

Equip, Operate and Transfer Agreement

Between

**INLAND WATERWAYS AUTHORITY OF INDIA
(as “Authority”)**

And

[_____]
(as “Concessionaire”)

For

**Equip, Operate and Transfer at Multimodal Terminal at Haldia, West
Bengal, India**

Dated: [_____]

Contents

1.	Definitions and Interpretations.....	2
1.1.	Definitions.....	2
1.2.	Other References.....	11
1.3.	Interpretations.....	12
1.4.	Measurements and Arithmetic Conventions.....	14
1.5.	Ambiguities and Discrepancies.....	14
2.	Concession Agreement and Terminal Assets.....	15
2.1.	Concession Agreement.....	15
2.2.	Concession Period.....	15
2.3.	Acceptance of the Concession.....	16
2.4.	Terminal’s Assets.....	16
2.5.	Use of Terminal’s Assets.....	16
2.6.	Information about Project Site and Terminal’s Assets.....	16
2.7.	Acceptance of the Project Site and Terminal’s Assets.....	17
2.8.	Peaceful Occupation.....	17
3.	Conditions Precedent.....	18
3.1.	Conditions Precedent to be satisfied by the Concessionaire.....	18
3.2.	Conditions Precedent to be satisfied by the Concessing Authority:.....	19
3.3.	Other Requirements.....	20
4.	Performance Guarantee.....	22
5.	Independent Engineer and Independent Surveyor.....	23
6.	Project Implementation for the Terminal Equipment Phase.....	25
6.1.	Preparation of DTR.....	25
6.2.	Review of DTR.....	25
6.3.	Terminal Equipment Phase.....	26
6.4.	Obligations of the Concessionaire.....	26
6.5.	Obligations of the Concessing Authority.....	27
6.6.	Suspension of Works.....	28
6.7.	Issue of Completion Certificate.....	28
6.8.	Change of Scope.....	29
6.9.	Liquidated Damages.....	31

7.	Operations and Maintenance	32
7.1.	Obligations of the Concessionaire.....	32
7.2.	Rights of Concessionaire.....	37
7.3.	Obligations of the Concessioneing Authority.....	38
7.4.	Rights of Concessioneing Authority	39
7.5.	Utilities and services	39
7.6.	Liability for shortfall in performance.....	40
8.	Tariff.....	41
8.1.	Levy and Recovery of Tariff.....	41
9.	Payments to the Concessioneing Authority	42
9.1.	License fee.....	42
9.2.	Payments of Royalty	42
9.3.	Certified accounts.....	43
9.4.	Escrow account	43
10.	Assets: Ownership and Permitted Charge.....	46
10.1.	Ownership of Assets.....	46
10.2.	Permitted Charge.....	46
11.	Shareholding.....	47
11.1.	Ownership Structure.....	47
11.2.	Shareholding.....	47
11.3.	Constituent documents	48
12.	General Rights, Duties and Obligations.....	49
12.1.	Of the Concessionaire	49
12.2.	Of the Concessioneing Authority.....	53
12.3.	Of the Concessioneing Authority and the Concessionaire.....	53
12.4.	Assistance of Expert.....	54
13.	Change in Law	56
13.1.	Change in law.....	56
13.2.	The Concessionaire’s Remedy	56
14.	Force Majeure	59
14.1.	Force Majeure Event	59
14.2.	Non-Political Events	59
14.3.	Political Events.....	60
14.4.	Other Events	60

14.5.	Notice of Force Majeure Event	61
14.6.	Period of Force Majeure.....	62
14.7.	Resumption of Performance.....	62
14.8.	Performance Excused.....	62
14.9.	Costs, Revised Timetable.....	63
14.10.	Termination due to Force Majeure Event	63
15.	Events of Default.....	64
15.1.	Events of Default.....	64
15.2.	Parties Rights.....	66
15.3.	Consultation Notice.....	66
15.4.	Remedial Process	66
15.5.	Obligations during Remedial Period.....	67
15.6.	Revocation of Consultation Notice	67
15.7.	Termination due to Events of Default	68
15.8.	Concessioning Authority’s Rights of Step-in	68
16.	Termination of Concession Agreement.....	69
16.1.	Termination Procedure.....	69
16.2.	Obligations during Termination Period.....	69
16.3.	Requisition	69
16.4.	Condition Survey.....	70
16.5.	Consequences of Termination.....	70
17.	Compensation.....	72
17.1.	Compensation.....	72
17.2.	No Compensation on Expiry of Concession Period.....	73
17.3.	Transfer Fee and Charges.....	73
17.4.	Payment of Compensation to Senior Lenders.....	73
17.5.	Delayed Payment of Compensation	74
17.6.	Delayed Transfer of Assets	74
17.7.	Remedies Cumulative	75
18.	Transfer on expiry of Concession Period.....	76
18.1.	General Scope of Transfer/Payment	76
18.2.	Concessionaire’s Obligations.....	76
18.3.	Concessioning Authority’s Obligations	77
18.4.	Risk.....	77

19.	Dispute resolution	78
19.1.	Amicable settlement.....	78
19.2.	Assistance of Expert.....	78
19.3.	Arbitration	78
20.	Representations and warranties	80
20.1.	Representations and warranties of the Concessionaire	80
20.2.	Representations and warranties of the Concessioneing Authority.....	81
20.3.	Disclosure.....	82
21.	Miscellaneous provisions	83
21.1.	Amendments.....	83
21.2.	Agreement to override other Agreements	83
21.3.	Survival of Obligations	83
21.4.	Articles to survive Termination.....	83
21.5.	Joint Responsibility	83
21.6.	Several Obligations	84
21.7.	Severability.....	84
21.8.	Waiver; remedies.....	84
21.9.	Severance of terms	84
21.10.	Language	84
21.11.	Confidentiality.....	84
21.12.	Notices.....	85
21.13.	Waiver	86
21.14.	Amendments, Modifications or Alterations.....	86
21.15.	Governing Law.....	86
21.16.	Entire Agreement	86
22.	Annexures.....	88
23.	Annexure I: Project site.....	89
24.	Annexure II: Terminal’s assets	90
25.	Annexure III: Scope of Work.....	92
26.	Annexure IV: Performance Standards and damages.....	93
27.	Annexure V: Terms of Reference for Independent Engineer and Independent Surveyor	100
28.	Annexure VI: ESCROW Agreement	103
29.	Annexure VII: Expert Committee	118

30.	Annexure VIII: Standards	119
31.	Annexure IX: Substitution Agreement.....	123
32.	Annexure X: Monitoring Arrangement.....	131
33.	Annexure XI: Performance Guarantee	138
34.	Annexure XII: Certificates	141
35.	Annexure XIII: Applicable Permits	143
36.	Annexure XIV: Schedule I, II and III of Inland Waterways Concessioning Authority of India Amendment Regulations 2018	144
37.	Annexure XV: Environment Management Plan	161
38.	Annexure XVI: Detailed Project Report	162
39.	Annexure XVII: Base Case Financial Model.....	163
40.	Annexure XVIII: Draft Tripartite Agreement.....	164
41.	Annexure XIX: Auditors	179

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CONCESSION AGREEMENT

THIS CONCESSION AGREEMENT is made at _____ on the _____ day of

BETWEEN:

Members of the Inland Waterways Authority of India, a body corporate constituted and incorporated under the provision of the Inland Waterways Authority of India Act, 1985 of the Government of India, and having its Administrative Office at A-13, Sector – 1, Noida – 201301, Uttar Pradesh, hereinafter referred to as “**the Concessions Authority**” (which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns);

AND

_____, a Special Purpose Vehicle (SPV) incorporated under the Companies Act, 2013, and having its registered office at _____

hereinafter referred to as “**the Concessionaire**” (which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns).

WHEREAS:

(A) The Concessions Authority is desirous of implementing an equip, operate and transfer Project for multimodal terminal at Haldia, West Bengal through private sector participation;

(B) About equip, operate and transfer project at multimodal terminal at Haldia, the Concessioneing Authority invited bids from the interested parties in accordance with the Request for Proposal (as defined hereinafter) dated DD MMMM YYYY, to shortlist competent parties bids from whom shall subsequently be considered for identifying selected bidder for the Project;

(C) In response to the Request for Proposal, the Concessioneing Authority received proposals from bidders including the one submitted by the Bidder/Consortium;

(D) The Concessioneing Authority, after evaluating all the proposals received by it from qualified bidders, accepted the proposal referred to in recital “(C)” above submitted by the Bidder/Consortium and communicated its acceptance to the Bidder/Consortium vide Letter of Intent for Award of Concession dated DD MMMM YYYY.

(E) The Bidder/Consortium has/have incorporated the Concessionaire as a special purpose company in India, under the Companies Act, 2013 to implement the Project;

(F) Following the issue of the Letter of Intent for Award of Concession, the Concessioneing Authority has agreed to grant the Concession to the Concessionaire to implement the Project on the terms, conditions and covenants hereinafter set forth in this Agreement.

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NOW, THIS AGREEMENT WITNESSETH AS FOLLOWS:

ARTICLE 1

1. Definitions and Interpretations

1.1. Definitions

In this Agreement, unless the context otherwise requires the following terms shall have the following meanings assigned/ascribed thereto:

“**Additional Cost**” means the additional capital expenditure which the Concessionaire has or would be required to incur and which has arisen as a result of Change in Law.

“**Additional Auditor**” means another firm of chartered accountants duly licensed to practice in India empanelled by CAG, to conduct special audit of the quantity MT of cargo/ TEUs handled and the financial statements, documents and supporting evidences thereto as may be mandated by the Concessing Authority.

“**Agreement**” means this agreement as of date hereof, including Annexures I through XIX as may be amended, supplemented or modified in accordance with the provisions hereof.

“**Annexure**” means the schedules, supplements or documents, annexed to this Agreement.

“**Applicable Laws**” means all laws, brought into force and effect by GOI or any of the state governments, including rules, regulations and notifications made thereunder, and judgements, decrees, injunctions, writs and orders of any court of record, applicable to this Agreement and the exercise, performance and discharge of the respective rights and obligations of the Parties hereunder, as may be in force and effect during the subsistence of this Agreement;

“**Applicable Permits**” means any and all permissions, clearances, licenses, authorizations, consents, no-objections, approvals and exemptions under or pursuant to any of the Applicable Laws or from any Government Authority required in connection with the Project and for undertaking, performing or discharging the obligations contemplated by this Agreement or any other Transaction Document.

“**Bidder**” means [●]¹.

“**Appointed Date**” means the date of signing of this Agreement

“**Associate**” means, with respect to any Party and/or with respect to the Bidder and/or with respect to any member of Consortium, any other Person directly or indirectly controlling, controlled by or under common control with such Party, Bidder and/or member of

¹ Name and address of the bidder to be added here

Consortium. For the purposes of this definition, the term “control” (including with correlative meaning, the terms “controlled by” and “under common control with”) as applied to any Party or Bidder or a member of Consortium, means the possession, directly or indirectly, of the power to direct or cause the direction of the management of that Party or Bidder or a member of Consortium whether through ownership of more than 50% (fifty percent) of the voting securities, by contract, or otherwise.

“**Bid**” means the proposal and the entire set of documents submitted by the Bidder and/or the Consortium in response to the RFP.

“**Bid Security**” means the bank guarantee [●] dated [●] furnished by the Bidder/Consortium along with its Bid.

“**Book value**” means the aggregate written down value as on the date of issue of the Termination Notice in the books of the Concessionaire of (i) the tangible assets (including capital works in progress) forming part of, fixed or attached to the ground, created, installed or provided by the Concessionaire and comprised in Project Facilities and Services, and (ii) the moveable assets including cargo handling equipment belonging to the Concessionaire, in accordance with Indian Accounting Standards using depreciation rates as set forth in the (Indian) Companies Act, 1956, as applicable from time to time.

“**Cargo throughput**” means the volume of cargo handled at the Terminal in the period of one year.

“**Change in Law**” shall have the meaning set out under Article 13 of this Agreement.

“**Change of Scope**” means requisition by the Concessions Authority for the provision of additional works and services which are not included in the scope of the Project as per this Agreement.

“**Change of Scope Notice**” means a notice issued by Concessions Authority specifying in reasonable detail the works and services contemplated thereunder, if the Concessions Authority determines that Change of Scope is necessary.

“**Completion Certificate**” means a certificate obtained from the Concessions Authority as to completion of development of Project Facilities and Services in accordance with the provisions of this Agreement not later than 24 months from the date of commencement of the Terminal Equipment Phase of the terminal in the Concession Period.

“**Concessionaire DPR**” means the designs and drawings, and other technical information submitted by the Concessionaire from time to time and reviewed by the Concessions Authority in accordance with the provisions of this Agreement.

“**Concessionaire Event of Default**” shall have the meaning as set out under Article 15.1.1.

“**Concessioneing Authority Event of Default**” shall have the meaning as set out under Article 15.2.

“**Concession Period**” means the period of the EOT project specified in Article 2.2 of this Agreement.

“**Conditions Precedent**” shall mean conditions prescribed in Article 3 of this Agreement.

“**Consortium**” (if applicable) means the consortium consisting of (i) XXXX, (ii) YYYY, and (iii) ZZZZ formed, to implement the Project.

“**Consultation Notice**” has the meaning ascribed to it in Article 15.3.

“**Contractor**” means a Person with whom the Concessionaire has entered into/may enter into a contract relating to the execution of any works and /or operation and maintenance of the Project Facilities and Services, including the Management Contractor.

“**Commercial Operation Date (COD)**” means the date when the Conditions Precedent have either been satisfied and/or waived by the Party other than the Party responsible for satisfying the same.

“**Day**” means the 24 (twenty four) hour period beginning and ending at 12:00 midnight Indian Standard Time.

“**Debt Due**” means the aggregate of the following sums representing the amounts advanced by the Senior Lenders towards Total Project Cost, expressed in Indian rupees as may be outstanding and payable to the Senior Lenders under the Financing Documents on the Transfer Date:

- (a) the principal amount of the debt including any Subordinated Debt provided by the Senior Lenders under the Financing Documents for financing the Project (“Principal”) but excluding (i) working capital loans; (ii) any part of the principal that had fallen due for repayment two years prior to the Transfer Date, if the Transfer Date is related to expiry of the Concession Period or any part of the Principal that had fallen due before the Termination Notice, if the Transfer Date is related to termination prior to the expiry of the Concession Period; and (iii) any debt that has been rescheduled or refinanced, unless such repayment had been rescheduled or refinancing made with the prior consent of Concessioneing Authority; and
- (b) all accrued interest, financing fees and charges payable on or in respect of the debt referred to in sub-article (a) above upto the Transfer Date but excluding (i) any interest, fees or charges that had fallen due one year prior to the Transfer Date, and (ii) penal interest or charges, payable under the Financing Documents to any Senior Lender.

provided that if all or any part of the Debt Due is convertible into Equity at the option of Senior Lenders and/or the Concessionaire, it shall for the purposes of this Agreement be deemed to be Debt Due even after such conversion and the principal thereof shall be dealt with as if such conversion had not been undertaken;

“Development/Equipment Phase” means the period from the Date of start of the Development/Equipment Works of the Concession agreement to the Date of start of commercial operations for the Development/Expansion Works as specified under Article 6.3.1.

“Development/Equipment Works” means all works including equipment and things necessary to complete the Project and provide the Project Facilities and Services in accordance with this Agreement.

“DPR” means Detailed Project Report given in Annexure XVI of this Agreement.

“Encumbrance” means any encumbrance such as mortgage, charge, pledge, lien, hypothecation, security interest, assignment, privilege or priority of any kind having the effect of security or other such obligations and shall include without limitation any designation of loss payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Project, physical encumbrances and encroachments on the Project Site/Terminal’s Assets/Project Facilities and Services.

“EOT” means the Equip, Operate and Transfer agreement granted by the Concessioneing Authority to the Concessionaire in accordance with the provisions of Article 2.1 of this Agreement for implementing the Project and providing Project Facilities and Services.

“EPC Contract” means the contract entered into by the Concessionaire with one or more Contractors inter-alia for the purpose of design, engineering, procurement of equipment and materials (including by import thereof) and construction of the Project in accordance with the provisions of this Agreement.

“Environmental Law” means any statute, rule, regulation, ordinance, code, guideline or policy having the force of law, in each case, applicable to the Project now or hereafter in effect and any applicable judicial or administrative interpretation, pronouncement, order, decree or judgment, relating to the environment, health and safety.

“Equity” means the paid up share capital of the Concessionaire representing the equity component of the Total Project Cost, as capitalized in the books of the Concessionaire and duly certified by the Statutory Auditors.

“Equity Documents” means collectively the documents evidencing subscription to Equity to the extent of equity component of cost of the Project.

“Equity IRR” means the internal rate of return on equity investment of the project based on projected/actual cash flows during the Concession Period.

“Escrow Account” means the account used for withdrawals and appropriations during the Concession Period as mentioned under Article 9.3.

“Escrow Agreement” means the agreement to be executed inter alia between the Concessionaire, the Concessions Authority and the Senior Lenders/Senior Lenders representative substantially in the format set out in Annexure VI hereto.

“Event of Default” shall have the meaning assigned under Article 15.

“Exclusivity Period” shall have the meaning ascribed to it in Article 12.2.2

“Expert” means any person, body or organization of repute with recognized technical/professional expertise in respect of any field, matter or subject relevant, including the relevant subject-matter expert(s), financial expert(s), industry expert(s) and technical expert(s), for the purpose of this Agreement.

“Expert Committee” means the committee set up for dispute resolution in accordance with Annexure VII hereto.

“Financial Assistance” means all funded and non-funded credit assistance including but not limited to loans, advances, lease assistance and guarantees required for the Project.

“Financial Close” means the date on which the Financing Documents providing for Financial Assistance by the Senior Lenders, Equity Documents and the documents in respect of debt, if any, committed by the Bidder/Consortium have become effective and the Concessionaire has access to such Financial Assistance.

“Financial Year” means twelve month period commencing from 1st April and ending 31st March

“Financing Documents” means, collectively, the documents executed in favour of or entered into with the Senior Lenders, by the Concessionaire in respect of the Financial Assistance relating to the financing (including any re-financing) of the Total Project Cost and includes any document providing security for the Financial Assistance.

“Financing Plan” means the base case financial model adopted by Concessionaire with the approval of the Senior Lenders and approved by the Concessions Authority in accordance with Article 3.1.2 (a), setting forth the capital and operating cost of the Project and revenues therefrom on the basis of which financial viability of the Project has been determined by the Senior lenders, and includes a detailed description of the assumptions and parameters used for making calculation and projections therein including inter alia the Total Project Cost, and Royalty payable to the Concessions Authority annual estimated revenue, equity contribution, cargo handling projections estimated by Concessionaire, discounted net present value of the cash flows, Equity IRR, debt equity ratio and debt service coverage ratio

“Force Majeure Event” shall have the meaning ascribed to it in Article 14 of this Agreement.

“GoI” means the Government of India.

“Good Industry Practice” means the exercise of that degree of skill, diligence and prudence and those practices, methods, specifications and standards of equipment, safety and performance, as may change from time to time and which would reasonably and ordinarily be expected to be used by a skilled and experienced operator engaged in construction, operation and maintenance of facilities, equipment or systems of the type and size similar to the Project Facilities and Services.

“Government Authority” means GoI, any state government or any governmental department, commission, board, body, bureau, agency, authority, instrumentality, administrative body, at central, state, or local level, having jurisdiction over the Concessionaire, the Terminal’s Assets, the Project Facilities and Services or any portion thereof, but shall not include the Concessioneing Authority.

“Independent Engineer” means a person appointed in accordance with Article 5 for supervising and monitoring of compliance by the Concessionaire as per Scope of Work , more particularly to undertake, perform, carry out the duties, responsibilities, services and activities set forth in Annexure V.

“Indian Accounting Standards” means the Indian accounting standards issued by the Institute of Chartered Accountants of India.

“Insurance Cover” shall have the meaning ascribed to it in Article 12.1.3(b).

“IWAI Act” means The Inland Waterways Authority of India Act, 1985 as amended, supplemented, re- enacted or replaced from time to time.

“LAD” means Least Available Depth.

“Management Control” means the possession, directly or indirectly of the power to direct or cause the direction of the management and policies of the Concessionaire, whether through the ownership of voting securities, by contract or otherwise or the power to elect or appoint more than 50% (fifty percent) of the directors, managers, partners or other individuals exercising similar authority with respect to the Concessionaire.

“Material Adverse Effect” means material adverse effect of any act or event on the ability of either Party to exercise any of its rights or perform any of its duties under and in accordance with the provisions of this Agreement and which act or event causes a material financial burden or loss to either Party.

“Minimum Guaranteed Cargo” shall have the meaning ascribed to it in Article 7.1.12.

“**Month**” means the calendar Month as per the Gregorian calendar.

“**Notional Royalty**” means Royalty calculated as product of actual waterfront volume for the respective quarter and Royalty (per MT) agreed upon in this contract. This will be applicable to calculate penalties during a period of first 4 (four) years after COD.

“**Non-riverine cargo**” means cargo other than Riverine Cargo. Quantity of such cargo will be ascertained as per Goods Receipt document.

“**Operations Phase**” means the period from the Commercial Operation Date to the expiry/termination of the Concession Period.

