**INLAND WATERWAYS AUTHORITY OF INDIA** 

Ministry of Shipping, Government of India

## "CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1" BETWEEN HALDIA AND VARANASI

(JAL MARG VIKAS PROJECT)

# STANDALONE ENVIRONMENT MANAGEMENT PLAN FOR CONSTRUCTION AND OPERATION PHASE FOR INLAND WATER TRANSPORT TERMINAL

### AT KALUGHAT, BIHAR

DECEMBER-2018 (Modified September -2019)





#### ENVIRONMENT MANAGEMENT PLAN: IWT TERMINAL AT KALUGHAT

#### **INTRODUCTION**

Inland Waterways Authority of India (IWAI) is augmenting the navigation capacity of National Waterway (NW-1) and continue to maintain the entire stretch. Under the Jal Marg Vikas Project, IWAI is developing the infrastructure facility like Multimodal Inland Water Transport (IWT) Terminals, Navigation aids for day & night navigation, River information system with all hardware and software, Ro-Ro jetties, Bank & slope protection, River training works, Equipment like tow barges, inland vessels, survey vessels including rescue boats & survey equipment and maintenance dredging of the navigation channel, to augment the navigation capacity of the National Waterway -1.

An Inland Water Transport Terminal at Kalughat is proposed under this project to enhance the navigation facility of NW-1. Proposed terminal site is located at Kalughat in Village Parmanandpur and Murthan of Sonepur Tehsil, Saran District, Bihar. Project site is directly accessible through NH-19. Geographical coordinates of the centre of site are 25.738846°N & 85.120266° E. Location map of the project is given in **Figure 1** below:



Figure 1: Location Map

#### **PROJECT BRIEF**

The Kalughat terminal is proposed to be developed as inland water transport intermodal terminal facility. Kalughat terminal is proposed to be located on River Ganga in Saran District at approx. 15 km aerial distance from Patna city. Site is directly connected to NH-19. Terminal site falls in village Parmanandpur & Murthan of Saran District, Bihar. The project will be developed in single phase. Total area of terminal site is 5.159 ha. Site abuts River Ganga in West direction and is relatively plain land. Elevation of the site varies from around RL+50 m to RL+ 52 m. Proposed site is at approx. 15 km aerial distance from Patna City. There are no eco-sensitive zones or forest areas located within 5 km radius of the project site. There are approx. 50 trees at the project site which may require to be cut for development of the project. However some of the trees may be retained as they are in the periphery of the project site. Apart from this, there are 2-3 households which may be partially impacted due to terminal development. This terminal will have offshore facilities like jetties and manoeuvring areas like approach channels, turning circles, berthing pockets, holding areas and onshore facilities like terminal & other buildings, storage facility, electrical substation and other environmental facilities like ETP cum STP and fire fighting facilities. One no. of berth of length 125 m will be developed. The proposed terminal is planned for transportation of containerized cargos. Maximum containers handling capacity of the terminal is 77000 TEU/annum. The terminal will be developed in one phase. Number of working days of terminal are assumed to be 315 and working hours are assumed to be 20 hours. Vessels of size 3000 dwt will ply in the waterway. Parcel size considered per vessel is 90 TEUs. Overall length of the vessel is 95 m.

Facilities to be developed at terminal site include both onshore and off-shore facilities. Onshore facilities includes: Storage area -14900 sq m, Unloading & Loading Areas, Terminal building (admin building, storage shed, ESS, Weigh bridge control room & Security office, Gate house, toilet block & UG reservoir) and LNG Bunkering. Offshore facilities includes: to develop 1 (One) berth as container-cargo berth for handling containers. The total length of the berth is 125 m and width is 30 m. The berth is aligned parallel to the bank and will be connected by approach trestles for movement of trucks, vehicles, operating and maintenance equipment. Two numbers of approach trestle of 10 m width and 60 m length are proposed to connect the berth with the terminal site. 10 m width is proposed to accommodate the 2 lane traffic. In view of the above arrangement of berth and their locations, piled foundation is considered as best option for the structural system. Area of 14,900 sq m is reserved for development of storage yard. Storage capacity of terminal is decided considering the dwell time of 2 days for import and 4 days for export. Storage space of 190 TGS will be available in the storage yards. Total capacity of the storage yard is 97511 TEU/annum. Other proposed onshore facilities include development of storm water drainage system, sewerage system with ETP cum STP, waste and wastewater collection and treatment facility from vessels, water supply with water storage (overhead and underground for raw and portable water), power supply system, Lighting System, communication system, fire-fighting system, dust suppression system, power supply and backup system, green belt area and vehicle parking area. The GRIHA guidelines shall be adopted for terminal design. All terminals shall be designed with zero waste discharge concepts to prevent pollution to river Ganga.

#### ENVIRONMENTAL LEGAL FRAMEWORK

Various environmental regulations and policies of Government of India & State Government, International conventions and the World Bank's safeguard policies are applicable. Some of the applicability & requirements of clearances and permits for different activities as per the GoI and the World Bank Policy requirement have been



identified for the project as listed below in Table 1. Apart from the listed legislation, various international conventions are applicable on the project which includes MARPOL Convention, 1973/78, Ballast Water Management, 2004, List of Safety Related Regulations, United Nations Convention on the Law of the Sea, Montego Bay, (1982), International Maritime Dangerous Goods Code (IMDG-code), SOLAS and PIANC guidelines. International Maritime Conventions, Protocols and Agreements Relevant to the Project are given in **Annexure-1**.

Some of the environmental standards and guidelines applicable on the project are Standards for discharge of effluent in inland surface water bodies and Marine Coastal Areas, Classification of Surface water Bodies on basis of Quality, Water Quality Standards for Coastal Waters, Standards for permissible level of water quality indicators, Permissible limit for off-shore dumping of dredged material, Criteria for harmful bottom sediments, Approximate Quantity of Suspended Sediments Generated by Dredging or Dumping Operations which should be followed to maintain the environmental pollution load within the specified limits. The applicable Environmental Standards / Norms are presented in **Annexure-2**. Process Write up and schematic diagram of ETP/STP for Proposed Combined Waste Water Scheme is provided in **Annexure-3** 

Name	Applicability	Type of permit and	Responsibility
		stage of applicability	
Environment Protection Act-1986 and Rules there under including EIA Notification 14th Sep 2006 and amendment till date	Considered Not Applicable (EIA Notification 2006 does not classify IWT terminals on river or maintenance dredging in the river as a project requiring environmental clearance. The non- applicability of this legislation has been confirmed by MoEF&CC. Borrowing of earth for road construction & terminal condition (if any required) should fall under mining category and would require prior environmental clearance.	Environment Clearance Construction stage for EC for borrowing earth	EPCContractorforobtainingenvironmentalclearances as applicable.EPCcontractor shall alsoberesponsibleforEMPimplementationandcompliancetoenvironmentalclearanceconditions.
Air (Prevention and Control of Pollution) Act, 1981, 1987	Applicable. The applicability is due to emission from operation of construction equipment like batching plants, hot mix plants, DG sets, and similarly, during operation stage backup power generation, material handling related aspects.	Consent to Establish & Consent to Operate	EPC contractor, for setting up terminal, batching plant, hot-mix plant as prior to its establishment from SPCB CTE &CTO shall be taken by the contractor for batching plant, hot-mix plant & quarry site as required prior to operation and it should be renewed before the expiry of permit.

#### Table 1: List of the Permits/Clearances Required as per GoI Legislations

			EDC contractor shall also
			obtain CTO from SPCB for terminal site before its handover to IWAI.
Water Prevention and Control of Pollution) Act, 1974, 1988	Applicable. It is applicable for the projects having potential to generate effluent during any stage of the project. Effluents are expected to be generated during both the construction and operation phase of the project.	Consent to Establish & Consent to Operate	CTE/CTO should be taken by contractor for disposal of sewage and construction of septic tank/soak pit prior to start of construction from SPCB. CTE/CTO for terminal site shall also be obtained by EPC contractor along with CTE / CTO under Air Act.
NoisePollution(Regulation and ControlAct)2000amendment till date	Applicable due to generation of noise during construction and operation stage.	No permits issued under this act	EPC contractor and IWAI to ensure compliance to Ambient Noise Level Standards.
Hazardous & Other Waste Rules, 2016	Applicable. Project has potent to generate hazardous waste (Waste Oil) during both construction and operation phase.	Authorization for storage and handling hazardous waste	EPC Contractor shall obtain authorization for handling, storage and disposal of hazardous waste (Waste Oil) along with CTE/CTO for air and water act.
MSIHC Rules, 1989	Applicable only for storage of highly inflammable liquids like HSD/LPG	License if the storage of hazardous material exceeds the threshold quantity	EPC contractor
The Bio Medical Waste Management Rules, 2016	Applicable for the disposal of bio-medical waste from first aid centres and dispensaries	No specific permit is required. Just comply with the handling and disposal requirements of the rule	EPC contractor
Construction and Demolition Waste Management Rules, 2016	Applicable Applies to all those waste resulting from Construction, re- modelling, repair & demolition of any civil structure of individual or organization who generates construction and demolition waste such as building material, rubble, debris.	Approval required from local authorities, if waste generation is >20 tons in a day or 300 tons per project in month	EPC contractor. Compliance to the rules should be ensured
Plastic waste	Applicable	No authorization to be	EPC contractor.



Management Rules, 2016 as amended	Rule applies to every waste generator, local body, Gram Panchayat, manufacturer, Importers and producer.	obtained.Wastemanagementandminimization to be done.Fee to be paid to localbodies, if applicable	Compliance to the rules should be ensured
The Batteries (Management and Handling) Rules 2001	Applicable for disposal of used led acid battery if likely to be used in any equipment during construction and operation stage.	No specific registration required. Compulsion to buy and sale through registered vendor only.	EPC contractor
TheForest(Conservation)Act,1980 and amendmentsTheForest(conservation)Rules1981 and amendmentstill date	No forest land is being diverted thus forest clearance will not be required. There are approx. 50 trees present on site which will be cut for project development.	Permission for tree cutting.	Permission for tree cutting from Forest Department should be taken by EPC contractor if required
Petroleum Rules, 2002	Applicable as storage of HSD/LPG or any other petroleum product may be required for the project purpose	License to store petroleum beyond prescribed quantity.	EPC Contractor
Central Motor Vehicle Act 1988 and amendment Central Motor Vehicle Rules, 1989 and amendments till date	Applicable, for all the vehicles at site during construction phase	No permit issued under this Act	EPC Contractor to follow Rules for all the construction vehicles being used at site during construction purpose.
The Gas Cylinder Rules 2004	Applicable if contractor store more than the exempted quantity of gas cylinder.	License to store gas cylinder more than the regulated quantity	EPC Contractor
Guidelines for evaluation of proposals/requests for ground water abstraction for drinking and domestic purposes in Notified areas and Industry/Infrastructure project proposals in Non-notified areas, 2012	Applicable if bore well is done for extracting water for meeting drinking/domestic water needs of terminal & vessels	No objection certificate	EPC Contractor shall obtain NOC from CGWA/CGWB prior digging any bore well during construction and operation of terminal.

#### ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Effective measures are required to be proposed and implemented during design, preconstruction and construction stage to eliminate or minimize the impact of the project development. **Table 2** provides details of mitigation

measures with implementation and supervision responsibility of contractor during construction phase. Implementation of all mitigation measures require for environmental management plan and environmental monitoring during construction stage is the responsibility of EPC contractor under supervision of IWAI through TSSC and during operation phase will be responsibility of terminal operator under supervision of IWAI. **Table 3** provides details of mitigation measures with implementation and supervision responsibility of terminal operator during operator because with implementation and supervision responsibility of terminal operator during operation phase.

Since project is likely to have impact on various components of environment, the monitoring requirement covering soil erosion, tree plantation, air quality, water quality, noise, river sedimentation has been defined and included under respective head at **Table 4**.

It will be essential for contractor to comply with applicable regulations and the World Bank safeguard requirements. Contractor and terminal operator will also have to comply with applicable national standards with respect to Water, Air, Noise, Dredge Material, Soil, Biodiversity and Inland Vessels Act as applicable to this project.

#### ENVIRONMENT HEALTH AND SAFETY CELL

It is essential to establish environment, health and safety cell for the project by contractor and terminal operator to ensure the health & safety of workers and environmental management of study area through effective implementation of EMP during construction and operation phase respectively. Highly qualified and experienced persons in the field of Environmental Management of Similar projects shall be considered to man the cell who shall ensure the effective implementation of the environment management plan

#### **REPORTING REQUIREMENTS:**

It is required that contractor will submit monthly, quarterly and six-monthly compliance report to Project Management Consultant (PMC)/Technical Support Services Consultant (TSSC) as well as to PMU (Project Management Unit) of IWAI. TSSC will analyze the report and notify the corrective action if any required to contractor under intimation to IWAI. Reports to be submitted by contractor includes monthly SHE reports, Monthly environmental reports, Monthly progress report, Monthly accident report and monthly, quarterly & six-monthly compliance reports for compliance to regulatory permits and EMP requirements.

It is required that terminal operator will submit monthly, quarterly and six-monthly compliance report, audit reports, accident report and report on dredging and operation of terminal to PMU (Project Management Unit) of IWAI. PMU will analyze the report and notify the corrective action if any required to terminal operator. Reports to be submitted by terminal operator includes monthly, quarterly & six-monthly compliance report of suggested EMP requirements, audit report for plantation survival, energy audit report, accident and investigation report and Report containing details of dredging quantities and LAD maintained at terminal site.

# TABLE 2: ENVIRONMENT MANAGEMENT PLAN OF KALUGHAT TERMINAL (DURING DESIGN, PRE-CONSTRUCTION AND CONSTRUCTION PHASE)<sup>12</sup>

Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract Documents	Location	Frame
	DESIGN AND CONSTRUCT	ION PHASE		
1. Permission and	Clearances			
1.1 Obtaining Statutory Clearances	<ul> <li>Obtaining environmental clearance for borrow areas as applicable</li> <li>Obtaining consent to establish and operate for batching plant, hot mix plant, RMC, DG sets and terminal from SPCB under Air Act and Water Act</li> <li>Obtaining authorization for generation, storage and disposal of hazardous waste (used oil)</li> <li>Obtaining permission from CGWB if ground water withdrawal is undertaken</li> <li>A waste reception facility should be design and constructed by the contractor at the terminal site as per the Inland Vessels (Prevention and Control of Pollution and Protection of Inland Water) Rules, 2016 wherein the terminal operator can collect, segregate and treat the solid waste and wastewater including bilge from barge and vessels as per the applicable laws.</li> </ul>	EIA Notification, 2006 Air(Prevention and Control of Pollution) Act 1981/1987 Water (Prevention and Control of Pollution) Act, 1974/1988 Guideline for Ground Water Withdrawal, Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016 (as amended) Solid Waste Management Rules, 2016. Inland Vessels (Prevention & Control of Pollution and Protection of Inland	Construction Area	During Pre- construction phase

<sup>&</sup>lt;sup>1</sup>The Project Management Unit (PMU) and Project Implementation Unit (PIU) in IWAI to manage social and environmental aspect of NW1 augmentation. Technical Support Services Consultant (TSSC) anticipated to be appointed for project management and quality check.

<sup>&</sup>lt;sup>2</sup>Implementation of all mitigation measures and statutory clearances require for environmental management plan and environmental monitoring during design and construction stage is the responsibility of EPC contractor. Supervision of implementation of environmental management plan and environmental monitoring will be carried out by IWAI through TSSC.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame
		Water) Rules, 2016.		
2. Climate		I		
2.1 Project is unlikely to cause negative effect on climate. However, project can contribute positively for climate	<ul> <li>Project should be designed in a way to minimize the tree cutting. As far as possible trees along the terminal boundary retains as a greenbelt.</li> <li>Compensatory plantation should be carried out in ratio of 1:2 (100 nos. to be planted in place of 50 trees to be cut).</li> <li>Compensatory plantation should be carried out in the areas near to the site to the extent possible.</li> <li>Tree species high in organic content like Neem, Mango etc should be preferably planted to compensate for loss of carbon sequestration source.</li> <li>Tree cutting to be carried out only after obtaining NOC from forest department.</li> <li>Shifting to alternative energy options like solar energy.</li> <li>Adoption of best practices to cut down resources and energy requirement.</li> </ul>	-	Construction site	During Design, and construction stage.
3. Natural & Man-	made Hazard			
3.1 Earthquake- Seismic	• Relevant IS code for structures shall be adopted for designing the civil structures to sustain the	NBC, 2005, loc building bye law	cal Construction vs, site&	During Design and construction

Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
Zone –III damage risk	earthquake of medium to high intensity. As per	state factory rules,	Navigation	stage.
zone <sup>3</sup> and Risk of	building code the terminal buildings are required to	Petroleum Rules and	Channel	
floods	be designed for structure requirement of one higher	MSIHC Rules, 1989		
	(seismic zone IV) zone	as amended till date		
	• All facilities developed shall be above HFL. River			
	embankment protection measures shall be			
	strengthened considering high flood levels to			
	prevent soil erosion.			
	• In addition to natural hazard, operational hazard			
	like fire, accidents and grounding of cargo can			
	happen at the site. Provision of adequate fire			
	protection measures as per standard code and			
	practices should be provided in terminal buildings			
	and storage areas. Adequate safety provisions like			
	caution sign boards, emergency hooter; designation			
	of assembly points shall be made. International			
	environmental and occupational health and safety			
	management systems as per			
	ISO14001/OHSAS18001 shall be adopted.			
	Standard safety guidelines covering most probable			
	accident scenarios shall be developed and followed.			

<sup>3</sup>IS:1893 (Part 1): 2002 Indian Standard Criteria for Earthquake Resistant Design of Structures Part 1 General Provisions and Buildings Fifth Revision divides the



Indian subcontinent into five seismic zones (II to V) depending on the magnitude and damage intensity of seismic activity.



