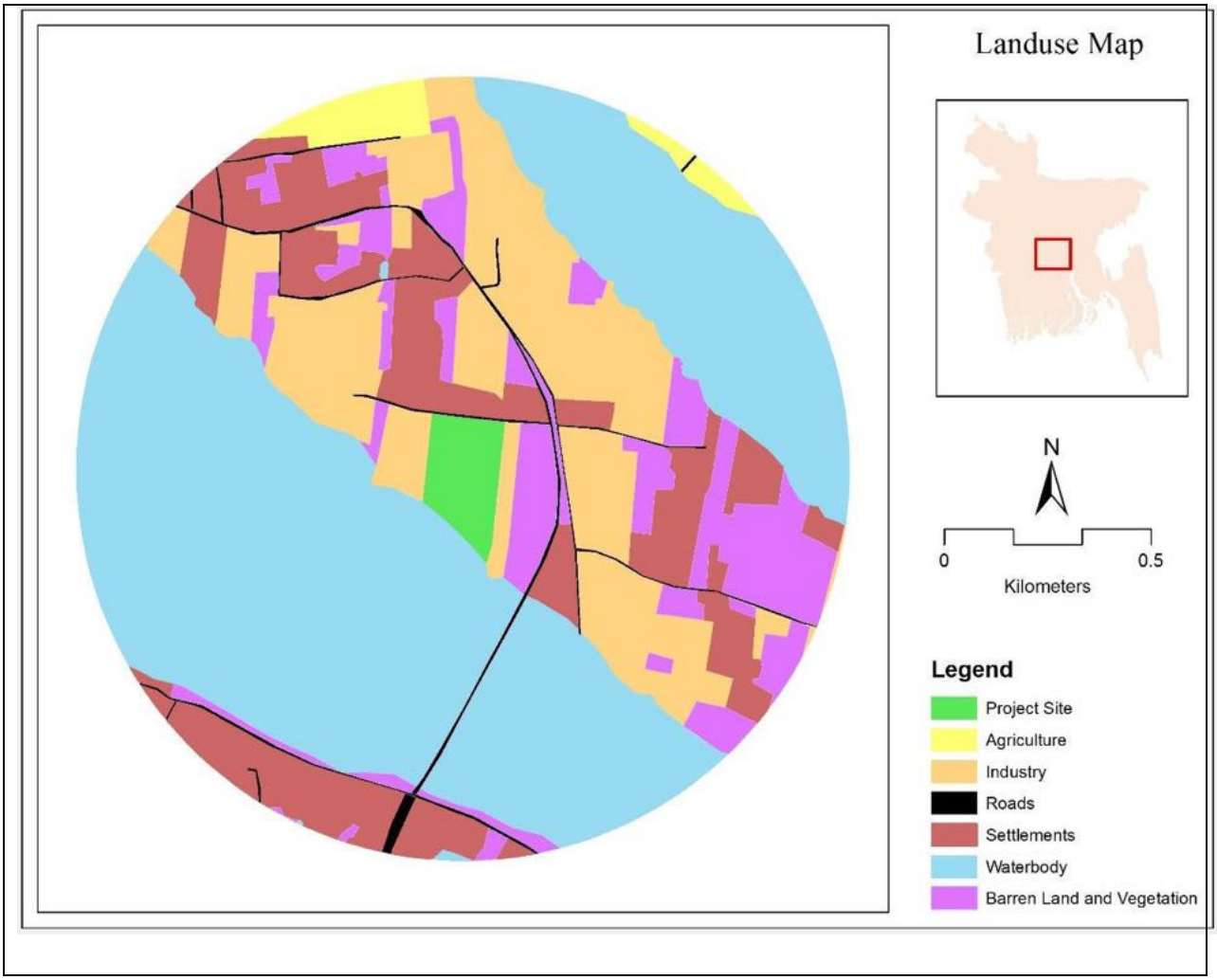


Appendix 8: Location of SAPL site in respect of South Asia

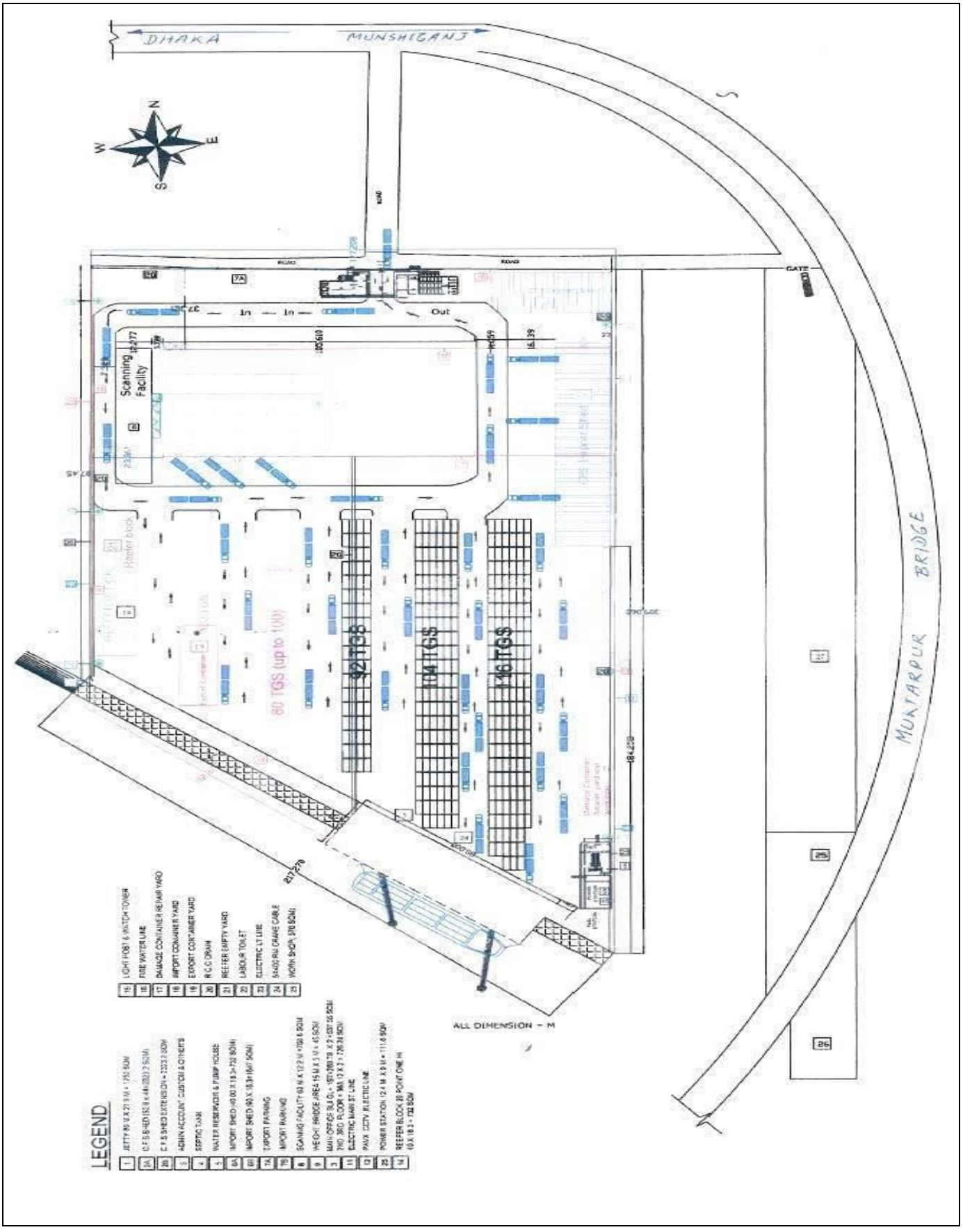
Appendix 9: Navigation route between Chittagong and Munshigonj



Appendix 10: Landuse in the project area (I km radious airshed)



Appendix 11: Master Plan (layout part)



Appendix 12: Location of the project site in respect of national highway and Muktarpur Bridge

Appendix 13: Structural design calculation for RCC Jetty

The approach of the design for RCC jetty is according to the technical standards for port-stand harbor facilities in Japan – The Overseas Coastal Area Development Institute in Japan (OCDI). The design of RCC jetty i.e. open type pier with vertical RCC piles has been made by analyzing the rigid frame composed of the piles and the super-structure.