“**Operations and Maintenance Standards**” means the minimum standards of operations and maintenance set out in the Annexure VIII with regards the Project Facilities and Services.

“**Party**” means either the Concessions Authority or the Concessionaire as the context may require or admit and “Parties” means both Concessions Authority and Concessionaire.

“**Performance Standards**” means the minimum standards of performance set out in Annexure IV with regards the Project Facilities and Services.

“**Performance Guarantee**” shall mean the bank guarantee procured by the Concessionaire for the benefit of the Concessions Authority guaranteeing the performance of the obligations of the Concessionaire hereunder in the manner specified in Article 4.

“**Person**” means any individual, company, corporation, partnership, joint venture, trust, unincorporated organization, government or governmental authority or agency or any other legal entity.

“**Political Event**” means the Force Majeure Events set out in Article 14.3.

“**Project**” means the design, finance, construction, operation, maintenance, and marketing and providing of the Project Facilities and Services at Multimodal Terminal at Haldia, West Bengal, India; in accordance with the provisions of this Agreement.

“**Project Capacity**” means the capacity of the Project Facilities and Services to handle 3.07 mmtpa.

“**Project Contracts**” means collectively this Agreement, the EPC Contract, O&M Contract and any other material contract (other than the Financing Documents, the Escrow Agreement, the Substitution Agreement or any commercial agreement with the users) entered into or may hereafter be entered into by the Concessionaire in connection with the Project and Project Facilities and Services.

“Project Facilities and Services” means the facilities and services as set out under the Scope of Work, to be provided by the Concessionaire during the Concession Period, in accordance with this Agreement.

“Project Site” means the area demarcated in Annexure I including the waterfront (which shall include adjacent channel stretch of 700 meters on both sides of terminal from center point at coordinates 22° 03' 38" N and 88° 08' 26" E) existing berth, land together with buildings, structures if any and easement rights thereto that may be given to the Concessionaire and all other assets comprised therein on which the Concessionaire is authorized to develop and operate the Project Facilities and Services as set forth in this Agreement.

“Provisional Certificate” shall have the meaning assigned to it under Article 6.7.4.

“Punch List” shall have the meaning assigned to it under Article 6.7.4.

“Quarter” means a period of 3 (three) months.

“Remedial Period” has the meaning ascribed to it in Article 15.4.

“Request for Proposal” or **“RFP”** means the Request for Proposal dated [●] issued by the Concessioneing Authority to the bidders and includes any addendum / clarification issued in respect thereof by the Concessioneing Authority.

“Requisition” has the meaning ascribed to it in Article 16.3.

“Riverine cargo” means cargo transported to and/or from the Terminal through waterways. For the avoidance of doubt, it is clarified that in the event cargo imported into the Terminal has been processed and exported, such cargo shall be treated as Riverine Cargo in the event either the import or export is through waterways.

“Royalty” means the share payable by the Concessionaire to the Concessioneing Authority, pursuant to Article 9.2.1 hereof.

“Safety Standards” means the minimum standards of safety set out in the Annexure VIII with regards the Project/Project Facilities and Services.

“Scope of Work” means the minimum requirements as to the operation, management and development of the Project and provision of Project Facilities and Services set out in Annexure III.

“Selectee” has the meaning ascribed to it in Article 15.4.215.4.

“Senior lenders” means the financial institutions, multilateral lending agencies, trusts, banks, funds and agents of trustees of debentures, including their successors and assignees, who have agreed to guarantee or provide finance to the Concessionaire under any of the

Financing Agreements for meeting all or any part of the Total Project Cost and who hold *pari passu* charge on the assets, rights, title and interests of the Concessionaire.

“**Special Audit**” means an audit of the quantity of cargo handled as MT and the financial statements, documents and supporting evidences thereto as may be mandated by the Concessioneing Authority and report to the Concessioneing Authority such information as may be desired by the Concessioneing Authority for any period.

“**Standards**” means the standards set out in Annexure VIII.

“**Statutory Auditors**” means a firm of chartered accountants appointed in terms of Section 139 of the Companies Act, 2013 and acting as the statutory auditors of the Concessionaire. Appointment of Statutory Auditors shall be as per Annexure XIX.

“**Stressed Project**” means the PPP reaching a situation in which either Party is unable to perform/discharge its obligations under this Agreement due to reasons beyond its control or due to certain unanticipated conditions.

“**Substitution Agreement**” means the agreement substantially in the form set out at Annexure IX, to be entered into between the Concessioneing Authority, the Concessionaire and the Senior Lenders.

“**Subordinated Debt**” means the aggregate of the following sums expressed in Indian Rupees as the case may be, outstanding as on the Transfer Date:

- (a) the principal amount of debt provided by Senior Lenders for meeting the Total Project Cost and subordinated to the financial assistance provided by the Senior Lenders; and
- (b) all accrued interest on the debt referred to in Sub-clause (a) above but restricted to the lesser of actual interest rate and a rate equal to 5% (five per cent) above the Bank Rate in case of loans expressed in Indian Rupees and lesser of the actual interest rate and six-month LIBOR (London Inter Bank Offer Rate) plus 2% (two per cent) in case of loans expressed in foreign currency, but does not include any interest that had fallen due one year prior to the Transfer Date;

“**Tariff**” means the applicable rate’s that may be charged by the Concessionaire for and in respect of providing the Project Facilities and Services.

“**Ten Year G Sec**” means the 10 Year G Sec rate published by Reserve Bank of India prevailing as on the date of a payment due from which the computation of interest is required to be made under the Agreement.

“**Terminal’s Assets**” means the assets set out in Annexure II, developed and/or provided by Concessioneing Authority.

“**Termination Notice**” means a notice for termination of this Agreement issued pursuant to Article 16.1.1 hereof.

“**Termination Period**” shall have the meaning as set out under Article 16 hereof.

“**Tests**” shall have the meaning assigned to it under Article 6.7.1 hereof.

“**Terminal**” means multimodal terminal at Haldia

“**Total Project Cost**” means the lowest of -

- (a) The capital cost of the Project for Concessionaire as set forth in the Financial Package including capital cost incurred by Concessionaire for development/equipment of Terminal infrastructure
- (b) The actual capital cost of the Project for Concessionaire upon completion including capital cost incurred by Concessionaire for development/equipment of Terminal infrastructure
- (c) A sum of INR 47.5 crore (INR Forty-seven crore and fifty lakh) only

“**Transfer**” means to transfer, sell, assign, pledge, hypothecate, create a security interest in or other encumbrance on, place in trust (voting or otherwise), transfer by operation of law or in any other way dispose of, whether or not voluntarily, the legal or beneficial interest in the equity shares of the Concessionaire.

“**Transfer Date**” means the date of expiry or termination as the case may be, of the Concession Period in accordance with the terms of this Agreement.

“**Transaction Documents**” means collectively the Project Contracts and the Financing Documents.

1.2. **Other References**

In this Agreement:

“**BIS**” means Bureau of Indian Standards.

“**BS**” means British Standard.

“**CISF**” means Central Industrial Security Force.

“**CPI (IW)**” means Consumer Price Index (Industrial Workers)

“**DIN**” means German Industrial Standard.

“**FEM**” means Federation of Equipment Manufacturers.

“**IWT**” means Inland Waterways Transportation

“**IS**” means Indian Standard.

“**ISO**” means International Standards Organization.

“**IEC**” means International Electro Technical Commission.

“**km**” means kilometre, the unit of length.

“**kWh**” means Kilowatt-hour, the unit of electrical energy.

“**KVA**” means Kilovolt- Ampere, the unit of power.

“**m**” means Metre, the unit of length.

“**mm**” means Millimetre, the unit of length.

“**mt**” means Metric Tonne, the unit of weight.

“**mmtpa**” means million metric tonnes per annum

“**MVA**” means Mega Volt Ampere, the unit of power.

“**MSIHC**” means Manufacture Storage and Input of Hazardous Chemicals.

“**OISD**” means Oil Industry Safety Directorate.

“**WPI**” means annual Wholesale Price Index published by Reserve Bank of India

1.3. **Interpretations**

This Agreement constitutes the entire understanding between the Parties regarding the Project and supersedes all previous written and/or oral representations and/or arrangements regarding the Project. If there is any aspect of the Project not covered by any of the provisions of this Agreement, then and only in that event, reference may be made by the Parties to the bid documents, inter alia including the RFP document, issued by the Concessioning Authority and also including addendums, clarifications given in writing in the pre-bid meetings and the submissions of the Concessionaire and the bid submitted by the Concessionaire but not otherwise. In case of any contradictions in the terms of this Agreement and any such other bid documents as referred to above, the terms of this Agreement shall prevail.

In this Agreement unless the context otherwise requires:

1.3.1. any reference to a statutory provision shall include such provision as is from

time to time modified or re-enacted or consolidated so far as such modification or re-enactment or consolidation applies or is capable of applying to any transactions entered into hereunder;

1.3.2. the words importing singular shall include plural and vice versa, and words denoting natural persons shall include partnerships, firms, companies, corporations, joint ventures, trusts, associations, organisations or other entities (whether or not having a separate legal entity);

1.3.3. the table of contents and any headings in this Agreement are for ease of reference only and shall not affect its construction or interpretation;

1.3.4. the words “include” and “including” are to be construed without limitation;

1.3.5. references to “development/equipment” include investigation, design, engineering, procurement, delivery, transportation, installation, processing, fabrication, testing, commissioning and other activities incidental to the development/ equipment;

1.3.6. any reference to any period of time shall mean a reference to Indian Standard Time;

1.3.7. any reference to Day shall mean a reference to a calendar Day; any reference to month shall mean a reference to a calendar month;

1.3.8. “Recital”, “Articles” and “Annexures” shall refer, except where the context otherwise requires, to Articles of and any Annexure to this Agreement. The Annexures to this Agreement shall form an integral part and parcel of this Agreement and will be in full force and effect as though they were expressly set out in the body of this Agreement;

1.3.9. any reference at any time to any agreement, deed, instrument, license or document of any description shall be construed as reference to that agreement, deed, instrument, license or other document as amended, varied, supplemented, modified or novated at the time of such reference;

1.3.10. any agreement, consent, approval, authorization, notice, communication, information or report required under or pursuant to this Agreement from or by any Party or the Independent Engineer and/or a Statutory Auditor shall be valid and effectual only if it is in writing under the hands of duly authorized representative of such Party or the Independent Engineer and/or Statutory Auditor, as the case may be, in this behalf and not otherwise;

1.3.11. unless otherwise stated, any reference to any period commencing “from” a specified Day or date and “till” or “until” a specified Day or date shall include both such days or dates;

1.3.12. unless otherwise specified, any interest to be calculated and payable under this

Agreement shall accrue on a monthly basis and from the respective due dates as provided for in this Agreement; and

1.3.13. any word or expression used in this Agreement, unless defined or construed in this Agreement, shall be construed as per the definition given in General Clauses Act, 1897 failing which it shall bear the ordinary English meaning.

1.4. Measurements and Arithmetic Conventions

All measurements and calculations shall be in metric system and calculations done to 2 (two) decimal places, with the third digit of 5 (five) or above being rounded up and below 5 (five) being rounded down.

1.5. Ambiguities and Discrepancies

In case of ambiguities or discrepancies within this Agreement, the following shall apply:

1.5.1. between two Article of this Agreement, the provisions of specific Articles relevant to the issue under consideration shall prevail over those in other Articles;

1.5.2. between any value written in numerals and that in words, the latter shall prevail; and

1.5.3. between the provisions of this Agreement and any other documents forming part of it, the former shall prevail.

ARTICLE 2

2. Concession Agreement and Terminal Assets

2.1. Concession Agreement

2.1.1. In consideration of the Concessionaire agreeing to pay to the Concessions Authority (a) License Fee and (b) Royalty along with performing its obligations as set out in this Agreement, the Concessions Authority hereby grants to the Concessionaire, an exclusive license to Equip, Operate and Transfer (“EOT”) the Project Facilities and Services as per Scope of Work defined in Annexure III subject to the provisions of this Agreement.

2.2. Concession Period

2.2.1. The Concession hereby granted is for a period of 10 (ten) years commencing from the COD during which the Concessionaire is authorized and obliged to implement the Project and to provide Project Facilities and Services as per Scope of Work in accordance with the provisions hereof.

Provided that:

- (a) In the event of the Concession being extended by the Concessions Authority beyond the said period of 10 (ten) years in accordance with the provisions of this Agreement, the Concession Period shall include the period by which the Concession is so extended, and
- (b) In the event of an early termination of this Agreement by either Party in accordance with the provisions hereof, the Concession Period shall mean and be limited to the period commencing from the COD and ending with the date of termination of this Agreement.

2.2.2. The Concessionaire shall, at any time not earlier than 7th (seventh) anniversary of the COD and no later than 8th (eighth) anniversary of the COD, intimate the Authority about its interest and request for extending the term of this Agreement by a period of 5 (five) years. The Authority may accept the request for extending the term of this Agreement subject to the following condition:

Actual riverine cargo throughput at the Terminal was greater than the slab for minimum annual riverine cargo throughput in corresponding year as given in Article 7.1.12 in any 3 (three) years between the 4th (fourth) and 8th (eighth) year of Operations Phase.

For avoidance of doubt it is clarified that actual terminal utilization for riverine cargo shall mean the actual volume of riverine cargo handled at the Terminal in the corresponding year. It is further clarified that measurement and monitoring of

cargo throughput shall be according to the provisions of this Agreement.

2.3. Acceptance of the Concession

2.3.1. The Concessionaire hereby accepts the Concession and agrees to undertake and implement the Project and to provide Project Facilities and Services in accordance with the provisions of this Agreement. Subject to and in accordance with the provisions of this Agreement and Applicable Laws and Applicable Permits, the Concessionaire shall at its costs, charges, expenses and risk including but not limited to foreign exchange variation risk if any, equip, operate, maintain and repair the Project/ Project Facilities and Services.

2.4. Terminal's Assets

2.4.1. In consideration of the Concessionaire agreeing to perform and discharge its obligations as set forth in this Agreement, the Concessions Authority hereby grants to the Concessionaire, the exclusive right to enter upon, occupy and use the Project Site and Terminal's Assets for the purpose of implementing the Project and provision of Project Facilities and Services pursuant thereto in accordance with this Agreement.

2.4.2. The Concessionaire shall at its costs, charges and expenses make such development and improvements in the Project Site and Terminal's Assets as may be necessary or appropriate for implementing the Project and providing Project Facilities and Services in accordance with the Agreement, Applicable Laws and Applicable Permits.

2.5. Use of Terminal's Assets

2.5.1. The Concessionaire shall not without the prior written consent or approval of the Concessions Authority use the Project Site and the Terminal's Assets for any purpose other than those of the Project/the Project Facilities and Services and those incidental thereto as permitted under this Agreement or as may otherwise be approved by the Concessions Authority.

2.6. Information about Project Site and Terminal's Assets

2.6.1. The information about the Project Site and Terminal's Assets as set out in Annexures I and II respectively is provided by the Concessions Authority in good faith and with due regard to the matters for which such information is required by the Concessionaire. The Concessions Authority agrees to provide to the Concessionaire, upon a reasonable request, any further information relating to the Project Site and Terminal's Assets, which the Concessions Authority may now possess or may hereafter come to possess, as may be relevant to the implementation of the Project. Subject to this, the Concessions Authority makes no representation and gives no warranty to the Concessionaire in respect of the condition of the Project Site and

Terminal's Assets.

2.7. Acceptance of the Project Site and Terminal's Assets

2.7.1. The Concessionaire accepts possession of the Project Site and Terminal's Assets on 'as is where is' basis and confirms having:

- (a) inspected the Project Site and Terminal's Assets, including the berths and all structures there and its surroundings;
- (b) satisfied itself as to the nature of the climatic, hydrological and general physical conditions of the Project Site and Terminal's Assets, the nature of the ground and subsoil, the form and nature of the Project Site and Terminal's Assets, and the nature of the design, work and materials necessary for the performance of its obligations under this Agreement; and
- (c) obtained for itself all necessary information as to the risks, contingencies and all other circumstances which may influence or affect the Concessionaire and its rights and obligations under or pursuant to this Agreement.

2.8. Peaceful Occupation

2.8.1. Handing over physical possession of the Project Site and Terminal's Assets, free from all encumbrances, after receipt of performance guarantee from the Concessionaire is a Condition Precedent for Concessioning Authority. The Concessioning Authority warrants that the Concessionaire shall, subject to complying with the terms and conditions of this Agreement, remain in occupation of the Project Site and Terminal's Assets during the Concession Period. In the event the Concessionaire is obstructed by any Person claiming any right, title or interest in or over the Project Site and Terminal's Assets or any part thereof or in the event of any enforcement action including any attachment, distraint, appointment of receiver or liquidator being initiated by any Person claiming to have charge on the Project Site and Terminal's Assets or any part thereof pursuant to the IWAI Act, the Concessioning Authority shall, if called upon by the Concessionaire, defend such claims and proceedings. The Concessioning Authority represents that the Concessionaire shall be kept indemnified and harmless against any adverse court order or direction.

ARTICLE 3

3. Conditions Precedent

3.1. Conditions Precedent to be satisfied by the Concessionaire

3.1.1. The Concession shall be subject to satisfaction or waiver of the following conditions precedent (the “**Conditions Precedent**”)

- (a) Furnishing of the Performance Guarantee as stipulated in Article 4 hereof;
- (b) Furnishing of copies (certified as true copies by a director of the Concessionaire) of the constituent documents of the Concessionaire;
- (c) Furnishing of all resolutions adopted by the Board of Directors of the Concessionaire (certified as true copies by a director of the Concessionaire) authorizing the execution, delivery and performance by the Concessionaire, of each of the Bidding Documents;
- (d) Opening the Escrow Account and executing the Escrow Agreement;
- (e) Signing of substitution agreement as per Annexure IX;
- (f) Furnishing a certificate from its principal officer/director on the shareholding pattern of the Concessionaire;
- (g) Procuring and furnishing the following confirmations, in original, (from the Bidder/all members in case of a Consortium) that the Concessionaire:
 - (i) shall at all times comply with the provisions of Article 11.2 in respect of its shareholding;
 - (ii) has the financial standing and resources to fund /raise finances for undertaking and implementing the Project in accordance with this Agreement;
 - (iii) is duly organized and validly existing under the laws of jurisdiction of its incorporation, and has requested the Concessions Authority to enter into this Agreement with the Concessionaire and has agreed to and unconditionally accepted the terms and conditions set forth in this Agreement;
- (h) Furnishing to the Concessions Authority a legal opinion from the legal counsel of the Concessionaire with respect to the Concessions Authority of

the Concessionaire to enter into this Agreement and the enforceability hereof.

- (i) Insurance requirement: The Concessionaire shall, at its cost and expense, purchase and maintain insurances as are prudent, including but not limited to the following:
 - (i) builder's all risk insurance;
 - (ii) loss, damage or destruction of Project Facilities and Services, at replacement value;
 - (iii) comprehensive third-party liability insurance including injury or death to personnel of the Concessions Authority and others who may enter the Project Site or the Terminal's Assets;
 - (iv) workmen's compensation insurance;
 - (v) marine cum storage cum erection insurance; and
 - (vi) any other insurance necessary to protect the Concessionaire, its employees and its assets and the Concessions Authority, its employees and agents engaged in or connected to the Project and the Project Site and Terminal's Assets, against loss, damage or destruction at replacement value, including all Force Majeure Events that are insurable and not otherwise covered in items (i) to (v).

3.1.2. The Concessionaire shall satisfy the following conditions precedent no later than 60 days prior to the start of development/equipment works for the Terminal Equipment Phase.

- (a) Submission to Concessions Authority of its Financing Plan and Financing Documents for the Project and demonstrating Financial Close for verification that there is no violation of the terms and conditions of this Agreement. Concessions Authority, within 30 days, shall notify Concessionaire of violations if any, which shall be promptly addressed by the Concessionaire.
- (b) Obtaining "Applicable Permits" as may be required for commencement of Terminal Equipment Phase as set out in Annexure XIII.

3.2. Conditions Precedent to be satisfied by the Concessions Authority:

3.2.1. Share the clearances required for the Project, as set out in Annexure XIII;

3.2.2. Handing over physical possession of the Project Site and Terminal's Assets,

free from all encumbrances, after receipt of performance guarantee from the Concessionaire with the provision that license fee and applicable taxes shall be paid by concessionaire from the date of taking the physical possession.

3.2.3. Notification of tariff schedule for charges to be collected and retained by the Concessionaire. Proposed tariff schedule is given in Annexure XIV of this Agreement.

3.3. Other Requirements

3.3.1. The aforesaid Conditions Precedent shall be complied within 90 (Ninety) days of the Appointed Date. For the purpose of compliance of Financial Close obligation, operator shall not be considered at default if the conditions pending for achieving Financial Close are only those which are required to be fulfilled by the Concessing Authority under Article 3.2.

3.3.2. Any of the Conditions Precedent set forth in Article 3.1 may be waived fully or partially by the Concessing Authority at any time in its sole discretion or the Concessing Authority may grant additional time for compliance with these conditions. The Concessionaire shall ensure compliance within such additional time as may be specified by the Concessing Authority. Any of the Conditions Precedent set forth in Articles 3.2 may be waived fully or partially by the Concessionaire at any time in its sole discretion.