<b>Environmental Issue/</b>	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
	Adverse servicing to 11 hours to find with	Documents		
	Adequate provision shall be made for first and			
	facilities at the terminal and periodic health check-			
4. Site Prenaration	Levelling Terminal Site, Construction Camp, Constr	uction Works		
4.1 Levelling of	• Tree cutting should be carried out only after	Solid Waste	Construction	During design
terminal site & Removal	obtaining NOC from forest department	Management Rules,	site	and
of vegetation	• Site levelling works shall be immediately started	2016		Construction
	after removal of the vegetation	Hazardous& Other		Stage
	• Filling shall be followed by compaction and water	Wastes(Management		
	sprinkling to prevent dust emission	& Transboundary		
	• Top soil (15 cm) should be stripped and preserved	Movement Rules),		
	This should be stored in the form of the been with	2016as amended		
	the slide slopes covered with grass	Construction and		
	• Dredged soil should be preferably used for site	Demolition Waste		
	filling rest of the dredge material should be	Management Rules,		
	disposed as per norms.	2016		
	• If borrow areas are excavated for obtaining the soil			
	then environmental clearance shall be obtained			
	prior excavating the borrow areas. Borrow areas			
	shall preferably be located on waste land and			
	agricultural land should be avoided. Borrow areas			
	should be made along the river as the borrow areas			
	by river water. Excavation should not be carried out			
	more than 1.5 m or till the ground water is obtained			
	(whichever is lesser).			
	• Green belt should be developed at the site and as			
	per the Green Belt management Plan (Annexure 4)			
	• Survival rate of tree should be regularly monitored.			
	It is should be minimum 70%.			
	• Work timings should be restricted between 10:00			
	PM to 6:00 AM. Adequate illumination should be			



<b>Environmental Issue/</b>	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	provided at site during evening hours			
	• Rest area should be provided for workers at site and			
	sleeping/lying down at site should be strictly			
	prohibited to prevent accidents			
	• Develop and obtain approval from IWAI for			
	occupational health & safety management. The plan			
	should follow safety guidelines as given at			
	Annexure 5 and other tools such as OSHAS 18001			
	• Movement of construction vehicles shall be			
	restricted to the designated haulage roads only to			
	The earth stack is a be growided with contact			
	• The earth stockplies to be provided with genue			
	• Sedimentation tanks shall be provided with storm			
	• Sedimentation tanks shall be provided with storm			
	sediments shall be removed and stored with			
	remaining excavated soil			
	• Shore protection works like stone pitching along			
	the bank shall be undertaken.			
	• Wash-off from concrete mixing tanks and wash			
	from washing area shall not be allowed to enter the			
	soil. This wash shall be collected through drains			
	into tanks and concrete shall be settled, collected,			
	dried and re-used in the site again.			
	Solid Waste Management:			
	• Arrangement should be made for segregation of			
	waste into recyclable and non-recyclable waste.			
	• The plan and design for the IWT Terminal should			
	include such measures for operation period of the			
	Terminal including collection of solid wastes from			
	the barges and vessels that will be using the			
	Terminal. Modular designs be prepared for the			
	collection, segregation, recycling and final disposal			



Environmental Issue/	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
	<ul> <li>of solid wastes for the entire operation period of the Terminal; and the modules required to serve the needs of first 5 years of operation will be constructed as part of the Contract. Additional modules, as per estimates of solid waste load during the later operation period of the Terminal should be planned/designed, and reserve space should be provided for in such a manner that the additional modules when constructed in future could be easily integrated with the initial modules constructed.</li> <li>Non-recyclable waste generated should be disposed regularly through authorized agency. Recyclable waste should be sold to authorized vendors.</li> <li>Construction waste generated should be segregated at site into recyclable, reusable &amp; rejected fraction. Recyclable should be stored at site for usage and rejected fraction should be disposed at designated sites by the municipal authority.</li> <li>If no debris or waste disposal site exists in the area then a site should be identified for debris disposal, should be approved by IWAI and should be used &amp; manage for the same as per the Debris Management Plan (Annexure 6).</li> <li>Any waste oil generated from construction machinery, should be stored on concrete platform and disposed off to authorized recyclers.</li> </ul>	Documents		
4.2 Setting of Labour	Location of Camp:	The Building and	Labour Camp	During design
Camps : Loss of	• Construction camp sitting, establishment, location	Other Construction	Locations	and
agriculture land,	and management should be as per proposed Construction & Labor Camp Management Plan	of Employment and		Construction Stage
contamination of land	(Annexure 7).	Conditions of Service)		Sugo
from municipal waste	• Labour camps should be located close to the	Act 1996 and		



Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
from Camps, worker's	construction sites to the extent possible.	The Water (Prevention		
health, Pressure on	Sanitation and Worker's Health& Safety:	& Control of		
natural resources due to	• Hygiene in the camps should be maintained by	Pollution) Act, 1974		
establishment of labour	providing good sanitation and cleaning facilities.	and amendments		
camps	Soak Pits can be provided only if labour camp is	thereof. Solid Waste		
F -	located away from river.	Management Rules,		
	• Camp should be well ventilated. It should have	2016, Hazardous &		
	adequate provision for illumination, kitchen and	Other Waste		
	safe drinking water facility. Proper drainage to be	(Management and		
	maintained around the sites to avoid water logging	Transboundary		
	leading to disease.	Movement) Rules,		
	• Proper sanitation facility like toilet and bathing	2010		
	facility should be provided at site and labor camps.			
	Wastewater generated from these facilities should			
	be disposed off through septic tanks and soak pit.			
	Septic tank/soak pit should be constructed at min			
	Dressontive modical care to be provided to workers			
	<ul> <li>Fleventive medical care to be provided to workers.</li> <li>Segregated collection and disposed of solid workers.</li> </ul>			
	• Segregated, collection and disposal of solid waste			
	disposal location. If municipal solid waste site not			
	available than waste should be land fill following			
	the regulations			
	<ul> <li>Provision should be made essential material supply.</li> </ul>			
	like cooking fuel (gas)			
	<ul> <li>Provision should be made for day crèche for</li> </ul>			
	children			
	• First aid facilities first aid room first aid trained			
	personnel and ambulance should be provided at the			
	site 24 X 7. Also, tie-ups with local hospital should			
	be done to handle emergency case. if any.			
	• Rest area should be provided at the site where			
	labour can rest after lunch and should not lie on site			



Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
4.3 Setting up Concrete Mix Plant, Hot Mix Plant, Mechanical Workshop, Fuel storages, Lubricant storages	<ul> <li>anywhere.</li> <li>Working hours of labour should not exceed the standard norms as per The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Central Rules, 1998 and The Contract Labour (Regulation and Abolition) Act, 1970.</li> <li>Wastewater from construction site should not be allowed to accumulate at site as standing water may lead to breeding of mosquitoes. Septic tanks/soak pits should be provided for its disposal.</li> <li>Temporary storm water drainage system should also be provided at camp site and construction site so as to drain the storm water and prevent accumulation of storm water at site and thus breeding of mosquitoes/flies.</li> <li>All these facilities shall be installed at proposed terminal site itself. In case these are to be set up away from site than these shall be located at minimum distance of 500 m from habitation, water bodies and 1000 m from forest areas.</li> <li>All maintenance facilities, hot mix plant and concrete mixing plant shall be established with prior consent to establish to be obtained from SPCB.</li> <li>All such equipment/plant shall be fitted with air pollution control system and shall comply with conditions.</li> </ul>	Air (Prevention and Control of Pollution) Act, 1981 and Water (Prevention and Control of Water Pollution) Act, 1974	Site construction Camp	During design and construction Stage
5. Site Preparation	: Power supply, Water Supply, and Drainage, disposa	l of piling muck and De	bris	1
-				
5.1 Power supply and	• Power shall be sourced from State Electricity Grid	Air (Prevention and	Construction	During design

Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract Documents	Location	Frame
Energy Conservation: Air Pollution, energy loss	<ul> <li>during construction stage DG sets shall be used only in case of power failure. DG sets shall be enclosed in acoustic enclosures and shall be provided with stacks as per CPCB norms to discharge exhaust gases.</li> <li>Solar energy shall be used in common lighting area on 1:3 bases.</li> <li>Energy Conservation Building Code shall be used</li> </ul>	Control of Water Pollution) Act, 1981 & ECBC Norms, 2016	Sites and Labour Camp Locations	and construction stage
5.2 Water Supply, Drainage and effluent discharge	<ul> <li>as applicable to various office and other structures.</li> <li>The Area is under safe category as per Central Ground Water Board. However, necessary permission shall be taken to drawl ground water.</li> <li>Caution signage shall be placed at site for optimal use of water. Applicable discharge standard provided in Annexure-8</li> <li>Storm water drain network should be developed. Storm water drains shall be connected to sedimentation tank for arresting the sediments before discharging into the river.</li> <li>Rain water should be collected into temporary ponds which should be used for various construction activities and dust suppression.</li> <li>All washing and maintenance effluent from the workshop area of vehicle maintenance area should drain to separate collection areas fitted with oil and grease trap and de- siltation chamber. The treated water shall be used for dust separation and green belt development. This water shall not be discharged to river at all.</li> <li>No wastewater should be discharged to river at all either during construction or operation of the Terminal, and as such should be provided in the design of the entire Terminal facility.</li> </ul>	Water (Prevention and Control of Water Pollution) Act, 1974	Construction Sites and Labour Camp Locations	During design and construction stage



Environmental Issue/	Remedial Measure	Reference to laws	Approximate Location	Time Frame
Component		Documents	Location	France
	<ul> <li>Vehicle washing and maintenance workshops shall be located away from river.</li> <li>Rain water should be collected into temporary ponds which should be used for various construction activities and dust suppression.</li> </ul>			
5.3 Disposal of construction & demolition debris and dredged material: uncontrolled disposal may leads to increased sedimentation of the river.	<ul> <li>Dredged soil shall be used preferably for filling of the site if found non toxic. If found toxic shall be sent to TSDF.</li> <li>If dredged material cannot be used for filling then it should be disposed off to the designated location/ nearest TSDF site</li> <li>Construction and demolition waste should be used preferably for filling the site Dredged soil (approx. 6,60,000 cum for constructing in approach channel and 1,00,000 cum for turning circle) shall be tested for toxicity, if toxic shall not be disposed off back in water and should be send for disposal to TSDF.</li> </ul>	Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016	River Bank along the terminal site	Pre-Construction and construction Stage
6. Embankment De	esign and Construction, Drainage Pattern	I		
6.1 River Bank Erosion Protection: Construction of Embankment and construction of jetty may lead to accumulation of sediments on the updraft side and erosion of the downdraft side.	<ul> <li>Embankment protection measures (stone pitching) shall be made all along the length (about 600m) of bank.</li> <li>During stone pitching, the stone shall be dropped from suitable distance and shall not by drop from height to prevent injury or killing of aquatic species. Stones shall be placed by making grid in pitching area.</li> <li>Erosion monitoring shall be carried out periodically downstream as well.</li> <li>River Bed material/dredged material shall be tested for toxicity before its use or disposal for land fill site. If any level of heavy metal contamination or toxicity is found than it shall be disposed off in a secure manner to TSDF.</li> </ul>	Water (Prevention and Control of Water Pollution) Act, 1974	Area for stone pitching-River Bank along the terminal site	During design, Pre-Construction and construction Stage

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame
6.2 Dredging activities :Impacts on fishes, and benthic organisms	<ul> <li>As part of the detailed engineering design and when dredging is required, the Contractor shall prepare a Dredging plan that will ensure no adverse impacts shall occur on the local biodiversity. However a dredging management plan has been prepared for the entire NW-1 stretch which can be referred by the contractor for preparation of stretch specific dredging management plan. The Dredging Plan shall comply with the following:</li> <li>Roles and Responsibilities. Define roles and responsibilities for implementing and adhering to the commitments made within this Dredge Management Plan.</li> <li>Legislative Requirements and Guidelines. All dredging and disposal of dredge material will be undertaken in compliance with relevant national and state legislation. In case no standards exist, best international practice will apply.</li> <li>Studies on the existing Environment: Contractor shall carry out supplementary EIA study including Key Environment: Riverbed morphology and geology, Bathymetry, Hydrodynamics, Sediment quality. Fresh Water Quality: Physiochemical, Chemical, Sediment plume modelling. Biological freshwater Environment: Benthic Primary Producer Habitat, Freshwater Fauna.</li> <li>Dredging Environmental Impact Assessment And Management: The Contractor shall prepare a supplementary EIA to establish potential impacts and its effective management in terms key performance indicators, mitigation and monitoring</li> </ul>	Wild Life Protection Act, 1972	Approach channel	During design and construction stage



<b>Environmental Issue/</b>	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	measures on the: freshwater quality, benthic			
	primary producer habitat (BPPH), tidal, riverbank			
	including bank, freshwater fauna, dredge materials			
	disposal and spoil ground management.			
	The Dredging Plan shall highlight the following:			
	• Location of dredging sites must avoid key habitat			
	areas such as breeding and feeding grounds etc. of			
	key biodiversity species found in the project area			
	• The schedule or time of dredging must avoid			
	breeding season of aquatic fauna. Decisions on			
	method of dredging and type of technology and			
	equipment to be used must consider the noise and			
	vibration levels and extent of siltation being			
	generated. Noise and vibration levels must be			
	below levels that can cause injury to aquatic			
	fauna. The dredging space must include measures			
	to contain silt or suspended solids to a minimum			
	area within the river as excess siltation can			
	hamper wildlife activities.			
	• Appropriate protocols and procedures must be			
	prepared for sighting of large fishes & other fauna			
	within the vicinity of the dredging site. The			
	objective of the protocols and procedures must be			
	aimed at having no or minimal impacts on the			
	respective wildlife species.			
	• Dredged soil shall be tested for contamination and			
	toxicity and accordingly shall be disposed.			
	• Dredged soil shall not be pilled on the River			
	banks.			
6.3 Drainage	• Natural Drainage pattern of area around the		Construction	During
Pattern	terminal shall be maintained.		Sites, Access	construction
1 4110111	• Storm water management drains shall be provided		road, and	stage
	at site		Labour Camp	
	at bite.		p	



Environmental Issue/ Component	Remedial Measure	Reference to laws	Approximate Location	Time Frame
component		Documents	Locution	Trunic
			Locations	
7. Construction Ma	aterial Sourcing			
7.1 Borrow areas for sourcing earth for filling as required (erosion, loss of productive land, land degradation, air pollution)	<ul> <li>Material shall be sourced from nearby area and local markets nearby Kalughat to the extent possible. Dredged sand and sand purchased from local market can be used for filling the site and borrow area may not be required to be established. However, if borrow areas will be required following guidelines should be followed.</li> <li>if borrow area is required then it should be as per following: <ul> <li>Non-productive lands, barren lands, raised lands; wastelands shall be used for borrowing earth with the necessary permissions/consents.</li> <li>Agricultural areas not to be used as borrow areas unless requested by the landowner for lowering the land for making it cultivable.</li> <li>Excavation depth should not exceed 1.5 m bgl</li> <li>Environmental Impact Assessment Authority under EIA Notification, 2006 and required permission from District Magistrate shall be obtained prior to excavation&amp; establishing borrows areas. Copy of this permission shall be submitted to IWAI before start of excavation.</li> <li>Record of location, area, accessibility to the location and photograph of borrow area should be maintained prior to excavation.</li> </ul> </li> </ul>	IRC Guidelines on borrow areas and for quarries. EIA Notification 2006( under Environmental Protection Act and Rules, 1986;) as amended till date	All Identified Borrow sites	During design and construction stage



<b>Environmental Issue/</b>	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
7.2 Quarries for sourcing stone and aggregates (loss of productive land, land degradation, air pollution. Any illegal quarrying may lead to land use change, unstable rock formation)	<ul> <li>intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage.</li> <li>The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).</li> <li>Topsoil to be stockpiled and protected for use at the rehabilitation stage.</li> <li>Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon.</li> <li>Unpaved surfaces used for the haulage of borrow materials to be maintained.</li> <li>Transportation of earth materials shall be through covered vehicles.</li> <li>Aggregates required for embankment stone pitching and roads shall be procured from licensed quarries. All the material will be available locally.</li> <li>It shall be ensures that selected quarries are having requisite environment clearance, and comply with Air Pollution Control and Noise level requirements as per the law.</li> <li>Copy of Environmental Clearance letter and Consent to operate and shall be obtained from the quarry owner and submitted to IWAI.</li> <li>Material shall be transported in covered vehicles only.</li> <li>No new quarry shall be opened without due permissions. If new quarry is opened then it is require to obtain environment clearance from MoEF&amp;CC/SEIAA.</li> </ul>	EIA Notification 2006(under Environmental Protection Act and Rules, 1986;) as amended till date	Quarry Site	During design and construction stage
	to ensure its compliance with lease conditions, EC and consent conditions.			



Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract	Approximate Location	Time Frame
	• Stone crushers, if required, shall be set up only after consent from SPCB and taking adequate measures for air pollution control.	Documents		
8. Protection of Flo	bra and Fauna			<b>D</b> · · · ·
terrestrial flora & fauna	<ul> <li>Thick and To m whe green bert shall be developed as per the CPCB guidelines at the periphery and along the approach &amp; internal roads on the project site which will prevent spread of dust and reduce noise propagation.</li> <li>Green belt development should be started during construction phase only.</li> <li>Survival rate for green belt to be developed at the site shall be monitored regularly and measures shall be taken so as to achieve minimum rate of 70%.Provision shall be made for strict penalty for hunting/harming any animal/bird/aquatic fauna.</li> <li>Construction activities shall be restricted to 6:00 AM to 10:00 PM especially noise generating activities.</li> <li>Workers should not use any timber or firewood as fuel for any purpose. LPG should be made available to workers in construction camp.</li> <li>About 50 trees require cutting. Permission for</li> </ul>		labour camp site, plant site	and construction stage
	<ul> <li>The present along the terminal boundary shall retained as greenbelt. Trees retained at the site (after site clearance) should not be disturbed, cut or harmed in anyway. These trees should be maintained.</li> <li>No hazardous material or waste shall be disposed off in the other land or nearby area as it may harm the animals, if consumed accidently.</li> </ul>			



<b>Environmental Issue/</b>	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	<ul> <li>Speed limit will be regulated to prevent any accidents of animals.</li> <li>Regular maintenance of the dumper shall be done to prevent leakage of oil so as to prevent pollution of the soil and impact on fauna and flora dependant on soil.</li> <li>Regular Water Sprinkling shall be carried out to minimize dust generation and settling the dust on surface of flora.</li> <li>Adequate parking space should be provided within the site for construction vehicle and equipment so as they are not parked in other areas like road side, others agricultural field, open areas etc to avoid any harm to flora of that area due to movement of heavy vehicles.</li> <li>Construction activities and vehicle washing should not be undertaken at the river or any other water body or close to the water body</li> <li>Site should be barricaded to prevent entry of the animal in the site</li> <li>Hunting, poaching and harming any animal (wild or domestic) by any worker or project related person should be strictly prohibited and monitored</li> <li>Illumination at the night time should not be undertaken during the night time to minimize disturbance to animals. Noise levels should be maintained within the prescribed CPCBs limits to</li> </ul>	Documents		
	the extent possible during the day time.			
8.2 Protection of Aquatic Fauna	• The area in which the construction of the jetty is planned, it is advisable to carefully determine drop	Wild Life (Protection) Act, 1972	Around Pilling Area	During design and construction

Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
including Dolphins from high sound generation during piling	<ul> <li>sites before anchor placement to ensure that fisheries that could locally still be present in the area are not unnecessarily damaged.</li> <li>Before starting piling allow some time to aquatic fauna to displace from the piling area.</li> <li>Bubble curtains can be provided at the time of pilling so as to displace the aquatic fauna prior start of construction activities</li> <li>The piling activities must be carried out in shortest possible timeframe as possible</li> <li>All the debris shall dispose away from river course as per debris management plan of the project.</li> <li>Decisions on method of construction and type of technology and equipment to be used must consider the noise and vibration levels and extent of siltation being generated. Noise and vibration levels must be far below levels that can cause injury to dolphins and other aquatic life.</li> <li>Noise reducing devices like mufflers, enclosures shall be fitted with the equipments as much as feasible. Erecting barrier shall also be installed</li> <li>Fish exclusion devises shall be installed in water column around the pile driving area to prevent fish access.</li> <li>Geo Textile synthetic sheet curtain &amp; turbidity traps shall be placed around pilling and construction area to prevent movement of sediments and construction waste.</li> </ul>			stage
8.3 Protection of Aquatic Fauna from increased	• To avoid the construction debris wash or blown into the water the area shall be surrounded by silt screens, which must be placed in the water before the work starts	Wild Life (Protection) Act, 1972	Around Pilling Area	During design and construction stage
sedimentation in water	the work starts.			

Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
Environmental Issue/ Component body during piling & dredging and other construction activities	<ul> <li>Remedial Measure</li> <li>Geo-Textile synthetic sheet curtain can act silt screen which should be placed around pilling and construction area to prevent movement of sediments and construction waste. The screens should also be placed around storage areas, to prevent waste from blowing away and to prevent sediment run-off into the river.</li> <li>The storm water drain shall be connected to temporary sedimentation pit and collected water shall be used for dust suppression. Run-off from site should also pass through oil/grease traps and flow down to the same sedimentation tank before its reuse</li> <li>In addition to silt screens, building guidelines of the Bonaire National Marine Park<sup>4</sup> require that storage areas for sand and soil, and all work areas, must be at least 20 meters away from the highwater mark and construction equipment must not</li> </ul>	Reference to laws and Contract Documents	Approximate Location	Time Frame
	<ul> <li>water mark and construction equipment must not be cleaned or washed within 50 meters of the high-water mark.</li> <li>Piling and dredging activities should be carried out rapidly. Piling should not be carried out during breeding and spawning season. It should be carried out in low water season, i.e. pre-monsoon</li> <li>Piling/Dredging should be stopped for some time, if any large fish is sighted in activity area</li> <li>Equipments shall be maintained in good condition to prevent leaks or spills of potentially hazardous materials like hydraulic fluid, diesel, gasoline and other petroleum products.</li> </ul>			

<sup>&</sup>lt;sup>4</sup>http://www.bonairegov.com/sites/default/files/uploads/pdf/construction-guidelines-bonaire.pdf



<b>Environmental Issue</b> /	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
Component	<ul> <li>Excavation activities onshore should not be undertaken during monsoon season so as to minimize sediment load of run-off.</li> <li>Workers should be trained to handle the equipment and material at site so as to minimize the spillage of materials and contamination of water.</li> <li>All workers should be made aware of not throwing any waste in the river or any drain.</li> <li>No construction debris/ already accumulated solid waste at site or waste generated from labour camp should be thrown in river or any drain.</li> <li>Sewage generated from labour camp should not be directed into river but should be disposed off through septic tank/soak pit. Septic tank/soak pit should be constructed at min 100 m distance from river/water body.</li> <li>Aquatic ecology monitoring should be carried out prior start of construction and after completion of construction so as to assess the impact of construction activities on aquatic life.</li> <li>Run-off from site should pass through oil/grease traps and sedimentation tank prior discharging into the river.</li> <li>All construction and operation equipment shall be maintained in good condition shall be checked for oil &amp; grease leakage.</li> <li>Dredged soil (approx. 6,60,000 cum for constructing in approach channel and 100 000</li> </ul>	and Contract Documents	Location	Frame
	cum for turning circle)shall not be disposed off in river or its banks especially during breeding			
	spawning seasons of aquatic organisms. This soil should be tested for toxicity and if found non-			

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame
	toxic should be disposed off in the river only away from banks. If found toxic shall be sent to TSDF.			
8.4 Conservation of Dolphins	• Dolphins are reported in Ganga River however it has not been seen in the study area. Appropriate protocols and procedures must be prepared for sighting of dolphins and fishes in the construction zone. The objective of the protocols and procedures must be aimed at having no or minimal impacts on the dolphins.	Wild Life (Protection) Act, 1972	Around Pilling Area	During design and construction stage
9. Air Quality				<b>.</b>
9.1 Fugitive Dust Generation due to construction activities	<ul> <li>Barricading the site to prevent dust dispersion to nearby areas.</li> <li>Water sprinkling to suppress the dust generated to be carried out at site, approach road &amp; haulage roads.</li> <li>Controlled flow of the sprinklers to avoid ponding of water</li> <li>Excavation and filling to be carried out in parallel and in phases.</li> <li>Proper servicing and maintenance of excavators/levellers/loaders and other machinery to minimize the emission generation</li> <li>Top soil stripping before excavating the soil and storage under covered conditions for usage in landscaping at later stages</li> <li>To develop 10 m wide and dense (as space available) greenbelt all around the terminal premises as well as all along the approach road.</li> <li>Ensuring survival rate of plantation carried out at terminal should have survival rate of at least 70% and periodic monitoring and reporting should be carried out on half yearly basis</li> </ul>	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Construction sites, Loading areas, storage areas,	During the Construction phase



Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	<ul> <li>like sand and aggregates shall be covered.</li> <li>Masks and other PPE shall be provided to people working in high dust generation area</li> <li>Loading and unloading of construction materials shall be made at designated locations in project area with provisions of water sprinkling around these locations</li> <li>Construction vehicle, machinery &amp; equipment shall be regularly serviced and maintained and should comply with emission standards as per CPCB norms. Vehicles entering the construction site shall carry valid PUC certificate.</li> <li>Wheel wash facility shall be provided at exit points of the site.</li> <li>LPG should be used as fuel source in construction camps instead of wood. Tree cutting shall not be allowed for fuel wood.</li> <li>Monitoring of air quality shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EM P</li> </ul>			
9.2 Exhaust gas emissions from machinery and vehicular traffic.	<ul> <li>Regular maintenance shall be carried out of machinery and equipment.</li> <li>Mixing Plant, crushers and batching plant shall be located on downwind direction of the site fitted with adequate stack height to ensure enough dispersion of exit gases. with appropriate pollution control measures.</li> <li>Low sulphur diesel should be used for operating DG sets and construction equipment.</li> <li>Diesel Generating (DG) sets shall be fitted with stack of adequate height as per regulations (Height of stack = height of the building + 0.2 √ KVA).</li> <li>Periodic monitoring of air quality for PM<sub>10</sub>, PM<sub>2.5</sub>,</li> </ul>	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Construction camps and sites, batching plants, DG sets locations	During the Construction phase



<b>Environmental Issue</b> /	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
	SO NO and CO shall be corriad out quarterly at	Documents		
	so <sub>x</sub> , No <sub>x</sub> , and CO shall be carried out quarterly at construction site			
9.3 Emissions at access road : avoidance of traffic Jams	<ul> <li>Two lanes NH-19 abutting the site along the western boundary further efforts shall be made for smooth traffic movement.</li> <li>No construction, material, equipment or vehicle shall be stored or parked at any road or the non-project area.</li> <li>Transportation vehicle shall strictly adhere to the designated routes and timings and shall avoid the peak traffic hours.</li> <li>Parking space for dumpers shall be provided within the site so as to prevent parking of vehicles on road and other area and thus preventing traffic jams.</li> </ul>	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Existing roads	During the Construction phase
10. Noise and Vibra	tion			
10.1 Noise from construction vehicle, equipment and machinery.	<ul> <li>Protection devices (earplugs or earmuffs) shall be provided to the workers operating near high noise generating machines.</li> <li>Construction equipment and machinery shall be fitted with silencers and maintained properly.</li> <li>Barricading (Temporary noise barrier) the construction site to minimize the noise level outside the site boundary.</li> <li>All equipment shall be fitted with silencers and will be properly maintained to minimize its operational noise.</li> <li>Hearing test for the workers prior to deployment at site and high noise areas followed by periodic testing every six months.</li> <li>Restriction of high noise generating activity between 10:00 PM to 6:00 AM.</li> <li>Restriction on Honking at the project site</li> <li>Job rotations systems for workers, working in high</li> </ul>	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Terminal site and accesses road.	During the Construction stage



Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		Documents	Location	<b>F</b> rame
	<ul> <li>noise level areas.</li> <li>Periodic monitoring (monthly level) of noise levels to check the level of pollutants and effectiveness of proposed EMP.</li> </ul>			
11. Land-use and La	andscape			<b>D</b> ·
agricultural land and productive top soil	<ul> <li>Agricultural land shall not be selected for setting up construction camps, borrow area and Hot mix plant.</li> <li>15 cm of top soil layer shall be stripped off prior to filling in built-up areas and shall be stored separately in covered condition and used for landscaping purpose within the site.</li> </ul>	Design requirement	and borrow area	During construction Stage
11.2 Soil erosion due to construction activities, earthwork	<ul> <li>The earth stockpiles to be provided with gentle slopes to prevent soil erosion.</li> <li>Sedimentation tanks shall be provided with storm water drain to arrest the sediments and these sediments shall be removed and stored with remaining excavated soil</li> <li>Provision of side drain shall be made in access road if required to prevent water logging.</li> <li>Shore protection works like stone pitching proposed along the bank to prevent the erosion of the banks</li> </ul>	Solid Waste Management Rules, 2016, Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016	Access road, terminal site and river bank	During construction Stage
11.3 Compaction and contamination of soil due to movement of vehicles and equipment	<ul> <li>Filling of the site should be carried out by dividing site into various activity areas. Filling should be followed by the compaction to minimize the erosion.</li> <li>Water shall be sprinkled on the compacted soil to further minimize soil erosion due to wind</li> <li>Dredged sand should preferably be used for filling purpose, if not used then it should be disposed off at the location designated by local body only. Dredged sand should be transported in covered</li> </ul>	SolidWasteManagementRules,2016,Hazardous &OtherWaste(ManagementandTransboundaryMovement)Movement)Rules,2016	Terminal site	During Design & Construction stage.



Environmental Issue/	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	vehicles to the disposal site. Dredged soil disposal			
	should not be carried out within 100 m of the water			
	body. Borrow areas should be restored back			
	properly prior closure. A procedure of reporting			
	and approval should be followed prior opening and			
	closure of the borrow area by contractor.			
	• 15 cm of top soil shall be stripped off prior filling			
	and this top soil should be used for landscaping &			
	green belt development.			
	• Soil for filling should be sourced from authorized			
	vendors and from the local areas only to prevent			
	illegal mining and minimize emissions during			
	transportation. Aggregates will be sourced from			
	existing licensed quarries. Copies of consent/			
	approval / rehabilitation plan for a new quarry or			
	use of existing source should be obtained by			
	contractor and submitted to I w AI.			
	• If borrow areas are excavated for obtaining the soil			
	then environmental clearance shall be obtained			
	shall preferably be located on waste land and			
	agricultural land should be avoided Borrow areas			
	should be made along the river as the borrow areas			
	may get filled quickly with the sediments brought			
	by river water Excavation should not be carried out			
	more than 1.5 m or till the ground water is obtained			
	(whichever is lesser).			
	• The earth stockpiles to be provided with gentle			
	slopes to prevent soil erosion.			
	• Fuel shall be stored in HDPE containers on paved			
	surfaces with provision of catchment pit to prevent			
	soil contamination from oil spillages.			
	• Arrangement should be made for segregation of			



Environmental Issue/	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	<ul> <li>municipal solid waste into recyclable and non-recyclable waste at the labour camp site. Non-recyclable waste generated should be disposed regularly through authorized agency. Recyclable waste should be sold to authorized vendors.</li> <li>Construction waste generated should be segregated at site into recyclable, reusable &amp; rejected fraction. Recyclable should be sold to authorized vendor, reusable waste should be stored at site for usage and rejected fraction should be disposed at designated sites by the municipal authority. This construction waste should preferably be used for filling of the site.</li> <li>If no debris or waste disposal site exists in the area then a site should be identified by contractor for debris disposal, should be approved by IWAI and should be used &amp; manage for the same as per the Debris Management Plan. No waste should be dumped in the river or low lying areas near the River/water body.</li> <li>Hazardous waste like used oil from DG sets shall be stored in HDPE containers and shall be stored on paved surfaces in isolated location to prevent its spillage and contamination of soil. Used oil shall be disposed off through authorized vendors only.</li> <li>Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction and labour camp site. Septic tank/soak pit should be constructed at min 100 m distance from river/water body.</li> <li>Wash-off from concrete mixing tanks and wash from washing area shall not be allowed to enter the</li> </ul>	Documents		
	soil. This wash shall be collected through drains			



<b>Environmental Issue/</b>	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	<ul> <li>into tanks and concrete shall be settled, collected, dried and re-used in the site again.</li> <li>Movement of construction vehicles shall be restricted to the designated roads only to prevent compaction of soil in other areas</li> <li>Sedimentation tanks shall be provided with storm water drain to arrest the sediments and these sediments shall be removed and stored with remaining excavated soil.</li> <li>Provision of side drain &amp; cross drainage structure like culverts shall be made in the approach road if required to maintain the natural drainage pattern and prevent soil erosion.</li> <li>Shore protection works like stone pitching etc should be provided along the river bank to prevent the erosion due to water action.</li> </ul>			
12. Water Resources	S			
12.1 Depletion of Groundwater resources due to unregulated abstraction for construction purpose	<ul> <li>Preference shall be given to source water from rivers with due permission from authorities.</li> <li>The depth to water level in the study area during pre-monsoon season varies from 2 mbgl to 5 m bgl and in post monsoon season depth to water table remains &lt;2 m. Stage of Ground water development in the Sonepur block is 40.09%. Overall the study area including Sonepur block fall under the safe category.</li> <li>Temporary rain water storage structures should be provided at the site to store rain water and this water should be used for sprinkling and construction activities. This structure can be retained in the operation phase also as the rain water storage sump.</li> </ul>	Water (Prevention and Control of Pollution) Act, 1974	Terminal site	During Construction stage



<b>Environmental Issue/</b>	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
12.2 Increase in	<ul> <li>Hazardous waste or wastewater shall not be stored in unlined ponds.</li> <li>Permission shall be obtained from irrigation department in case river water is used and from CGWA/CGWB in case ground water is used.</li> <li>Natural Drainage pattern of area shall be</li> </ul>	Water (Prevention and	Terminal Site	During
12.2 Increase in water Siltation levels due to construction of terminal and contamination due to disposal of domestic waste	<ul> <li>Natural Drainage pattern of area shall be maintained by making a proper drainage network in project site.</li> <li>Permission shall be obtained from irrigation department in case river water is used and from CGWA/CGWB in case of ground water.</li> <li>Washing of vehicle and equipment shall not be carried out at river or near any water body. Washing area should be provided with the storm water drains fitted with oil &amp; grease trap.</li> <li>Piling of the raw materials &amp; debris shall be avoided at the site. Storage of debris and raw material shall be carried out in paved and covered areas. This will minimize interface of run-off with raw material and debris.</li> <li>Site should be cleaned regularly.</li> <li>Septic tank/soak pit shall be provided at site for disposal of sewage from the toilets at site and from the labour camps. Adequate toilets &amp; bathrooms shall be provided to prevent open defecation. No septic tank shall be provided within 100 m of the water body. In such area, mobile toilets with anaerobic digestion facility shall be provided. No domestic waste shall be discharged to river.</li> <li>Water use shall be minimized by using RMC, practicing curing by water sprinkling, maintaining flow of sprinklers, covering the water storage tanks to minimize water evaporation, creating awareness</li> </ul>	Water (Prevention and Control of Pollution) Act, 1974	Terminal Site	During Construction stage