Idealization of the Structure:

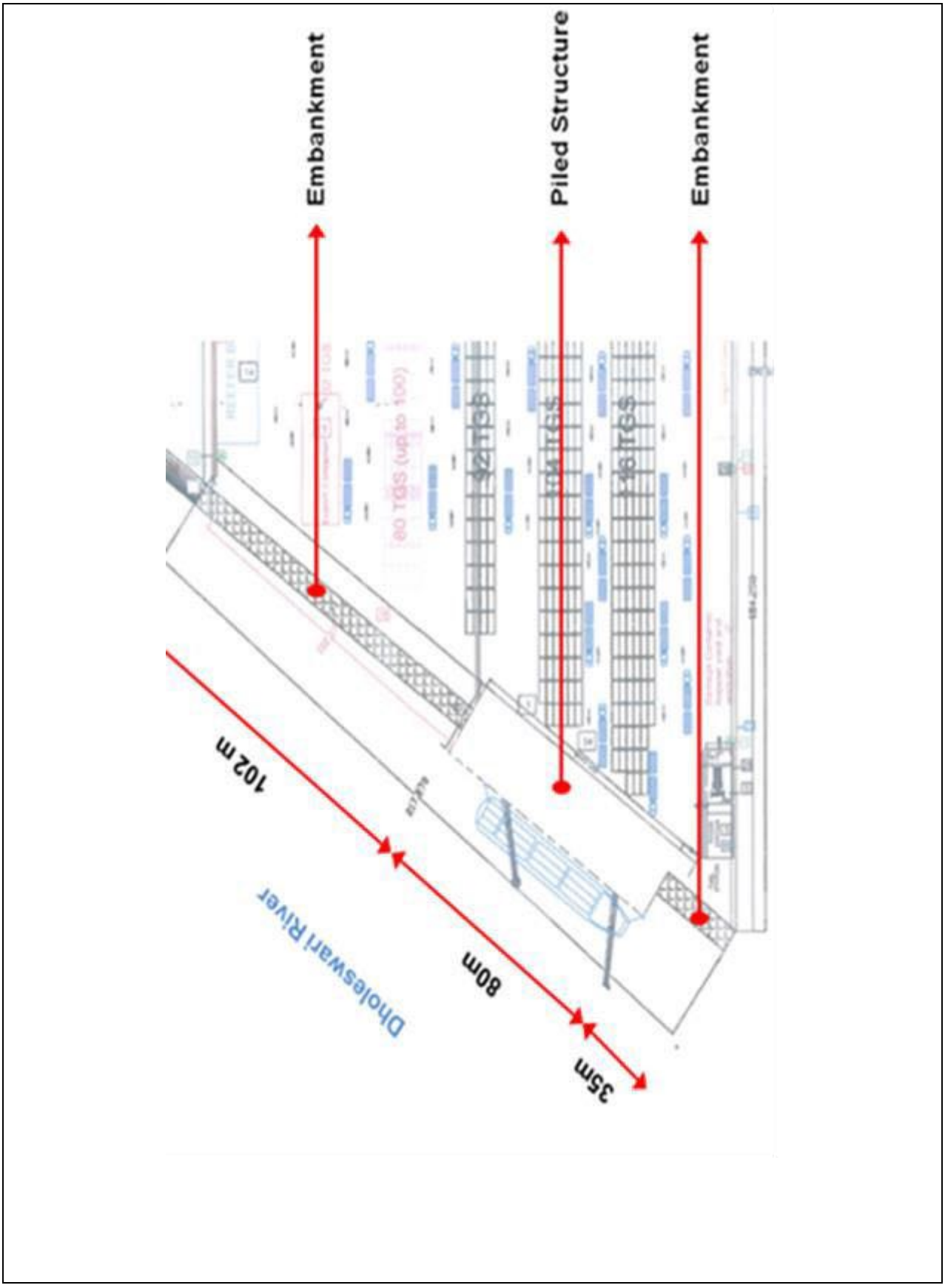
The open-type pier has been idealized according to the virtual fixed point method.

Analysis of the Structure:

- STAAD.Pro V8i software has been used for detail analysis of the idealized structure. A mathematical model has been developed and generated with the aid of the aforesaid software.
- The quay structure is based on geotechnical investigation results, executed in September 2011, and consisting of 6 (six) boreholes up to a depth of about 150 feet from the existing ground surface.
- The quay structure is designed for fixed column cranes, a point wheel load while in operation of 1020 kN and a standard load for container terminal of 30 kN/m2. There are no facilities incorporated to change to another type of crane (rail mounted, mobile harbour crane etc.).
- There are total 72 bearing piles, 4 rows of piles, from riverside to landside, consisting of diameter 900mm, 800mm, and 700mm. Toe level of all piles is at -35m PWD.
- Two Fixed Column Cranes (FCC) incorporated in the design, foundation of each consists of 9 bearing piles. Toe level of piles is at -35m PWD.
- There are 8 sets of bollard (50 ton according to the design). Center to center distance of two bollards is 11m.
- Rubber fender SA 400H with separate horizontal fender system in front of the piled deck structure (steel frame of H piles with wooden frame)