3.3.3. If the Concessionaire has fulfilled all the Conditions Precedent under Article 3.1 including the furnishing of the Bank Guarantee and has not waived or extended the time under Article 3.3.2 above, and if the Concessing Authority has failed to fulfill the Conditions Precedent to be fulfilled by it under Article 3.2 (and which are within the power of the Concessing Authority), and the Concessionaire has not waived or extended the time under Article 3.3.2 above, the Concessing Authority shall be liable to pay liquidated damages in a sum calculated at the rate of 0.1% (zero point one percent) of the Performance Guarantee for each Day's delay until fulfilment of the Conditions Precedent subject to a maximum of 5% (five percent) of the figure mentioned in the Performance Guarantee furnished by the Concessionaire. In such event, having regard to the quantum of damages, the time for the performance shall be deemed to have been extended by the number of days for which the liquidated damages is paid and if, after the extended period the Concessing Authority is still not in a position to comply with the Conditions Precedent, then the agreement shall be liable to be terminated as provided for in Article 3.3.5 below.

3.3.4. If the Concessing Authority has fulfilled all the Conditions Precedent under Article 3.2 and has not waived or extended the time under Article 3.3.2 above, and if the Concessionaire has failed to fulfil the Conditions Precedent under Article 3.1 (and which are within the power of the Concessionaire), the Concessionaire shall be liable to pay liquidated damages in a sum calculated at the rate of 0.1% (zero point one percent) of the Performance Guarantee for each Day's delay until fulfillment of the Conditions Precedent subject to a maximum of 5% (five percent) of the figure mentioned in the

Performance Guarantee furnished by the Concessionaire. In such event, having regard to the quantum of damages, the time for the performance shall be deemed to have been extended by the number of days for which the liquidated damages is paid and if, after the extended period the Concessionaire is still not in a position to comply with the Conditions Precedent, then the agreement shall be liable to be terminated as provided for in Article 3.3.5 below.

3.3.5. In the event that the Conditions Precedents are not complied within the time (including the extended time, if any) in terms of the aforesaid Article 3, this Agreement shall be liable to be terminated. If such termination is on account of failure of the Concessionaire to comply with Conditions Precedent, the Bid Security shall stand forfeited. If such termination is on account of failure of the Concessioneing Authority, the Concessioneing Authority shall be obliged to return the Bid Security/Performance Guarantee. It is clarified that except for the payment as stipulated in the foregoing Article 3.3.3 and 3.3.4 and forfeiture in this Article 3.3.5, each party hereto shall have no claims against the other for costs, damages, compensation or otherwise.

ARTICLE 4

4. Performance Guarantee

4.1 The Concessionaire shall for due performance of its obligations towards the Project as given in this Agreement provide to Concessions Authority an unconditional and irrevocable bank guarantee, within 15 (fifteen) days of execution of this Agreement, in favour of the Concessions Authority, encashable and enforceable at Noida, Uttar Pradesh, substantially in the form set forth in Annexure XI (the "Performance Guarantee"). The Performance Guarantee shall be for a sum of INR 4.8 crore (INR Four crore and eighty lakh only) effective from COD till the end of the Concession Period.

4.2 Till such time the Concessionaire provides to Concessions Authority the Performance Guarantee pursuant hereto, the Bid Security shall remain in full force and effect. The Performance Guarantee, if in the form of a bank guarantee shall be valid for an initial period of 1 (one) year and shall be renewed no later than 30 (thirty) Days prior to expiry of each year, for an additional term of 1 (one) year.

4.3 The Concessionaire shall be liable to restore the Performance Guarantee to the full amount in case of part encashment of the same by the Concessions Authority. This shall be done within 30 (thirty) Days of any such part encashment.

4.4 Failure of the Concessionaire to provide and maintain a valid Performance Guarantee and in accordance with this Article shall entitle the Concessions Authority to terminate this Agreement forthwith and also if relevant, to forfeit the Bid Security.

ARTICLE 5

5. Independent Engineer and Independent Surveyor

5.1 The Independent Engineer and Independent Surveyor shall be selected out of the panel prepared for the purpose by the Concessions Authority. The Concessions Authority shall in the procurement documents published by it, set out in reasonable detail the scope of work as indicated in this document and shortlist Persons based on their technical capability. The Concessions Authority shall within 30 (thirty) Days of the date of this Agreement forward to the Concessionaire a list of shortlisted Persons and their profiles.

5.2 Any objection raised by the Concessionaire shall be considered by the Concessions Authority and Persons against whom such objections are raised will at the discretion of the Concessions Authority, which discretion shall be used with the highest degree of prudence and fairness, be disqualified prior to seeking a financial bid.

5.3 If within 15 (fifteen) Days of forwarding the list, the Concessions Authority does not receive any objection from the Concessionaire with reasons therefor, the Concessions Authority shall call for financial bids from the shortlisted Persons and select the Independent Engineer and Independent Surveyor ordinarily based on the lowest fee quote for respective position.

5.4 The Independent Engineer and Independent Surveyor selected pursuant to the aforesaid process shall be appointed within 90 (Ninety) Days of the date of this Agreement. The Independent Engineer and Independent Surveyor shall discharge its duties and functions substantially in accordance with the terms of reference set forth in Annexure -V. The Independent Engineer and Independent Surveyor shall submit regular periodic reports (at least once every month) to the Concessions Authority in respect of its duties and functions set forth in Annexure -V.

5.5 The scope of work of Independent Engineer shall inter-alia include work of certification of Performance Parameters as stipulated in this Concession Agreement

5.6 The scope of work of Independent Surveyor shall inter-alia include work of validating insufficient LAD and validating penalty payable for insufficient LAD as stipulated in this Concession Agreement. Validating occasions of unsuccessful vessel passage due to insufficient LAD. The Independent engineer shall validate/ certify that unsuccessful passage is not due to Concessionaire default subject to the following conditions:

- (a) Concessionaire has taken an informed decision about the size of the vessel and volume of cargo that can pass through the waterway by checking the LAD information updated weekly by the Authority on their website or any other source of information used in the future.
- (b) Concessionaire has adhered to the waterway channel as declared by the

Authority in their navigational charts updated periodically.

Independent Surveyor shall also validate penalty payable by Concessioneing Authority in case of occasions of insufficient LAD.

5.7 The costs and expenses of the Independent Engineer and Independent Surveyor for their services shall be borne by the Concessioneing Authority and Concessionaire, equally.

5.8 If the Concessioneing Authority either on its own or on a report of the Concessionaire has reason to believe that the Independent Engineer and Independent Surveyor is not discharging its duties in a fair, appropriate and diligent manner, the Concessioneing Authority may after giving the Independent Engineer and Independent Surveyor due opportunity of being heard, terminate the appointment of the Independent Engineer/ Independent Surveyor and appoint another firm in its place in accordance with the preceding Article 5.1 above.

5.9 If either Party disputes any advice, instruction or decision of the Independent Engineer/ Independent Surveyor, the dispute shall be resolved in accordance with the dispute resolution procedure set out in Article 19.

5.10 The Concessioneing Authority shall require the Independent Engineer and Independent Surveyor to designate and notify to the Concessioneing Authority and the Concessionaire up to 2 (two) persons employed in its firm to sign for and on behalf of the Independent Engineer and Independent Surveyor, and any communication or document required to be signed by the Independent Engineer and Independent Surveyor shall be valid and effective only if signed by any of the designated persons; provided that the Independent Engineer and Independent Surveyor may, by notice in writing, substitute any of the designated persons by any of its employees.

ARTICLE 6

6. Project Implementation for the Terminal Equipment Phase

6.1. Preparation of DTR

6.1.1. The Concessionaire shall at its cost, charges and expenses, prepare the detailed technical report (the “**DTR**”) including traffic study and operational design for Development/Equipment Works in conformity with the Scope of Work for the Terminal Equipment Phase.

6.2. Review of DTR

6.2.1. The Concessionaire shall submit the DTR for review of the Independent Engineer.

6.2.2. The Independent Engineer shall review the DTR submitted by the Concessionaire and provide its observations and suggestions on the same including the observations of the Concessions Authority in respect thereof within 60 (sixty) Days from the date of the receipt of such DTR.

6.2.3. In the event that the Independent Engineer and/or Concessions Authority has observed that the DTR is not in conformity with the Scope of Work, the Concessionaire shall promptly and without any undue delay revise and resubmit the DTR or satisfy the Independent Engineer and/or Concessions Authority with regards its compliance within 45 (forty five) Days of receiving observations and suggestions from the Independent Engineer.

6.2.4. Concessions Authority shall provide a No-Objection Certificate (“**NOC**”) for Terminal Equipment Phase development on basis of DTR submitted by the Concessionaire. If the Independent Engineer and/or Concessions Authority does not make any observations with respect to the DTR submitted to it by the Concessionaire within 60 (sixty) days of the submission, it shall be deemed that the Independent Engineer/ Concessions Authority has no objections to the DTR and the Concessionaire is permitted to proceed with the Project according to the DTR.

6.2.5. The Concessionaire shall not be entitled to any extension of time for completing development or any other relief on account of delay caused due to providing any clarification or in resubmitting the DTR. Provided, however, that the Concessions Authority at its sole discretion may suitably extend the Terminal Equipment Phase or provide other relief to compensate for any such delay not attributable to the Concessionaire.

6.2.6. The Concessionaire shall not change approved DTR under this Agreement, without submitting such revised DTR for the review of the Independent

Engineer/Concessions Authority.

6.2.7. Notwithstanding the review by the Independent Engineer, the Concessionaire shall be responsible for any defect and/or deficiency in the DTR relating to the Project or any part thereof, and accordingly, the Concessionaire shall at all times remain responsible for its obligations under this Agreement.

6.3. Terminal Equipment Phase

6.3.1. The Concessionaire shall promptly commence and complete the works, including installation of equipment in accordance with the conditions of the Terminal Equipment Phase and shall also obtain from the Independent Engineer a certificate as to completion of development/equipment of Project Facilities and Services in accordance with provisions of this Agreement (“**Completion Certificate**”) not later than 24 months from the date of commencement of the Terminal Equipment Phase.

6.4. Obligations of the Concessionaire

Without prejudice to the generality of Article 6.3 and in addition to any of its other obligations under this Agreement, during the Terminal Equipment Phase, the Concessionaire shall:

6.4.1. arrange for, in a timely manner all necessary financial and other resources required for development, equipment and installation of the Project Facilities and Services.

6.4.2. engage professionally competent Persons for project management and development/equipment and ensure that all works are carried out in compliance with the Standards given in this Agreement;

6.4.3. give written notice to the Concessions Authority within 7 (seven) Days of any material modification to any of the Financing Documents and/or any Equity Documents and shall simultaneously therewith also furnish copies of such modified documents to the Concessions Authority. Provided no such modification will be made if it in any manner whatsoever has the effect of imposing an additional financial obligation or increasing the financial obligation of the Concessions Authority in addition to that contemplated under the Financing Documents provided on Financial Close, without the prior written consent of the Concessions Authority. For avoidance of doubt any such modifications made without the prior written consent of the Concessions Authority will not be enforceable against the Concessions Authority;

6.4.4. obtain Applicable Permits, comply with Applicable Laws and Applicable Permits and give priority to safety in its development/equipment and planning activities in order to protect life, health, property and environment;

6.4.5. provide to the representatives of the Concessions Authority, at reasonable

times and upon prior intimation, access to the Project Site to review progress in development/equipment and to ascertain compliance with any of the requirements of this Agreement. Provided that non- inspection by the Concessioneing Authority of any works shall not, in relation to such works,

- (a) amount to any consent or approval by the Concessioneing Authority nor shall the same be deemed to be waiver of any of the rights of the Concessioneing Authority under this Agreement; and
- (b) release or discharge the Concessionaire from its obligations or liabilities under this Agreement in respect of such work;

6.4.6. provide monthly reports on the progress of Development/Equipment Works or such other relevant information as may be required by the Independent Engineer;

6.4.7. promptly carry out at its cost such further works as may be necessary to remove any defects or deficiencies observed by the Independent Engineer and ensure timely completion of development/equipment of Project Facilities and Services in all respects; and

6.4.8. to ensure safe and timely development/equipment and completion of Project Facilities and Services, the Concessionaire may, at its cost, interrupt and divert the water or the road traffic or Terminal traffic, adjacent to the Project Site if such interruption and diversion is imperative for efficient progress of Development/Equipment Works and conforms to Good Industry Practice. Such interruption and diversion shall be undertaken by the Concessionaire only with prior written approval of the Independent Engineer which approval shall not be unreasonably withheld. For avoidance of doubt, it is agreed that the Concessionaire shall, at all times, be responsible for ensuring safe operation of Development/Equipment Works and shall remove interruption or diversion within the period specified by the Independent Engineer.

6.5. Obligations of the Concessioneing Authority

In addition to any of its other obligations under this Agreement, the Concessioneing Authority shall:

6.5.1. in matters falling within its authority, grant, Applicable Permits, approvals and consents as may be required by the Concessionaire and, on a best efforts basis, assist the Concessionaire in obtaining all other Applicable Permits as may be required by the Concessionaire;

6.5.2. make available all records of sub-soil investigations carried out on its behalf in the Terminal's Assets, if requested by the Concessionaire. It is clarified that the Concessionaire shall be solely responsible for determining the adequacy or otherwise of such investigations and will not in reliance of such records, be entitled to claim any relief under this Agreement.

6.6. Suspension of Works

6.6.1. Upon recommendation of the Independent Engineer to this effect, the Concessioneing Authority may by notice require the Concessionaire to suspend forthwith whole or any part of Development/Equipment Works if, in the reasonable opinion of the Concessioneing Authority, such work is not in accordance with Standards given in this Agreement.

6.6.2. The Concessionaire shall, pursuant to the notice under foregoing provision suspend Development/Equipment Works or any part thereof for such time and in such manner as may be specified by the Concessioneing Authority and thereupon represent to the Concessioneing Authority / Independent Engineer, measures to remedy defects notified. The Concessionaire may by notice require the Independent Engineer to inspect such remedial measures forthwith and make a report to the Concessioneing Authority recommending whether or not the suspension hereunder may be revoked. Any dispute as regards suspension of works or remedial measures proposed, if not resolved within 30 (thirty) Days of the suspension or proposal of the remedial measures respectively, shall be submitted for dispute resolution in accordance with Article 21 hereof.

6.7. Issue of Completion Certificate

6.7.1. At least 60 (sixty) Days prior to the likely completion of Terminal Equipment Phase, the Concessionaire shall notify the Independent Engineer of the date when it intends to commence commercial operations. The Independent Engineer shall then proceed to inspect Development/Equipment Works with the intention of issuing Completion Certificate and determine and notify to the Concessionaire schedule and manner of tests as are specified in Annexure V that it shall carry out to ensure that the Project meets with the Standards (“Tests”). The date and time of each of the Tests shall be determined by the Independent Engineer in consultation with the Concessionaire, and notified to the Concessioneing Authority who may designate its representative to witness the Tests. The Concessionaire shall provide such assistance as the Independent Engineer may reasonably require for conducting the Tests. In the event of the Concessionaire and the Independent Engineer failing to mutually agree on the dates for conducting the Tests, the Concessionaire shall fix the dates by not less than 10 (ten) Days’ notice to the Independent Engineer;

6.7.2. Upon completion of each Test, the Independent Engineer shall provide to the Concessionaire and the Concessioneing Authority copies of all Test data including detailed Test results;

6.7.3. Upon completion of Development/Equipment Works and the Independent Engineer determining all the Tests to be successful, it shall forthwith issue to the Concessionaire and the Concessioneing Authority a Completion Certificate substantially in the form set forth in Annexure XI;

6.7.4. The Independent Engineer may, at request of the Concessionaire, issue a provisional certificate of completion substantially in the form set forth in Annexure XI (“**Provisional Certificate**”) if the Tests are successful and the Project can be safely and reliably placed in commercial operation though certain works or things forming part thereof are outstanding and not yet complete. The Provisional Certificate shall have appended thereto a list of outstanding items signed jointly by the Independent Engineer and the Concessionaire (“**Punch List**”) to be completed by the Concessionaire within a stipulated time. All items in the Punch List shall be completed by the Concessionaire within 90 (ninety) Days of date of issue of the Provisional Certificate or such other extended period that the Concessions Authority may in its sole discretion determine, failing which the Provisional Certificate shall lose its validity and the Concessions Authority shall be entitled to terminate this Agreement;

6.7.5. Without prejudice to the foregoing, if the Concessionaire fails to complete any Development/Equipment Works on account of Force Majeure or for reasons solely attributable to the Concessions Authority, the Concessions Authority may, in its discretion, reduce the scope of Project and require the Concessionaire to pay 80% (eighty percent) of the sum saved due to such reduction of scope. Upon such payment to the Concessions Authority, obligations of the Concessionaire in respect of such works shall be deemed to have been fulfilled.

6.8. **Change of Scope**

6.8.1. The Concessions Authority may, notwithstanding anything to the contrary contained in this Agreement, require the provision of additional works and services which are not included in the scope of the Project as contemplated by this Agreement (“**Change of Scope**”). Provided no such Change of Scope shall be made in the Terminal Equipment Phase if it is in the reasonable judgment of the parties hereto likely to delay the Scheduled Project Completion Date. Provided further, cost of implementing a single Change of Scope shall not exceed a sum corresponding to INR 2.4 crore (INR Two crore and forty lakh only) and during the Concession Period the cumulative cost of implementing orders pertaining to Change of Scope shall not exceed a sum corresponding to INR 9.5 crore (INR Nine crore and fifty lakh only). The Change of Scope shall be considered only for development of multimodal transportation projects;

6.8.2. If the Concessions Authority determines that a Change of Scope is necessary, it shall issue to the Concessionaire a notice specifying in reasonable detail the works and services contemplated thereunder (“**Change of Scope Notice**”);

6.8.3. Upon receipt of a Change of Scope Notice, the Concessionaire shall, provide to the Concessions Authority, the following:

- (a) adverse impact, if any, which the Change of Scope is likely to have on the Project; and

- (b) cost to be incurred by the Concessionaire for and in respect of such Change of Scope;

6.8.4. Upon receipt of the foregoing information, the Concessions Authority shall, if it decides to proceed with the Change of Scope, convey its agreement or otherwise of the assessment of the Concessionaire. If the Concessionaire does not notify any adverse impact of a Change of Scope notified under the Change of Scope Notice within 30 (thirty) Days of the date thereof and/or the Concessions Authority does not disagree with the cost assessment of the Concessionaire, the Concessions Authority shall issue an order requiring the Concessionaire to proceed with the implementation of such Change of Scope. If an adverse impact is notified by the Concessionaire and/or the Concessions Authority disagrees with the cost assessment, the Parties shall in good faith modify the Change of Scope envisaged so as to remove the adverse impact/agree to the cost implication for carrying out the Change of Scope within a period of 30 (thirty) Days of notification of the adverse impact/cost. In the event that the Parties are unable to mutually agree to a Change of Scope and/or the cost of implementing the same, they may seek intervention of an Independent Engineer to resolve the differences and upon the final determination of the desired Change of Scope and its cost implication, the Concessions Authority may issue an order to implement the Change of Scope;

6.8.5. The provisions of this Agreement, insofar as they relate to Development/Equipment Works and Tests, shall apply mutatis mutandis to the works undertaken by the Concessionaire in respect of a Change of Scope;

6.8.6. Within 7 (seven) days of an order for Change of Scope being issued, the Concessions Authority shall make an advance payment to the Concessionaire of a sum equal to 20% (twenty per cent) of the cost of Change of Scope as agreed hereunder. The Concessionaire shall, after commencement of work, present to the Concessions Authority bills for payment in respect of the works in progress or completed works, as the case may be, supported by such documentation as is reasonably sufficient for the Concessions Authority to determine the accuracy thereof. Within 30 (thirty) days of receipt of such bills, the Concessions Authority shall disburse to the Concessionaire after deducting Pro-rata advance payment, such amounts as are certified by the Statutory Auditors as being expended by the Concessionaire for and in respect of implementing Development/Equipment Works or procuring equipment following an order for a Change of Scope;

6.8.7. Notwithstanding anything to the contrary contained in this Article 6.8, the Concessions Authority may, after giving the Change of Scope Notice to the Concessionaire and considering its reply thereto, decide to seek competitive bids for carrying out the works envisaged in a Change of Scope; provided that the Concessionaire shall have the option of matching the first ranked bid in terms of selection criteria, subject to payment of 2% (two per cent) of bid amount to the Concessions Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if it has participated in the bidding process and its bid does not exceed the first ranked bid by

more than 10% (ten percent) thereof; and

6.8.8. If during the pendency of the Agreement, the Concessionaire determines at any time that a Change of Scope is necessary for providing safer and improved Project Facilities and Services, it shall by notice in writing request the Concessions Authority to consider such Change of Scope. The Concessionaire may implement the Project and provide Project Facilities and Services in accordance with the Change of Scope as may be approved in writing by the Concessions Authority and all provisions of this Article 6 for Project Implementation shall mutatis mutandis apply. Provided, it is clarified that the provisions contained in Article 6.8.6 and 6.8.7 shall not apply to a Change of Scope required by the Concessionaire.