<b>Environmental Issue</b> /	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	for water conservation and regular inspections at			
	site to monitor the leakages in water storage area.			
	• In case RMC is not used then concrete transit mixer			
	should be washed and cleaned daily. Wash from			
	these mixers shall be collected in block work tanks			
	which will allow settling of concrete, removal of			
	aggregates and allowing the waste to wastewater			
	drain. This collected waste concrete can be dried			
	and used for various purposes at site like			
	colony			
	• Westewater concreted from the weshing/cleaning			
	• Wastewater generated from the washing/cleaning			
	curing area shall be re-used for water sprinkling			
	and wheel washing			
	• Fuel shall be stored in leak proof containers and			
	containers shall be placed on paved surface			
	• Restoration of changes in the stream, if any, made			
	during construction to its original level.			
	• The piling work in river shall be undertaken during			
	low flow period.			
	• Provision shall be made for collection and draining			
	of water for the piling earth. It shall be used for			
	embankment protection or road construction			
	depending on its suitability.			
	• Turbidity traps/curtains should be provided or Geo-			
	Textile synthetic sheet curtain shall be placed			
	around pilling and construction area to prevent			
	movement of sediments and construction waste.			
	• Sedimentation tanks shall be provided at the site so			
	as run-off from site shall enter the sedimentation			
	tanks before discharging into the river.			
	Sedimentation tanks will trap the sediments in the			



<b>Environmental Issue/</b>	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	<ul> <li>run-off.</li> <li>Provision shall be made for geo Synthetic Screen for arresting silt flowing down stream.</li> <li>Proper collection, management and disposal of construction and municipal waste from site shall be made to prevent mixing of the waste in run-off and entering the water bodies.</li> <li>Dredged soil (approx. 6,60,000 cum for constructing in approach channel and 1,00,000 cum for turning circle) shall be tested for toxicity &amp; contamination, if toxic/contaminated shall not be disposed off back in water and should be send for disposal to TSDF.</li> <li>Monitoring of surface water quality shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP.</li> </ul>			
13. Accident and Sa	fety Risks			
13.1 Impact on Social life	<ul> <li>Proper compensation should be made to all the land owners for the land as well as the assets on their land as per agreed rates.</li> <li>Local labour should preferably be employed for construction purpose.</li> <li>Site should be barricaded and should have entry guarded by security guard.</li> <li>Resister should be maintained for entry of outsiders. No unauthorized person should be allowed to enter the site especially village children.</li> <li>A board should be displayed at entrance of site displaying name of project, area and hazards associated with the site on entrance and activities prohibited within and near site area in local language.</li> <li>Implementation of EMP adequately so as to prevent</li> </ul>	BOCWA 1996 & BOCWR, 1998	Terminal Site and the material source areas and haulage roads	During Construction stage


Environmental Issue/	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
	<ul> <li>environmental pollution and its impact on socio- economy due to project development.</li> <li>No fishing activity is reported in the river stretch along the terminal site but if there is any loss i.e. loss of fishing net and boat of fisherman and boatman due to the construction activities of this terminal shall be compensated immediately.</li> <li>Non-productive lands, barren lands, raised lands; wastelands should be used for setting up labour camps, plant sites and debris disposal site. Labour camps, plant sites and debris disposal site should not be located close to habitations, schools, hospitals, religious places and other community places. A minimum distance of 500 m should be maintained for setting up such facilities.</li> <li>Necessary permits should be obtained from concerned authorities in case any quarry site, batching plant, hot mix plant, WMM plant etc. is set up. Management, rehabilitation and closure of these sites should be as per the Management plans proposed for these sites. Records for starting, maintaining and closure should be maintained and should be approved by site engineers.</li> </ul>			
13.2 Accident risk from construction activities and health & safety of workers	<ul> <li>Adequate illumination should be provided at site during evening and night time till the work is being carried out.</li> <li>Rest area should be provided at site in which workers can take rest.</li> <li>Personal protective equipment like helmet, gum boots, safety shoes, safety jackets, ear plugs, gloves etc to be provided to worker while working. Fines should be imposed if they are found not wearing PPE.</li> </ul>	Central Motor and Vehicle Act 1988 as amended, The Environment (Protection) Act 1986 and Noise Rules 2000 as amended	Construction sites	Construction period





<b>Environmental Issue/</b>	Remedial Measure	<b>Reference to laws</b>	Approximate	Time
Component		and Contract	Location	Frame
		Documents		
	Septic tank/soak pit should be constructed at min			
	100 m distance from river/water body.			
	• LPG should be provided as fuel for cooking to			
	workers and open burning of fuel should not be allowed.			
	• Temporary storm water drainage system should			
	also be provided at camp site and construction site			
	so as to drain the storm water and prevent			
	accumulation of storm water at site and thus			
	breeding of mosquitoes/flies.			
	• Dustbins should be provided at labour camps for			
	collection of waste and waste should be regularly			
	disposed off through the concerned agency.			
	• Safety officers should be appointed at site so as to			
	ensure all safety measures are taken at the site.			
	• Job rotation should be carried out for workers			
	exposed to high noise and dust areas.			
	• Activity like smoking and consuming liquor should			
	be prohibited at the site.			
	• Awareness on AIDS should be spread among the			
	workers.			
	• Traffic manager should be present at the site all the			
	time to manage incoming and outgoing traffic to			
	prevent accidents.			
	• Speed limit of venicles should be restricted at site			
	imposed on vehicles if same is not maintained All			
	construction vehicles should follow the designated			
	routes & timings only.			
	• Construction vehicle movement should be restricted			
	to non-peak hours, i.e late evening (7-12:00 pm)			
	only. Villagers should also be given intimation of			
	these timings.			



<b>Environmental Issue/</b>	Remedial Measure	Reference to laws	Approximate	Time
Component		and Contract	Location	Frame
	<ul> <li>All construction vehicles should be regularly serviced and maintained and carry pollution under control certificate.</li> <li>Crèche facility should be provided for kids if female workers are employed.</li> <li>Regular inspection for hygiene and safety in labour camps should be done.</li> <li>Arrangement of fire-fighting should be made at site and workers should be trained to use the system in case of fire.</li> <li>Site should be barricaded and should have entry guarded by security guard.</li> <li>A board should be displayed at entrance of site displaying name of project, area and hazards associated with the site on entrance and activities prohibited within and near site area in local language/</li> <li>All proposed environmental pollution measures should be taken during construction of phase of terminal to minimize the harm to existing environmental quality of the area, which is being enjoyed by the residents of that area/</li> <li>Maintenance and repair of the village road should be carried out both before and end of construction by contractor.</li> </ul>	Documents		
13.3 Shifting of community properties and utilities	• There are 2-3 households which may be partially impacted due to terminal. Proper compensation to be given to the house holder. No other utility is required to be shifted due to the project. However, if any CPR will be removed then that shall be		Project Area	Pre- Construction

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract	Approximate Location	Time Frame
	relocated at the earliest with consent of the villagers and the Gram Panchayat to suitable location in consent with the villagers	Documents		
13.4 Construction of Pollution control and resource conservation system for use in operation stage	<ul> <li>Total waste water generation from terminal will be about 40 KLD. The entire waste water passes through Oil &amp; grease separator to remove oil and grease and then treated in ETP cum STP (Capacity 50 KLD). Treated water should be used for horticulture purpose at the site and dust suppression purpose.</li> <li>Storm water drainage system should be provided at the site to manage storm water generation during operation phase. Arrangement shall be made to collect the roof water from the building and other areas like storage areas/sheds and roads shall be directed into a collection pond.</li> <li>Water conservation fixtures shall be installed in toilets and kitchen area of terminal building. Some of the water conservation fixtures which can be installed are dual flushing cisterns, sensor taps, low water urinals etc.</li> <li>Solar Lighting provisions of 1:3 basis.</li> <li>Maintenance of village road before and after completion of construction.</li> <li>Provisions of the measures in the terminal building to achieve platinum rating under green Building Certification.</li> <li>Adoption of zero pollution discharge concept at terminal.</li> <li>Development of thick green belt(10-15 m wide) as per provision in the design. Species selected for development of green belt shall also be tolerant to expected pollutants and shall have the ability to</li> </ul>		Contractor	Construction stage.



Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame
	<ul> <li>adsorb the pollutants. Suggested species are suitable for different areas are also listed under CPCB guidelines for green Belt development<sup>5</sup>.</li> <li>Provision of system for water sprinkling for dust suppression during loading and unloading of material in operation stage.</li> <li>Development of waste reception and treatment facility as per design</li> <li>Construction of Room for e-waste storage.</li> <li>Construction of oil interceptor in the storm water drain around parking and loading and unloading areas</li> </ul>			

<sup>&</sup>lt;sup>5</sup> CPCB guidelines for green Belt development http://cpcb.nic.in/upload/Publications/Publication\_513\_GuidelinesForDevelopingGreenbelts.pdf



#### TABLE 3: ENVIRONMENT MANAGEMENT PLAN OF KALUGHT TERMINAL DURING OPERATION PHASE<sup>6</sup>

Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
1 1	OPERA ermission and Clearances	ATION AND MAL	NTENANCE STA	AGE		
1.1 Obtaining Statutory Clearances	<ul> <li>Obtaining consent to operate and renewal for terminal</li> <li>Obtaining authorization for generation, storage and disposal of hazardous waste (used oil)</li> <li>Obtaining permission from CGWB if ground water withdrawal is undertaken</li> </ul>	TheAir(Prevention andControlofPollution)Act,1981andamendmentsthereof,GuidelineforGroundWaterWithdrawal,HazardousandOtherWaste(ManagementandTransboundaryMovement)Rules, 2016 (asamended)	Terminal	During Operation stage	• As per the statutory requirement	Contractor
2. (	limate				-	
2.1 Impact on Climate	<ul> <li>Dense greenbelt shall be developed all along the terminal premises.</li> <li>Adopting all energy efficiency measures e.g the terminal building along the terminal building along the terminal building.</li> </ul>	-	Terminal site	Survival rate of trees and monitoring performance of energy	Observations     and inspection	Aftercare &maintena nce cost 1.0 Lac per year for 3

<sup>&</sup>lt;sup>6</sup>Implementation of all mitigation measures and statutory clearances require for environmental management plan and environmental monitoring during operation stage is the responsibility of terminal operator. Supervision of implementation of environmental management plan and environmental monitoring will be carried out by PMU of IWAI



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	<ul> <li>platinum rated for Green building provisions</li> <li>street lighting solar lighting provisions(on 1:3 ratio of minimal needs) along with solar power generation system should also be provided as to meet the other power requirements of the terminal thus reducing dependence on power grid supply.</li> </ul>			equipments		Lac by IWAI
3.	Air Quality					
3.1 Air pollution dueto vehicular movement & loading and unloading areas	<ul> <li>Only container cargo will handle in the terminal hence no dust pollution anticipated.</li> <li>Only 6 (to &amp;fro) trailers to be required for transportation of the container, hence very less dust generation anticipated.</li> <li>Thick green belt shall be developed as per the provision already made in the design and maintained all along the periphery and along the roads. The green belt shall be developed in canopy <sup>7</sup> shape with local species of broad leaf</li> </ul>	Environmenta 1 Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981and amendments thereof	Throughout the project area	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	<ul> <li>As per CPCB requirements</li> <li>Site inspection</li> </ul>	Included in Operatio n/ Maintena nce cost

<sup>&</sup>lt;sup>7</sup> Canopy shape green belt design includes three row of trees with middle tree species gore more in height compared to inside and outside tree species. Each of tree will have wider leaf which forms like a curtain and acts as beerier to dust spread. Dust accumulated over leaf falls down within the site boundary. Similarly external dust gets prevented from entering the terminal site. http://cpcb.nic.in/upload/Publications/Publication\_513\_GuidelinesForDevelopingGreenbelts.pdf



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	<ul> <li>variety.</li> <li>Species selected for development of green belt shall also be tolerant to expected pollutants and shall have the ability to absorb the pollutants. Suggested species are suitable for different areas are also listed under CPCB guidelines for green Belt development.</li> <li>Water sprinkling should be carried out in dust generating areas. Monitoring of air quality shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP</li> </ul>					
4.	. Land and Soil		1	1	Γ	I
4.1 Soil erosion at embankme nt during heavy rainfall.	<ul> <li>Periodic checking of the slope stabilization measures (stone pitching) should be carried to assess the effectiveness. Necessary measures for repair shall be followed wherever there are failures</li> <li>Necessary measures to be followed wherever there are failures</li> </ul>	Project requirement	Along river bank and embankment	MI: Existence of soil erosion sites Number of soil erosion sites <u>PT</u> : Zero or minimal occurrences of soil erosion	On site observation	Included in Operatio n/ Mainten ance cost



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance	Monitoring Methods	Mitigation Costs
4.2 Soil contaminat ion	<ul> <li>Fuel shall be stored in HDPE containers on paved surfaces only to prevent spillage of fuels on the soil and thus soil contamination</li> <li>Dustbins shall be provided at all the required locations at the site for collection of recyclable and non-recyclable waste.</li> <li>Recyclable waste shall be sold to authorized vendors and non-recyclable waste shall be disposed off through authorized agencies and shall not be dumped in open.</li> <li>Used oil from DG sets and other equipment shall be stored in HDPE containers in isolated location on paved surfaces and shall be disposed through authorized vendors only and shall not be dumped in open.</li> <li>There shall be a designated area for storage of E-waste at site and this waste shall be sold to authorized vendors periodically. Bio- medical waste disposal rules</li> </ul>	Project requirement	Terminal site, access road, railway alignment and along river bank	MI: Existence of soil erosion sites Number of soil erosion sites <u>PT</u> : Zero or minimal occurrences of soil erosion	On site observation	Included in Operatio n/ Mainten ance cost



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	• Dredged soil (approx. 6,60,000 cum for constructing in approach channel and 1,00,000 cum for turning circle )) shall be tested for toxicity prior disposal, if toxic it shall not be disposed off back in water and should be send for disposal to TSDF.					
5. \	Water resources/Flooding and Inun	dation		I		1
5.1 Siltation	• Regular checks shall be made for soil erosion and integrity of the stone pitching	Project requirement	Near surface Water bodies	<u>MI</u> : Water quality <u>PT</u> : No turbidity of surface water bodies due to the terminal activity	Site observation	Include d in Operati on/ Mainte nance cost
5.2 Water logging due to blockage of drains, culverts or streams	<ul> <li>Regular visual checks and cleaning of drains shall be done along the alignment to ensure that flow of water is maintained through cross drains and other channels/streams.</li> <li>Monitoring of water borne diseases due to stagnant water bodies.</li> <li>Storm water drains provided in parking &amp; road areas shall be provided with oil &amp; grease</li> </ul>	Project requirement	Near surface Water bodies	MI: Presence/ absence of water logging along the approach road/termina l area <u>PT</u> : No record of overtopping/ Water	Site observation	Include d in Operati on/Mai ntenan ce cost



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	traps.			logging		
5.3 Waste Water treatment and conservation	<ul> <li>traps.</li> <li>Open defecation shall be discouraged and toilets constructed shall be used</li> <li>Total waste water generation from terminal will be about 40 KLD. The entire waste water passes through Oil &amp; grease separator to remove oil and grease and then treated in ETP cum STP. Treated water should be used for horticulture purpose at the site and dust suppression purpose.</li> <li>Storm water drainage system should be provided at the site.</li> <li>Arrangement shall be made to collect the roof water from the building and other areas like storage areas/sheds and roads shall be directed into a collection pond.</li> <li>Storm water shall be retained in pond so as to allow the settling of dust and suspended particles in the water, this water should be used for horticulture, cleaning and dust suppression.</li> </ul>	Project requirement	Project area	logging         MI: proper         treatment         PT: treated         water         quality         check	Treatment parameter ,ph , BOD,TDS etc.	Include d in Operati on/Mai ntenan ce cost
	• Sludge from the dump pond shall be sent for disposal along with other municipal waste.					