Appendix 14: Embankment of the project at river side

Appendix 15: Structural design of embankment



Appendix 16: Some important equipment

Photographs: Fixed Column Crane of Liebherr

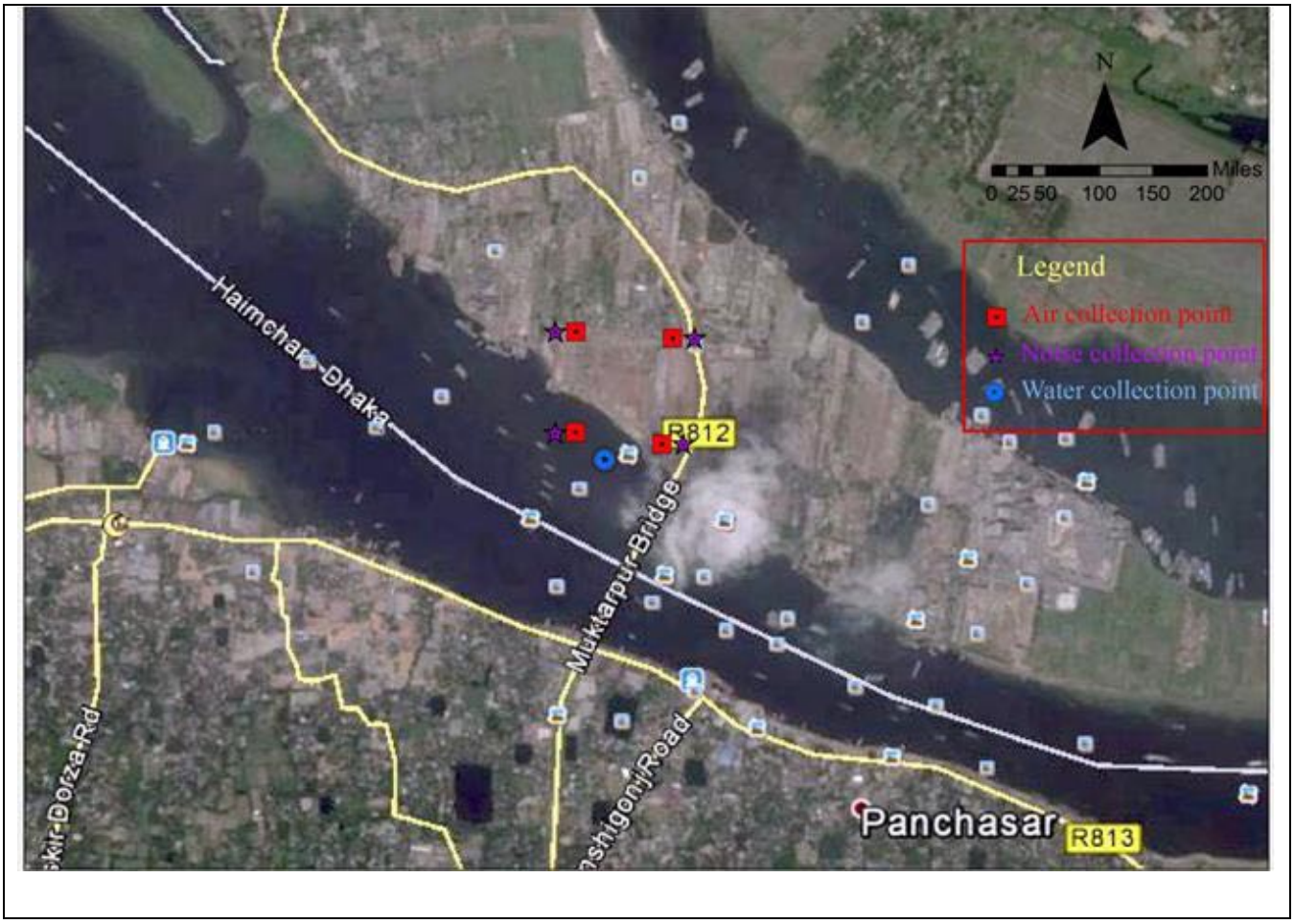
Photographs: Reach Stacker of Kalmar

Photographs: TCM Forklift

Appendix 17: Some important accessories

Particulars	Quantity	Brand	Assembler	Country of Origin
11 KV HT Switchgear (VCB)	01	ETON	Energypac Engineering Ltd., Bangladesh	USA
Cast Resin Transformer - 2500KVA, 11/.415KV	01	ELANTAS	Energypac Engineering Ltd., Bangladesh	Italy
4000A LT switchgear panel with bus coupler	01	ABB	Energypac Engineering Ltd., Bangladesh	Italy
LT Panel-1 (Lighting, A/C etc.)	01	ABB	Energypac Engineering Ltd., Bangladesh	Italy
LT Panel-2 (Cren)	01	ABB	Energypac Engineering Ltd., Bangladesh	Italy
LT Panel-3 (Reefer Container)	01	ABB	Energypac Engineering Ltd., Bangladesh	Italy
2000A Emergency Panel (Generator Panel)	01	ABB	Energypac Engineering Ltd., Bangladesh	Italy
1500 KVAR Automatic PFI Plant	01	ABB	Energypac Engineering Ltd., Bangladesh	Italy
Dropout Fuse	01	ELECTRONICON	Energypac Engineering Ltd., Bangladesh	N/A

Appendix 18: Location of noise, air and water quality monitoring points



Appendix 19: Air quality data collection at the project site

Appendix 20: National ambient air quality standards (NAAQS) of Bangladesh

Pollutant	Objectives	Averaging period
Carbon Monoxide (CO)	10 mg/m^3	8 hours(a)
	40 mg/m^3	1 hours(a)
Lead (Pb)	0.5 μg/m^3	Annual
Nitrogen Dioxide (NO_2)	100 μg/m^3	Annual
Particulates of ~10μm (PM_{10})	50 μg/m^3	Annual (b)
	150 μg/m^3	24 hours (c)
Particulates of ~2.5μm ($PM_{2.5}$)	15 μg/m^3	Annual
	65 μg/m^3	24 hours
Ozone (O_3)	235 μg/m^3	1 hours (d)
	157 μg/m^3	8 hours
Sulphur Dioxide (SO_2)	80 μg/m^3	Annual
	365 μg/m^3	24 hours (a)

Appendix 21: Noise monitoring at the project site

a. Location: River side (south)

Date: 26.08.2014

Geographic location of measuring point: N 23^0 34' 31.12'' E 90^0 30' 40''

Period	**Time**	**Noise level in dBA**	
		Max	Minimum
Day time	8.10 am-9-10 am	66	56
	9.15 am-10.10 am	62	55
	10.15 am-11.10 am	65	57
	11.15 am-12.10 am	61	56
	12.15 am-1.10 pm	66	52
	2.00 pm-3.00 pm	67	52
	3.00 pm-4.00pm	68	53
	4.00 pm-5.00pm	65	55
	5.00 pm-6.00 pm	68	52
Night time	6.00 pm-7.00 pm	65	53
	7.00 pm-8.00 pm	64	53
	8.00 pm-9.00 pm	55	54
	9.00 pm-10.00 pm	56	53
	10.00 pm-11.00 pm	56	54
	11.00 pm-12.00 pm	56	54
	12.00 pm-1.00 am	55	53
	1.00 am-2.00 am	54	53
	4.00 am-5.00 am	55	54

b. Location: North side (south)

Date: 27.08.2014

Geographic location of measuring point: N 23^0 34' 30.54''E 90^0 30' 47.75''

Period	**Time**	**Noise level in dBA**	
		Max	Minimum
Day time	8.10 am-9-10 am	69	59
	9.15 am-10.10 am	68	58
	10.15 am-11.10 am	67	56
	11.15 am-12.10 am	66	57
	12.15 am-1.10 pm	65	55
	2.00 pm-3.00 pm	68	52
	3.00 pm-4.00 pm	69	53
	4.00 pm-5.00 pm	65	55
	5.00 pm-6.00 pm	68	54
Night time	6.00 pm-7.00 pm	63	52
	7.00 pm-8.00 pm	63	53
	8.00 pm-9.00 pm	54	53
	9.00 pm-10.00 pm	52	51
	10.00 pm-11.00 pm	56	54
	11.00 pm-12.00 pm	54	53
	12.00 pm-1.00 am	54	53
	1.00 am-2.00 am	54	53
	4.00 am-5.00 am	54	53

c. Location: Gate side

Date: 28.8.2014

Geographic location of measuring point: N 23^0 34' 21.64'' E 90^0 30' 44''

Period	**Time**	**Noise level in dBA**	
		Max	Minimum
Day time	8.10 am-9-10 am	71	66
	9.15 am-10.10 am	72	65
	10.15am-11.10 am	65	57
	11.15am-12.10 am	65	56
	12.15am-1.10 pm	62	52
	2.00 pm-3.00 pm	68	52
	3.00 pm-4.00 pm	69	53
	4.00 pm-5.00 pm	67	55
	5.00 pm-6.00 pm	68	52
Night time	6.00 pm-7.00 pm	65	53
	7.00 pm-8.00 pm	62	53
	8.00 pm-9.00 pm	52	51
	9.00 pm-10.00 pm	53	52
	10.00 pm-11.00 pm	53	52
	11.00 pm-12.00 pm	55	54
	12.00 pm-1.00 am	57	57
	1.00 am-2.00 am	58	58
	4.00am-5.00 am	59	59