6.9. Liquidated Damages

6.9.1. Subject to any of the provisions of this Agreement providing for extension of time for performance or excuse from performance, as the case may be, of any of the obligations of the Concessionaire under this Agreement, apart from performance standards and damages as mentioned in Annexure IV, the Concessionaire shall pay to the Concessions Authority liquidated damages at the rate of 0.1% (zero point one percent) of the Performance Guarantee for every day of delay in fulfilling specified obligations on or before a Milestone Date including a delay in obtaining the Completion Certificate or the Provisional Certificate on or before the Scheduled Project Completion Date. Provided such liquidated damages shall not in aggregate exceed INR 4.8 crore (INR Four crore and eighty lakh only) and unless the delay is in obtaining of the Completion Certificate or the Provisional Certificate, shall not be payable for less than 15 (fifteen) days of delay from a Milestone Date, in fulfilling a specified obligation. The Parties agree that liquidated damages as provided are a genuine pre-estimate of the damages the Concessions Authority is likely to suffer and are not by way of a penalty. In case the aggregate delay exceeds 180 (one hundred and eighty) days or the aggregate liquidated damages paid and/or payable under this provision exceeds specified limit of INR 4.8 crore (INR Four crore and eighty lakh only), the Concessions Authority shall be entitled to terminate this Agreement and consequences of termination as laid down in Article 15 shall follow. The Concessions Authority may, at its discretion recover any amounts with respect to liquidated damages from the Performance Guarantee.

ARTICLE 7

7. Operations and Maintenance

7.1. Obligations of the Concessionaire

In addition to any of its other obligations under this Agreement, the Concessionaire shall manage, operate, maintain and repair the Project Facilities and Services, entirely at its cost, charges, expenses and risk in accordance with the provisions of this Agreement. The Concessionaire's obligations under this Article shall include, but not be limited to the following:

7.1.1. Berth and Terminal Operations

The Concessionaire shall:

- (a) Promptly commence Project operations after the COD;
- (b) Make efforts to maximize cargo handled so as to achieve optimal utilization of the Project Facilities and Services;
- (c) Ensure compliance of Scope of Work
- (d) Be free to deploy higher capacity equipment/facilities/ technology, etc. and induct new technology and carry out value engineering for improved productivity and/or improved utilization and/or cost saving of Project assets during the concession period;
- (e) Ensure that the Project Facilities and Services shall adhere to the Operations and Maintenance Standards and Safety Standards and there is safe, smooth and uninterrupted flow of traffic under normal operating conditions;
- (f) Minimize disruption to traffic in the event of accidents or other incidents affecting the safety and use of the Project Facilities and Services by providing a rapid and effective response and maintaining liaison with emergency services of the Concessioning Authority or other agencies;
- (g) Make available all necessary financial, technical, technological, managerial and other resources for operation, maintenance and repair of and procurement and installation of equipment for the Project Facilities and Services in a timely manner;
- (h) Ensure maintenance of proper and accurate record/data/accounts relating to operations of the Project Facilities and Services and revenue earned therefrom;

- (i) Obtain, maintain and comply with Applicable Permits and comply with the Applicable Laws including those relating but not limited to Terminal side safety, health, environment and labour;
- (j) Subject to the provisions of this Agreement, perform, undertake or provide, in connection with the Project, all services which the Concessioneing Authority is authorized to perform, undertake or provide under provisions of the IWAI Act; and
- (k) Prevent, with assistance of concerned law enforcement agencies, any encroachment or unauthorized use of the Project Facilities and Services.

7.1.2. Marine and Terminal Services

- (a) Scheduling the entry, berthing and sailing of vessels, pilotage and towage on a non-discriminatory basis subject to priority berthing norms and the sailing schedule
- (b) Concessionaire share provide pilotage and towage services at the waterfront on the Project Site
- (c) Provide for/put in place arrangements for provision of supporting Project Infrastructure other than those covered under the Concession Agreement
- (d) Provide office space of 500 (Five hundred) square feet for the Concessioneing Authority within the Terminal Administrative Building

7.1.3. Repairs and Maintenance

The Concessionaire shall at its own cost:

- (a) Repair as necessary and maintain Project Facilities and Services or any part thereof in accordance with Scope of Work and for this purpose carry out routine preventive measures and maintenance of Project Facilities and Services
- (b) Maintain the Project Facilities and Services in accordance with the provisions of this Agreement and Good Industry Practice with the objective of providing adequate service standards and ensuring that Project Facilities and Services to be transferred to the Concessioneing Authority upon expiry of the Concession Period are in good condition, except for normal and reasonable wear and tear.
- (c) Ensure that maintenance Performance Standards as specified in Annexure IV are met.

7.1.4. Repairs or Restoration

The Concessionaire shall at its own costs, promptly and diligently, repair or restore any of Project Facilities and Services or part thereof which may be lost, damaged, or destroyed for any reason whatsoever.

7.1.5. Removal and/or Replacement of Assets

Except as provided/authorized under this Agreement, the Concessionaire shall not, without prior written notice to the Concessions Authority, remove or replace any assets forming part of Project Facilities and Services. Such notice shall contain the exact details of assets that the Concessionaire intends to remove and/or replace, its reasons for doing so and the likely period for replacement.

7.1.6. Payments to the Concessions Authority

The Concessionaire shall ensure payments to the Concessions Authority as per Article 9.

7.1.7. Access for Inspection

The Concessions Authority, Authority's Personnel and their respective agents will at all times have access to the Terminals, technical documents, materials, records and accounts relating to such operations for the purpose of inspection and review, consistent with relevant safety procedures. The Concessionaire shall be obliged to extend all co-operation to subject matter Experts appointed by the Concessions Authority for purposes of verifying that Project Facilities and Services are operated and maintained in compliance with Performance Standards and adhere to Operations and Maintenance Standards and Safety Standards. Such verification shall be made annually. Additionally, the Concessionaire shall upon prior intimation by the Concessions Authority provide authorized representatives of the Concessions Authority access to Project Facilities and Services for inspection and review of assets and operations and also to ascertain compliance with the requirements under this Agreement. Without prejudice to generality of this provision, it is agreed that the Concessionaire shall in particular extend all co-operation and information required by subject matter Experts appointed by the Concessions Authority for conducting a safety audit and verifying that Project Facilities and Services are in strict compliance with Safety Standards.

7.1.8. Reports

The Concessionaire shall provide to the Concessions Authority, Monthly reports on cargo traffic, unit gross output/ discharge rates at berth, Tariff billed and collected in respect of Project Facilities and Services. The Monthly Report shall be submitted within 15 (fifteen) days following the end of each month along with any other information relating to Project Facilities and Services which the Concessions Authority may require from time to time. The Concessionaire shall provide reports in prescribed formats and in such electronic form so as to provide online access to the Concessions Authority and its representatives.

7.1.9. Computer System and Network

The Concessionaire shall install, operate and maintain such computer system and network (such as Electronic Data Interchange and Terminal Community System) and follow such protocol as the Concessions Authority may specify from time to time. In addition, the Concessionaire shall install, operate and maintain an automated Gate Management System to ensure transparent and accurate reporting of total cargo throughput at the entry and exit gate of the terminal. The Concessionaire shall ensure live access of Gate Management System to the Concessions Authority. The system shall report the entry time, exit time, type of cargo and quantity of cargo carried by the vehicle exiting the terminal;

7.1.10. Security Arrangements

The Concessionaire may make his own arrangements for security of Project Site and Terminal Assets. The Concessionaire shall abide by the security regulations and procedures prescribed by the Concessions Authority or a competent Government Concessions Authority from time to time.

7.1.11. Employment of personnel and manpower training

- (a) The Concessionaire shall employ qualified and skilled personnel required to operate the Project Facilities and Services. The terms of employment may be as deemed fit by the Concessionaire and the Concessionaire shall comply with all Applicable Laws and bear all costs in this regard. Without prejudice to the generality of this provision, all requisite approvals for employment of personnel of foreign origin or nationality shall be obtained by the Concessionaire prior to engaging such personnel. Failure to obtain approval will not amount to a Force Majeure Event. All employees shall always remain the Concessionaire's responsibility.
- (b) The Concessionaire shall adhere to all labour law compliances. The Concessionaire shall also ensure that adequate training is provided to the employees for skill development relevant to industry that would benefit the Terminal and enable knowledge transfer.

7.1.12. Minimum Guaranteed Cargo

- (a) The Concessionaire shall endeavor to achieve a minimum annual riverine cargo throughput as per below schedule starting from COD.

S No	Year	Minimum Annual Riverine Cargo (mmtpa)
1	1 to 5	1.29
2	6 to 10	1.50
3	11 onwards	1.72

- (b) Achievement of minimum annual riverine cargo throughput as per slabs in Article 7.1.12 (a) shall be monitored as given in Article 2.2.2 in case the Concessionaire requests for an extension of the Concession Period.

- (c) In the event that minimum annual riverine cargo throughput is not met as per slabs in Article 7.1.12 (a) in at least 3 (three) years between the 4th (fourth) year and 8th (eighth) year of concession, it shall be considered as case for Termination of contract as a Concessionaire Event of Default.
- (d) In the event that the Concession Period is extended as given in Article 2.2.2, the Concessionaire shall unconditionally guarantee a minimum annual riverine cargo throughput as per slabs in Article 7.1.12 (a)

For avoidance of doubt it is clarified that in the event that Concession Period is extended and minimum annual riverine cargo throughput is not met in any year 11th year onwards, the Concessionaire shall pay Royalty commensurate with minimum annual riverine cargo as per slabs in Article 7.1.12 (a).

7.1.13. Indemnity against claims for loss of goods

- (a) Notwithstanding anything contained in the IWAI Act or any other law for the time being in force, the Concessionaire shall be responsible for addressing any claim, action, suit or proceeding (“**Action**”) by any third party alleging loss, destruction or deterioration of goods of which charge has been taken by the Concessionaire and indemnify, save and hold harmless the Concessioneing Authority, its officers, employees, agents and representatives (“**Indemnified Persons**”) against all claims, which may be asserted against or suffered and legal fees and costs incurred and which relate to any such goods, provided that notice of the action received by the Indemnified Persons shall be forwarded to the Concessionaire expeditiously and in any case within 30 (thirty) Days of receipt thereof by any of the Indemnified Persons.
- (b) Provided further that the Indemnitees shall have the right but not the obligation, to contest, defend and litigate any Action by any third party alleged or asserted against any of such Indemnitees in respect of, resulting from, related to or arising out of any matter for which it is to be indemnified hereunder, and reasonable costs and expenses thereof shall be indemnified by the Concessionaire.
- (c) If the Concessionaire acknowledges in writing its obligation to indemnify the Indemnitees in respect of loss to the full extent, the Concessionaire shall be entitled, at its option, to assume and control the defence of such Action at its expense and through the counsel of its choice; provided it gives prompt notice of its intention to do so to the Indemnitees and reimburses to them for reasonable cost and expenses incurred by them prior to assumption of such defence by the Concessionaire.
- (d) In such case the Indemnitees shall not be entitled to settle or compromise any Action without prior written consent of the Concessionaire, which consent shall not be unreasonably withheld or delayed. This indemnity shall survive the termination of this Agreement.

7.1.14. Maintenance of Complaint Portal

- (a) The Concessionaire shall maintain a “**Complaint Portal**” on its website which shall be available to all users of the Project Facilities and Services who shall be duly informed about availability of provision for lodging of complaints. The Complaint Portal will also be linked to the Concessioneing Authority website with an alert system for real time access to the complaints.
- (b) Concessionaire shall take action for just and fair redressal of the complaint and submit a reply to the complainant within 30 (thirty) days of the date of receipt of the complaint with a copy to Concessioneing Authority and maintain a proof of reply.
- (c) If concessionaire fails to address the complaint and the complainant makes a reference to the Concessioneing Authority, the Concessioneing Authority may issue directions that shall be binding on the Concessionaire. The Concessioneing Authority shall be just and fair in issuing such directions.

7.1.15. Operation and maintenance of Utilities

The operation and maintenance of Project utilities and related services shall be the responsibility of the Concessionaire.

7.1.16. Cargo visibility

The Concessionaire shall provide end-to-end visibility of cargo to all users by use of adequate technologies.

7.1.17. Reporting of Performance Standards

The Concessionaire shall report the Performance Standards to the Concessioneing Authority on a quarterly basis.

7.1.18. Compliance with the Environment Management Plan

The Concessionaire shall fully comply with the Environment Management Plan (“**EMP**”) provided by the Concessioneing Authority during all times. Detailed provisions of the EMP are given in Annexure XV of this document.

7.1.19. Operation and maintenance of Waste Reception & Treatment Facility

The Concessionaire shall take over operation and maintenance of the Waste Reception & Treatment Facility infrastructure at the Terminal from the Concessioneing Authority on COD to provide waste reception services to vessels as per Schedule IV of Ministry of Shipping Notification dated 13 July 2016.

7.2. **Rights of Concessionaire**

7.2.1. Preferential and priority berthing

The Concessionaire shall manage and operate Project Facilities and Services on a 'first come - first serve', common-user basis, open to any and all barge operators, importers, exporters, shippers, consignees and receivers; and refrain from indulging in any unfair or discriminatory practice against any user or potential user thereof. However, if there is a requirement to offer preferential or priority berthing to any one or more barge operators or vessel owners/operators to optimize the use of Project Facilities and Services, it shall be done based on volume commitments from the Concessionaire's client.

7.2.2. Liability for shortfall in draft maintenance along NW-1

In the event the Concessionaire observes that draft along NW-1 fall short of the mentioned LAD as per Article 7.3.3, the Concessionaire shall calculate the amount of liquidated damages payable by the Concessionaire in accordance with Annexure IV of this Agreement and demand the Concessioning Authority by a notice in writing to pay the same within 90 (ninety) days. On receipt of demand, the Concessioning Authority may make a written representation to the Concessionaire which shall be considered by the Concessionaire on merits. The Concessionaire may waive liquidated damages in part or full, if it is satisfied that the Concessioning Authority has been carrying out its obligations diligently and efficiently and the shortfall to be waived was on account of reasons beyond the control of the Concessioning Authority.

7.2.3. Refinancing of debts

The Concessionaire in accordance with the provisions of this document and the provisions of the Draft Tripartite Agreement (Annexure XVIII may issue bonds to refinance the debts raised and utilized by it from Senior Lenders for financing the project for which Concessioning Authority shall enter into Tripartite Agreement as per the Draft Tripartite Agreement given in Annexure XVIII.

7.3. **Obligations of the Concessioning Authority**

In addition to any of its other obligations in this Agreement, the Concessioning Authority shall arrange for, or provide the following:

7.3.1. Approvals

The Concessioning Authority shall promptly grant approvals sought by the Concessionaire as required under this Agreement subject to the Concessionaire having complied with all Applicable Laws and requirements.

7.3.2. Additional land, utilities and facilities

In the event that land, utilities and facilities are found to be insufficient by the Concessionaire for providing services as per the scope of work, at any time during the Concession Period, the Concessionaire may approach the Concessioning Authority for providing additional land,

utilities and facilities. The Concessions Authority on being approached by Concessionaire shall consider the same, subject to reasonableness and availability. The Concessions Authority may provide additional land, utilities and facilities if considered necessary. If the Authority is not in a position to provide the same, the Concessionaire shall not be entitled to any relaxation on the grounds that its request for additional land, utilities and services was not accepted by the Concessions Authority.

7.3.3. Maintenance of Least Available Depth

The Concessions Authority shall endeavour to provide the Least Available Depth (“LAD”) along NW-1 as follows:

Section	LAD (m)
Haldia – Barh	3.0
Barh - Ghazipur	2.5
Ghazipur –Varanasi	2.2

The Concessions Authority may arrange for dredging operations, as may be required to ensure the LAD as per this Agreement, with minimum inconvenience to or dislocation of the Project Facilities and Services;

7.3.4. Terminal Community System

The Terminal Community System would be developed by the Concessions Authority.

7.4. Rights of Concessions Authority

7.4.1. If in the reasonable opinion of the Concessions Authority, the Concessionaire is in material breach of its obligations under this Agreement for handling of cargo at the berth, the Concessions Authority may, without prejudice to any of its rights under this Agreement including Termination thereof, by notice require the Concessionaire to take reasonable measures for the handling of cargo.

7.4.2. In the event that the Concessionaire, upon receipt of notice above, fails to handle cargo at the berth within a reasonable period, the Concessions Authority may take over performance of any or all obligations of the Concessionaire to the extent deemed necessary by it for handling of cargo at the berth; provided that such taking over by the Concessions Authority shall be of no greater scope and of no longer duration than is reasonably required.

7.5. Utilities and services

7.5.1. The Concessions Authority shall, during the Concession Period, provide access to the Concessionaire for all infrastructure facilities and utilities including water, electricity and telecommunication facilities necessary for the implementation, operations and management of the Project Facilities and Services in accordance with this Agreement, at rates and on terms no less favourable to the Concessionaire than those generally available to commercial customers availing substantially equivalent facilities and utilities. Provided that, unless otherwise agreed

to by the Concessing Authority:

- (a) power made available shall be as received by the Concessing Authority from West Bengal State Electricity Distribution Company Limited. The take off point for electricity shall be from the sub station;
- (b) The Concessionaire shall, at its cost, and to satisfaction of the Concessing Authority, install meters to measure consumption of power and water. The Concessing Authority does not warranty reliability, quality and quantity of water and power and shall not be liable in any manner for shortage in or non-supply of these utilities;
- (c) The Concessionaire may, at its cost, make alternate arrangements for power including but not limited to installation of generators, subject to obtaining Applicable Permits, if any.

7.6. Liability for shortfall in performance

7.6.1. In the event the Concessing Authority, whether from the review of reports submitted by the Concessionaire or otherwise, observes that Project Facilities and Services fall short of the Performance Standards, the Concessing Authority shall issue a demand notice to the Concessionaire seeking liquidated damages. The liquidated damages shall be calculated in accordance with Annexure IV of this Agreement. The liquidated damages shall be payable within 30 (thirty) days of the date of issue of notice. On failure of the Concessionaire to pay the same, Concessing Authority shall recover the amount from the Performance Bank Guarantee provided by the Concessionaire.

7.6.2. Provided that, within 15 (fifteen) days of receipt of demand notice, the Concessionaire may make a written representation to the Concessing Authority which shall be considered by the Concessing Authority on merits. The Concessing Authority may waive the liquidated damages in part or full, if it is satisfied that the Concessionaire has been carrying out its obligations diligently and efficiently and that the performance shortfall to be waived was on account of reasons beyond the control of the Concessionaire.

7.6.3. It is clarified that this provision does not prejudice the rights of the Concessing Authority upon a Concessionaire Event of Default as set out in Article 15 including the Concessing Authority's right to terminate this Agreement which shall remain unaffected.

ARTICLE 8

8. Tariff

8.1. Levy and Recovery of Tariff

8.1.1. The Concessionaire shall levy and recover Tariff from the users of the Project Facilities and Services as per Annexure XIV. The tariff document as per Annexure XIV prescribes the maximum tariff that can be levied by the Concessionaire (“Ceiling Tariff”).

8.1.2. The Ceiling Tariff shall be revised every year based on a variation in the Wholesale Price Index (“WPI”). Such revision shall be based on indexation against 60% (sixty percent) of the variation in the WPI for a relevant year beginning 1st January and ending 31st December.

8.1.3. The revised Ceiling Tariff shall be regulated as per Section 17 of the Inland Waterways Authority Act, 1985. Such revised Ceiling tariff will become applicable after the same has been notified by the Concessions Authority.

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ARTICLE 9

9. Payments to the Concessing Authority

9.1. License fee

9.1.1. The Concessionaire shall, as consideration for the use, in its capacity as a bare licensee of the Project Site and the equipment comprised in the Terminal's Assets, made available in accordance with Article 2.4, pay to the Concessing Authority the sum of Re 1 (Rupee 1 Only) (the "License Fee"). Such amount shall be paid by the Concessionaire in yearly installments.

9.1.2. Any delay in payment of the amount in the preceding Article 9.1.1 shall entail payment of interest @ 10 Year GSec plus 6% (Six percent) per annum on the amount outstanding.

9.2. Payments of Royalty

9.2.1. The Concessionaire shall pay to the Authority Royalty equal to INR ___per MT on Riverine cargo handled during the previous month ("Royalty"). Such payments shall commence from 2nd (second) month (pertaining to previous month) after COD till the end of Concession Period or on termination whichever is earlier. The Concessionaire shall also make payments to the Concessing Authority an amount equivalent to the quoted Royalty plus a premium of 20% (twenty percent) on quoted Royalty for Non-Riverine cargo handled during the previous month. Such payments shall commence from 2nd (second) month (pertaining to previous month) after COD till the end of Concession Period or on termination whichever is earlier. All such payments shall be exclusive of applicable taxes which the Concessionaire will pay over and above Royalty payments.

9.2.2. Royalty per MT of cargo will be indexed as per the variations in the Wholesale Price Index (WPI) annually. Such revision shall be based on indexation against 60% (sixty percent) of the variation in the WPI for a relevant year beginning 1st January and ending 31st December.

9.2.3. Royalty for each month shall be paid on or before the 7th (seventh) day of the following month.

9.2.4. Royalty amounts remaining unpaid on respective due dates would carry interest @ 10 year GSec plus 6% (Six percent) per annum from the due date till the date of payment.