Environme	Avoidance/Mitigation/	Reference	Location	Monitoring	Monitoring	Mitigation
ntal Issue/	<b>Compensation Measures</b>	to laws/		indicators	Methods	Costs
Componen		guideline		(MI)/ Dorformonoo		
ι				Target (PT)		
	• Oil interceptors shall be					
	provided with the storm water					
	drains in the parking lots &					
	loading &unloading areas					
	• No waste/wastewater shall be					
	discharged in river or dumped					
	into the ground. Terminal					
	should be aligned with zero					
	pollution discharge.					
	• Fuel shall be stored in leak					
	proof containers and containers					
	shall be placed on paved					
	surfaces					
	• Dredged soil (approx. 6,60,000					
	cum for constructing in					
	approach channel and 1,00,000 sum for turning circle) shall be					
	tested for toxicity if toxic shall					
	not be disposed off back in					
	water and should be send for					
	disposal to TSDF.					
	• Monitoring of surface water					
	quality shall be carried out on					
	monthly basis to check the					
	level of pollutants and					
	effectiveness of proposed					
	EMP.					
<b>6.</b> I	Flora& Fauna					
6.1 Terrestrial	• Thick green belt (approx. 10m	Forest	Project tree	$\underline{MI}$ :	Records and	Operati
Ecology	wide) will be developed all	Conservation	plantation	I ree/plants	field	on/
6.2 Aquatic	around the terminal premises.	Act 1980 as	sites.	survival rate	observations.	Mainten

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Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
Ecology	<ul> <li>This will improve the ecology of the area and will provide the habitat to avifauna. Further it will act as a barrier to dust and noise pollution.</li> <li>Native plant species should preferably be planted at site</li> <li>70% survival of the plantation shall be maintained.</li> <li>The tree survival audit to be conducted at least once in a year to assess the effectiveness.</li> <li>Regular cleaning of internal roads should be carried out.</li> <li>Stack height in DG set shall be provided as per the CPCB norm. Shed leaves, branches and flowers should be used as manure within the site.</li> <li>ETP sludge should also be used as manure at the site.</li> <li>Possibility of composting the food waste within the site should be explored and composted waste should be used as manure within the site.</li> <li>Storage areas should be covered.</li> </ul>	amended, Wild Life Protection Act, 1972		PT: Minimum rate of 70% tree survival	Information from Forestry Department	ance Cost
	• The solid wastes, sewage, oily ballast, bilge water and bunker					



Environme ntal Issue/ Componen	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/	Monitoring Methods	Mitigation Costs
t				Performance Target (PT)		
	fuel bottoms generated from barge should not be discharged directly and it should be discharged as per the norms and as per the Inland Vessels Act.					
	<ul> <li>Further, Waste Reception from barges and vessels and its treatment facility (collection, storage, treatment and disposal of solid and liquid waste) should be provided as per 'Inland Vessels (Prevention and Control of Pollution and Protection of Inland Water) Rules, 2016'.</li> </ul>					
	• Cargo Operators needs to exercise all caution to avoid any kind of accidental discharge of such wastes.					
	• No provision of maintenance and repairing and fuel refilling of barge and vessels is proposed at Kalughat terminal site hence chances of oil spillage is almost negligible due to maintenance activities.					
	<ul> <li>The opposite bank of river shall remain untouched to balance the impacts of active site.</li> <li>To the extent possible river</li> </ul>					



Environme	Avoidance/Mitigation/	Reference	Location	Monitoring	Monitoring	Mitigation
ntal Issue/	Compensation Measures	to laws/		indicators	Methods	Costs
Componen		guideline		(MI)/		
t				Performance		
	training marks (DTW) must be			Target (PT)		
	training works (RTW) must be					
	avoided as it destroys the					
	Initial aqualic ecosystem					
	• If it is absolutely necessary to					
	nave river training and soll					
	stabilization works in the bank					
	for maintaining the stability of					
	the pile foundation, the design					
	and planning of the river					
	works Location of river					
	works. Location of fiver					
	habitat areas such as breading					
	and fooding grounds ato of key					
	habitat areas					
	No mostometer or mosto should					
	• No wastewater of waste should					
	terminal site on from vessel into					
	the water Density should be					
	imposed on the vessels					
	imposed on the vessels					
	reported of disposing					
	• Dup off from stocknile area					
	• Kull-oll fiolit stockpile alea,					
	storage yards, parking areas &					
	nond first Bup off should be					
	allowed to retain for some time					
	in the pond to allow the					
	settlement of dust contained in					
	it The clear run off should be					
	used for dust suppression and					
	other activities					



ntal Issue/     Compensation Measures     to laws/     indicators     Methods	Costs
Componen guideline (MI)/	
t Target (PT)	
Run-off from building should	
be collected separately and	
should be used for plantation	
and dust suppression	
• ETP cum STP should be	
provided at site for treatment of	
sewage generated. Treated	
water from ETP cum STP	
should be reused completely at	
site and should not be	
discharged into river	
• Dredged sand should not be	
disposed off in river. Dredging	
should be avoided during the	
breeding and spawning seasons	
• Instruction should be given to	
vessel operator that in case any	
accident with dolphin (if any)	
occurs that should be reported	
immediately to terminal	
authority	
• Waiting time of vessels should	
be reduced at the terminal by	
and unloading againment and	
and unloading equipment and vehicles	
Veniers.	
for not using sharp lights and	
sounds as they may disturb	
aquatic organisms	
• Propeller guards should be	

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Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	<ul> <li>provided for all the vessels to minimize the propeller inflicted injuries and scars.</li> <li>Quick clean-up operations should be carried out in case of accidents.</li> <li>Vessel owner should be responsible for paying the clean-up expenses in case of the accidents and pollution of river water quality.</li> </ul>					
7. 1	Noise & Vibration					
7.1 Increased noise due to material handling and vehicular movement	<ul> <li>Earplugs should be provided to workers involved in unloading operations.</li> <li>Provision of thick green belt along the boundary and roads which will act as noise buffer.</li> <li>Timely maintenance and servicing of transportation vehicles and the machinery/pumps to be used during operation phase to reduce the noise generation due to friction and abrasion.</li> <li>Honking shall be prohibited at the project site.</li> <li>Hearing test for the workers shall be undertaken before employing them and thereafter shall be done after every six</li> </ul>	Noise Pollution (Regulation and Control) Rules, 2000 as amended till date	Access Road & Terminal Site	<u>MI</u> : Noise levels at the site and access road <u>PT</u> : No accidents due to vegetation growth	Visual inspection Check accident records	Include d in operati on/Mai ntenan ce cost



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	<ul> <li>months.</li> <li>Job rotations should be practiced for people, working in high noise level areas.</li> <li>No noise generating activity shall be carried out between 10:00 PM</li> <li>DG sets shall be provided with acoustic enclosure.</li> <li>Monitoring of Noise levels shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP.</li> </ul>					
8. 9	Safety				1	
8.1 Accident Risk due to uncontrolled growth of vegetation	<ul> <li>Regular maintenance of plantation along the roadside</li> <li>No invasive plantation near the road.</li> </ul>	Project requirement	Access Road	<u>MI</u> : Presence and extent of vegetation growth on either side of road. Number of accidents. <u>PT</u> : No accidents due to vegetation growth	Visual inspection Check accident records	Include d in operati on/Mai ntenan ce cost



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
8.2 Accident risks associated with traffic movement.	<ul> <li>Traffic control measures, including speed limits should be forced strictly.</li> <li>Further encroachment of squatters within the ROW of approach road will be prevented.</li> <li>Monitor/ensure that all safety provisions included in design and construction phase are properly maintained</li> <li>Adequate illumination should be provided at the site during evening</li> </ul>	IRC:SP:55	Throughout the Project route	<u>MI</u> : Number of accidents Conditions and existence of safety signs, rumble strips etc. on the road <u>PT</u> : Fatal and non fatal accident rate is reduced after improvement	Review accident records Site observations	Include d in operati on /Maint enance cost
8.3 Accidents Risks Due to Moveme nt of Vessels and other hazards associate d with site	<ul> <li>Implementation of the environment management plan as proposed to prevent the environmental pollution during operation phase</li> <li>Vessels should comply with safety norms and should maintain the speed so as to prevent the accidents.</li> <li>In case of accidents, ship owner should be responsible for cleanup operations</li> <li>Safety norms should be followed for all operational phase activities at terminal</li> <li>Safety training should be given to the terminal staff for</li> </ul>	-	Throughout the project stretch	<u>MI</u> : Status of emergency system – whether operational or not <u>PT</u> : Fully functional emergency system	Review of spill prevention and emergency response plan Spill accident records	Include d in operati on/Mai ntenan ce cost.



Environme ntal Issue/ Componen t	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs
	<ul> <li>managing the floods, earthquake, fire, ship accidents like situation. Emergency assembly area should be designated at the site which is safe. All workers should be directed to collect at this area in case of emergency.</li> <li>Fire fighting facility should be</li> <li>Provided at site and trained personnel should be available at site who can operate the fire extinguishers and other fire- fighting equipment.</li> </ul>					
8.4 Social Environm ent	<ul> <li>Preference employment should be given to locals as per their skill and experience.</li> <li>Development activities should be carried out in the village and nearby areas for development of area</li> <li>Fishing activity should not be restricted in the river. Alternate provision for fishermen should be given in case fishing activity is restricted.</li> </ul>		Project area	<u>MI</u> : Status of emergency system – whether operational or not <u>PT</u> : Fully functional emergency system	Review of social issues	Include d in operati on/Mai ntenan ce cost.

# TABLE 4: ENVIRONMENT MONITORING PLAN OF KALUGHAT TERMINAL FOR CONSTRUCTION & OPERATION PHASE

S.	Aspect	Parameters to be	No of sampling	Standard methods for	Role & Re	esponsibility
No.		monitored	frequency	sampling and analysis	Implementatio n	Supervision
			Construction	Period		
1.	Air Quality (Ambient & Stack)	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , CO	Three Locations including project site, once in two months considering upwind and downwind direction	<ul> <li>Fine Particulate Samplers for PM<sub>2.5</sub></li> <li>Respirable Dust Sampler fitted PM<sub>10</sub></li> <li>Respirable Dust Sampler fitted with Gaseous sampling arrangements for SO<sub>2</sub> and NO<sub>x</sub></li> <li>CO analyser; TO-14A, TO-15, USEPA method for sampling</li> </ul>	Contractor through NABL Accredited Lab	IWAI &TSSC
2.	Surface Water Quality	Physical, chemical and biological	River Ganga Once a month (upstream & downstream of the terminal site)	Grab sampling and analysis by using standard methods	Contractor through NABL Accredited Lab	IWAI &TSSC
3.	Drinking water Quality	Physical, chemical and biological	Drinking water for labour camps Once in six month	Grab sampling and analysis by using standard methods	Contractor through NABL Accredited Lab	IWAI &TSSC
4.	Ground water quality	Physical, chemical and biological	Site and nearest village -Once in three month	Grab sampling and analysis by using standard methods	Contractor through NABL Accredited Lab	IWAI &TSSC
5.	Noise Level	Day time and night time noise level (max, min &Leq levels)	Three locations Construction labour camp, construction site and nearest village Once a month	Noise meter (24 hourly for Day and night time noise)	Contractor through NABL Accredited Lab	IWAI &TSSC
6.	Soil Quality & River bed sediments	Soil texture, type, Electrical conductivity, pH,	Construction site, labour camps and debris disposal site	Collection and analysis of samples as per IS 2720	Contractor through NABL Accredited Lab	IWAI &TSSC

		infiltration porosity	-Annually			
		etc.	7 minually			
7.	Plantation	Plantation survival	Terminal site-	Survey, counting, recording	Contractor	IWAI &TSSC
		rate	Annually	& reporting	through NABL	
					Accredited Lab	
8.	Soil Erosion		Upstream &	Survey & observation;	Contractor	IWAI & TSSC
			downstream of	erosion: Structures for	Accredited Lab	
			river bankOnce a	controlling soil erosion	Accicultur Lab	
			month			
9.	Aquatic ecology	Phytoplankton,	2 location on River	Plankton net of diameter of	Contractor	IWAI &TSSC
		Zooplankton	Ganga in upstream	0.35 m, No.25 mesh size 63	through NABL	
			and downstream of	and analysis by using	Accredited Lab	
			Six monthly	standard methods.		
10	Integrity of		Unstream &	Survey & observation:	Contractor	IWAL & TSSC
10.	embankment		downstream of	Extent and degree of	through NABL	10111 & 1550
			terminal site-Once a	erosion; Structures for	Accredited Lab	
			month	controlling soil erosion		
_			Operation I	Phase	MADY	*** * *
1	Air Quality	$PM_{10}$ , $PM_{2.5}$ , $SO_2$ ,	Three Locations	• Fine Particulate Samplers	NABL	IWAI
	(Annolent $\alpha$ Stack)	$NO_2$ , HC and CO	site Six monthly	I PM2.5	to be contracted	
	Stack)		considering upwind	• Respirable Dust Sampler	by Terminal	
			and downwind	Respirable Dust Sampler	operator	
			direction	fitted with Gaseous	•	
				sampling arrangements		
				for SO2 and NOx,		
				• CO analyser; TO-14A,		
				TO-15, USEPA method		
				tor sampling	NADI	
2	Carefood W					
	Surface Water	Physical, chemical	River Ganga Once in quarter (Upstream &	by using standard methods	accredited Lab	IWAI



					by Terminal	
					Operator	
3	Drinking water	Physical, chemical	Drinking water for	Grab sampling and analysis	NABL	IWAI
	Quality	and biological	staff-Once a quarter	by using standard methods	accredited Lab	
		_	-		to be contracted	
					by Terminal	
					Operator	
4	Ground water	Physical, chemical	Site and nearest	Grab sampling and analysis	NABL	IWAI
	quality	and biological	village -Once in a	by using standard methods	accredited Lab	
		C	six month		to be contracted	
					by Terminal	
					Operator	
5	Noise Level	Day time and night	Two locations:	Noise meter	NABL	IWAI
		time noise level (max,	Project site &	24 hourly for Day and night	accredited Lab	
		min &Leq levels)	nearest habitation -	time noise)	to be contracted	
			Once in quarter		by I Terminal	
			_		Operator	
6	Wastewater	Physical, chemical	Terminal site, testing		NABL	IWAI
	Management	and biological of inlet	of sewage and STP		accredited Lab	
		and ETP cum STP	treated water		to be contracted	
		treated water	Once in quarter		by Terminal	
					Operator	
7	Plantation	Plantation survival	Terminal site Once	Survey, counting, recording	Terminal	IWAI
		rate of 70%	In year	& reporting	Operator	
8	Soil Erosion		Upstream &	Survey & observation;	Terminal	IWAI
			downstream of	Extent and degree of	Operator	
			project site near	erosion; Structures for		
			river bank-Once in	controlling soil erosion		
			six months			
9	Aquatic ecology	Phytoplankton,	Two locations River	Plankton net of diameter of	Terminal	IWAI
		Zooplankton	Ganga in upstream	0.35 m, No.25 mesh size 63	Operator	
			and downstream of	and analysis by using		
			the terminal	standard methods.		
			Annually			
10	Soil Quality	Physio-Chemical	Once in Six Month	Depth Sampler	Terminal	IWAI
	&River Bed	Parameters	at Terminal Site		Operator	



	Sediments		Area			
* Test	* Test of Environment Monitoring parameters shall be carried out by NABL/MOEF Accredited Laboratory					



S. No.	Issues	International Maritime Conventions, Protocols and Agreements	Remarks
1.	International Maritime	IMO Convention, 1948	<ul> <li>The Convention establishing the IMO was adopted in 1948 but the Organization started life as the Inter-Governmental Maritime Consultative Organization (IMCO) until it was changed to the IMO in 1982.</li> <li>The Aims of the IMO include a range of objectives: <ol> <li>To provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade, and to encourage the general adoption of the highest practicable standards in matters concerning maritime safety and efficiency of navigation;</li> <li>To provide for the consideration by the Organization of any matters concerning shipping that may be referred to it by any organ or specialized agency of the United Nations;</li> <li>To provide for the exchange of information among Governments on matters under consideration by the Organization by the Organization.</li> </ol> </li> </ul>
			There have been a series of amendments to the Convention which are 1975 amendments, 1977 amendments, 1991 amendments.
2.	Maritime safety	SOLAS Convention, 1974	The SOLAS Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The 1974 version includes the tacit acceptance procedure - which provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties. The Convention came into force on May 25, 1980
3.	Measurement of ships	Load Lines Convention,1966	It has long been recognized that limitations on the draught to which a ship may be loaded make a significant contribution to her safety. These limits are given in the form of freeboards, which constitute, besides external weather tight and watertight integrity, the main objective of the Convention.
4.	Preventing collisions at sea	Convention on International Regulations for Preventing Collisions at Sea (COLREG), 1972	The 1972 Convention was designed to update and replace the Collision Regulations of 1960 which were adopted at the same time as the 1960 SOLAS Convention. One of the most important innovations in the 1972 COLREGs was the recognition given to traffic separation schemes - Rule 10 gives guidance

Annexure 1: International Maritime Conventions, Protocols and Agreements Relevant to the Project



			in determining safe speed, the risk of collision and the conduct of vessels operating in or near traffic separation schemes.
5.	International Maritime Satellite System	Convention on International Maritime Satellite Organization (INMARSAT), 1976	IMO recognized the potential for satellite communications to assist in distress situations at sea soon after the launch of the world's first telecommunications satellite, Telstar, in 1962. In February 1966, IMO's Maritime Safety Committee (MSC) decided to study the operational requirements for a satellite communications system devoted to maritime purposes. In 1973, IMO decided to convene a conference with the object of establishing a new maritime communications system based on satellite technology.
6.	Prevention of Pollution from Ships	International Convention for the Prevention of Pollution from Ships (MARPOL), 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997(MARPOL) Convention on Facilitation of International Maritime Traffic (FACILITATION), London, 1965	The MARPOL Convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 respectively and also includes the Protocol of 1997 (Annex VI). It has been updated by amendments through the years. The Convention's main objectives are to prevent unnecessary delays in maritime traffic, to aid cooperation between Governments, and to secure the highest practicable degree of uniformity in formalities and other procedures. In particular, the Convention reduces the number of declarations which can be required by public authorities
7.	Safety of maritime navigation	Convention for The Suppression of Unlawful Acts of Violence Against the Safety of Maritime Navigation (SUA convention), 1988	<ul> <li>which can be required by public autionities.</li> <li>The main purpose of the convention is to ensure that appropriate action is taken against persons committing unlawful acts against ships. These include:</li> <li>the seizure of ships by force;</li> <li>acts of violence against persons on board ships; and</li> <li>The placing of devices on board a ship which are likely to destroy or damage it.</li> <li>The convention obliges Contracting Governments either to extradite or prosecute alleged offenders.</li> </ul>
8.	Environmental Safety	Convention Relating to Intervention on the High Seas, 1969	Contracting States are empowered to act against ships of other countries which have been involved in an accident or have been damaged on the high seas if there is a grave risk of oil pollution occurring as a result.