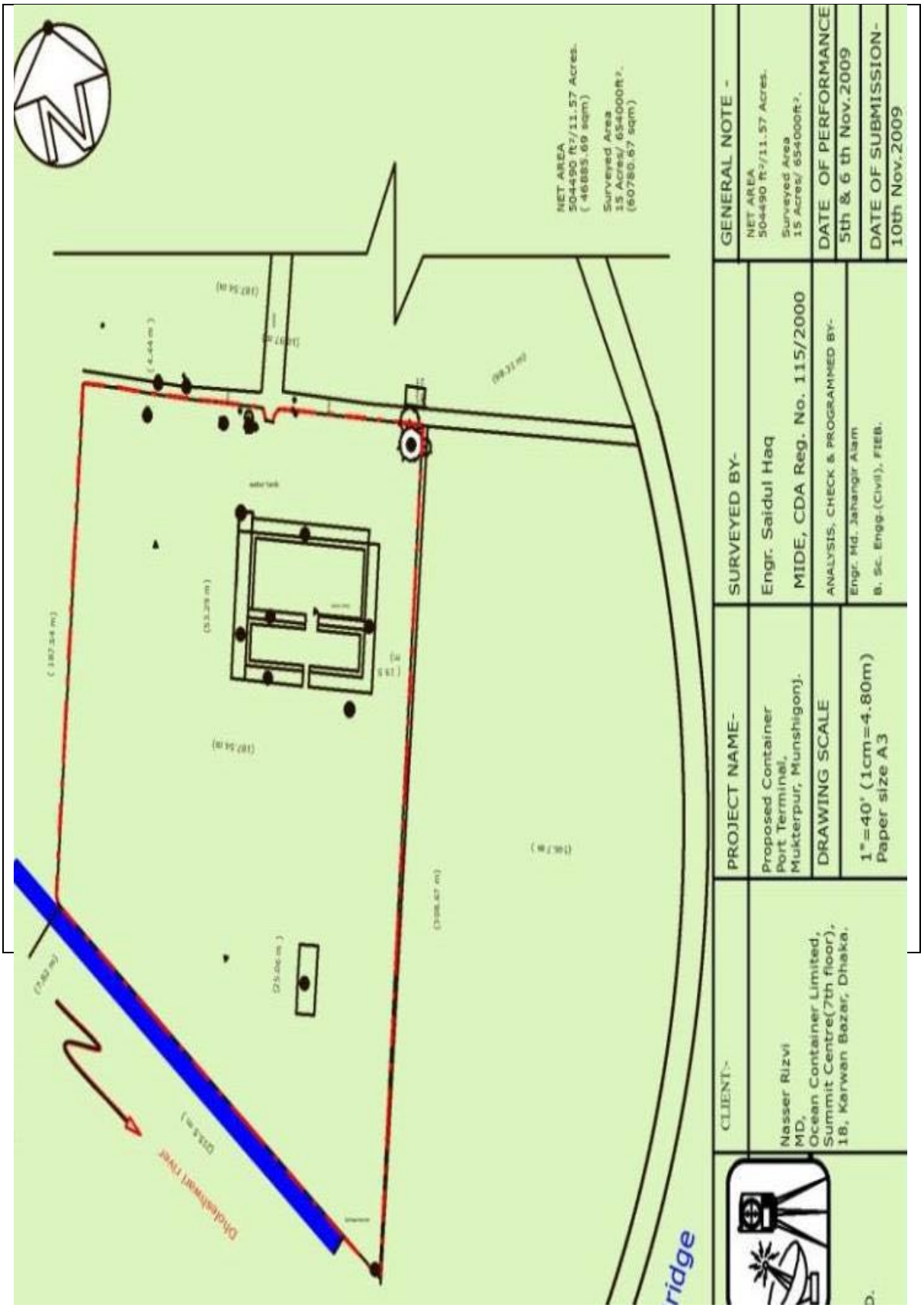
d. Location: Central point of project side

Date: 29.8.2014

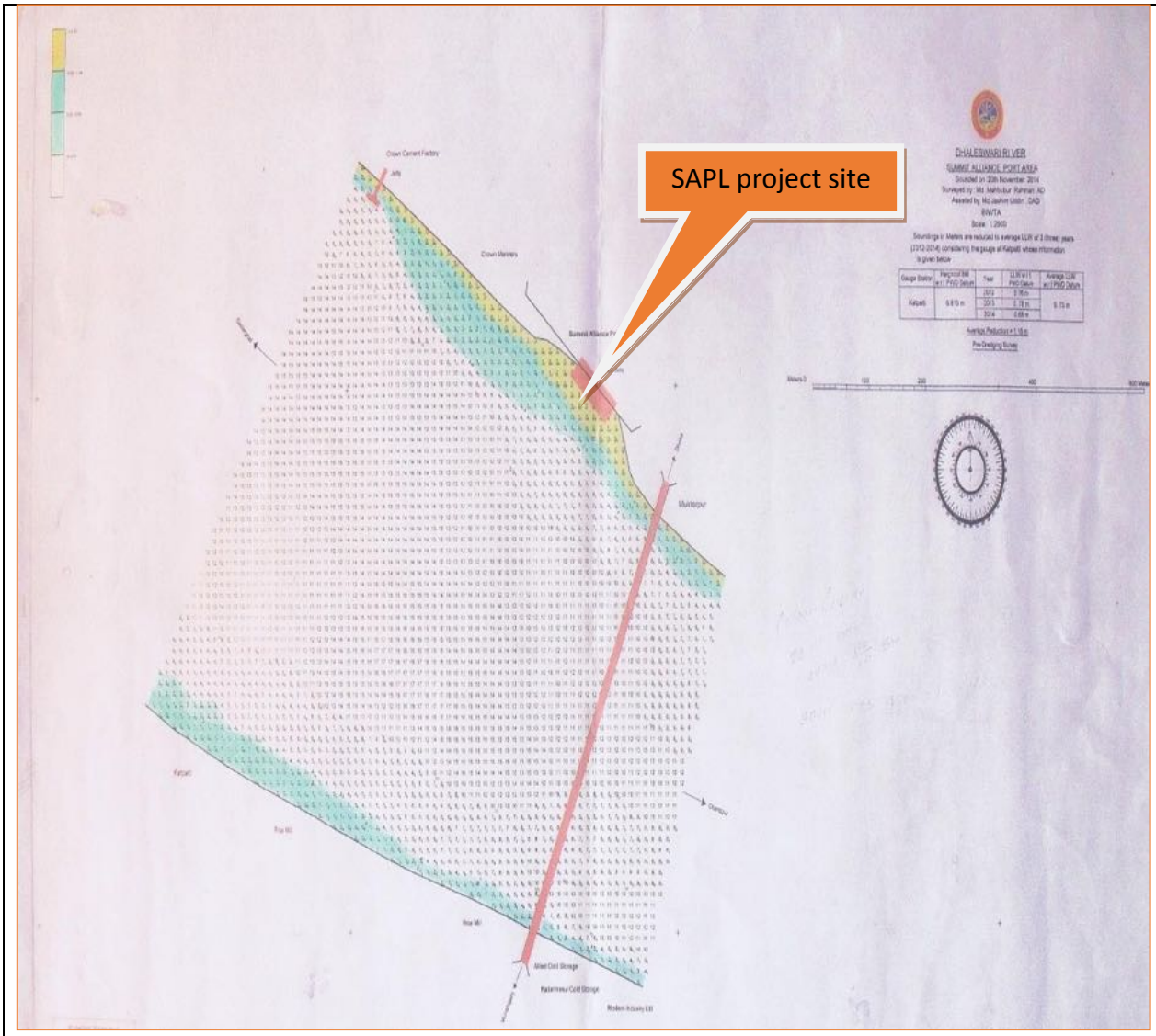
Geographic location of measuring point: N 23^0 34' 22.58'' E 90^0 30' 39.19''

Period	**Time**	**Noise level in dBA**	
		Max	Minimum
Day time	8.10 am-9-10 am	68	66
	9.15 am-10.10 am	72	68
	10.15am-11.10 am	71	66
	11.15am-12.10 am	64	57
	12.15am-1.10 pm	64	57
	2.00 pm-3.00 pm	66	58
	3.00 pm-4.00 pm	68	56
	4.00 pm-5.00 pm	66	57
	5.00 pm-6.00 pm	65	58
Night time	6.00 pm-7.00 pm	66	56
	7.00 pm-8.00 pm	64	57
	8.00 pm-9.00 pm	55	55
	9.00 pm-10.00 pm	56	54
	10.00 pm-11.00 pm	56	53
	11.00 pm-12.00 pm	55	54
	12.00 pm-1.00 am	56	52
	1.00 am-2.00 am	54	52
	4.00am-5.00 am	58	53