9.2.5. The Concessionaire shall submit a Monthly Report to the Concessing Authority showing, among other things, calculation of total cargo throughput in metric tons, for all types of cargo including dry-bulk, break-bulk, liquid-bulk, containers, bagged etc., measured through bill of lading or cargo manifest. For the purpose of Royalty calculation, cargo measurement mechanism as given below may be used:

S No	Cargo type	Cargo measurement
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1	Container	Gross weight in MT as per bill of lading/cargo manifest
2	Dry bulk	As per bill of lading/cargo manifest in MT
3	Liquid bulk	As per bill of lading/cargo manifest in MT
4	Break bulk	As per bill of lading/cargo manifest in MT
5	Bagged cargo	As per bill of lading/cargo manifest in MT
6	Any other cargo	As per bill of lading/cargo manifest in MT

The decision of the Additional Auditor shall be final in this matter as given in Article 9.3.3.

9.3. Certified accounts

9.3.1. During the subsistence of this Agreement, the Concessionaire shall maintain all documents and supporting evidences for its financial statements including agreements and documents with respect to all capital and debt raised by the Concessionaire, capital expenditure and operational expenses towards the Project; user-wise, vessel-wise information; cargo throughput by category; tariffs charged and the amount of money received. The Concessionaire shall submit to the Concessioneing Authority a financial statement including quantity (MT) of cargo handled for every 6 (six) monthly period ending 30th September and 31st March every year, duly certified by its Statutory Auditors. The certificate must be furnished within 30 (thirty) Days of the end of each such period.

9.3.2. The Concessioneing Authority may, at its own cost, appoint a firm of chartered accountants duly licensed to practice in India and empaneled by CAG (“**Additional Auditor**”) to conduct a special audit of the cargo throughput and the financial statements, documents and supporting evidences thereto as may be mandated by the Concessioneing Authority (“**Special Audit**”).

9.3.3. In the event that the cargo throughput reported by the Additional Auditor is higher than that reported by the Statutory Auditor, the auditors shall meet to resolve such differences and if they are unable to resolve the same, the Concessionaire shall pay Royalty on the cargo throughput reported by the Additional Auditor. The Concessionaire shall also pay interest @ 10 year GSec plus 6% - (Six percent) on the difference in Royalty as per the cargo throughput reported by the Statutory Auditor and the Additional Auditor. Further, the Concessionaire shall reimburse all costs, charges and expenses related to Special Audit. Without prejudice to the aforesaid, if difference between cargo throughput reported by the Additional Auditor and the Statutory Auditor is higher than 5% (five percent), the Concessioneing Authority shall have the right to require a Special Audit for the entire outstanding tenure of the Concession.

9.4. Escrow account

9.4.1. Withdrawals and appropriations during the Concession Period, at any relevant time, from the Escrow Account shall be in the following order of priority:

- (a) for all taxes due and payable by the Concessionaire;

- (b) towards payment of license fees;
- (c) all development/equipment expenses relating to Project Facilities and Services, subject to limits if any set out under Financing Documents;
- (d) all expenses relating to operation and maintenance of Project Facilities and Services subject to limits if any set out under Financing Documents;
- (e) towards payment of Royalty and other sums payable to the Concessioneing Authority and liquidated damages, if any;
- (f) towards Concessionaire's debt service obligations under Financing documents;
- (g) towards any reserve requirements in accordance with Financing Documents; and the Concessionaire shall be at liberty to withdraw any sums outstanding in Escrow Account after all the aforesaid payments due in any Quarter have been made and/or adequate reserves have been created in respect thereof for that Quarter. Provided, upon issuance of Termination Notice and/or suspension of the Concessionaire in accordance with provisions of this Agreement, withdrawal from the Escrow Account shall be made only in accordance with written instructions of the Concessioneing Authority and the Senior Lenders.

9.4.2. All amounts standing to the credit of Escrow Account at the end of the Concession Period including amounts credited to the Escrow Account towards compensation payable in accordance with Article 16 shall be appropriated in following order of priority:

- (a) towards taxes and statutory dues payable by the Concessionaire;
- (b) compensation to Senior Lenders in terms of Financing Documents towards discharge of the Concessionaire's liability under such Financing Documents;
- (c) all amounts due to the Concessioneing Authority and amounts payable towards transfer of Project Facilities and Services by the Concessionaire in accordance with this Agreement;

The Concessionaire shall be at liberty to withdraw any sums outstanding in Escrow Account after all the aforesaid payments due have been made and/or adequate reserves have been created in respect thereof to the satisfaction of the Senior Lenders and the Concessioneing Authority.

9.4.3. The Concessionaire agrees and undertakes that it shall deposit into and/or credit the Escrow Account with:

- (a) all monies received in relation to the Project from any source, including the Senior Lenders;

- (b) all funds received by the Concessionaire from its share-holders, in any manner or form;
- (c) all Fee levied and collected by the Concessionaire;
- (d) any other revenues from or in respect of the Project/Project Facilities and Services accruing to the Concessionaire including termination payments; and
- (e) all proceeds received pursuant to any insurance claims.

For avoidance of doubt, all amounts received by the Concessionaire in respect of the Project/Project Facilities and Services excepting any amounts in respect of cesses and duties collected by it from the users on behalf of the Concessions Authority or such other Concessions Authority in accordance with the Concession Agreement or pursuant to any other instructions in respect thereof shall be deposited in the Escrow Account.

ARTICLE 10

10. Assets: Ownership and Permitted Charge

10.1. Ownership of Assets

10.1.1. Land and Water Area

The ownership of the Project Site and Terminal's Assets shall always remain vested with the Concessioning Authority. The rights of the Concessionaire in the Project Site and Terminal's Assets shall only be that of a bare licensee of such assets and the Concessionaire shall neither assign, transfer, sublet, create any charge or Encumbrance, nor shall the Concessionaire create or permit creation of any third party rights whatsoever, on whole or any part of the Terminal's Assets or Project Site. Further, any such rights of the Concessionaire shall always be subject to existing rights of way. It is expressly agreed that the Concessionaire's rights in Project Site and/or Terminal's Assets shall cease without the need for any action to be taken by the Concessioning Authority upon termination of this Agreement for any reason whatsoever.

10.1.2. Assets created or provided by the Concessionaire

The ownership of all infrastructure assets, buildings, structures, berths, wharfs, equipment and other immovable and movable assets constructed, installed, located, created or provided by the Concessionaire at Project Site and/or in Terminal's Assets pursuant to this Agreement shall, until expiry of or termination of this Agreement, be with the Concessionaire. However, such ownership of buildings etc. erected by the Concessionaire at Project Site shall not be construed as and shall not confer any rights in Project Site or other Terminal's Assets upon the Concessionaire, save as that of a bare licensee.

10.2. Permitted Charge

The Concessionaire shall be entitled to create a charge on its rights, title and interest in the assets referred to in Article 10.1.2 in favour of Senior Lenders for securing the Financial Assistance provided or agreed to be provided by them under the Financing Documents. Provided, any such charge shall not be effective before Financial Close and shall not continue for a period exceeding the Concession Period.

Provided further, that such charge shall not be for the Project Site nor encumber the Project Site.

Provided further, in the event of termination of this Agreement, the said charge shall stand extinguished upon payment of compensation by the Concessioning Authority to the Senior Lenders, to the extent they are entitled to receive the same in accordance with the provisions of this Agreement.

ARTICLE 11

11.Shareholding

11.1. Ownership Structure

11.1.1. The Bidder/Consortium has caused the Concessionaire to be incorporated as a Special Purpose Vehicle (“SPV”) to equip, operate and transfer Project/Project Facilities and Services in accordance with this Agreement. The shareholding pattern of the SPV is as follows: [●].

11.2. Shareholding

The Concessionaire shall ensure that the Bidder/ members of the Consortium maintain Management Control at least until expiry of 4 (four) years after COD and also maintain their equity holding in the Concessionaire such that²:

11.2.1. Lead Consortium Member hold not less than 51% (fifty one percent) of its issued and paid up equity and that no member of Consortium whose technical and financial capacity was evaluated in response to Request for Proposal shall hold less than 26% (twenty six percent) of such equity until expiry of 4 (four) years after COD. At any time, after expiry of the aforesaid equity lock-in period, the lead member can seek Concessioning Authority’s approval for change in the SPV’s shareholding structure. The Concessioning Authority may, at its sole discretion, consider and approve it subject to the condition that the SPV, after the proposed change in shareholding structure, would not violate the eligibility criteria as prescribed in RFP for the Project; and

11.2.2. M/s [●] (“Lead Member”) of the Consortium (original or new as the case may be) legally and beneficially holds at any time at least 51% (fifty one percent) of the Consortium’s holding in paid up equity capital of the Concessionaire.

11.2.3. Any Transfer of shareholding in the Concessionaire and/or direct or indirect change in the Management Control of the Concessionaire, including by way of a restructuring or amalgamation, shall only be with the prior written approval of the Concessioning Authority which consent shall not be withheld except:

- (i) for reasons of national security; or
- (ii) if the Person proposed for assuming such Management Control would by virtue of the restrictions imposed under the Applicable Law or the conditions of bidding (including restrictions to avoid anti-competitive and monopolistic practice) and/or public policy be disqualified from undertaking the Project.

² This provision would be edited depending on whether the bidder is a single bidder or a Consortium. Article 11.2.2 will be omitted in case the bidder is a single Bidder.

- (iii) if in the reasonable view of the Concessioneing Authority such change is likely to cause material adverse impact on the Concessionaire and/ or the Project.

11.2.4. Provided, nothing contained in this Article shall preclude or prevent pledge of shares in the Concessionaire in favour of Senior Lenders as security for the Financial Assistance subject to enforcement and consequent Transfer thereof only with prior written consent of the Concessioneing Authority as stated hereinbefore and in accordance with the Financing Documents.

11.3. **Constituent documents**

11.3.1. The Concessionaire shall ensure that its articles of Association adequately reflect aforesaid and relevant commitments, obligations and responsibilities of the Concessionaire.

11.3.2. In particular, the articles of Association and Memorandum of Association of the Concessionaire shall be amended within 3 (three) months of the Appointed Date to include terms and conditions regarding composition and changes of shareholding structure and management stipulated in this Agreement;

11.3.3. The Concessionaire shall submit amended Articles of Association and Memorandum of Association to the Concessioneing Authority within 30 (thirty) days of the Appointed Date.

11.3.4. Any subsequent change in the Articles of Association or Memorandum of Association shall require prior approval of the Concessioneing Authority and the Articles of Association and Memorandum of Association shall include a specific provision to this effect.

ARTICLE 12

12. General Rights, Duties and Obligations

12.1. Of the Concessionaire

12.1.1. Applicable Permits

The Concessionaire shall at all times during the Concession Period maintain and comply with the Applicable Permits.

12.1.2. Taxes & duties

The Concessionaire shall during the Concession Period pay in a timely manner all taxes, duties, levies and charges including but not limited to income tax and goods and services tax that may be levied, claimed or demanded from time to time by any Government Authority including any increase therein effected from time to time from any Government Authority, in respect of Project/ Project Facilities and Services.

12.1.3. Insurance

- (i) Insurance Requirement: The Concessionaire shall, at its cost and expense, purchase and maintain insurances as are prudent, including but not limited to the following:
- (a) Concessionaire's all risk insurance;
 - (b) loss, damage or destruction of the Project Facilities and Services, at replacement value;
 - (c) comprehensive third party liability insurance including injury or death to personnel of the Concessioning Authority and others who may enter Project Site or Terminal's Assets;
 - (d) workmen's compensation insurance;
 - (e) marine cum storage cum erection insurance; and
 - (f) any other insurance that may be necessary to protect the Concessionaire, its employees and its assets and the Concessioning Authority, its employees and agents engaged in or connected to the Project and Project Site and Terminal Assets (against loss, damage or destruction at replacement value including all Force Majeure Events that are insurable and not otherwise covered in items (i) to (v)).

- (ii) **Insurance Cover & Insurance Companies:** The Concessionaire shall insure all insurable Terminal's Assets and Project Facilities and Services and all insurable risks associated with Project to the extent advisable in accordance with Good Industry Practice ("Insurance Cover"). Insurance of IWAI assets to be taken with zero deductible franchise to ensure maximum proceeds.
- (iii) **Evidence of Insurance Cover:** The Concessionaire shall, from time to time, provide to the Concessioneing Authority copies of all insurance policies (or appropriate endorsements, certifications or other satisfactory evidence of insurance) obtained by the Concessionaire in accordance with this Agreement.
- (iv) **Application of Insurance Proceeds:** Subject to provisions of the Financing Documents, all moneys received under insurance policies shall be promptly applied by the Concessionaire towards repair or renovation or restoration or substitution of Terminal's Assets and Project Facilities and Services or any part thereof which may have been damaged or destroyed and in respect of which the claim is lodged. The Concessionaire may designate Senior Lenders as loss payees under the insurance policies or assign the insurance policies in their favour as security for the Financial Assistance. The Concessionaire shall carry out such repair or renovation or restoration or substitution to the extent possible in such manner that the Project Facilities and Services or any part thereof, shall, after such repair or renovation or restoration or substitution be as far as possible in equal or better condition as they were before such damage or destruction, normal wear and tear excepted.
- (v) **Validity of Insurance Cover:** The Concessionaire shall pay premium payable on such insurance policies so as to keep the policies in force and valid throughout the Concession Period and furnish copies of the same to the Concessioneing Authority. Each insurance policy shall provide that the same shall not be cancelled or terminated unless 10 (ten) Days' clear notice of cancellation is provided to Concessioneing Authority in writing. If at any time the Concessionaire fails to purchase and maintain in full force and effect any and all insurances required under this Agreement, the Concessioneing Authority may at its option purchase and maintain such insurance and all sums incurred by the Concessioneing Authority therefor shall be reimbursed with interest @ 10 year GSec plus 6% - (six percent) per annum by the Concessionaire forthwith on demand, failing which the same shall be recovered by the Concessioneing Authority by exercising right of set off or otherwise.
- (vi) **Waiver of Subrogation:** All insurance policies procured in terms of provisions hereof shall include a waiver of any right of subrogation of insurers thereunder against, inter alia, the Concessioneing Authority and its assigns and successors and their respective subsidiaries, Associates, employees and of any right of the insurers of any set-off or counterclaim or any other deduction, whether by attachment or otherwise, in respect of any liability of any such person insured under any such policy or in any way connected with any loss, liability or obligation covered by such policies of insurance.

12.1.4. Indemnification

The Concessionaire shall, during pendency of this Concession Agreement and thereafter, until all claims and demands in respect to acts and omissions during the Concession Period as described hereunder are duly settled, indemnify and keep indemnified and otherwise save harmless, the Concessioneing Authority, its agents and employees, from and against all claims, demands made against and/or loss caused and/or damages suffered and/or cost, charges/expenses incurred to and/or penalty levied and/or any claim due to injury to or death of any person and/or loss or damage caused or suffered to property owned or belonging to the Concessioneing Authority, its agents and employees or third party as a result of any acts, deeds or thing done or omitted to be done by the Concessionaire or as a result of failure on part of the Concessionaire to perform any of its obligations under this Concession Agreement or on the Concessionaire committing breach of any terms and conditions of this Concession Agreement or on the failure of the Concessionaire to perform any of its duties and/or obligations including statutory duties or as a consequence of any notice, action, suit or proceedings, given, initiated, filed or commenced by consignee or owner of goods or vessel owner/agent or its employees or any third party or Government Authority or as a result of any failure or negligence or default of the Concessionaire or its Contractor(s), sub-contractor(s), or employees, servants, agents of such Contractor(s) and/or sub-contractor(s) and/or invitees as the case may be, in connection with or arising out of this Agreement and/or arising out of or, in connection with the Concessionaire's use and occupation of the Project Site or Terminal's Assets and/or development/equipment, operation, management and maintenance of Project Facilities and Services.

12.1.5. Assignability

Except as otherwise provided in this Agreement, the Concessionaire shall not assign its rights, title or interest in this Agreement in favour of any Person without prior written consent of the Concessioneing Authority.

Provided the Concessionaire may assign its rights, interests and benefits under this Agreement to Senior Lenders as security for Financial Assistance. Provided further nothing contained in this Article shall:

- (i) absolve the Concessionaire from its responsibilities to perform/discharge any of its obligations under and in accordance with the provisions of this Agreement; and
- (ii) authorize or be deemed to authorize the Senior Lenders to operate the Project Facilities and Services themselves and any such assignment to operate shall be in terms of the Substitution Agreement.

12.1.6. Engagement of Contractors

The Concessionaire shall engage the Management Contractor and execute the Management Contract, thereby entrusting the Management Contractor with the responsibilities of operating and managing the Project Facilities and Services in the manner envisaged under the Request for Proposal. A copy of the Management Contract shall be provided to the Concessions Authority and the same shall not be amended, substituted or revoked without prior written consent of the Concessions Authority.

The Concessionaire may engage any Person possessing requisite skill, expertise and capability of designing, engineering, procurement and development of civil/mechanical/electrical engineering structures/equipment, and/or operation and maintenance of Project Facilities and Services.

Provided that:

- (i) the Concessionaire shall at all times be solely responsible for all its obligations under this Agreement notwithstanding any such engagement and anything contained in any Project Contracts or any other agreement, and no default under any Project Contract or agreement shall excuse the Concessionaire from its obligations or liability hereunder and the Concessionaire shall at all times be solely responsible for non-performance or for any defect, deficiency or delay in development and erection and/or installation of structures/equipment or any part thereof and for the operation and maintenance of Project/Project Facilities and Services in accordance with provisions of this Agreement;
- (ii) the Concessionaire should have obtained, if required, security clearance for the Contractor the Concessionaire intends to engage;
- (iii) the Concessionaire shall ensure that Project Contracts contain provisions that entitle the Concessions Authority to step into such contract in its sole discretion in substitution of the Concessionaire in the event of termination or suspension of this Agreement; and
- (iv) any contract that it enters with an Associate in respect of the Project shall be on arms-length basis and shall require a written approval from the Concessions Authority.

12.1.7. Condition Survey

- (a) The Concessionaire agrees that at least 6 (six) Months prior to expiry by efflux of time of the Concession Period, it shall, cause to be conducted at its cost by an industry Expert appointed by Parties by mutual consent, a condition survey and an inventory of entire Project Facilities and Services. If, as a result of such survey, the industry Expert shall observe that the Terminal's Assets and/or Project Facilities and Services or any part thereof have/has not been operated and maintained in accordance with requirements therefor under this Agreement (normal wear and tear excepted) the Concessionaire shall, at its

cost and expenses, take all necessary steps to put the same in good working condition well before the Transfer Date. In the event the Concessionaire fails to comply with this provision, the Concessioneing Authority may itself cause the condition survey and inventory of the Terminal's Assets and Project Facilities and Services to be conducted and remove any defect or deficiency. The Concessioneing Authority shall be promptly reimbursed by the Concessionaire for costs incurred in conducting such survey and preparation of inventory as also in putting Project Facilities and Services in a good working condition.

- (b) The Concessionaire shall as security for performance of its obligation in preceding sub-Article (a), submit to the Concessioneing Authority a guarantee issued by a scheduled bank in India for a sum of INR 4.8 crore (INR Four crore and eighty lakh only), 2 (two) years prior to the expiry of the Concession Period. In the event of Concessionaire's failure to provide such guarantee, the same shall be deemed to be a Concessionaire Event of Default and the Concessioneing Authority shall accordingly be entitled to terminate this Agreement in accordance with Article 15. This shall be over and above the Performance Guarantee submitted in accordance with Article 4.

12.2. Of the Concessioneing Authority

12.2.1. Assistance in obtaining approvals, permits and licenses

The Concessioneing Authority shall, at the written request of the Concessionaire, but without guarantees and/or without assuming any responsibility in that behalf, issue recommendatory letters and make best efforts to assist the Concessionaire in obtaining all the Applicable Permits including renewals thereof. Provided that, nothing contained in this Article shall relieve the Concessionaire of its obligations under this Agreement to obtain the Applicable Permits and to keep them in force and effect throughout the Concession Period.

12.2.2. General rights of inspection and verification

The Concessioneing Authority may during pendency of the Agreement itself or by appointment of a subject matter Experts verify performance of obligations of the Concessionaire as set out in this Agreement.

12.3. Of the Concessioneing Authority and the Concessionaire

12.3.1. Monitoring Arrangement

The parties shall furnish to each other periodical status reports relating to key milestones and obligations as per Annexure X "Monitoring Arrangement"

12.3.2. Compliance with Laws and Regulations

The Parties shall perform their respective obligations under this Agreement in accordance with Applicable Laws and Applicable Permits.