9.	Standards of Training, Certification and Watch keeping for Seafarers	International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW) as amended, including the 1995 and 2010 Manila Amendments	The main purpose of the convention is to ensure the safety of seagoing personnel. Convention in explained in two codes A & B. Code A is mandatory while Code B is recommendation. It intends to help parties implement the convention.
10.	Maritime Search and Rescue (SAR)	SAR Convention 79	Aimed at developing an international SAR plan, so that, no matter where an accident occurs, the rescue of persons in distress at sea will be coordinated by a SAR organization and, when necessary, by co- operation between neighbouring SAR organizations.
11.	Safe containers	International Convention for Safe Containers (CSC) 72/77	<ul> <li>The 1972 Convention for Safe Containers has two goals.</li> <li>to maintain a high level of safety of human life in the transport and handling of containers by providing generally acceptable test procedures and related strength requirements</li> <li>to facilitate the international transport of containers by providing uniform international safety regulations, equally applicable to all modes of surface transport to avoid proliferation of divergent national safety regulations</li> <li>The requirements of the Convention apply to the great majority of freight containers used internationally, except those designed especially for carriage by air. As it was not intended that all containers or reusable packing boxes should be affected, the scope of the Convention is limited to containers of a prescribed minimum size having corner fittings - devices which permit handling, accuring or stocking</li> </ul>
12.	Safety of Fishing vessel	The Torremolinos International Convention for the Safety of Fishing Vessel <u>s</u> (SFV),1977, superseded by the 1993 Torremolinos Protocol; Cape Town Agreement of 2012 on the Implementation of the Provisions of the 1993 Protocol relating to the Torremolinos International Convention for the Safety of Fishing Vessels	The Protocol applies to fishing vessels of 24 meters in length and over including those vessels also processing their catch. The general trend in modern designed fishing vessels, if they are to be economically profitable, must include improvements in machinery and fishing gear, improvements in safety features as a whole and better working conditions for fishermen. The safety provisions include automatically controlled machinery spaces, improved life-saving appliances, immersion suits and thermal protective aids, satellite communication systems and other components of the global maritime distress and safety system.



13.	Standards of Training, Certification and Watch keeping for Fishing Vessel Personnel	International Convention on Standards of Training, Certification and Watch keeping for Fishing Vessel Personnel (STCW-F), 1995	General Provisions & certifications of Safety of Skippers, Officers, Engineer Officers and Radio Operators.	
14.	Space Requirements for Special Trade Passenger Ships, 1973	Special Trade Passenger Ships Agreement (STP), 1971 and Protocol on Space Requirements for Special Trade Passenger Ships, 1973	Following the International Conference on Special Trade Passenger Ships, 1971, IMO, in cooperation with other Organizations, particularly the World Health Organization (WHO), developed technical rules covering the safety aspects of carrying passengers on board in special trade passenger ships (ships carrying large nos. of unberthed passengers such as in pilgrim area)	
15.	Prevention of Marine Pollution by Dumping of Wastes and Other Matter	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matte <u>r</u> (LC), 1972 (and the 1996 London Protocol)	London Convention, one of the first international conventions for the protection of the marine environment from human activities, came into force on 30 August 1975. Since 1977, it has been administered by IMO. It contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials. In addition, a special permit is required prior to dumping of a number of other identified materials and a general permit for other wastes or matter.	
16.	Oil Pollution Preparedness, Response and Co operation	International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC), 1990	As per convention, Ships are required to carry a shipboard oil pollution emergency plan. Operators of offshore units under the jurisdiction of Parties are also required to have oil pollution emergency plans or similar arrangements which must be coordinated with national systems for responding promptly and effectively to oil pollution incidents. Ships are required to report incidents of pollution to coastal authorities and the convention details the actions that are then to be taken. The Convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents. Parties to the convention are required to provide assistance to others in the event of a pollution emergency and provision is made for the reimbursement of any assistance provided.	
17.	Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances	Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol)	Convention aims to establish national systems for preparedness and response and to provide a global framework for international co-operation in combating major incidents or threats of marine pollution. Parties to the OPRC-HNS Protocol are required to establish measures for dealing with pollution incidents, either nationally or in co- operation with other countries. Ships are required to carry a shipboard pollution emergency plan to deal specifically with incidents involving hazardous and noxious substances.	
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			The OPRC-HNS Protocol ensures that ships carrying hazardous and noxious substances are covered by preparedness and response regimes similar to those already in existence for oil incidents.
18.	Control of Harmful Anti- fouling Systems	International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS), 2001	Under the terms of the AFS Convention, Parties to the Convention are required to prohibit and/or restrict the use of harmful anti-fouling systems on ships flying their flag, as well as ships not entitled to fly their flag but which operate under their authority and all ships that enter a port, shipyard or offshore terminal of a Party. Anti-fouling paints are used to coat the bottoms of ships to prevent sea life such as algae and mollusks attaching themselves to the hull – thereby slowing down the ship and increasing fuel consumption. The early days of sailing ships, lime and later arsenic were used to coat ships' hulls, until the modern chemicals industry developed effective anti-fouling paints using metallic compounds. These compounds slowly "leach" into the sea water, killing barnacles and other marine life that have attached to the ship. But studies have shown that these compounds persist in the water, killing sea-life, harming the environment and possibly entering the food chain. One of the most effective anti-fouling paints, developed in the 1960s, contains the organotin tributyltin (TBT), which has been proven to cause deformations in oysters and sex changes in whelks.
19.	Safe and Environmentally Sound Recycling of Ships	The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009	Convention aimed at ensuring that ships, when being recycled after reaching the end of their operational lives, do not pose any unnecessary risk to human health and safety or to the environment. It intends to address all the issues around ship recycling, including the fact that ships sold for scrapping may contain environmentally hazardous substances such as asbestos, heavy metals, hydrocarbons, ozone depleting substances and others. It will address concerns about working and environmental conditions in many of the world's ship recycling facilities. Regulations in the new Convention cover: the design, construction, operation and preparation of ships so as to facilitate safe and environmentally sound recycling, without compromising the safety and operational efficiency of ships; the operation of ship recycling facilities in a safe and environmentally sound manner; and the establishment of an appropriate enforcement mechanism for ship recycling, incorporating certification and reporting requirements. Ships to be sent for recycling will be required to carry an inventory of hazardous materials, which will be specific to each ship.



20.	Control and	International Convention	Convention aims to prevent the spread of harmful
	Management	for the Control and	aquatic organisms from one region to another, by
	of Ships' Ballast	Management of Ships'	establishing standards and procedures for the
	Water and	Ballast Water and	management and control of ships' ballast water and
	Sediments	Sediments, 2004	sediment.
			Under the Convention, all ships in international
			traffic are required to manage their ballast water
			and sediments to a certain standard, according to a
			ship-specific ballast water management plan. All
			ships will also have to carry a ballast water record
			book and an international ballast water
			management certificate. The ballast water
			management standards will be phased in over a
			period of time. As an intermediate solution, ships
			should exchange ballast water mid-ocean.
			However, eventually most ships will need to install
			an on-board ballast water treatment system
21.	Tonnage	International Convention	The Convention, adopted by IMO in 1969, was the
	convention	on Tonnage	first successful attempt to introduce a universal
		Measurement of Ships	tonnage measurement system. The Convention
		69/82	provides for gross and net tonnages, both of which
			are calculated independently.
22.	Salvage	International Convention	As per convention, "special compensation" to be
	Convention,	on Salvage (SALVAGE),	paid to salvors who have failed to earn a reward in
	1989	1989	the normal way (i.e. by salving the ship and cargo).
			The compensation consists of the salvor's expenses,
			plus up to 30% of these expenses if, thanks to the
			efforts of the salvor, environmental damage has
			been minimized or prevented. The salvor's
			expenses are defined as "out-of-pocket expenses
			reasonably incurred by the salvor in the salvage
			operation and a fair rate for equipment and
			personnel actually and reasonably used".



### Annexure 2: Applicable Environmental Standards / Norms

1. **Ambient Air Quality Standards:** The MoEF&CC has the overall responsibility to set policy and Standards for the protection of environment along with Central Pollution Control Board (CPCB). Ambient Air Quality Standard given below:

### **REVISED NATIONAL AMBIENT AIR QUALITY STANDARDS (16<sup>TH</sup> NOVEMBER 2009)**

Pollutants	Time	Concentration in A	nbient Air
	Weighted	Industrial,	Ecologically
	Average	Residential,	Sensitive Area
	_	Rural, other areas	(Notified by Central
			Government)
Sulphur Dioxide (SO <sub>2</sub> ), $\mu$ g/m <sup>3</sup>	Annual *	50	20
	24 Hours **	80	80
Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual *	40	30
	24 Hours **	80	80
$PM_{10}, \mu g/m^3$	Annual *	60	60
	24 Hours **	100	100
$PM_{2.5}, \mu g/m^3$	Annual *	40	40
	24 Hours **	60	60
Ozone (O <sub>3</sub> ) $\mu$ g/m <sup>3</sup>	8 Hours *	100	100
	1 Hour **	180	180
Lead (Pb) $\mu g/m^3$	Annual *	0.50	0.50
in particulate matter	24 Hours **	1.0	1.0
Carbon Monoxide (CO), mg/m <sup>3</sup>	8 Hours **	02	02
	1 Hour **	04	04
Ammonia (NH <sub>3</sub> ), µg/m <sup>3</sup>	Annual *	100	100
	24 Hours **	400	400
Benzene (C <sub>6</sub> H <sub>6</sub> ), $\mu$ g/m <sup>3</sup>	Annual *	05	05
Benzo(a)Pyrene (BaP) ng/m <sup>3</sup>	Annual *	01	01
in particulate matter			
Arsenic (As), ng/m <sup>3</sup>	Annual *	06	06
in particulate matter			
Nickel (Ni), ng/m <sup>3</sup>	Annual *	20	20
in particulate matter			

\* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

\*\* 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

# 2. Ambient Noise Standards

Ambient standard with respect to noise have been notified by the Ministry of Environment and forest vide gazette notification dated 26<sup>th</sup> December 1989 (amended in February 2000). It is based on 'A' weighted equivalent noise level (Leq). The ambient noise standards are presented in table below:

### AMBIENT NOISE QUALITY STANDARDS

Area code	Category of Area	Limits in dB(A) Leq	
		Day Time	Night Time

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А	Industrial Area	75	70
В	Commercial Area	65	55
С	Residential Area	55	45
D	Sensitive Area	50	40

Note: \*Day time is from 6 am to 10 pm, Night time is 10 pm to 6.00 am; \*\* Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

#### 3. Ground Water Quality Standards

	Parameters	Unit	Acceptable Limit IS:10500	Permissible Limit IS:10500
1	Colour	Hazen units	5	15
2	Odour	-	Agreeable	Agreeable
3	Taste	-	Agreeable	Agreeable
4	Turbidity	NTU	1	5
5	Total Dissolved Solids	mg/l	500	2000
6	рН	-	6.5 to 8.5	No Relexation
7	Total Hardness as CaCO <sub>3</sub>	mg/l	200	600
8	Iron as Fe	mg/l	0.3	No Relexation
9	Aluminium	mg/l	0.03	0.2
10	Copper as Cu	mg/l	0.05	1.5
11	Manganese as Mn	mg/l	0.1	0.3
12	Zinc as Zn	mg/l	5	15
13	Magnesium as Mg	mg/l	30	No Relexation
14	Barium	mg/l	0.7	No Relexation
15	Calcium as Ca	mg/l	75	200
16	Silver	mg/l	0.1	No Relaxation
17	Selenium as Se	mg/l	0.01	No Relaxation
18	Molybdenum	mg/l	0.07	No Relaxation
19	Boron	mg/l	0.5	1.0
20	Nitrates as NO	mg/l	45	No Relaxation
21	Sulphate	mg/l	200	400
22	Sulphide		0.01	No Relaxation
23	Fluoride as F	mg/l	1.0	1.5
24	Chlorides as Cl	mg/l	250	1000
25	Ammonia	mg/l	0.5	No Relaxation
26	Chloramines	mg/l	0.2	No Relaxation
27	Residual, Free chlorine	mg/l	0.2	1.0
28	Total Alkalinity as calcium Carbonate	mg/l	200	600
29	Phenolic compounds (as $C_6H_5OH$ )	mg/l	0.001	0.002
30	Mineral Oil	mg/l	0.03	No Relaxation
31	Anionic detergents (as MBAS)	mg/l	0.2	1.0
32	Chromium	mg/l	0.05	No Relaxation

### **BIS STANDARDS FOR DRINKING WATER (IS:10500)**

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33	Arsenic as As	mg/l	0.01	0.05
34	Mercury as Hg	mg/l	0.001	No Relaxation
35	Cadmium as Cd	mg/l	0.003	No Relaxation
36	Lead as Pb	mg/l	0.01	No Relaxation
37	Nickel as Ni	mg/l	0.02	No Relaxation
38	Cyanide as CN	mg/l	0.05	No Relaxation
39	Polynuclear Aromatic	mg/l	0.0001	No Relaxation
	Hydrocarbons (as PAH)			
40	Polyclorinated biphenyls	mg/l	0.0005	No Relaxation
41	Total Coliform	MPN/100ml	Nil	No Relaxation

### 4. <u>Surface Water Quality</u>

### BEST DESIGNATED USE CRITERIA FOR SURFACE WATERS STREAMS

Designated-Best-Use	Class	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml <50 pH between 6.5 - 8.5 Dissolved Oxygen > 6mg/l Biochemical Oxygen Demand < 2mg/l
Outdoor bathing (Organised)	В	Total Coliforms Organism MPN/100ml < 500 pH between 6.5 - 8.5 Dissolved Oxygen > 5mg/l Biochemical Oxygen Demand < 3mg/l
Drinking water source after conventional treatment and disinfection	С	Total Coliforms Organism MPN/100ml < 5000 pH between 6 - 9 Dissolved Oxygen > 4 mg/l Biochemical Oxygen Demand < 3mg/l
Propagation of Wild life and Fisheries	D	pH between 6.5 - 8.5 Dissolved Oxygen > 4mg/l Free Ammonia (as N) < 1.2 mg/l
Irrigation, Industrial Cooling, Controlled Waste disposal	Ε	pH between 6.0 - 8.5 Conductivity at 25°C:.< 2250 umhos/cm Sodium Absorption Ratio < 26 Boron < 2mg/l

# 5. Soil Quality

### STANDARD SOIL CLASSIFICATION

The standard soil classification is shown below:

Sr. No.	Soil test	Classification
1.	Ph	5.51 - 6.0 Moderately acidic
		6.01 - 6.50 Slightly acidic
		6.51 - 7.30 Neutral
		7.31 - 7.80 Slightly alkaline
		7.81 - 8.50 Moderately alkaline
2.	Salinity as electrical conductivity	Up to 1.00 Average
	(milli mhos/cm)	1.01-2.00 Harmful to germination
		2.01-3.00 Harmful to crops
3.	Organic carbon (%)	0.21-0.4 Less

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		0.41-0.5 Medium
		0.51-0.8 On an average sufficient
		0.81-1.00 sufficient
4.	Nitrogen (kg/ha)	51-100 Less
		101-150 Good
		151-300 Better
		>300 Sufficient
5.	Phosphorus (kg/ha)	16-30 Less
		31-50 Medium
		51-65 On an average sufficient
6.	Potassium (kg/ha)	120-180 Less
		181-240 Medium
		241-300 Average
		301-360 Better



### Annexure 3: Process Write up for Proposed Combined Waste Water Scheme

The effluent generation is expected through the following activities at the IWT Terminal:

- From Domestic Water Consumption Domestic Waste Water from Office toilets & Canteen.
- From Vessels waste water receipt facility Oil mixed Bilge water effluent and domestic waste water from toilet & canteen.
- From Truck Washing & Miscellaneous usages Washing effluent water with small quantity of Oil & Grease

Considering total effluent generation from above all 3 waste streams, an Effluent Treatment Plant Cum Sewage Treatment Plant (ETP cum STP) is planned to treat entire effluent waste stream. Considering a recovery of 95% treated water from ETP cum STP, the treated effluent water will be available for usage in Gardening /Landscaping/ Washing etc.

### ETP cum STP PLANT TREATMENT PROCESS:

Considering the contaminants which are present in the combined effluent, the following treatment scheme is to be considered.

- The effluent from the above three activity will be collected in a collection cum Equalization Tank, of suitable capacity, where all the effluent will be mixed and stored for further treatment.
- The combined effluent from equalization tank will be pumped to a Tilted Plate Interceptor Unit, which will be basically a Gravity Separator which utilize the difference in specific gravity between two phases of liquid (predominantly for removal of free oil in water) as the principle of separation. The high surface area for separation will be provided by a lamellar arrangement of plates which also reduces the plant space requirement.
- The floating oil with water from the Tilted Plate Interceptor will be removed to a storage tank, installed with an Oil Grease Skimmer, for further separation of oil from water. Oil can be collected in MS barrels, for disposal as per Hazardous Waste Management Rules 2016 through authorised approved vendors of SPCB. Water after separation will be taken back to flash mixer. The sludge which will be in the form of slurry will get settled to the bottom of Interceptor and will be decanted to the sludge collection tank.
- ➤ The effluent after oil & grease removal from Interceptor will be sent to a Flash Mixer with arrangement of dosing Alum solution, prepared in a separate tank. The purpose of Alum dosing is to coagulate the suspended solids in the incoming effluent.
- The effluent mixed with alum will be fed to a Flocculater, with arrangement of dosing of Polyelectrolyte Chemical in a solution form. The Polyelectrolyte functions as a Flocculating agent, and helps the fine dust particles to settle down in the clarifier.
- The effluent mixed with Alum & Polyelectrolyte will be fed to a Primary Clarifier for settlement of suspended solids. The incoming effluent is expected to have 300-500 ppm of Suspended Solids, which will be reduced to less than 50 ppm, in the outlet water. The settled solids in slurry form will be removed from the clarifier bottom and sent to sludge collection tank.
- The clarified water will be fed to an Aeration Tank, installed with a diffuser aeration system. The aeration will help in biological treatment of the effluent.
- The effluent from aeration tank will be fed to Secondary Clarifier, where the particulate load after biological treatment will settle down.
- The clarified water will be stored in a Filter Feed Tank, for further filtration through Pressure Sand Filter & Activated carbon Filter. The back wash water from these filters is fed to the sludge

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storage tank.

- The filtered water will be stored in a tank, with arrangement for Chlorination, as disinfectant. This water will be stored in a treated water storage tank, for usage in Gardening/washing etc.
- The sludge collected from Tilted Plate Interceptor, Primary Clarifier & Secondary Clarifier is stored in a Sludge Collection holding Tank. The slurry from this tank will be pumped to a Filter Press, which concentrates the slurry, which is removed as cake for disposal. The filtrate from filter press is taken back to flash mixer.