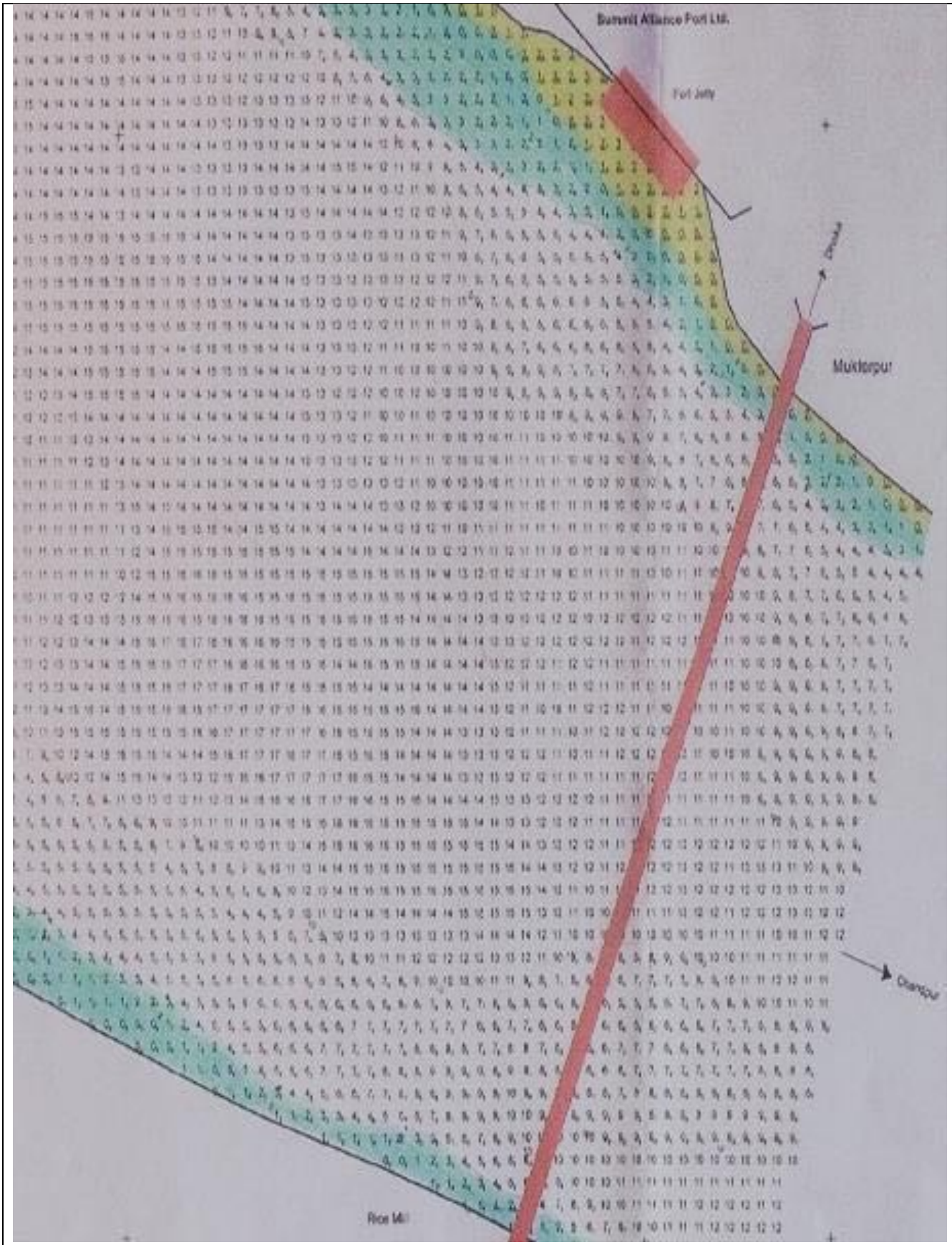
Appendix 22: Digital topography survey



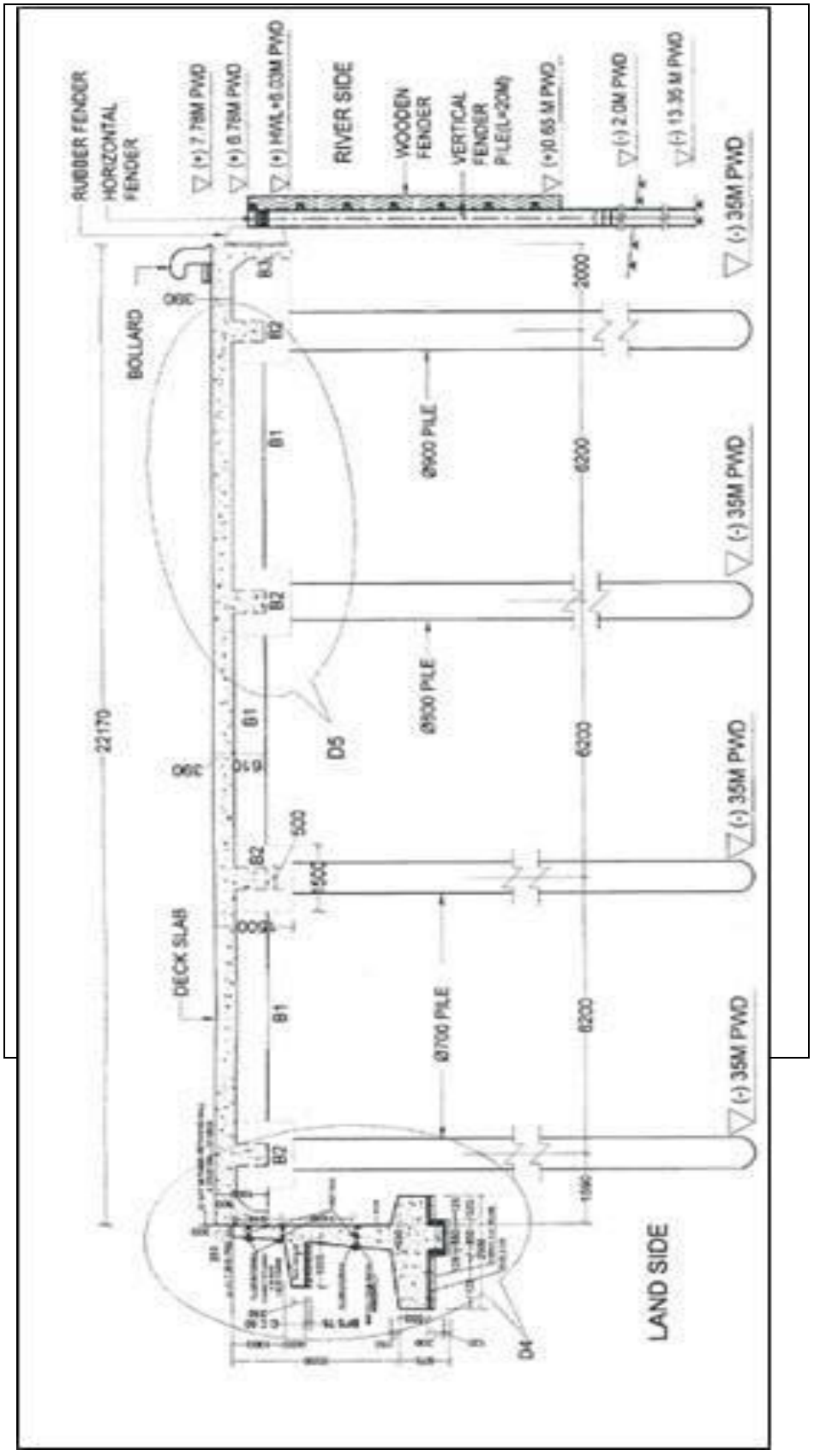
Appendix 23: Bathymetric survey (as is originally prepared in A3 paper)



Appendix 24: Enlarged view of Bathymetric survey (with focus on SAPL site)



Appendix 25: Typical cross section of piles structure



Appendix 26: Technical specification of gen-set

CROSS WORLD POWER LTD

TECHNICAL OFFER

Generator Details:

Tempest (Manufactured by Allam Marine Limited, UK) Diesel Generating Set Model: PS650 (650KVA Prime & 710 KVA Standby) at 1500 rpm, 50 Hz, 3 phase, 4 wire, 400/230 volts at 0.8 power factor. All other details are as follows:

BRAND	: Tempest	MODEL	: PS650
COUNTRY OF ORIGIN	: UK	PORT OF SHIPMENT	: Thames port, UK
CAPACITY (Prime)	: 650 KVA	CAPACITY (stand by)	: 710 KVA
START SYSTEM : Automatic Microcontroller based as well manual Start / Stop System			
EMERGENCY STOP : Emergency Stop available as protection device			
VIBRATION SKID : Built-in vibration skid for smooth operation			
BATTERY CHARGER : Auto Battery Charger (ABC) included			
DIMENSION (cm) : 340X154X227 (LxWxH)		FUEL TANK CAPACITY : 1539 Liter	
FUEL CONSUMPTION : 92 Ltr./Hr. at 75% Load			

Engine Details:

BRAND/ORIGIN	: Perkins, UK	MODEL	: 2806A-E18TAG2
SPEED	: 1500 RPM	INDUCTION SYSTEM : Turbocharged	
ENGINE TYPE : 4 stroke multi cylinder industrial diesel Engine suitable for tropical environment			
COOLING SYSTEM : Water cooled (Radiator cooled with engine driven fan)			
PROTECTION : Over speed, under speed, oil pressure, Over heating etc			
FUEL TANK : Built in with base			

All other details are as per attached Engine catalogues.