12.3.3. Rights to Documents

- (i) **Concessioneing Authority's Documents:** Documents and computer programs or copies thereof, if any, provided by the Concessioneing Authority to the Concessioneaire, shall always remain property of the Concessioneing Authority. Such documents, computer programs and/or copies shall not be used by the Concessioneaire for purposes other than for the Project. Such documents, computer programs and/or copies thereof shall, unless otherwise agreed upon by the Concessioneing Authority, be returned by the Concessioneaire to the Concessioneing Authority on Transfer Date.
- (ii) **Concessioneaire's Documents:** Documents and computer programs provided by the Concessioneaire, or which are developed (and owned by the Concessioneaire) for operation and/or management of Project /Project Facilities and Services shall be handed over by the Concessioneaire to the Concessioneing Authority free of cost on the Transfer Date.
- (iii) **Confidentiality:** All confidential information and documents (whether financial, technical or otherwise provided by either Party to the other shall not, unless compelled by law or the process of a Government Authority, be disclosed to any Person without the consent of the other Party with the exception of providing such information to legal advisors/auditors of the concerned party on a need-to-know basis. This covenant shall survive the Concession Period.
- (iv) **Obligation to Cooperate:** The Parties shall mutually cooperate with each other in order to achieve the objectives of this Agreement.
- (v) **Substitution Agreement:** The Substitution Agreement envisaged in this document, may be executed within 30 (thirty) Days' of notice by the Concessioneaire to the Concessioneing Authority of Senior Lenders' readiness to execute the same.

12.4. Assistance of Expert

12.4.1. The Parties, may, in circumstances mentioned in this Concession Agreement and other appropriate circumstances seek help of an Expert on case to case basis. The Parties shall ensure that the Expert proposed to be appointed is independent and has no conflict of interest and possesses the skill and experience to resolve the issue at hand. The cost of the service of the Expert shall be shared equally.

12.4.2. The Concessioneing Authority shall propose the name of three Experts proposed to be appointed and the Concessioneaire shall be required to choose one of them no later than 30 (thirty) days from date of proposal by Concessioneing Authority to act as Expert for the issue at hand.

12.4.3. The Expert shall be expected to resolve the issues referred to him expeditiously and the Parties shall ensure that all necessary and reasonable assistance is provided to the Expert.

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ARTICLE 13

13.Change in Law

13.1. Change in law

“Change in Law” means any of the following events which has a Material Adverse Effect:

13.1.1. adoption, promulgation, modification, reinterpretation or repeal after the date of this Agreement by any Government Authority of any statute, rule, ordinance, regulation or order, treaty, convention, directive, guideline, policy having force of law; or

13.1.2. the imposition by any Government Authority of any material condition (other than a condition which has been imposed as a consequence of a violation by the Concessionaire of any Applicable Permit) in connection with the issuance, renewal or modification of any Applicable Permits after the date of this Agreement which renders the performance by the Concessionaire of any of the terms of this Agreement impossible or unviable; or

13.1.3. Any Applicable Permit previously granted, ceasing to remain in full force and effect for reasons other than breach/violation by or the negligence of the Concessionaire or if granted for a limited period, being renewed on terms different from those previously stipulated.

13.1.4. Any imposition of new Taxes except a new Direct Tax (both State and Central), duties, cess and the like and/or the increase in Taxes except in Direct Taxes (both State and Central), duties, cess and the like effected from time to time by any Government Authority, and/or imposition of standards and conditions of operations, maintenance and safety arising out of a new or revised Environmental Law; and/or imposition of standards and terms of employment and working conditions of Labourers and Workmen; and/or any rules or regulations stipulated by IWAI Act or other regulatory authority having jurisdiction over the Project in respect of standards of service. A change in the interpretation or application of any Indian Law by the judgement of a court of record which has become final and binding in place of such interpretation or application of law by a court of record prior to the bid due date

13.2. The Concessionaire’s Remedy

13.2.1. In the event of Change in Law the Concessionaire may propose to the Concessions Authority modifications to the relevant terms of this Agreement which are reasonable and intended to mitigate the effect of the Change in Law. Thereupon, the Parties shall, in good faith, negotiate and agree upon suitable changes in the terms of this Agreement including extension of the Concession Period, so as to place the Concessionaire in substantially the same legal and financial position as it were prior to such Change in Law i.e Protecting Project IRR as per Financing Plan. Provided however, that if the resultant Material Adverse Effect is such that this Agreement is frustrated or is

rendered illegal or impossible of performance, the Change in Law shall be deemed to be a Political Event, whereupon the provisions with respect thereto shall apply.

13.2.2. In the alternative to the aforesaid, subject to the Concessionaire taking necessary measures to mitigate the impact or the likely impact of Change in Law on the Project, if as a direct consequence of a Change in Law, the Concessionaire is obliged to incur Additional Cost in any accounting year, any such Additional Cost above a sum of INR 2.4 crore (INR Two crore and forty lakh only) may at the option of the Concessioneing Authority be borne by the Concessioneing Authority. It is clarified that Additional Cost upto INR 2.4 crore (INR Two crore and forty lakh only) in any accounting year shall be borne by the Concessionaire;

13.2.3. Upon occurrence of a Change in Law, the Concessionaire shall notify the Concessioneing Authority, of the following:

- (a) the particulars, nature and the impact of Change in Law on the Project;
- (b) in sufficient detail, the estimate of the Additional Cost likely to be incurred by the Concessionaire on account of the Change in Law; and
- (c) the measures, which the Concessionaire has taken or proposes to take to mitigate the impact of Change in Law, including in particular, minimising the Additional Cost.

13.2.4. Upon receipt of the notice of Change in Law issued by the Concessionaire pursuant to the preceding sub-article 13.2.3, the Concessioneing Authority and the Concessionaire shall hold discussions and take all such steps as may be necessary including determination/certification by a financial Expert, appointed by the Parties by mutual consent, of the Additional Cost and to determine the quantum of the Additional Cost to be incurred.

13.2.5. If it is determined that the only material impact of a Change in Law is Additional Cost and the Concessioneing Authority opts to compensate the same in accordance with the preceding sub-article 13.2.4, the Concessionaire shall not be entitled to any other remedy nor shall seek any alterations to the Agreement and the Concessioneing Authority shall, within 30 (thirty) Days from the date of determination of quantum of Additional Cost to be borne by the Concessioneing Authority in accordance with sub-article (b) above, compensate the Concessionaire in either of the following ways:

- (a) by lump-sum reimbursement of such Additional Cost to the Concessionaire;
- (b) reimbursement of the such Additional Cost to the Concessionaire, in not exceeding four half yearly installments, subject to payment of interest at 10 Year GSEC + 6% - (Six percent) on the amount the payment of which is deferred.

13.2.6. Notwithstanding the aforesaid, if in terms of Good Industry Practice, the event constituting a Change in Law could be insured, the Concessionaire shall not be entitled to any remedy under this Article 13.2;

13.2.7. If as a result of Change in Law, the Concessionaire incurs a reduction in costs or other financial gain or benefit in connection with its development or operation of the Project, the aggregate financial effect of which exceeds INR 2.4 crore (INR Two crore and forty lakh only) in any Financial Year, the Concessionaire shall notify the Concessions Authority and pay to the Concessions Authority an amount that would put the Concessionaire in the same financial position it would have occupied had there been no such Change in Law resulting in such cost reduction, increase in return or other financial gain or benefit as aforesaid. Without prejudice to the aforesaid, the Concessions Authority may, by notice in writing require the Concessionaire to pay an amount that would put the Concessionaire in the same financial position it would have occupied had there been no such Change in Law resulting in such cost reduction, increase in return or other gain or benefit.

13.2.8. The Concessionaire shall make payment of such compensation within sixty (60) Days of the said financial benefit. If the Concessionaire shall dispute the quantum of such compensation claim of the Concessions Authority, the same shall be finally settled in accordance with the dispute resolution mechanism contained in Article 19 herein.

ARTICLE 14

14. Force Majeure

14.1. Force Majeure Event

14.1.1. As used in this Agreement, Force Majeure Event means the occurrence of any of the Non- Political Events, the Political Events or the Other Events in India, set out in Articles 14.2, 14.3 and 14.314.4 respectively including the impact/consequence thereof which:

- (a) is beyond the control of the Party claiming to be affected thereby (the “Affected Party”);
- (b) prevents the Affected Party from performing or discharging its obligations under this Agreement; and
- (c) the Affected Party has been unable to overcome or prevent despite exercise of due care and diligence.

14.2. Non-Political Events

14.2.1. Any of the following events which prevent the Affected Party from performing any of its obligations for a continuous period of not less than 7 (seven) Days from the date of its occurrence, shall constitute a Non-Political Event:

- (a) act of God, epidemic, extremely adverse weather conditions, lightning, earthquake, cyclone, flood, volcanic eruption, chemical or radioactive contamination or ionizing radiation, fire or explosion (to the extent of contamination or radiation or fire or explosion originating from a source external to the Project Site and by reasons not attributable to the Concessionaire or the Contractor or any of the employees or agents of the Concessionaire or the Contractor);
- (b) strikes or boycotts (other than those involving the Concessionaire, Contractors or their respective employees/representatives, or attributable to any act or omission of any of them), and not being an Other Event set forth in Article 14.4, labour disruptions or any other industrial disturbances not arising on account of the acts or omissions of the Concessionaire or the Contractor;
- (c) any failure or delay of a Contractor caused by any of the Non-Political Events, for which no offsetting compensation is payable to the Concessionaire or on behalf of the Contractor;

- (d) the discovery of geological conditions, toxic contamination or archeological remains on the Project Site that could not reasonably have been expected to be discovered through a site inspection; or
- (e) any event or circumstance of a nature analogous to any of the foregoing.

14.3. Political Events

14.3.1. Any of the following events shall constitute Political Event:

- (a) Change in Law for which no relief is provided under the provisions of Article 13, resulting in Material Adverse Effect;
- (b) action of a Government Authority having Material Adverse Effect including but not limited to:
 - (i) acts of expropriation, compulsory acquisition or takeover by any Government Authority of the Project/Project Facilities and Services or any part thereof or of the Concessionaire's or the Contractor's rights under any of the Project Contracts, and
 - (ii) any unlawful, unauthorized or without jurisdiction refusal to issue or to renew or the revocation of any Applicable Permits, in each case, for reasons other than the Concessionaire's or the Contractor's breach or failure in complying with the Scope of Work, Applicable Laws, Applicable Permits, any judgment or order of a Governmental Agency of any contract by which the Concessionaire or the Contractor as the case may be is bound;
 - (iii) early termination of this Agreement by the Concessions Authority for reasons of national emergency, national security or the public interest;
 - (iv) any failure or delay of the Contractor caused by any of the aforementioned Political Events, for which no offsetting compensation is payable to the Concessionaire by or on behalf of the Contractor; or
 - (v) any event or circumstance of a nature analogous to any of the foregoing.

14.4. Other Events

14.4.1. Any of the following events which prevents the Affected Party from performing any of its obligations under this Agreement for a continuous period of not less than 7 (seven) Days from the date of its occurrence, shall constitute the Other Event:

- (a) an act of war (whether declared or undeclared), invasion, armed conflict or act

of foreign enemy, blockade, embargo, riot, insurrection, terrorist or military action, civil commotion or politically motivated sabotage;

- (b) industry wide or State wide strikes or industrial action;
- (c) any civil commotion, boycott or political agitation which prevents collection of Fee by the Concessionaire;
- (d) any judgment or order of a court of competent jurisdiction or statutory authority in India made against the Concessionaire or the Contractor in any proceedings which is non-collusive and duly prosecuted by the Concessionaire; and any judgment or order of a court of competent jurisdiction or statutory authority in India made against the Concessionaire or the Contractor in any proceedings which is non-collusive and duly prosecuted by the Concessionaire other than relating to proceedings
 - (i) pursuant to failure of the Concessionaire to comply with any Applicable Law or Applicable Permit, or
 - (ii) on account of breach of any Applicable Law or Applicable Permit or of any contract, or
 - (iii) enforcement of this Agreement or
 - (iv) with respect to exercise of any of its rights under this Agreement by the Concessioning Authority; or
- (e) any event or circumstance of a nature analogous to any of the foregoing.
- (f) Insufficient LAD on NW-1 for a period of 7 (seven) Days or more as communicated by the Authority through a public notification.

14.5. Notice of Force Majeure Event

14.5.1. The Affected Party shall give written notice to the other Party in writing of the occurrence of any of the Force Majeure Event (the “**Notice**”) as soon as the same arises or as soon as reasonably practicable and in any event within 7 (seven) Days after the Affected Party knew, or ought reasonably to have known, of its occurrence and the adverse effect it has or is likely to have on the performance of its obligations under this Agreement.

14.5.2. The Notice shall inter-alia include full particulars of:

- (a) the nature, time of occurrence and extent of the Force Majeure Event with evidence in respect thereof;
- (b) the duration or estimated duration and the effect or probable effect which such Force Majeure Event has or will have on the Affected Party’s ability to

perform its obligations or any of them under this Agreement;

- (c) the measures which the Affected Party has taken or proposes to take, to alleviate the impact of the Force Majeure Event or to mitigate the damage; and
- (d) any other relevant information.

14.5.3. So long as the Affected Party continues to claim to be affected by a Force Majeure Event, it shall provide the other Party with periodic (fortnightly/monthly) written reports containing the information called for by Article 14.5.2 and such other information as the other Party may reasonably request.

14.6. Period of Force Majeure

14.6.1. Period of Force Majeure shall mean the period from the time of occurrence specified in the Notice given by the Affected Party in respect of the Force Majeure Event until the earlier of:

- (a) expiry of the period during which the Affected Party is excused from performance of its obligations in accordance with Article 14.8; or
- (b) termination of this Agreement pursuant to Article 14.10 hereof.

14.7. Resumption of Performance

14.7.1. During the period of Force Majeure, the Affected Party shall in consultation with the other Party, make all reasonable efforts to limit or mitigate the effects of the Force Majeure Event on the performance of its obligations under this Agreement. The Affected Party shall also make efforts to resume performance of its obligations under this Agreement as soon as possible and upon resumption shall notify the other Party of the same in writing. The other Party shall afford all reasonable assistance to the Affected Party in this regard.

14.8. Performance Excused

14.8.1. The Affected Party, to the extent rendered unable to perform its obligations or part thereof under this Agreement as a consequence of the Force Majeure Event shall be excused from performance of the obligations. Provided that, the excuse from performance shall be of no greater scope and of no longer duration than is reasonably warranted by the Force Majeure Event. Provided further, nothing contained herein shall absolve the Affected Party from any payment obligations accrued prior to the occurrence of the underlying Force Majeure Event.

14.9. Costs, Revised Timetable

14.9.1. Costs

Each Party shall bear its costs, if any, incurred as a consequence of the Force Majeure Event.

14.9.2. Extension of time/period

The Affected Party shall be granted by the other Party, extension of time specified in this Agreement for the performance of any obligation by such period not exceeding the period during which the relative performance was affected by the Force Majeure Event. Such extension may include extension of the Concession Period by the Concessions Authority in appropriate cases if permissible under Applicable Law.

14.10. Termination due to Force Majeure Event

14.10.1. If the period of Force Majeure continues or is in the reasonable judgment of the Parties likely to continue beyond a period of 120 (one hundred and twenty) Days, the Parties may mutually decide to terminate this Agreement or continue this Agreement on mutually agreed revised terms. If the Parties are unable to reach an agreement in this regard, the Affected Party shall after the expiry of the said period of 120 (one hundred and twenty) Days be entitled to terminate the Agreement in which event, the provisions of Articles 16 and 17 shall, to the extent expressly made applicable, apply.

ARTICLE 15

15. Events of Default

15.1. Events of Default

Event of Default means the Concessionaire Event of Default or the Concessions Authority Event of Default or both as the context may admit or require.

15.1.1. The Concessionaire Event of Default

Concessionaire Event of Default means any of the following events unless such an event has occurred as a consequence of the Concessions Authority Event of Default or a Force Majeure Event:

- (i) Concessionaire's failure to perform or discharge any of its obligations in accordance with the provisions of this Agreement;
- (ii) Development/Equipment at the Project Site is abandoned for a more than 90 (ninety) Days during the Terminal Equipment Phase;
- (iii) Delay of more than 180 (one hundred and eighty) Days from any Milestone Date in achieving any of the performance obligations set forth for the relevant Milestone Date or the Date of Commercial Operations is delayed for more than 180 (one hundred and eighty) Days from the Scheduled Project Completion Date;
- (iv) Delay in payment of Royalty for 2 (two) consecutive Months or more than (5) (five) times in the aggregate during the Concession Period;
- (v) Concessionaire's failure to perform or discharge any of its obligations under any other Project Contract, which has or is likely to affect the Project/the Project Facilities and Services, materially;
- (vi) Concessionaire fails to achieve Minimum Guaranteed Cargo for a consecutive period of 3 (three) years starting 11th (eleventh) onwards, in the event that Concession Period is extended by 5 (five) years. Provided, the Concessionaire shall not be deemed to be in default if such non achievement is due to a substantial change in economic policies including the policy regarding import/export of a particular commodity as a result of which the throughput could not be achieved;
- (vii) Minimum annual riverine cargo throughput as per Article 7.1.12 is not met in at least 3 (three) years between the 4th (fourth) year and 8th (eighth) year of

Concession Period;

- (viii) Any representation made or warranties given by the Concessionaire under this Agreement is found to be false or misleading;
- (ix) The Concessionaire passing a resolution for voluntary winding up;
- (x) Appointment of a provisional liquidator, administrator, trustee or receiver of the whole or substantially whole of the undertaking of the Concessionaire by a court of competent jurisdiction in proceedings for winding up or any other legal proceedings;
- (xi) Occurrence of default under the Financing Documents pursuant to which the Senior Lenders exercise their rights to substitute the Concessionaire in accordance with the provisions of the Substitution Agreement;
- (xii) Levy of an execution or distraint on the Concessionaire's assets which has or is likely to have Material Adverse Effect and/or affect the Project/Project Facilities and Services, materially and such execution or distraint remaining in force for a period exceeding 90 (ninety) Days;
- (xiii) The Performance Guarantee is not maintained in terms of the provisions hereof;
- (xiv) The Concessionaire abandons or expresses its intention to revoke/terminate this Agreement without being entitled to do so as is expressly provided in the Agreement;
- (xv) A change in shareholding such that the beneficial interest of the Bidder/Consortium in the Concessionaire reduces below the limits set in Article 11.2 and/or Management Control of the Concessionaire has occurred in contravention of the provisions of Article 11 hereof;
- (xvi) Amalgamation of the Concessionaire with any other company or reconstruction or transfer of the whole or part of the Concessionaire's undertaking [other than transfer of assets in the ordinary course of business] in contravention with the provisions of Article 11 hereof; and
- (xvii) The Concessionaire engaging or knowingly allowing any of its employees, agents, Contractor or representative to engage in any activity prohibited under this Agreement and/or by law or which constitutes a breach of the Agreement or breach of or an offence under any law, in the course of any activity undertaken pursuant to this Agreement.

15.1.2. The Concessions Authority Event of Default

- (i) The Concessioneing Authority's failure to perform or discharge its obligations in accordance with the provisions of this Agreement unless such failure has occurred as a consequence of any Concessionaire Event of Default or a Force Majeure Event.
- (ii) Any representation made or warranties given by the Concessioneing Authority under this Agreement is found to be false or misleading.
- (iii) Appointment of a provisional liquidator, administrator or receiver of the whole or part of the Terminal's Assets in any legal proceedings initiated against the Concessioneing Authority (unless such proceedings are initiated as a consequence of any Concessionaire Event of Default).
- (iv) Levy of an execution or destraint on the Terminal's Assets in any proceedings against the Concessioneing Authority (unless such proceedings are initiated as a consequence of any Concessionaire Event of Default) which has or is likely to have Material Adverse Effect and such execution or destraint remaining in force for a period exceeding 90 (ninety) Days.

15.2. **Parties Rights**

15.2.1. Upon the occurrence of a Concessionaire Event of Default, the Concessioneing Authority shall without prejudice to any other rights and remedies available to it under this Agreement be entitled to terminate this Concession Agreement.

15.2.2. Upon the occurrence of a Concessioneing Authority Event of Default, the Concessionaire shall without prejudice to any other rights and remedies available to it under this Agreement be entitled to terminate this Concession Agreement.

Provided that before proceeding to terminate this Concession Agreement, the Party entitled to do so shall give due consideration and shall have due regard to the nature of the underlying Event of Default, its implication on the performance of the respective obligations of Parties under this Agreement and the circumstances in which the same has occurred.

15.3. **Consultation Notice**

15.3.1. Either Party exercising its right under Article 15.2, shall issue to the other Party a notice in writing specifying in reasonable detail the underlying Event of Default(s) and proposing consultation amongst the Parties and the Senior Lenders to consider possible measures of curing or otherwise dealing with the underlying Event of Default ("**Consultation Notice**").

15.4. **Remedial Process**

Following the issue of Consultation Notice by either Party, within a period not exceeding 90 (ninety) Days or such extended period as the Parties may agree (“**Remedial Period**”) the Parties shall, in consultation with the Senior Lenders, endeavour to arrive at an agreement as to the manner of rectifying or remedying the underlying Event of Default. Without prejudice to this, if the underlying event is a Concessionaire Event of Default, the Concessioning Authority shall in consultation with the Senior Lenders endeavour to arrive at an agreement as to one or more of the following measures and/or such other measures as may be considered appropriate by them in the attendant circumstances:

15.4.1. the change of management or control/ownership of the Concessionaire;

15.4.2. the replacement of the Concessionaire by a new operator (“**Selectee**”) proposed by the Senior Lenders (in terms of the Substitution Agreement), and the specific terms and conditions of such replacement which shall include:

- (a) the criteria for selection of the Selectee;
- (b) the transfer of rights and obligations of the Concessionaire surviving under this Agreement to the Selectee;
- (c) handing over/ transfer of the Project Site, the Terminal’s Assets and the Project Facilities and Services to the Selectee;
- (d) acceptance by the Selectee of the outstanding obligations of the Concessionaire under the Financing Documents and preserving Senior Lenders’ charge on the Concessionaire’s assets;
- (e) acceptance by the Selectee of any amounts due to the Concessioning Authority from the Concessionaire under this Agreement; and
- (f) payment of consideration for the Concessionaire’s assets comprised in the Project Facilities and Services and the manner of appropriation thereof.