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#### **Annexure 4: Tree Plantation and Management Plan**

## **1.0 Introduction**

Site is agricultural land with approx. 50 nos. of trees are present on the site. It is proposed to develop 10 m thick peripheral green belt all around the terminal site and also green belt will be developed along approach road& internal roads. Total green area of 1791 sq m will be provided at the project site.. As extent possible the trees present on the boundary of the terminal shall maintained as greenbelt. Green belt shall be developed as per the following guidelines.

# **1.1 Selection of Tree Species**

The Project involve movement of vehicle for transportation of material Thus emissions like particulate matter,  $SO_2$ ,  $NO_x$  CO shall be generated at site. Thus the plantation species tolerant to these pollutants and mitigate these from air shall be planted. Species selecting criteria is given below:

- 1. Tolerant to expected pollutants at site
- 2. Longer duration of foliage
- 3. Freely exposed foliage (adequate height of crown, openness of foliage, big leaves, small stomata apertures, stomata well exposed)
- 4. Leaves supported on firm petioles

## **1.2 Recommended Plant species**

Based on nature of pollutants following tree species are recommended to be planted

S. No.	Plant Species	Common Name	Habit
1.	Pongamia pinnata	Indian beech	Tree
2.	Anthocephalus cadamba	Kadam	Tree
3.	Ficus benghalensis	Badh	Tree
4.	Mangifera indica	Aam	Tree
5.	Tectona grandis	Teak	Tree
6.	Ficus religiosa	Peepal	Tree
7.	Dalbergia sissoo	Shisham	Tree
8.	Tabernaemontana divaricata	Chandani	Shrub
9.	Cassia fistula	Golden shower	Tree
10.	Delonix regia	Gulmohar	Tree
11.	Bougainvillea glabra	Bougainvillea	Shrub
12.	Nerium indicum	Kaner	Shrub
13.	Celosia argentea	Croton	Herb
14.	Hibiscus rosasinensis	Hibiscus	Shrub
15.	Azadirachta indica	Neem	Tree
16.	Swetania mohogini	Cuban Mahagony	Tree

## **1.3 Plantation Methodology**

Components of green belts on roadside fence should be both absorbers of gases as well as of dust particles, including even lead particulates. Thus the choice of plants should include pollution tolerant shrubs of height 1 to 1.5 m and trees of 3 to 5m. The intermixing of trees and shrubs should be such that the foliage

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area density in vertical is almost uniform. For effective removal of pollutants, it is necessary that (i) plants should grow under conditions of adequate nutrient supply, (ii) absence of water stress and (iii) plants are well exposed to atmospheric conditions (light & breeze).

Multiple rows of green belt shall be developed. Green belt should be pyramidal in shape. Plantation pattern shall be kept as given below:

- Short trees and tall shrubs shall be planted as first row (from road) followed by tall tree plantation which will be followed by another row of medium and small trees and tall shrubs.
- Planting of trees should be in appropriate encircling rows, each rows alternating the previous one to prevent further fanning and horizontal pollution dispersion;
- Since tree trunks are normally devoid of foliage, it would be appropriate to have small shrubs in front and in between the tree spaces;
- The open areas between the process installations where trees cannot be planted should be covered with lawn grasses for effective trapping and absorptions of air pollutants.
- Fast growing trees with thick canopy and perennial foliage should be selected so that the effective tree height with envisaged objective will be attained in minimum span of time

# **1.4** Plantation Pattern

A standard horticultural practice involving planting of saplings in pits of substantial dimensions i.e.,  $1m \times 1m \times 1m$  for big trees and along half of these dimensions for smaller trees and shrubs. The pits are then filled with earth, sand, silt and manure in pre-determined proportions. Saplings planted in such pits are watered liberally during dry months.

# **1.5** Time of Plantation

Plantation of the tree sapling should be done only after the first shower during the rainy season. The best time for plantation is after 15 days from the day of first shower during rainy season.

# **1.6** Protection of Tree saplings

Circular tree guard should be placed after the plantation of the saplings for the protection of these young plants from the ravages of cattle, sheep and goat and other animals. If tree saplings died or damage occur after placing the circular tree guard, timely replacements of damaged plant and thereafter care is important.

# 1.7 After Care & Monitoring

The growing plants are cared at least for the first two years under favourable conditions of climate and irrigation. Nutrients in pits are supplemented and the juveniles provided protection.

Thinning shall start after the stand is 3-4 years old and repeated every 4 years until the stand is 15 years old. Between 15-25 years old, thinning should be conducted every 5 years and after 25 years old, thinning shall be done after every 10 years. When the canopy closes, at about 6 years, 30-40% of the stems shall be thinned to selectively remove suppressed, diseased and badly formed trees.

Periodic assessment shall be carried for survivability of the trees. Minimum 70% survival rate shall be achieved.

# **1.8 Records Keeping & Reporting**

The following records shall be maintained:

1. Record of Tree plantation



2. Record of Survivability rate

Inspection shall be carried out at site to know the survival rate of the plantation. The tree plantation and survivability report shall be prepared every six monthly.

## 1.9 Responsibility

Compensatory plantation shall be responsibility of the contractor which may be carried out through Forest department and all the associated costs shall be borne by the contractor for the same. Survival rate of plantation shall be inspected by IWAI. Plantation within the terminal site shall be carried out by the contractor and shall be monitored by IWAI.



# Annexure 5: Guidelines for On Site and Off Site Emergency Management

## **1.0 INTRODUCTION**

Many emergencies can occur on any construction site and need to be effectively handled. The environmental and occupational health and safety aspects and related emergency can include incidence such as Collapse / subsidence of soil / Fire / Explosion / Gas Leak, Collapse of Building / Equipment and other Occupational Accidents. On site and off site emergency management plan shall be developed to effectively handle them.

Thus every contractor shall have an approved on-site emergency plan. The contractor should submit a copy of this plan to PIU and Supervision consultant before the start of the work. Contractor shall develop the onsite emergency plan considering the potential environmental, occupational health and safety emergency situation at site and activities involved. This plan shall include a list of these potential emergency situations in the onsite emergency preparedness & response plan. Contractor shall get the plan approved from IWAI/PMC.

# 1.1 ANTICIPATED EMERGENCIES AT CONSTRUCTION SITE

The potential emergency situations have been defined below for guidance purposes. The contractors can follow these for developing site specific on site emergency preparedness plan.

Emergency conditions / situations	Sources
Collapse / subsidence of soil	Civil structures
Bulk spillage	<ul> <li>Hazardous substance / inflammable liquid storage</li> </ul>
	<ul> <li>Vehicular movement on highway</li> </ul>
Fire and explosion	<ul> <li>Inflammable Storage Areas</li> </ul>
	<ul> <li>Gas Cylinder Storage Areas</li> </ul>
	<ul> <li>Electrical Circuits</li> </ul>
	<ul> <li>Isolated Gas Cylinders (LPG / DA)</li> </ul>
	<ul> <li>Welding / Gas Cutting Activity</li> </ul>
Electrical Shock	• HT line
	<ul> <li>LT distribution</li> </ul>
	• Electrically Operated Machines / Equipment / Hand Tools /
	Electrical Cables
Gaseous Leakage	<ul> <li>Gas Cylinder Storage Areas</li> </ul>
_	<ul> <li>Gas Cylinder used in Gas Cutting / Welding Purposes</li> </ul>
Accidents due to Vehicles	<ul> <li>Heavy Earth Moving Machinery</li> </ul>
	<ul> <li>Cranes</li> </ul>
	<ul> <li>Fork Lifts</li> </ul>
	<ul> <li>Trucks</li> </ul>
	• Workman Transport Vehicles (cars / scooters / motor cycles /
	cycles)
	<ul> <li>Collapse, toppling or collision of transport equipment</li> </ul>
Slips & Falls	• Work at Height (Roof Work, Steel Erection, Scaffold, Repair
(Man & Material)	& Maintenance, Erection of equipment, Excavation etc.)
	<ul> <li>Slips (Watery surfaces due to rain)</li> </ul>
	<ul> <li>Lifting tools &amp; Tackles (Electric Hoist &amp; Forklifts)</li> </ul>



Collision with stationary/	Vehicular movement			
moving objects				
Other Hazards	<ul> <li>Cuts &amp;Wounds</li> </ul>			
	<ul> <li>Confined Space (under &amp; inside machinery etc.)</li> </ul>			
	Hot Burns			
	• Pressure Impacts (Plant contains several Pressure Vessels &			
	pipefitting containing CO <sub>2</sub> , air, water, product & steam,			
	which can cause accidents & injuries to person around.)			

# 1.1 DESIGN OF 'ON-SITE EMERGENCY PLAN'

The 'On-site emergency plan' to be prepared by contractor and shall include minimum the following information:

- Name & Address of Contractor
- Updation sheet
- Project Location
- Name, Designation & Contact Numbers of the organization, nearby hospitals, fire agencies etc. and key personnel including their assigned responsibilities in case of an emergency.
- The roles and responsibilities of executing personnel
- Site Layout Diagram showing location of fire extinguishers, emergency collection area and fire alarm
- Identification of Potential Emergencies Situations/ preventive measures / control & response measures
- Location of Emergency Control Centre (or designated area for emergency control / coordination) with requisite facilities.
- Medical services / first aid
- List of emergency equipment including fire extinguishers, fire suits etc.

# **1.2 EMERGENCY CONTROL CENTRE**

The emergency control centre shall be equipped with following facilities

- Copy of current on-site emergency plan
- Display of the name of site emergency controller
- Two numbers of artificial respiratory sets
- Two numbers of Stretchers
- Vehicle for 24 hours (for large construction sites)
- Inter personnel/section telephone (2 numbers)
- Site layout diagram with entry and exit routes / Assembly points
- Directory of internal / external emergency phone Numbers
- A set of fire extinguishers (DCP type / Foam Type / CO2)
- List of fire extinguishers installed in the construction site including maintenance record
- A set of personal protective equipment (PPE)
- Two numbers of first-aid boxes with prescribed first-aid medicines
- List of competent first-aiders
- List of fire trained personnel
- Two numbers of blankets
- Drinking water
- Two numbers of rescue ropes
- Two numbers of high beam torches
- Two numbers of gas leak detectors
- Life boat & jackets (if working in or near water course)



## **1.3 RECORDS**

The following records shall be maintained:

- 1. Record of emergency preparedness plan with emergency contact numbers
- 2. Mock drill/emergency preparedness exercise records
- 3. Corrective preventive action record after emergency is occurred

## **1.4 REPORTING**

The accident and incident records and emergency preparedness drill reports shall form part of quarterly report to EA

# **1.5 RESPONSIBILITY**

Contractor shall be responsible to handle emergency condition and shall be liable to compensate the damage against accident, if any occurs at site.



# Annexure 6: Guidelines for Debris and Solid Waste Management

# **1.0 INTRODUCTION**

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

## **Dredged Material**

Dredging shall be carried out in the river for construction of off-shore structures like jetty & berths (pilling) and navigation channels. Dredged soil shall not be disposed off along the river bank as they are sensitive habitat for various aquatic species and provide as the spawning and breeding grounds also. Dredged material shall be tested for its quality. If non-toxic then should be used for filling the site. If not found suitable then it should be disposed off at disposal site but if toxic & contains heavy metals, then it should be disposed off to TSDF site.

## **Construction Waste**

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

## Municipal Waste

Municipal waste will be generated from labour camp. Dustbins for recyclable and non-recyclable waste shall be provided in labour camp area. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be disposed off through authorized agency in area responsible for waste collection and management.

Waste generated requires proper management so as to minimize the negative impacts on environment. Concept of reduce, re-use and recycle shall be followed at site. The rejected waste should be disposed off in a secured manner. Thus a site should be identified for disposal of the rejected waste.

## **1.1 SELECTION OF DISPOSAL SITES:**

The locations of Disposal sites have to be selected such that:

- Disposal sites are located at least 1000 m away from sensitive locations like settlements, water body and notified forest areas.
- Disposal sites shall not contaminate any water sources, rivers etc so the site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the village/local community is to be obtained for the Disposal site selected.
- Environment Engineer of PMC and Executive Engineer of Contract Management Unit must approve the Plan before commencement of work.



# **1.2 PRECAUTIONS TO BE ADOPTED DURING DISPOSAL OF DEBRIS / WASTE MATERIAL**

The Contractor shall take the following precautions while disposing off the waste material.

- During the site clearance and disposal of debris, the Contractor will take full care to ensure that public or private properties are not affected, there is no dwellings around the dumpsite and that the traffic is not interrupted.
- The Contractor will dispose off debris only to the identified places or at other places only with prior permission of Engineer-in-Charge of works.
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Engineer-in-Charge of works.
- The Contractor will at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust will not the loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Engineer-in-Charge of works.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it. The debris should not be disposed along the bridges & culverts and near the water bodies.
- While disposing debris / waste material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems.
- Contractor should display the board at disposal site stating the name of project, usage of the site and type of debris being disposed.
- A guard shall be kept at disposal site to prevent any unauthorized disposal of waste at the debris disposal site.
- Material should be disposed off through covered vehicles only.
- No contaminated/hazardous/e-waste shall be disposed off at the debris disposal site.

# **1.3 RECORD KEEPING**

Site approved by site engineer only can be used as disposal site. Record of all such site should be maintained along with the area of disposal site, type & quantity of material disposed off daily and capacity of disposal site.

# 1.4 GUIDELINES FOR REHABILITATION OF DISPOSAL SITES

The dumpsites filled only up to the ground level could be rehabilitated as per guidelines below and to be decided by the Engineer and the supervision consultant.

- The dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants. Local species of trees has also to be planted so that the landscape is coherent and is in harmony with its various components.
- In cases where a dumpsite is near to the local village community settlements, it could be converted into a play field by spreading the dump material evenly on the ground. Such



playground could be made coherent with the landscape by planting trees all along the periphery of the playground.

• Closure of the disposal site should be up to the satisfactory level of site engineer

# **1.5 PENALTIES**

Stringent action & penalties should be imposed off on contractor for dumping of materials in locations other than the pre-identified locations. Grievance Redressed mechanism should be in place for taking note and action on such complaints.



#### Annexure 7: Selection and Management of Construction/Labour Campsite

#### 1.0 Selection and layout of construction camp

Labour camps, plant sites and debris disposal site shall not be located close to habitations, schools, hospitals, religious places and other community places. A minimum distance of 500 m shall be maintained for setting up such facilities.

#### 2.0 Facilities at workers camps

During the construction stage of the project, the construction contractor will construct and maintain necessary (temporary) living accommodation, rest area and ancillary facilities for labour. Facilities required are listed and elaborated below.

- Site barricading
- Clean Water Facility
- Clean kitchen area with provision of clean fuel like LPG
- Sanitation Facilities
- Waste Management Facilities
- Rest area for workers at construction site
- Adequate Illumination & ventilation
- Safe access road is required at camps
- Health Care Facilities
- Creche Facility & Play School
- Fire-fighting Facility
- Emergency Response Area

## 2.1 Site Barricading

Site should be completely barricaded from all the sides to prevent entry of outsiders and animals into the site. Entry gate should be provided at the site and labour camp which should be guarded by security guard. All workers should be issued ID cards and entry of outsiders shall be maintained in the register at the gate. Board should be displayed at the site and the labour camp, the name of project, capacity of project, authority carrying our projects, restriction of entry without authorization, and no smoking zone and associated risks. Plant operation shall be restricted to 10:00 PM to 6:00 AM.

## 2.2 Clean Water Facility

Potable water shall be provided for construction labour for drinking & cooking purpose. Clean water shall be provided for bathing, cleaning and washing purpose. Water quality testing for water shall be carried out on monthly basis.

## 2.3 Clean Kitchen Area

Provision of clean kitchen area for cooking and storage of eatables shall be provided. Clean fuels like LPG shall be provided for cooking purpose. Burning of firewood, garbage, paper and any other material for cooking or any other purpose shall strictly be prohibited at the site.

## **2.4 Sanitation Facilities**

Construction camps shall be provided with sanitary latrines and urinals. Toilets provided should have running water availability all the time. Bathing, washing & cleaning areas shall be provided at the site

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for construction labour. Washing and bathing places shall be kept in clean and drained condition. Workers shall be hired especially for cleaning of the toilets and bathing area. Septic tanks and soak pits shall be provided at site for disposal of the sewage generated.

## 2.5 Waste Management Facilities

Waste generated should be segregated at the site by providing the different color bins for recyclable and non-recyclable waste. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be handed over to authority responsible in area for waste management. Waste management for construction site shall be as per waste management plan proposed in EMP.

## 2.6 Rest Area For Workers at Site

A rest area/shelter shall be provided at the site for construction workers where they can rest after lunch time and shall not lay down at site anywhere. The height of shelter shall not less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 1.0 Sq.m per head.

# 2.7 Adequate Illumination & Ventilation

Construction worker camps shall be electrified and adequately illuminated. Illumination level shall be maintained after 5.30 Pm at the site to minimum 200 lux. Labour camps shall be adequately ventilated. Fans shall be provided for ventilation purpose.

## 2.8 Safe Access Road for Labour Camps

Temporary paved surface shall be constructed to approach the labour camp from the site. Movement shall not be hampered during monsoon season due to water logging and muddiness.

## 2.9 Health care Facilities:

First aid box, first aid room and personnel trained in first aid shall be available at labour camp and site all the time (24X7). Equipment in first-aid box shall be maintained as pet State Factory's Law. Ambulance/ 4 wheeler motorized vehicle shall be available at the site for carrying injured to the nearby hospital. Tie-ups should be made with nearby hospital to handle emergency, if any. Nos. of ambulance, doctors and nearby hospital shall is displayed in first-aid room, site office & labour camps. Workers shall be made aware about the causes, symptoms and prevention from HIV/AIDS through posters and awareness programs.