Ensuring Power Since 1982

Cross-world

Appendix 27: Floor Plan of the 7-storied main office building

Floor Plan	Area (Sqm.)	Facilities
Ground Floor	268.78	• Customs and C&F facilities • Customs' accommodation • Survey Team Office
1st Floor	268.78	Office of Accounts Department
2nd Floor	363.12	• Office for Ship management team (Vessel Handling) • ECD (Equipment Control Department) • Dept. of CFS documentation and reporting
3rd Floor	363.12	• Dept. of HR • Dept. of IT • Dept. of MD (Maintenance and Development) • Dept. of Admin
4th Floor	363.12	• Office space for Senior Management (GM, AGM, DGM)
5th Floor	363.12	• Office space for Director • Conference Room
6th Floor	363.12	• Office space for clients

Appendix 28: Declaration of SAPL about Hazardous Goods

SAPL
Summit Alliance Port Limited

TO WHOM IT MAY CONCERN

This is to certify that Summit Alliance Port Limited River Terminal will not handle any Dangerous Goods (DG) Cargo at their River Terminal at Muktarpur.

Thanking you

Captain Asif Mahmood

Director.

CORPORATE OFFICE : Summit Centre, 18 Kawran Bazar C/A, Dhaka-1215. Tel : 88 02 9130845-54, Fax : 88 02 8189235, E-mail : info@saplbd.com
HEAD OFFICE & OFF-DOCK : Katghar, South Patenga, Chittagong-4204. Phone : 88 031 2500703, 2500933, 2500934, Fax : 88 031 2500935
RIVER TERMINAL : West Mukterpur, Munshigonj.
www.saplbd.com

Appendix 29: Location of meteorological station (MS) of Dhaka

Appendix 30: Monthly average precipitation in the project area (2007- 2012)

Year	Rainfall in mm											
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
2007	0	30	11	163	185	668	753	505	179	320	111	0
2008	23	56	45	91	205	577	563	319	279	227	0	0
2009	1	1	43	14	168	170	676	482	298	74	4	0
2010	0	48	22	37	177	308	167	340	169	174	0	81
2011	0	0	20	123	235	314	356	409	207	112	0	0
2012	10	1	37	269	137	175	226	350	225	140	2	0

Source: BMD

Appendix 31: Average monthly relative humidity of the project area (2007- 2012)

Humidity in %	Monthly Mean Humidity												
Year	Jan.	Feb.	Mar	Apr.	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2007	68	68	54	69	70	81	84	80	80	78	77	78	73
2008	69	61	67	64	70	80	83	81	81	77	69	79	73
2009	72	55	53	66	72	74	80	82	81	73	66	69	70
2010	71	56	59	67	71	79	77	78	79	74	68	66	70
2011	69	54	57	64	76	80	79	82	77	73	67	73	70
2012	66	52	57	69	74	75	76	80	80	72	65	68	65

Source: BMD

Appendix 32: Monthly wind speed in the project area (2007-2012)

Year	Monthly wind speed in knot											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	2.9	3.1	4.2	3.8	3.5	3.1	3.1	3.1	3.2	4.1	5.5	2.9
2008	3.6	3.2	3.8	3.4	3.4	3.3	3.4	2.8	2.8	9.6	2.5	3.3
2009	3.3	4.1	4.0	4.1	3.8	3.1	4.3	2.8	4.2	2.3	2.8	2.4
2010	2.9	3.3	3.8	4.1	3.7	3.0	2.4	2.2	2.6	2.0	2.9	2.4
2011	2.2	2.4	3.8	2.4	3.0	2.7	2.4	2.4	2.6	2.0	2.3	2.1
2012	2.4	3.0	2.5	2.6	2.5	3.0	2.3	2.5	2.2	2.1	2.2	2.3

Source: BMD

Appendix 33: Monthly maximum ambient air temperature in the project area (2007-2012)

Year	Monthly maximum temperature in degree Celsius (°C)											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	28.8	30.8	36.7	35.9	37.5	35.9	34.8	35.9	34.9	35.6	31.8	28.2
2008	29.0	30.6	34.6	36.9	36.7	35.4	34.0	36.0	34.8	34.8	32.3	29.0
2009	28.1	33.9	36.0	39.6	37.8	36.5	35.7	34.3	35.3	35.8	33.9	29.0
2010	29.0	34.2	37.3	37.9	36.9	35.8	35.1	35.1	34.0	35.7	33.2	29.7
2011	27.8	31.0	34.5	35.8	35.3	36.0	35.4	35.0	36.2	34.5	32.4	30.0
2012	28.5	33.0	37.3	35.2	35.3	36.0	35.4	35.0	36.2	34.5	32.4	30.0

Source: BMD

Appendix 34: Monthly minimum ambient air temperature in the project area (2007-2012)

Year	Monthly minimum temperature in degree Celsius (°C)											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2007	9.6	12.6	15.0	18.1	22.3	22.0	23.4	24.2	24.5	19.5	16.8	11.3
2008	10.5	10.8	16.5	19.6	20.3	22.5	24.6	23.6	24.4	18.0	16.3	13.0
2009	11.1	12.2	15.8	20.4	21.6	22.6	24.4	24.3	24.5	20.6	15.2	11.4
2010	9.6	12.0	18.4	20.8	21.3	23.2	25.3	25.0	24.8	21.5	16.6	11.0
2011	8.2	13.0	16.0	20.2	21.3	23.2	23.9	24.5	23.7	22.0	17.2	11.0
2012	10.5	12.2	18.3	20.2	21.3	23.2	23.4	24.3	23.7	22.0	17.4	11.2

Source: BMD

Appendix 35: OSHA noise exposure limits for the work environment

Noise (dBA)	Permissible Exposure (hours and minutes)
85	16 hrs
90	8 hrs
96	3 hrs 30 min
102	1 hr 30 min
108	40 min
115	15 min
121	6 min
127	3 min
130	1 min

Source: Marsh, 1991, p. 322

Note: *Exposure above or below the 90 dBA limit has been 'time weighted' to give what OSHA believes are equivalent risks to a 90 dBA eight-hour exposure.*