15.5. Obligations during Remedial Period

15.5.1. During the Remedial Period, the Parties shall continue to perform their respective obligations under this Agreement which can be performed, failing which the Party in breach shall compensate the other Party for any loss or damage occasioned or suffered on account of the underlying failure/breach.

15.6. Revocation of Consultation Notice

15.6.1. If during the Remedial Period the underlying Event of Default is cured or waived or the Parties and the Senior Lenders agree upon any of the measures set out in Article 15.4, the Consultation Notice shall be withdrawn in writing by the Party who has

issued the same.

15.7. Termination due to Events of Default

15.7.1. If before the expiry of the Remedial Period, the underlying Event of Default is neither cured nor waived nor the Parties and the Senior Lenders have agreed upon any of the measures in accordance with Article 15.4, the Party who has issued the Consultation Notice shall have the right to terminate this Agreement, in which event, the provisions of Article 16 and 17 shall, to the extent expressly made applicable, apply.

15.8. Concessioneing Authority's Rights of Step-in

15.8.1. Upon a Termination Notice being issued due to a Concessioneing Event of Default, the Concessioneing Authority may, at its discretion:

- (a) re-enter upon and take possession and control of Project Site/Project Facilities and Services forthwith;
- (b) prohibit the Concessioneing and any Person claiming through or under the Concessioneing from entering upon/dealing with the Project Facilities and Services;
- (c) step in and succeed upon election by Concessioneing Authority without the necessity of any further action by the Concessioneing, to the interests of the Concessioneing under such of the Project Contracts as the Concessioneing Authority may in its discretion deem appropriate with effect from the date of communication of such election to the counter party to the relative Project Contracts.

15.8.2. Provided, that in such circumstances, the Concessioneing Authority shall assume the obligations of the Concessioneing with respect to the Senior Lenders during such Remedial Period out of the current revenues. Provided further, the Concessioneing acknowledges that any payments made by the Concessioneing Authority during the Remedial Period shall be adjusted against compensation payable by the Concessioneing Authority to the Concessioneing in terms of the provisions of this Agreement.

ARTICLE 16

16. Termination of Concession Agreement

16.1. Termination Procedure

16.1.1. The Party entitled to terminate this Concession Agreement either on account of a Force Majeure Event or on account of an Event of Default having Material Adverse Effect shall do so by issue of a notice in writing (“**Termination Notice**”) to the other Party and simultaneously deliver a copy thereof to the Senior Lenders. The Termination Notice shall be of not less than 90 (ninety) Days and not ordinarily be more than 180 (one hundred and eighty) Days, (“**Termination Period**”) and at the expiry of the Termination Period, this Agreement shall stand terminated without any further notice.

16.2. Obligations during Termination Period

16.2.1. During Termination Period, the Parties shall, subject where applicable to the provisions of this Article 16, continue to perform such of their respective obligations under this Agreement which are capable of being performed with the object, as far as possible, of ensuring continued availability of the Project Facilities and Services to the users, failing which the Party in breach shall compensate the other Party for any loss or damage occasioned or suffered on account of the underlying failure/breach.

16.3. Requisition

16.3.1. Except where the Termination Notice is issued prior to Financial Close being achieved by the Concessionaire, when the Concession Agreement has not come into effect the Concessionaire has no right hereunder and no compensation is payable by the Concessions Authority, upon issue or receipt as the case may be of Termination Notice, either as a consequence of a Force Majeure Event or as a consequence of an Event of Default, or otherwise 6 (six) months prior to the expiry of the Concession Period, the Concessions Authority shall by a notice in writing (“**Requisition**”) call upon the Concessionaire to furnish the following information to enable the Concessions Authority to estimate the likely compensation payable by the Concessions Authority to the Concessionaire and/or to finalise the items of Concessionaire’s assets comprised in the Project Facilities and Services to be handed over to/taken over by the Concessions Authority:

- (a) except in cases where no Financial Close has been achieved, the particulars of Debt Due supported by Senior Lenders’ certificate;
- (b) data or records including test certificates, survey reports, inspection reports, records of maintenance, statutory certificates issued for operation and establishment of the project facilities and services and regarding the operation and maintenance of the Project Facilities and Services;

- (c) specifications regarding the Concessionaire's assets comprised in the Project Facilities and Services; and
- (d) any other information or records [to be specified by Concessioneing Authority at its discretion] regarding Concessionaire, its business, the Project/Project Facilities and Services, assets and liabilities.

16.3.2. The Concessionaire shall within a period of 30 (thirty) Days of receipt of Requisition furnish the particulars called for by the Concessioneing Authority.

16.4. Condition Survey

16.4.1. The Concessionaire agrees that on the service of a Termination Notice or at least 6 (six) months prior to the expiry of the Concession Period, as the case may be, it shall conduct or cause to be conducted under the Concessioneing Authority's supervision, a condition survey of the Project Facilities and Services including the Project Site and/or the Terminal's Assets to ascertain the condition thereof, verifying compliance with the Concessionaire's obligations under this Concession Agreement and to prepare an inventory of the assets comprised in the Project Facilities and Services. During this period, the designated key personnel of the Concessioneing Authority shall be associated with the operations of the Project Facilities and Services (except when the same is impossible due to a Force Majeure Event) in order to facilitate smooth takeover of the same by the Concessioneing Authority on the Transfer Date.

16.4.2. If, as a result of the condition survey, the Concessioneing Authority shall observe/notice that the Project Site and/or the Terminal's Assets and/or the Project Facilities and Services or any part thereof have/has not been operated and maintained in accordance with the requirements therefor under this Concession Agreement (normal wear and tear excepted) the Concessionaire shall, at its cost and expenses, take all necessary steps to put the same in good working conditions well before the Transfer Date.

16.4.3. In the event the Concessionaire fails to comply with the provisions of this Concession Agreement, the Concessioneing Authority may itself cause the condition survey and inventory of Terminal's Assets and the Project Facilities and Services to be conducted. The Concessioneing Authority shall be compensated by the Concessionaire for any costs incurred in conducting such survey and preparation of inventory as also in putting the Project Facilities and Services in good working condition.

16.5. Consequences of Termination

16.5.1. Without prejudice to any other consequences or requirements under this Concession Agreement or under any law:

- (a) the Concessionaire shall transfer all the assets and rights upon expiry of the Concession Period by efflux of time or termination of the Agreement due to a

Force Majeure Event or on account of an Event of Default in accordance with Article 18;

- (b) the Concessioneing Authority shall be entitled to encash any subsisting bank guarantee(s) provided by the Concessionaire against any amounts owing to the Concessioneing Authority by the Concessionaire.

16.5.2. Notwithstanding anything contained in this Concession Agreement, except for ensuring the deposit of the compensation payable to the Concessionaire in accordance with Article 17 in the Escrow Account, the Concessioneing Authority shall not, as a consequence of termination or otherwise, have any obligation whatsoever to any third party including but not limited to obligations as to compensation for loss of employment, continuance or regularization of employment, absorption or re-employment on any ground, in relation to any person in the employment of or engaged by the Concessionaire in connection with the Project, and the handback of the Project Site/Terminal Assets/Project Facilities & Services by the Concessionaire to the Concessioneing Authority shall be free from any such obligation.

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ARTICLE 17

17.Compensation

17.1. Compensation

17.1.1. Termination due to Force Majeure Event

- (i) If the termination is due to a Non Political Event, compensation payable to the Concessionaire shall be the lower of the Book Value or the Debt Due LESS any amount due to the Concessioneing Authority by the Concessionaire under this Agreement LESS all insurance claims received or admitted.
- (ii) If the termination is due to an Other Event compensation payable to the Concessionaire shall be the higher of the Book Value or the Debt Due LESS any amount due to the Concessioneing Authority by the Concessionaire under this Agreement LESS all insurance claims received or admitted. Provided, the Book Value or the Debt Due, as the case may be shall not exceed the Total Project Cost.
- (iii) If termination is due to a Political Event, compensation payable to the Concessionaire shall be the same as that stipulated for termination due to a Concessioneing Authority Event of Default under Article 15.
- (iv) Provided, no compensation shall be payable to the Concessionaire if the Concessionaire fails to maintain Insurance Cover as contemplated under Article 12 of this Concession Agreement.

17.1.2. Termination due to Concessionaire Event of Default

If the termination is after the Date of Commercial Operation, due to a Concessionaire Event of Default, the compensation payable by the Concessioneing Authority to the Concessionaire shall be the lowest of:

- (i) the Book Value;
- (ii) 90% (ninety percent) of Debt Due;
- (iii) the Total Project Cost;

Provided, no compensation shall be payable to the Concessionaire if the Concessionaire fails to maintain Insurance Cover as contemplated under Article 12 of this Concession Agreement.

17.1.3. Termination due to Concessioneing Authority Event of Default

If the termination is due to a Concessioneing Authority Event of Default, the compensation payable by the Concessioneing Authority shall be equal to the aggregate of:

- (a) Debt Due plus
- (b) 150% (one hundred and fifty percent) Equity

17.2. **No Compensation on Expiry of Concession Period**

17.2.1. In the event of expiry of Concession Agreement by efflux of time (the Concession Agreement having run its full course), the Concessionaire shall hand over/ transfer peaceful possession of the Project Site including land, Terminal's Assets and the Project Facilities and Services free of cost and Encumbrance.

17.3. **Transfer Fee and Charges**

17.3.1. Transfer costs, stamp duties, notary fees and taxes, if applicable, for the transfer of the Project Facilities and Services consequent to the expiry or termination of this Concession Agreement shall be borne by:

- (a) the Concessionaire in the event of expiry of Concession Period or termination due to a Concessionaire Event of Default;
- (b) the Concessioneing Authority in the event of termination due to an Concessioneing Authority Event of Default or Political Event; and
- (c) by both parties equally in case of termination due to Change in Law or Non Political Event or Other Event.

17.4. **Payment of Compensation to Senior Lenders**

17.4.1. The Concessionaire hereby irrevocably authorises the Concessioneing Authority to pay to the Senior Lenders or at their instruction to any designated bank account in India the compensation payable to the Concessionaire. The Concessionaire confirms that upon such payment being made, the Concessioneing Authority shall stand duly discharged of its obligations regarding payment of compensation under this Concession Agreement and the charge created by the Concessionaire in favour of the Senior Lenders on any of its assets taken over by the Concessioneing Authority shall stand satisfied and all such assets shall on and from the Transfer Date be free from such charge. The Concessionaire

further confirms that payment of compensation by Concessioneing Authority in accordance with this Article 17.4 shall be a valid discharge to the Concessioneing Authority in respect of Concessioneing Authority's obligation regarding payment of compensation to the Concessioneaire under this Concessione Agreement.

17.4.2. Provided notwithstanding anything inconsistent contained in this Concessione Agreement, the Concessioneaire/the Senior Lenders as the case may be shall be entitled to remove at its/ their cost all such moveables which are not taken over by the Concessioneing Authority and to deal with the same in accordance with their respective rights under law.

17.4.3. Provided further, if there are no amounts outstanding under the Financing Documents and a certificate to that effect issued by the Senior Lenders is furnished by the Concessioneaire to the Concessioneing Authority, the compensation shall be paid by the Concessioneing Authority to the Concessioneaire directly.

17.5. Delayed Payment of Compensation

17.5.1. If for any reasons, other than those attributable to the Concessioneaire, the Concessioneing Authority fails to pay the compensation on the Transfer Date, the Concessioneing Authority shall be liable to pay interest @ 10 year GSEC plus 6% (six percent) per annum thereon from the Transfer Date till payment thereof. Provided, nothing contained in this Article shall be deemed to authorise any delay in payment of compensation in accordance with this Concessione Agreement.

17.6. Delayed Transfer of Assets

17.6.1. If for any reasons other than those attributable to the Concessioneing Authority the Concessioneaire fails to transfer assets, rights and contracts on the Transfer Date in accordance with Article 16.5 read with Article 18, there shall be no suspension of the operation and maintenance of the Project Facilities and Services and the Concessioneaire shall, as a trustee of the Concessioneing Authority,

- (a) continue to operate and maintain the Project Facilities and Services or such of them, as directed by Concessioneing Authority until completion of the relative transfer formalities and
- (b) account for and pay to the Concessioneing Authority the Project Revenue minus operating costs and statutory dues, from such operations. In the event of failure to do so, the Concessioneaire shall be liable to pay to the Concessioneing Authority, for every Day of delay, liquidated damages computed at the rate of the average daily profits earned during the 3 (three) years immediately preceding the Transfer Date. Parties confirm that this is a true and correct estimate of damages and not in the nature of a penalty. Provided nothing contained in this Article 17.6 shall be deemed or construed to authorise delay

in completion of formalities of transfer of assets, rights and contracts by the Concessionaire to the Concessioneing Authority in accordance with the requirements thereof under this Concession Agreement.

17.6.2. In case the transfer of assets by the Concessionaire to the Concessioneing Authority is delayed for reasons attributable to the Concessioneing Authority, the Concessionaire shall nonetheless continue to operate the Project Facilities and Services but as agent of the Concessioneing Authority. Provided however, the Concessionaire shall be liable to pay Royalty in accordance with Article 9.2.1.

17.7. Remedies Cumulative

17.7.1. The exercise of right by either Party to terminate this Agreement, as provided herein, shall not preclude, such Party from availing any other rights or remedies that may be available to it under law. All remedies available to the Parties shall be cumulative and the exercise or failure thereof of one or more remedies by any Party shall not limit or preclude the exercise of or constitute a waiver of any other remedies by such Party.

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ARTICLE 18

18. Transfer on expiry of Concession Period

18.1. General Scope of Transfer/Payment

18.1.1. The Parties shall perform/discharge their respective obligations to be performed or discharged under the provisions of this Concession Agreement on the Transfer Date in entirety. Without prejudice to the generality of this provision and the provisions of Article 16, the transactions to be consummated and the formalities to be completed by the Parties on the Transfer Date shall be as set out in Articles 18.2 and 18.3.

18.2. Concessionaire's Obligations

The Concessionaire shall;

18.2.1. hand over peaceful possession of the Project Site, Terminal's Assets, the Project and the Project Facilities and Services free of Encumbrance;

18.2.2. transfer all its rights, titles and interests in the assets comprised in the Project Facilities and Services which are required to be transferred to the Concessions Authority in accordance with this Concession Agreement and execute such deeds and documents as may be necessary for the purpose and complete all legal or other formalities required in this regard;

18.2.3. hand over to the Concessions Authority all documents including as built drawings, manuals and records relating to operation and maintenance of the Project Facilities and Services;

18.2.4. transfer technology and up-to-date know-how relating to operation and maintenance of the Terminal's Assets and/or the Project Facilities and Services;

18.2.5. transfer or cause to be transferred to the Concessions Authority any Project Contracts which are:

- (a) valid and subsisting;
- (b) capable of being transferred to the Concessions Authority; and
- (c) those the Concessions Authority has chosen to take over, and cancel or cause to be cancelled such Project Contracts not transferred to the Concessions Authority. For this purpose, the Concessionaire shall ensure that all Project Contracts are assignable in favor of the Concessions Authority without any further action on part of the respective counterparties. The Concessionaire shall entirely at its cost, terminate all such Project

Contracts which are not transferred/assigned and/or are not required to be transferred/assigned to the Concessing Authority;

18.2.6. at its cost, transfer to the Concessing Authority all such Applicable Permits which the Concessing Authority may require and which can be legally transferred. Provided if the termination is on account of Concessing Authority Event of Default the cost of such transfer shall be borne/ reimbursed by the Concessing Authority;

18.2.7. at its cost, remove within 90 (ninety) days from expiry of the Concession Period, from the Project Site/Terminal's Assets, any moveable assets that are not taken over by or not to be transferred to the Concessing Authority in terms of the provisions of this Concession Agreement.

18.3. Concessing Authority's Obligations

18.3.1. Except in the event of expiry of the Concession Agreement by efflux of time, the Concessing Authority shall pay compensation payable to the Concessionaire in accordance with Article 17.1 of this Concession Agreement, to the Senior Lenders, or deposit the same in the Escrow Account or on the written instructions of the Senior Lenders to any designated bank account in India, or to the Concessionaire, as the case may be. The Concessionaire confirms that upon such payment being made, the Concessing Authority shall stand duly discharged of its obligations regarding payment of compensation under this Concession Agreement and the charge created by the Concessionaire in favour of the Senior Lenders on any of the assets shall stand satisfied and all such assets shall on and from the Transfer Date be free from such charge.

18.3.2. The Concessionaire further confirms that payment of compensation by Concessing Authority in accordance with this Article 18.3 shall be a valid discharge to the Concessing Authority in respect of Concessing Authority's obligation regarding payment of compensation to the Concessionaire under this Concession Agreement.

18.4. Risk

18.4.1. Until transfer in accordance with this Article 18, the Terminal's Assets and the Project Facilities and Services shall remain at the sole risk of the Concessionaire except for any loss or damage caused to or suffered by the Concessionaire due to any act or omission or negligence on the part of the Concessing Authority under this Concession Agreement.

ARTICLE 19

19. Dispute resolution

19.1. Amicable settlement

19.1.1. If any dispute or difference or claims of any kind arises between the Concessing Authority and the Concessionaire in connection with interpretation or application of any terms and conditions or any matter or thing in any way connected with or in connection with or arising out of this Agreement, whether before or after the termination of this Agreement, then the Parties shall meet together promptly, at the request of any Party, in an effort to resolve such dispute, difference or claim by discussion between them.

19.2. Assistance of Expert

19.2.1. The parties, may, in appropriate cases agree to refer the matter to a legal Expert appointed by them with mutual consent. The cost of obtaining the service of the legal Expert shall be shared equally.

19.3. Arbitration

19.3.1. Arbitration

Failing amicable settlement and/or settlement with the assistance of legal expert appointed by the parties by mutual consent, the dispute or differences or claims as the case may be, shall be finally settled by binding arbitration under the Arbitration and Conciliation Act, 1996. Unless the parties mutually agree otherwise, within 30 (thirty) days of invocation of the arbitration as mentioned below, the rules of arbitration prescribed by the International Centre for Alternative Dispute Resolution, New Delhi shall apply to the arbitration. The arbitration shall be by a panel of three arbitrators, one to be appointed by each party and the third, who shall act as presiding arbitrator, to be appointed by the two arbitrators appointed by the parties. The arbitration shall be invoked by one party issuing to the other a notice in writing invoking the arbitration and appointing an arbitrator. Upon receipt of the notice, the other party shall appoint the second arbitrator. The two arbitrators so appointed shall appoint the third arbitrator who shall act as the 'Presiding Arbitrator'. If the other Party fails to appoint a second arbitrator within 30 (thirty) days from the receipt of the request to do so, then the arbitrator so appointed by the first party shall adjudicate the disputes as 'Sole Arbitrator'.

19.3.2. Place of arbitration

The place of arbitration shall be the headquarters of the Concessing Authority in India.

19.3.3. English language

The request for arbitration, the answer to the request, the terms of reference, any written submissions, any orders and rulings shall be in English and, if oral hearings take place, English shall be the language to be used in the hearings.

19.3.4. Procedure

The procedure to be followed within the arbitration, including appointment of arbitrator/arbitral tribunal, the rules of evidence which are to apply shall be in accordance with the Arbitration and Conciliation Act, 1996.

19.3.5. Enforcement of award

Any decision or award resulting from arbitration shall be final and binding upon the parties. The parties hereto agree that the arbitral award may be enforced against the parties to the arbitration proceeding or their assets wherever they may be found and that a judgment upon the arbitral award may be entered in any court having jurisdiction thereof.

19.3.6. Fees and expenses

The fees and expenses of the arbitrators and all other expenses of the arbitration shall be initially borne and paid equally by respective parties subject to determination by the arbitrators. The arbitrators may provide in the arbitral award for the reimbursement to the successful party of its costs and expenses in bringing or defending the arbitration claim, including legal fees and expenses incurred by the party. The fee of arbitration shall be determined according to the Arbitration and Conciliation Act, 1996.

19.3.7. Performance during arbitration

Pending the submission of and/or decision on a dispute, difference or claim or until the arbitral award is published, the Parties shall continue to perform all of their obligations under this Agreement without prejudice to a final adjustment in accordance with such award.