# 2.10 Crèche Facility & Play School

Crèche facility and play school should be constructed at the site temporarily so as children of construction labour can be kept there. Care takers should be hired for taking care of children. Attendance records of children shall be maintained. Children should not be allowed to enter active work areas.

# 2.11 Fire-Fighting facilities

Fire-fighting facility such as sand filled buckets and potable fire-extinguishers shall be provided at labour camps and at site. Fire-extinguishers shall be provided as per NBC norms.

# 2.12 Emergency Collection Area

Area shall be demarcated as emergency collection area near the gate where all the workers shall be guided to collect in case of any emergency like fire, flood and earthquake.

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## **3.0** Activities prohibited at site

Activities which should be strictly prohibited at site shall include

- Open burning of wood, garbage and any other material at sit for cooking or any other purpose
- Disturbance to the local community.
- Operation of the plant and machinery between 10 pm to 6 am unless approved by team leader
- No animal (wild or domestic or bird) shall be harmed by any construction worker in any condition at site and nearby areas
- Cutting of tree without permission of team leader/authorized person
- No indigenous population shall be hurt or teased

## 4.0 Guidelines for night time working at the site.

No activity generating noise shall be carried out at the site after 10:00 PM. Night working protocol should be followed (if required) as per guidelines prepared by IWAI. Site should be well illuminated to maintain minimum illumination level of 200 lux. Personnel working shall obtain permit to work from the team leader prior carrying out any work in night time and the record of such working shall be maintained in register. Any accidents, if occurs at site during night time working shall be immediately reported and recorded. Penalty shall be imposed on the contractor for the accident. Analysis shall be carried out to find the reason for such accidents for future learning.

## 5.0 Record keeping & Maintenance

Record of entry/exit of the people in the construction site and labour camp area shall be maintained in register at gate. Record of material coming in and going out from site also shall be maintained.

#### 6.0 Auditing & Inspection

Conditions of labour camp and site shall be inspected and audit report shall be submitted to IWAI on monthly basis.

## 7.0 Closure of the Construction Site and Construction labour Camps

Construction site and labour camps shall be restored back to the original site conditions. Following measures are required to be taken during closure

- Septic tanks/soak pits should be dismantled
- Any temporary/permanent structure constructed shall be dismantled
- Construction/demolition waste, hazardous waste and municipal waste at site and labour camp site shall be disposed off as per waste management plan in EMP
- The site shall be cleaned properly
- Tree plantation to be carried out, if any required for stabilizing the area
- Any pit excavated shall be filled back
- Closure of the site and labour camp shall be approved by authorized person.



# Annexure 8: Environmental Standards for water/ waste water Applicable to the Project

**Standards for Discharge of Effluents:** Under EPA Act, 1986, standards are prescribed for discharge of effluents in inland water bodies and marine coastal area and are given in **Table 1**.

C. No	Donomotomo	Standards				
Sr. No.	Parameters	Inland Surface Waters	Marine Coastal Areas			
1	Color & odour	All efforts shall be made to	All efforts shall be made to remove colour and			
		remove colour and	unpleasant odour as far as practicable			
		unpleasant odour as far as				
		practicable				
2	Suspended solids mg/l,	100	1. For process wastewater-100			
	Max		2. For cooling water effluent			
			10% above total suspended matter of			
	D. (1)		influent			
3	Particle size of	Shall pass 850 Micron IS	1. Floatable solids max. 3 mm			
	suspended solids	sieve	2. Settleable solids max. 850			
4	ull Value	5500	microns			
4	pH value	5.5-9.0	5.5-9.0			
5	Temperature	the receiving water	Shall not exceed 5° C above the receiving			
		temperature	water temperature			
6	Oil and grease mg/ 1		20			
0	Max.	10	20			
7	Total residual chlorine	1.0	1.0			
	mg/l Max.	110				
8	Ammonical Nitrogen (as	50	50			
-	N), mg/l Max.					
9	Total Kjeldahl nitrogen	100	100			
	(as NH3), mg/l Max.					
10	Free ammonia (as NH <sub>3</sub> )	5.0	5.0			
	mg/l Max.					
11	Bio-chemical oxygen	30	100			
	demand (3 days at 270					
	C), mg/l max.					
12	Chemical oxygen	250	250			
1.0	demand, mg/l max					
13	Arsenic (as As), mg/l	0.2	0.2			
1.4	max.	0.01	0.01			
14	Mercury (as Hg), mg/l	0.01	0.01			
15	max.	0.1	2.0			
15	Cadmium (as Cd) mg/l	0.1	2.0			
10	max	2.0	2.0			
17	Hexavalent chromium	0.1	1.0			
1,	(as $Cr + 6$ ), mg/l max					
18	Total chromium (as Cr)	2.0	2.0			
-	mg/l max					
19	Copper (as Cu), mg/l	2.0	3.0			
-	max.					
20	Zinc (as Zn), mg/l max	5.0	15.0			
21	Selenium (as Se) mg/l	0.05	0.05			

# **Table 1: Standards for Discharge of Effluents**

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C. No	Domonostono		Standards
Sr. No.	Parameters	Inland Surface Waters	Marine Coastal Areas
	max.		
22	Nickel (as Ni), mg/l	3.0	5.0
	max		
23	Cyanide (as CN), mg/l max.	0.2	0.2
24	Fluoride (as F), mg/l max.	2.0	15
25	Dissolved phosphates (as P), mg/l max.	5.0	
26	Sulphide (as S), mg/l max.	2.0	5.0
27	Phenolic compounds (as C6 H5OH), mg/l max.	1.0	5.0
28	Radioactive materials:	10-7	10-7
	a. Alpha emitter micro curie/ml b. b. Beta emitter micro curie/ml	10- <sup>6</sup>	10- <sup>6</sup>
29	Bio-assay test	90% survival of fish after 96 hours in	90% survival of fish after 96 hours in
30	Manganese (as Mn), mg/l	2	2
31	Iron (as Fe), mg/	3	3
32	Vanadium (as V), mg/l	0.2	0.2
33	Nitrate nitrogen (mg/l)	10	20

**Standards Classification of Inland Surface Water Bodies:** Surface water bodies are classified on the basis of use by CPCB and the classification is given in **Table 2**.

Table	2:	Surface	Water	Body	Classification,	<b>CPCB</b>
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Designated – Best – Use	Class of Water	Criteria				
Drinking Water Source	А	1. Total Coliforms or Organism MPN / 100 ml shall be				
without conventional		50 or less				
treatment but after		2. pH between 6.5 and 8.5				
disinfection		3. Dissolved Oxygen 6mg/l or more				
		4. Biochemical Oxygen Demand 5 days 20°C 2mg/l or				
		less				
Outdoor bathing	В	1. Total Coliforms Organism MPN / 100 ml shall be 500				
(Organized)		or les				
		2. pH between 6.5 and 8.5				
		3. Dissolved Oxygen 5 mg/l or more				
		4. Biochemical Oxygen Demand 5 days 20°C 3 mg/l or				
		less				
Drinking water source	С	1. Total Coliforms Organism MPN / 100 ml shall be				
after conventional		5000 or less				
treatment and disinfection		2. pH between 6 to 9				
		3. Dissolved Oxygen 4 mg / l or more				
Propagation of Wild life	D	1. pH between 6.5 to 8.5				
and Fisheries		2. Dissolved Oxygen 4 mg / l or more				



Designated – Best – Use	<b>Class of Water</b>	Criteria
		3. Free Ammonia (as N) 1.2 mg / 1 or less
Irrigation, Industrial	E	1. pH between 6.0 to 8.5
Cooling, Controlled Waste		2. Electrical Conductivity at 25°C micro mhos / cm Max.
Disposal		2250
-		3. Boron Max. 2 mg/l

**Criteria for Classification of water bodies on basis of level of Eutrophication:** Standard for accessing Eutrophication level in the water bodies is assessed on the basis of water quality, bottom sediments and aquatic biota quality and nos. in Environment Impact Assessment Study of Port Development, UN, New York, 1992. Same can be referred here to assess the level on Eutrophication in the river and tributaries.

Pollution level Environmental	Seprotrophic water	Pertrophic w	ater (severely	Eutrophic water (slightly	Ollgotrophic water (clean)
Indicator	(extremely polluted)	Deep water area (more than several metres)	Shallow water area (less than several metres)	polluted)	wheel (crean)
Water Quality	Γ			T	ſ
Transparency (m)			3	3 – 10	□ 10
Discolouration	Blakish	Yellow, Olive, Bi	rownish, etc	Temporal and local colouring	No colouring
COD (ppm)	□ 10	3 -	- 10	1-3	$\Box$ 1
BOD (ppm)	□ 10	3 -	- 10	1-3	
DO saturation (%)	(anaerobic condition from surface layer to the sea bottom)	100 - 200% at surface layer (over saturated), 0 - 30% at the bottom layer	100 – 200% at surface layer (over saturated)	<ul> <li>&gt; 80% at surface and middle layer,</li> <li>30 - 80% deeper layer than several metres</li> </ul>	in all layers (saturated)
Hydrogen sulphide	Detected at most layers	Detectable at the bottom layer	Not detectable	Not detectable	Not detectable
Inorganic N compounding (□g at N/l)	□ 10	10 -	- 100	2-10	
<b>Bottom Sediment</b>	s				
Colour of sediments	Black, Oxidation layer (brownish layer at the surface of the bottom) not found	Black, Oxidation layer not found	Blackish Oxidation layer not found	Occasionally blackish Oxidation layer found	Natural Oxidation layer found
COD (mg/g)	-	>	30	5-30	< 5
Sulphide (mg/g)	> 10	0.3 -	- 3.0	0.03 - 0.3	< 0.03
Aquatic Biota					
Bacteria (cell no.	$\Box 10^5$	$10^2 - 10^5$		$10^2 - 10^4$	$\Box 10^2$

**Table 3: Criteria for Level of Eutrophication** 

EQMS India Pvt. Ltd.

Pollution level Environmental	Seprotrophic water	Pertrophic water (severely polluted)		Eutrophic water (slightly	Ollgotrophic water (clean)		
Indicator	(extremely polluted)	Deep water area (more than several metres)	Shallow water area (less than several metres)	polluted)			
/ ml)							
Phytoplankton (cell no. / ml)	$\Box 10^3$	10 <sup>2</sup> ·	- 10 <sup>5</sup>	$10^{1} - 10^{3}$	$\Box 10^1$		
Chlorophyll (mg/m <sup>3</sup> )		10 -	- 200	1 – 10			
Primary							
production	d	1 - 10	< 1				
(mgc/m <sup>2</sup> /hr)	$\Box d$						
	10 - 200	0.3 - 1.0	.3 – 1.0 < 0.3				
(Gc/m <sup>2</sup> /day)	1 – 10						
Protozoa	Extremely abundant	Abundant		Scarce	Scarce		
Crustacean	-	Scarce, little dive	rsity	Abundant, great	Scarce, great		
zooplankton				diversity	diversity		
Benthic	Scarce, little	Scarce, little	Abundant, great	Abundant, great	Scarce, great		
polychaetes	diversity	diversity	diversity	diversity	diversity		
worm							
Crustacean -		Scarce, little dive	rsity	Abundant, great	Scarce, great		
				diversity	diversity		
Typical water	Enclosed bays	or ports with abun	dant discharge of	Bays and	Offshore open		
area	pollutants			coastal zone	water areas		

Source: Assessment of the Environment Impact of Port Development, United Nations, New York, 1992

**Standards for permissible level of water quality indicator:** The permissible level of indicators for assessing water quality, in port development in India is given below in **Table 4**.

# Table 4 Standard for Permissible Level of Water Quality Indicator

		Indicator						
Country	Purpose / Place	Ph	DO (mg/l)	COD (mg/l)	BOD (mg/l)	Oil (mg/l)	Coliform bacteria (MPN / 100 ml)	
India	Polluted area • Recreation • Harbor Non-polluted area • Bathing • Aquatic biota	6.5 – 9.5 6.5 – 9.0 - -		-	$\leq 5$ $\leq 5$ $\leq 3$ $\leq 6$	≤ 0.1 ≤ 10 - -	≤ 1000 ≤ 2500 ≤ 500 ≤ 500	
Indonesia	Coastal Water • Bathing • Aquaculture • Marine Park • Industry	6.0 - 9.0 6.0 - 9.0 6.0 - 9.0 6.0 - 9.0	≥ 5 ≥ 4 ≥ 4 -	<ul> <li>≤ 40</li> <li>≤ 80</li> <li>≤ 80</li> <li>≤ 40</li> </ul>	≤ 20 ≤ 45 ≤ 45 ≤ 20	≤ 3 ≤ 5 ≤ 5 ≤ 2	≤ 1000 ≤ 1000 ≤ 1000 ≤ 1000	
Japan	Sea o Bathing	7.8 – 8.3	≥ 7.5	≥2	-	≤ 0.5	≤ <b>1</b> 000	



	<ul> <li>Industry (B)</li> <li>Industry (B)</li> </ul>	7.8 – 8.3 7.0 – 8.3	≥ 5 ≥ 2	≥ 3 ≥ 8	-	≤ 0.5 -	-
Malaysia	Sea • Natural • Aquatic biota • Recreation • Common	6.5 - 8.5 6.0 - 9.0 6.0 - 9.0 6.0 - 9.0	≥7 5-7 5-7 3-7	≤ 10 ≤ 25 ≤ 25 ≤ 25 ≤ 25	$ \leq 1 \\ \leq 3 \\ \leq 3 \\ \leq 6 $	ND - -	≤ 100 ≤ 5000 ≤ 5000 ≤ 50,000
Philippines	Sea • Recreation • Aquatic biota • Industry • Navigation	6.5 - 8.5 6.5 - 8.5 6.5 - 8.5 6.0 - 9.0		-	- - -	≤ 2 ≤ 5 ≤ 5 ≤ 10	≤ 1000 ≤ 5000 - -
Thailand	Sea • Swimming • Conservation	6.5 – 8.3 7.5 – 8.9	≥ 4 ≥ 5	-	-	ND ND	≤ 1000 -

**Criteria for Disposal of Harmful Bottom Sediments:** No specific standards are defined in India for disposal of dredged material. If dredged material is toxic / harmful then these sediments should either be disposed off in landfill or in Sea. Criteria followed in Japan are given in the **Table 5**.

Table 5: Criteria f	or Harmful Bottom	Sediments, Jai	oan (unit: mg/l)
	of marminu Doctom	beuments, sa	pan (unit. mg/1)

Contaminated Material	Dumping in Landfills (mg/l)	Dumping at sea (mg/l)
Alkylmercuric compounds	Not detectable	Not detectable
Mercury and its compounds	0.005	0.005
Cadmium and its compounds	0.1	0.1
Lead and its compounds	1	1
Organophosphorus compounds	1	1
Chromium (VI) compounds	0.5	0.5
Arsenic and its compounds	0.5	0.5
Cyanogen compounds	1	1
РСВ	0.003	0.003
Copper and its compounds	-	3
Zinc and its compounds	-	5
Fluoride	-	15

#### Note: Criteria are based on the examination of dissolution of contaminated materials

Source: Assessment of the Environment Impact of Port Development, United Nations, New York, 1992

**Criteria for Off-shore dumping of Dredged material:** No criteria is defined for off-shore disposal of dredged material in India, thus reference to the UN standards can be made and is given in **Table 6**.

Substance	Canada	USA
PCB (ppb)	100	380
Hg (ppm)	0.5	0.15
Cd (ppm)	0.60	0.7
Zn (ppm)	169	105
Cu (ppm)	45	68
As (ppm)	(5 – 25)	12.5
Pb (ppm)	45	33
Organochlorine pesticide (ppb)	10	5.0
	for any compound	Sum of DDT, DDE and DDD
Polyaromatic hydrocarbon (ppb)	(1,000) Sum of 16 compounds	680
		Sum of six low mol. Wt. compounds
		2,690
		Sum of 10 high mol. Wt. compounds

 Table 6: Criteria for Off-Shore Dumping of Dredged Material (unit: ppm or ppb)

Source: Assessment of the Environment Impact of Port Development, United Nations, New York, 1992

**Estimated Suspended Sediments Generation Standards from Dredging and Dumping operations:** Estimations had been made in Assessment Manual for dredging and Reclamation, Ministry of Transport, Japan for suspended sediment generation from dredging and dumping operations is given in **Table 7**. These can be used for estimating the suspended sediments to be generated from dredging for construction and operation of terminal

Table 7: Approximate Suspended Sediment Generation from Dredging Operation

Activity / Type of the Bottom	SS generated by dredging or dumping of one cubic metre of sandy material	SS generated by dredging or dumping of one cubic meter of silt / clay
Pump dredging	Kg/m <sup>3</sup>	Kg/m <sup>3</sup>
Ordianry 4,000 PS $^{\underline{1}}$	(2) 2.2 – 4.5	(2) 1.2 – 1.4
Ordinary 2,000 PS	(3) 0.1 – 0.3	NA
Low – pollution type 1,600 PS	NA	(3) 1.2 – 1.6
Low – pollution type 800 PS	NA	(2) 1.5 – 3.5
Grab dredging		
Ordinary 8m <sup>3</sup> bucket	NA	(2) 10 – 89



Activity / Type of the Bottom	SS generated by dredging or dumping of one cubic metre of sandy material	SS generated by dredging or dumping of one cubic meter of silt / clay
Ordinary 3 m <sup>3</sup> bucket	(1) 8.4	(4) 12 – 84
Water – tight type 8 m <sup>3</sup> bucket	NA	(1) 3.5
Bucket dredger	(1) 17	(1) 56
Dumping		
By grab bucket	(11) 0.4 – 5.0	NA
From hopper barge	(2) 2.4 – 5.2	(5) 12 – 203

Note: Parentheses are the number of times of observations

NA: Not Available

 $\underline{^{1\!\prime}\!}:$  Capacity of pump in Horse Power

Source: Assessment of the Environment Impact of Port Development, United Nations, New York, 1992