Appendix 36: Surroundings of Alternative Site-1

Photograph: Northern side for Alternative site 1

Photograph: Eastern side for Alternative site 1

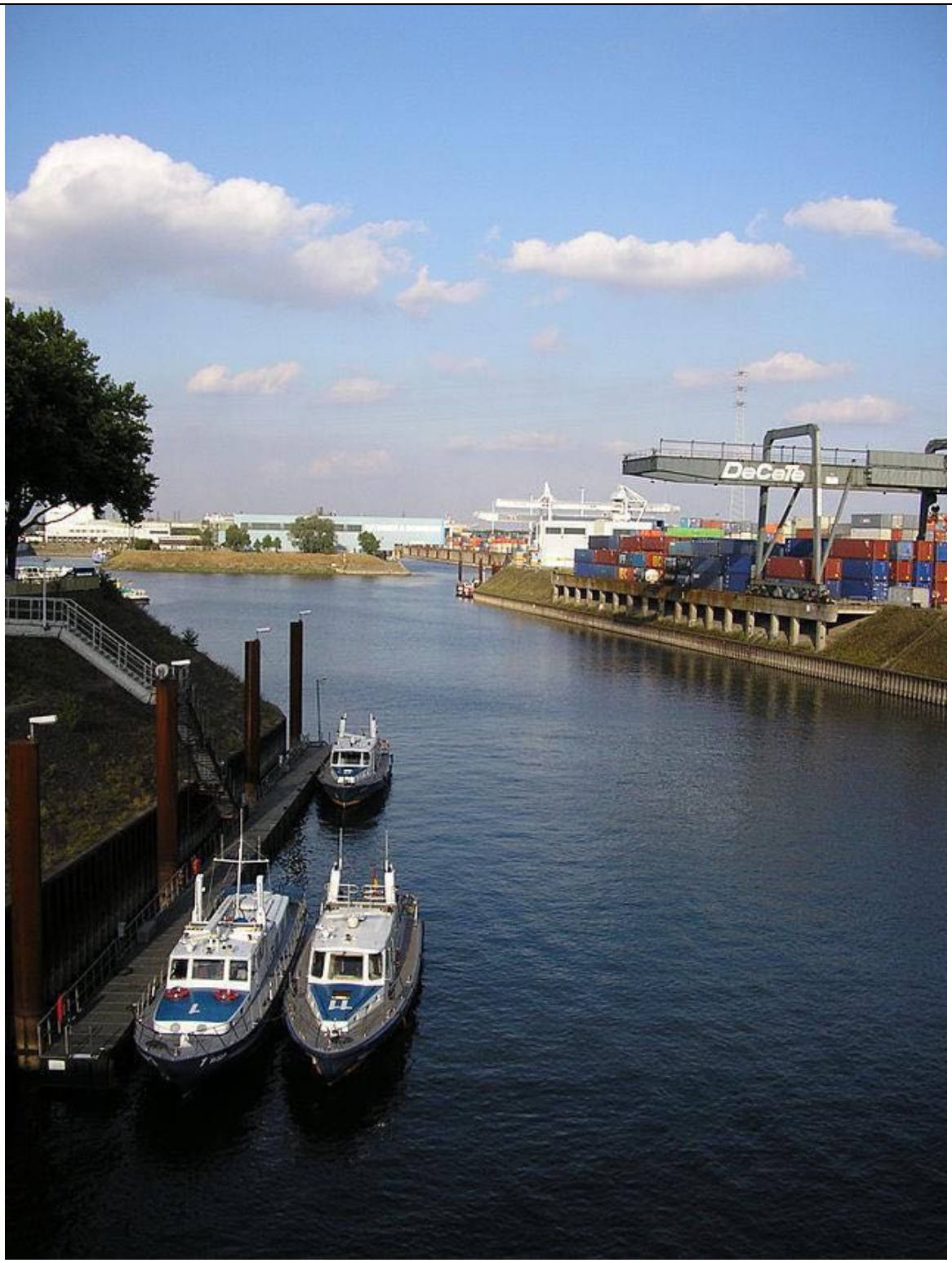
Photograph: Western side for alternative site 1

Photograph: Southern side for alternative site 1

Appendix 37: Surroundings of Alternative Site-2

	
Photograph: Southern side for Alternative site 2	**Photograph:** Northern side for Alternative site 2
	
Photograph: Western side for alternative site 2	**Photograph:** Eastern side for alternative site 1

Appendix 38: Largest inland river port in the world



Photograph: Duisburg Inner Harbour, the world's largest inland port

Source: http://en.wikipedia.org/wiki/Inland_port

Appendix 39: Application of PPE at SAPL project site

Appendix 40: Housekeeping and waste management

Appendix 41: Hurricane Katrina damaged boats in Gulf Coast ports

Source: National Oceanic and Atmospheric Administration, USA

Appendix 42: Noise level of major construction equipment (1 m distance from source)

Equipment	Noise Level (dB(A)
Earth Movers	
Front Loaders	72-84
Backhoes	72-93
Tractors	76-96
Scrapers, Graders	80-93
Pavers	86-88
Bull dozer	86-88
Excavator	84-86
Trucks	82-94
Material Handlers	
Concrete Mixers	75-88
Concrete Pumps	81-83
Cranes	75-86
Winch	85-88
Stationary	
Generators (in canopy)	71-82
Electric Saw	81-85
Wood Planer	81-85

Appendix 43: Contents of a generic Occupational Health and Safety Manual

I.	Policy and Objectives;
II.	Appointment of qualified EHS specialist(s)
III.	Detailed section wise OHS guidelines
IV.	Details of how rules and updates (if required) will be communicated to workers
V.	Identification and risk assessment of hazardous activities and high risk areas;
VI.	Emergency Response Plan;
VII.	Training on Emergency Response Plan;
VIII.	Safe working methods for hazardous activities;
IX.	Ensure all personnel are provided with all required Personal Protective Equipment (PPE) for the environment they are in and the tasks they are performing;
X.	Implementation of a Grievance Redress Mechanism;
XI.	Implementation of a Lock-out Tag-out program; and
XII.	Reporting and investigation procedure for all severe and minor accidents, and near misses.

Appendix 44: Photographs of Key Informants

Photograph: Consultation with Mr. ABM Momtaj Uddin(left) and Mr. Khokan Mia (right)

Photograph: Consultation with Mr. Abul Kashem (left) and Mr. Akhter Hossain (right)

Photograph: Consultation with Mr. Rais Uddin Pathan (left) and Dr. Doctor (right)

Appendix 45: List of Key Informants

Name	Designation/Occupation	Institute/Organization/ locality	Cell phone number
Mrs. Saraban Tahura	Thana Nirbahi Officer	Munshigonj Upazila Sadar, Munshigonj	01927 432 442
Mr. ABM Momtaj Uddin	Deputy Assistant Director	Civil Defense, Munshigonj	01711577451
Mr. Khokan Mia	Union Parishad Councilor	Panchsar Union Parishad	01915688193
Mr. Abul Kashem	Deputy Chief Personnel Manager	BIWTC, Narayangonj	01553723476
Mr. Akhter Hossain Khan	General Manager	Ideal Textile Mills Limited	01720549356
Mr. Rais Uddin Pathan	Assistant Director	Munshigonj Fisheries Office, Munshigonj	01816 497367
Mr. Ikbal Hossain[32]	Azmeri Enterprise (LP Gas and Battery seller)	West Mukterpur, Munshigonj	

[32] Mr. Ikbal Hossain is a renowned businessman at West Muktarpur.

Appendix 46: Focus Group Discussion

Photograph: FGD with female respondents (one session)

Photograph: FGD with some fishermen (one session)

Appendix 47: Male respondents in Focus Group Discussion

SN	Name of the participant	Profession	Mobile Number
1	Mr. Md. Dulal Fakir	Farmer	01776455689
2	Mr. Md. Shamim	Social Worker	01623590040
3	Mr. Md. Rabiul Islam	Farmer	01715837471
4	Mr. Md. Mostafa	Farmer	01716738501
5	Mr. Md. Joni	Social Worker	-
9	Mr. Sonkor Roy	Business	-
10	Mr. Omar Faruk	Social Worker	01989200514
11	Mr. Babul Mia	Worker	01913555245
12	Mr. Delwar Hossain	Social Worker	01715223421
13	Mr. Badsha Mia	Worker	019124981267
14	Mr. Md. Ilias	House owner	01748955001
15	Mr. Md. Hanif	Business	01915694629
16	Mr. Md. Oli Mia	Rickshaw puller	01915694629
17	Mr. Abdul Hakim	Day Labourer	01915694629
18	Mr. Md. Ramjan	Day Labourer	01911150528
19	Mr. Abdul Motaleb	Garments worker	01710298516
20	Mr. Md. Ali Hossain	Worker	01915802772

Appendix 48: Female respondents in Focus Group Discussion

Name of the participant	Profession	Mobile Number
Mrs. Simu Begum	Housewife	01913552434
Mrs. Habiba Begum	Garments Worker	01715223421
Mrs. Taslima Begum	Housewife	01924981267
Mrs. Aleya Begum	Housewife	01748955001
Mrs. Nargis Akter	Housewife	01915694914
Mrs. Monowara Begum	Housewife	01915694629
Mrs. Najma Begum	Garments Worker	01915694627
Mrs. Rabeya Begum	Garments Worker	01911150528
Mrs. Sohagi Begum	Garments Worker	01764374891
Mrs. Rahima Begum	Garments Worker	01915286277
Mrs. Amena Begum	Housewife	01716482057
Mrs. Fatema Begum	Housewife	01726582017

Appendix 49: Large Public Consultation

Photographs: Large Public Consultation

Appendix 50: Participants in Large Public Consultation

SN	Name of the participant	Locality	Mobile No.
1	Mr. Elahi Mollah	West Muktarpur, Munshigonj	0173366971
2	Mr. Gias Uddin	Panchabati, Munshigonj	01934548197
3	Mr. Ali Ahammad Mia	West Muktarpur, Munshigonj	01740562093
4	Mr. Osman Goni	Panchabati, Munshigonj	01682056560
5	Mr. Wahab Mia	West Muktarpur, Munshigonj	016777290991
6	Mr. Sannar Mia	Panchabati, Munshigonj	01934203370
7	Mr. Azab Ullah	West Muktarpur, Munshigonj	01815456641
8	Mr.Abul Hashem	West Muktarpur, Munshigonj	01957951120
9	Mr.Abdul Hanif	West Muktarpur, Munshigonj	01913386643
10	Mr. Sujan Mia	West Muktarpur, Munshigonj	01685491907
11	Mr. Polas Mia	West Muktarpur, Munshigonj	01937662833
12	Mr. Amzad Mia	West Muktarpur, Munshigonj	01702302016
13	Mr. Ali Hashem	West Muktarpur, Munshigonj	01685491907
14	Mr. Sazzad Ali	West Muktarpur, Munshigonj	01736623381
15	Mr. Aziz Mia	West Muktarpur, Munshigonj	01764374891
16	Mr.Idris Ali	West Muktarpur, Munshigonj	01722715255
17	Mr. Sabbir Mia	West Muktarpur, Munshigonj	01686205195
18	Mr. Salim Mia	Panchabati, Munshigonj	01911628320
19	Mr. Ayubur Rahman	West Muktarpur, Munshigonj	01937400418
20	Mr. Zahidul Hasan	West Muktarpur, Munshigonj	01963693767
21	Mr. Wahidul Hasan	West Muktarpur, Munshigonj	01918981365
22	Mr. Habib Mia	Panchabati, Munshigonj	01911787382
23	Mr. MosarrafHossain	Panchabati, Munshigonj	01712504072
24	Mr. ManjurMian	West Muktarpur, Munshigonj	01716220087
25	Mr. YadHossain	Panchabati, Munshigonj	01920707228
26	Mr. Abdur Rashid	West Muktarpur, Munshigonj	01814116102
27	Mr. Sakil Mia	Panchabati, Munshigonj	01926251276

SN	Name of the participant	Locality	Mobile No.
28	Mr. Sahadat Mia	West Muktarpur, Munshigonj	01926395711
29	Mr. SohagMollah	West Muktarpur, Munshigonj	01929946938
30	Md. RagibHasan	Panchabati, Munshigonj	01923753232
31	Mr. Shahin Ahmed	West Muktarpur, Munshigonj	01753187815
32	Mr.Nayan Pramanik	Panchabati, Munshigonj	01939415230
33	Mr. Omar Faruk	West Muktarpur, Munshigonj	01920080177
34	Mr. Dalim	Panchabati, Munshigonj	01827444688
35	Mr. RabiulMondal	West Muktarpur, Munshigonj	01955692079
36	Mr. Abdullah Al Mamun	Panchabati, Munshigonj	01913461785
37	Mr. Shafikul Islam	West Muktarpur, Munshigonj	01924446831
38	Mr. Dulal Mia	West Muktarpur, Munshigonj	01710496864
39	Mr. Anwar	Panchabati, Munshigonj	01947510985
40	Mr. NasirHossain	West Muktarpur, Munshigonj	01923263356
41	Mr. AbulKalam	Panchabati, Munshigonj	01714877328
42	Mr. Nasir	West Muktarpur, Munshigonj	01815328561
43	Mr. AbdurRazzak	West Muktarpur, Munshigonj	01716486017
44	Mr. Anwar Hossain	Panchabati, Munshigonj	01818348783
45	Mr. Abdus Salam Master	West Muktarpur, Munshigonj	01713496018
46	Mr. Sharif	Panchabati, Munshigonj	01558501329
47	Dr. Kabir Ahmed	West Muktarpur, Munshigonj	01714235175
48	Ms. Sonia Begum	West Muktarpur, Munshigonj	01716487017
49	Ms. Ratna Begum	Panchabati, Munshigonj	01782438917
50	Ms. Zakia Begum	West Muktarpur, Munshigonj	Not Available
51	Mrs. Laila Begum	West Muktarpur, Munshigonj	01929425203
52	Mrs. MituAkhter	Panchabati, Munshigonj	01845141151
53	Mrs. Arzu Begum	West Muktarpur, Munshigonj	01934203370
54	Mrs. Suma Begum	West Muktarpur, Munshigonj	Not Available
55	Mrs. SadiaAkhter	West Muktarpur, Munshigonj	01934203370

SN	Name of the participant	Locality	Mobile No.
56	Mrs. Khadija Begum	Panchabati, Munshigonj	Not Available
57	Ms. Lipi Begum	West Muktarpur, Munshigonj	Not Available
58	Dr. MI Sharif	Team Leader, ESIA, BCAS, Dhaka	01746748198
59	Abdul Hakim	Chief Operation Officer, SAPLRT	01971422505
60	Mr. AnisurRahman	General Manager, SAPLRT	01971422505
61	Mr. Abdul Latif	Social Worker, West Mukterpur	01923263356
62	Mr. Khokan Member	Word Councilor, West Mukterpur	01714877328
63	Mr. Osman Goni Shawkat	Project Coordinator, BCAS, Dhaka	01815328561
64	Mr. Moniruzzaman	Research Officer, BCAS, Dhaka	01923263356
65	Mr. ZiaulHaque Khan	Research Officer, BCAS, Dhaka	01714877328
66	Mr. ZahidHossain	Civil Engineer, SAPLRT	01733669716
67	Mr. Mollah	Staff, SAPLRT	01733669716

Appendix 51: Basic information of household leader of 7 *Bede* families

Sl. No.	Name	Father's name	Permanent address	Occupation
01	Md. Samsuddin	Md. Toser Sheikh	Village: Maizbari, Thana: Islampur District: Jamalpur	Informal and unskilled (mainly hawkers of small commodities)
02	Md. Helal Uddin	Md. Tajul Nur Islam	Village: Chawlia, Thana: Sribuddi District: Sherpur	Informal and unskilled (mainly hawkers of small commodities)
03	Md. Lokman Hossain	Md. Robiul Islam	Village: Chawlia, Thana: Sribuddi District: Sherpur	Informal and unskilled (mainly hawkers of small commodities)
04	Md. Mofizul Islam	Md. Owadud	Village: Dormontto, Thana: Islampur District: Jamalpur	Informal and unskilled (mainly hawkers of small commodities)
05	Md. Hazrat Ali	Late Tasu Mondol	Village: Jangalia, Thana: Melando District: Jamalpur	Informal and unskilled (mainly hawkers of small commodities)
06	Md. Odu Sheikh	Late Abul Sheikh	Village: Malbari, Thana: Islampur District: Jamalpur	Informal and unskilled (mainly hawkers of small commodities)
07	Md. Sabuj Sheikh	Late Sukkur Sheikh	Village: Maizbari, Thana: Islampur District: Jamalpur	Informal and unskilled (mainly hawkers of small commodities)

Appendix 52: Photographs of household leader of 7 *Bede* families

Photograph: Md. Samsuddin

Photograph: Md. Healaluddin

Photograph: Md. Lokman Hossain

Photograph: Md. Mofizul Islam

Photograph: Md. Hazrat Ali

Photograph: Md. Odu Sheikh

Photograph: Md. Sabuj Sheikh

Appendix 53: Sample Grievance Reporting Form

Contact Details	**Name:**		
	Address:		
	Telephone Number/ Cell Phone Number:		
	Email:		
How would you prefer to be contacted (please tick box)	**By Phone/Mobile** **By e-mail**		
Details of your Grievance (Please describe the problems, how it happened, when , where, and how many times, as relevant)			
What is your suggested resolution for the grievance?			
Signature:		**Date:**	