ARTICLE 20

20. Representations and warranties

20.1. Representations and warranties of the Concessionaire

The Concessionaire represents and warrants to the Concessioneing Authority that:

20.1.1. it is duly organised, validly existing and in good standing under the laws of India and hereby expressly and irrevocably waives any immunity in any jurisdiction in respect of this Agreement or matters arising thereunder including any obligation, liability or responsibility hereunder;

20.1.2. it has full power and authority to execute, deliver and perform its obligations under this Agreement;

20.1.3. it has taken all necessary action to authorise the execution, delivery and performance of this Agreement;

20.1.4. this Agreement constitutes the legal, valid and binding obligation of the Concessionaire, enforceable against it in accordance with the terms hereof;

20.1.5. there are no actions, suits or proceedings pending or to its best knowledge, threatened against or affecting it before any court, administrative body or arbitral tribunal which might materially and adversely affect its ability to meet or perform any of its obligations under this Agreement;

20.1.6. it has the financial standing and capacity to undertake the Project in accordance with the terms of this Agreement;

20.1.7. the execution, delivery and performance of this Agreement will not conflict with, result in the breach of, constitute a default under, or accelerate performance required by any of the terms of its memorandum of association and articles of association or any Applicable Laws or any covenant, contract, agreement, arrangement, understanding, decree or order to which it is a party or by which it or any of its properties or assets is bound or affected;

20.1.8. it has no knowledge of any violation or default with respect to any order, writ, injunction or decree of any court or any legally binding order of any Government Authority which may result in any Material Adverse Effect on its ability to perform its obligations under this Agreement and no fact or circumstance exists which may give rise to such proceedings that would adversely affect the performance of its obligations under this Agreement;

20.1.9. it has complied with Applicable Laws in all material respects and has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities

which in the aggregate have or may have a Material Adverse Effect on its ability to perform its obligations under this Agreement;

20.1.10. all its rights and interests in the Project/Project Facilities and Services shall pass to and vest in the Concessing Authority on the Transfer Date free and clear of all liens, claims and Encumbrances, without any further act or deed on its part or that of the Concessing Authority, and that none of the Project Terminal Assets shall be acquired by it, subject to any agreement under which a security interest or other lien or Encumbrance is retained by any person, save and except as expressly provided in this Agreement;

20.1.11. no representation or warranty by it contained herein or in any other document furnished by it to the Concessing Authority including the Bid or to any Government Authority in relation to Applicable Permits contains or will contain any untrue or misleading statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading;

20.1.12. no sums, in cash or kind, have been paid or will be paid, by it or on its behalf, to any person by way of fees, commission or otherwise for securing the Concession or entering into this Agreement or for influencing or attempting to influence any officer or employee of the Concessing Authority in connection therewith;

20.1.13. agrees that the execution, delivery and performance by it of this Agreement and all other agreements, contracts, documents and writings relating to this Agreement constitute private and commercial acts and not public or governmental acts; and

20.1.14. consents generally in respect of the enforcement of any judgement against it in any proceedings in any jurisdiction to the giving of any relief or the issue of any process in connection with such proceedings.

20.2. Representations and warranties of the Concessing Authority

The Concessing Authority represents and warrants to the Concessionaire that:

20.2.1. it is duly organised, validly existing and in good standing under the laws of India;

20.2.2. it has full power and authority to execute, deliver and perform its obligations under this Agreement;

20.2.3. it has taken all necessary action to authorise the execution, delivery and performance of this Agreement;

20.2.4. this Agreement constitutes the legal, valid and binding obligation of the Concessing Authority, enforceable against it in accordance with the terms hereof; and

20.2.5. there are no actions, suits or proceedings pending or to its best knowledge,

threatened against or affecting it before any court, administrative body or arbitral tribunal which might materially and adversely affect its ability to meet or perform any of its obligations under this Agreement.

20.3. **Disclosure**

20.3.1. In the event that any occurrence or circumstance comes to the attention of either Party that renders any of its aforesaid representations or warranties untrue or incorrect, such Party shall immediately notify the other Party of the same. Such notification shall not have the effect of remedying any breach of the representation or warranty that has been found to be untrue or incorrect nor shall it adversely affect or waive any obligation of either Party under this Agreement.

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ARTICLE 21

21. Miscellaneous provisions

21.1. Amendments

21.1.1. No amendment or waiver of any provision of this Agreement, nor consent to any departure by any of the parties therefrom, shall in any event be effective unless the same shall be in writing and signed by the parties hereto and then such waiver or consent shall be effective only in the specific instance and for the specified purpose for which given.

21.2. Agreement to override other Agreements

21.2.1. This Agreement supersedes all previous agreements or arrangements between parties, including any memoranda of understanding entered into in respect of the contents hereof and represents the entire understanding between the parties in relation thereto.

21.3. Survival of Obligations

21.3.1. Any cause of action which may have occurred in favour of either Party or any right which is vested in either Party under any of the provisions of this Agreement during the Concession Period as the case may be as a result of any act, omission, deed, matter or thing done or omitted to be done by either Party before the expiry of the Concession Period by efflux of time or otherwise in accordance with the provisions of this Agreement shall survive the expiry of the Concession Period/ termination of this Agreement.

21.4. Articles to survive Termination

21.4.1. The provisions of Articles 16 to 21 shall, to the fullest extent necessary to give effect thereto, survive the Concession Period/the termination of this Agreement and the obligations of Parties to be performed/discharged following the termination/early determination of this Agreement shall accordingly be performed/discharged by the Parties.

21.5. Joint Responsibility

21.5.1. In the event that any damage is caused partly due to the negligence or default or omission on the part of the Concessioneing Authority and partly due to the negligence or default or omission on the part of the Concessionaire, each Party shall be liable to the other Party only in the proportion to its respective degree of negligence or default or omission, as the case may be.

21.6. Several Obligations

21.6.1. Nothing contained in this Agreement shall be construed to create an association, trust, partnership, agency or joint venture among the Parties and Parties shall be liable to perform their respective duties and discharge their respective liabilities or obligations in accordance with the provisions of this Agreement.

21.7. Severability

21.7.1. If for any reason whatsoever any provision or any part(s) of this Agreement is held or shall be declared to be void or illegal or invalid under present or future laws or regulations effective and applicable during the Concession Period, by any competent arbitral tribunal or court, and if such provisions shall be fully separable and this Concession shall be constructed as if such provision or such part(s) of this Agreement never comprised part of this Agreement and the remaining provisions of this Agreement shall remain in full force and effect and shall not be affected by such void or illegal or invalid provision or by its severance from this Agreement.

21.8. Waiver; remedies

21.8.1. No failure on the part of any party to exercise, and no delay in exercising any right, power or privilege hereunder shall operate as a waiver thereof or a consent thereto; nor shall any single or partial exercise of any such right, power or privilege preclude any other or further exercise thereof or the exercise of any other right, power or privilege. The remedies herein provided are the cumulative and not exclusive of any remedies provided by applicable law.

21.9. Severance of terms

21.9.1. If any provisions of this Agreement are declared to be invalid, unenforceable or illegal, by any competent arbitral tribunal or court, such invalidity, un-enforceability or illegality shall not prejudice or affect the remaining provisions of this Agreement which shall continue in full force and effect and shall not be affected by such void.

21.10. Language

21.10.1. All notices, certificates, correspondence or other communications under or in connection with this Agreement, and Project contracts, if any, or the Project shall be in English.

21.11. Confidentiality

21.11.1. No Party shall, without the prior written consent of the other Parties, at any time divulge or disclose or suffer or permit its servants or agents to divulge or disclose to any person or use for any purpose unconnected with the Project any information which is, by its nature or it marked "proprietary material", concerning the other (including any information concerning the contents of this Agreement) except to their respective

officers, directors, employers, agents, representatives and professional advisors or as may be required by any law, rule, regulation or any judicial process for period of five years after the transfer date; provided, however, that any Party, with the written consent of the other Parties, may issue press releases containing non-sensitive information in relation to the progress of the Project. This article shall not apply to information:

- (a) Already in the public domain, otherwise than by breach of this Agreement.
- (b) Already in the possession of the receiving party before it was received from any other party in connection with this Agreement and which was not obtained under any obligation of confidentiality; or
- (c) Obtained from a third party who is free to divulge the same and which was not obtained under any obligation of confidentiality.
- (d) Disclosure to lenders under terms of confidentiality.

21.12. Notices

Any notice to be given thereunder shall be in writing and shall either be delivered personally or sent by registered post, telex, facsimile transmission, electronic mail or other means of telecommunication in permanent written form. The addresses and numbers for service of notice shall be given to the Parties at their respective addresses set forth below:

The Concessioneing Authority:

CHAIRMAN

Fax No: Email:

This Agreement and the Annexures together constitute a complete and exclusive statement of the terms of the agreement between the Parties. All prior written or oral understandings, offers or other communications of every kind pertaining to this Agreement unless specifically retained in this Agreement and the Annexures, by reference or otherwise, are abrogated and withdrawn.

IN WITNESS WHEREOF, the Parties, intending to be legally bound, have caused this Agreement on the dates indicated next to their signatures below:

Common Seal of the Concessing Authority is affixed pursuant to its resolution dated _____ of the Board in the presence of Mr. _____ who has signed this Agreement in token thereof.

Signed and Delivered by the Concessionaire by the hand of its authorized representative Mr. _____ pursuant to Resolution dated _____ of its Board of Directors.

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22. Annexures

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23. Annexure I: Project site

Please refer to the attached CAD drawing for Project site's details including Terminal and connectivity features.

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24. Annexure II: Terminal's assets

The following is the list of Terminal's assets to be handed over to the Concessionaire.

S No	Item Description	Value (INR crore)
1	Approach Trestle 1, 2, 3 & 4	84.37
2	Berths 1, 2, 3 & 4	151.98
3	Transfer Tower & Conveyor, Staircase, Silo	15.83
4	Gate Complex	1.07
5	Boundary Wall	6.92
6	Water Supply	0.15
7	Drainage	7.55
8	Cable Trench	2.01
9	Swing Gates	0.03
10	Overhead Tank	0.34
11	Settling Pond	0.38
12	Sewage Treatment Plant	0.83
13	UG Tank Pump Room	0.65
14	Roads	19.35
15	Buildings	12.34
16	Minor Bridges	3.90
17	Weigh Bridge	0.47
18	Conveyors, Silos, Transfer Towers, Electrical, Automation, Fire Fighting, Barge Loader	81.51
19	Yard Handling Machinery	-
a	Fork Lift	0.32

b	Front End Loader	0.84
	Total	390.83

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25. Annexure III: Scope of Work

The scope of work (“Scope of Work”) shall mean and include the following:

Terminal Equipment Phase

Development/Equipment Works shall mean and include the following:

1. preparation of the DTR for Terminal Equipment Phase
2. the design, planning, procurement and installation of equipment at Terminal to increase design capacity of Terminal to at least 3.07 mmtpa;
3. to increase design capacity of Terminal to at least 3.07 mmtpa the Concessionaire shall mandatorily complete procurement and installation of equipment not later than 4th anniversary of COD.
4. As per DPR shared in Annexure XVI with this Agreement, design capacity of Terminal can be increased to at least 3.07 mmtpa by introducing the following equipment:

S No	Equipment	Number
1	Mobile harbor crane	1
2	Dumper trucks	10

The Concessionaire may adopt a different approach towards increasing design capacity of Terminal to at least 3.07 mmtpa as per DTR approved for Terminal Expansion Phase by Independent Engineer.

For avoidance of doubt, it may be clarified that any equipment on lease shall be considered out of scope of Terminal Equipment Phase as given in this Agreement.

Operation and Maintenance

1. Operation and maintenance of the terminal’s assets as mentioned in Annexure II handed over to the Concessionaire by the Concessioneing Authority in accordance with the provisions of this Agreement, applicable laws and applicable permits.
2. Performance and fulfilment of all other obligations of the Concessionaire and matters incidental thereto or necessary for the performance of any or all of the obligations of the Concessionaire under this Agreement, in accordance with the provisions of this Agreement, applicable laws and applicable permits.

26. Annexure IV: Performance Standards and damages

The following are the performance standards for the Concession agreement for the Terminal

S No	Key Performance Indicator	Threshold	Measurement
1	Equipment reliability (maintenance)	Greater than 95%	<ul style="list-style-type: none"> • Frequency: Quarterly • Actual Equipment reliability = $(1 - [\text{Downtime hours} / \text{Total deployed hours}]) \times 100$ <p>Wherein:</p> <p>Downtime hours is the actual number of hours during which the equipment was not running due to failure of the equipment</p> <p>Total deployed hours is the total number of hours for which an equipment is given to the operations team</p>
2	Equipment availability (maintenance)	Greater than 90%	<ul style="list-style-type: none"> • Frequency: Quarterly • Actual equipment availability = $(1 - ((\text{Planned maintenance hours} + \text{downtime hours}) / \text{total deployed hours})) \times 100$ <p>Wherein:</p> <p>Planned maintenance hours is the actual number of preventive maintenance hours during which the equipment was not running</p> <p>Downtime hours is the actual number of hours during which the equipment was not running due to failure of the equipment</p> <p>Total deployed hours is the total number of hours for which an equipment is given to the operations team</p>
3	Average container	Greater than 10 containers per hour	<ul style="list-style-type: none"> • Frequency: Quarterly • Relevant for Cranes only

S No	Key Performance Indicator	Threshold	Measurement												
	moves (operational)		<ul style="list-style-type: none"> Actual average container moves = Number of container moves/effective crane working hours <p>Wherein:</p> <p>Container moves means the total number of container moves made by the crane</p> <p>Effective crane working hours means the time for which the crane was deployed measured by the HMR (Hour meter reading) device on the crane</p>												
4	Average conveyor handling rate (operational)	<p>Thresholds as given below:</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Commodity</th> <th>Minimum handling rate (MT/Hour)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Fly ash</td> <td>150</td> </tr> <tr> <td>2</td> <td>Coal</td> <td>150</td> </tr> <tr> <td>3</td> <td>Others</td> <td>150</td> </tr> </tbody> </table>	S. No.	Commodity	Minimum handling rate (MT/Hour)	1	Fly ash	150	2	Coal	150	3	Others	150	<ul style="list-style-type: none"> Frequency: Quarterly Actual average handling rate = Cargo handled /effective conveyor working hours <p>Wherein:</p> <p>Cargo handled means the total amount of bulk, break-bulk and liquid cargo in metric tonnes handled by the crane</p> <p>Effective conveyor working hours means the time for which the crane was deployed measured by the HMR (hour meter reading) device on the crane</p>
S. No.	Commodity	Minimum handling rate (MT/Hour)													
1	Fly ash	150													
2	Coal	150													
3	Others	150													
5	Average crane handling rate (operational)	<p>Thresholds as given below:</p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Commodity</th> <th>Minimum handling rate (MT/Hour)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Petroleum products</td> <td>16</td> </tr> <tr> <td>2</td> <td>Chemicals</td> <td>16</td> </tr> <tr> <td>3</td> <td>Others</td> <td>16</td> </tr> </tbody> </table>	S. No.	Commodity	Minimum handling rate (MT/Hour)	1	Petroleum products	16	2	Chemicals	16	3	Others	16	<ul style="list-style-type: none"> Frequency: Quarterly Actual average handling rate = Cargo handled /effective crane working hours <p>Wherein:</p> <p>Cargo handled means the total amount of bulk, break-bulk and</p>
S. No.	Commodity	Minimum handling rate (MT/Hour)													
1	Petroleum products	16													
2	Chemicals	16													
3	Others	16													

S No	Key Performance Indicator	Threshold	Measurement
			liquid cargo in metric tonnes handled by the crane <ul style="list-style-type: none"> • Effective crane working hours means the time for which the crane was deployed measured by the HMR (hour meter reading) device on the crane
6	Average turnaround time of trucks (operational)	Less than 120 minutes	<ul style="list-style-type: none"> • Frequency: Quarterly • Actual average turnaround of trucks = $\Sigma(\text{Gate out time} - \text{Gate in time}) / \text{total number of trucks}$ <p>Wherein:</p> <p>Gate-in time means time at which the driver enters terminal gate</p> <p>Gate-out time means time of reception of documentation which would allow the truck to exit the terminal</p>

Performance evaluation and calculation of liquidated damages

Performance evaluation shall be made on a quarterly review of the reports furnished by the Concessionaire and/or the records of the Concessionaire and/or by an enquiry by the Concessioning Authority.

The Concessionaire shall be liable to pay liquidated damages determined as per the following:

- (i) at the rate of 5% (five per cent) of the Royalty of the respective quarter for shortfall upto 10% (ten per cent) in the average performance
- (ii) at the rate of 12.5% (twelve point five per cent) of the Royalty of the respective quarter for shortfall between 10% (ten per cent) and 20% (twenty per cent) in the average performance
- (iii) at the rate of 22.5% (twenty two point five per cent) of the Royalty of the respective quarter for shortfall between 20% (twenty per cent) and 30% (thirty per cent) in the average performance
- (iv) at the rate of 35% (thirty five per cent) of the Royalty of the respective quarter for shortfall between 30% (thirty per cent) and 40% (forty per cent) in the average performance
- (v) at the rate of 50% (fifty per cent) of the Royalty of the respective quarter for shortfall between 40% (forty per cent) and 50% (fifty per cent) in the average performance which shall be assessed in the manner as described below.

Each Performance Standard is calculated as an average in the manner indicated above. The actual average performance vis-à-vis a standard will be evaluated against the prescribed standard. The shortfall will be computed as a percentage of the prescribed standard. The shortfall in respect of each performance standard will have a weightage assigned to it.

The overall shortfall in average performance shall be assessed as the aggregate of the weighted shortfalls in respect of each of the Performance Standards. The following weights would be applied:

KPI	Equipment reliability (v)	Equipment availability (w)	Truck turnaround time (x)	Average container moves (y)	Average handling rate (z)
Weight	20%	20%	10%	25%	25%

Based on the above table, the overall shortfall in average performance will be $(0.2v + 0.2w + 0.1x + 0.25y + 0.25z)$ %.

The maximum Royalty charged as damages would be limited to 50% (fifty per cent) in the respective quarter.

No liquidated damages shall be paid before 1st anniversary of COD. After 1st anniversary and before 4th anniversary of the COD, liquidated damages shall be calculated on basis on Notional Royalty of the respective quarter.

If Performance Standards for KPIs are not met by operator for 4 (four) consecutive quarters, the Concessing Authority will initiate a performance assessment to identify improvement areas. The Concessionaire shall be allowed a time period of 2 (two) consecutive quarters to improve areas of performance shortfall, during which no action will be taken by Concessing Authority. If Performance Standards for KPIs are not met even at the end of 6 (six) consecutive quarters, it may be considered as case of contract termination by the Concessing Authority.

Calculation of penalty in case of shortfall in LAD maintenance

The Concessing Authority shall be liable for penalty to the Concessionaire at a specific location/stretch in event of LAD shortfall discovered by unsuccessful passage of vessel through waterway as certified/ validated by the Independent Surveyor. The Concessing Authority shall be liable for such penalty only in stretches upstream of Tribeni which is located at a chainage distance of 193 km on National Waterway-1. For avoidance of doubt, it is stated that the Concessing Authority shall not be liable for such penalty in stretches downstream of Tribeni. The Concessing Authority shall also be liable for such penalty in the 7 km long connecting channel between the Terminal and National Waterway-1.

Independent Surveyor shall validate/ certify that unsuccessful passage is not due to Concessionaire default subject to the following conditions:

- i. Concessionaire has taken an informed decision about the size and draft of the vessel and volume of cargo that can pass through National Waterway-1 by duly checking the LAD information updated periodically by the Authority on their website or any other source of information used in the future.
- ii. Concessionaire has adhered to the National Waterway-1 channel as declared by the Authority in their navigational charts updated periodically.

Concessionaire will immediately communicate such instance to the Concessing Authority. The Concessing Authority will then have 48 (forty eight) hours to rectify the shortfall in LAD to ensure passage of vessel. Liability for penalty will arise only if there is LAD shortfall for a period greater than an initial duration of 48 hours from the exact time of receiving written validation from Independent Surveyor that unsuccessful vessel passage was due to LAD shortfall on National Waterway-1. Liability for penalty shall arise only if period of unsuccessful vessel passage due to LAD shortfall exceeds 48 hours and not for the initial duration of 48 hours.

Penalty component shall be assessed by the Independent Surveyor. Penalty component by the Concessing Authority shall be adjusted from the Royalty payments due from the Concessionaire and the Concessionaire shall make reduced Royalty payment to the Concessing Authority with specific relation to the volume of cargo being carried in the particular vessel.

Penalty component shall be capped at 50% of Royalty for the vessel unable to pass due to shortfall in LAD which shall be calculated on the basis of Royalty per MT to be paid by Concessionaire and volume of cargo carried by the vessel which was delayed due to LAD shortfall.

The Concessions Authority shall be liable for penalty commensurate to loss of productivity induced for the particular vessel which was delayed due to LAD shortfall. Penalty payable will be calculated on basis of performance shortfall induced in operational KPIs for the Concessionaire. The induced performance shortfall for the Concessionaire will be used to calculate a notional penalty which would have been paid by the Concessionaire if there was equal operational performance shortfall only for the duration when LAD was not available beyond 48 hours.

The notional penalty amount arrived at as stated above will be the liability for penalty by Concessions Authority to the Concessionaire as compensation for LAD shortfall for a period exceeding 48 hours. The same has been illustrated with an example below.

If a 1,500 MT vessel carrying bulk cargo is unable to pass through waterway due to LAD shortfall for a duration of 72 hours, the Concessions Authority will pay penalty for loss of operational performance for the period of 24 hours, which is the period exceeding initial duration of 48 hours. If the quoted royalty is INR 100 per MT, the total Royalty payable by Concessionaire shall amount to INR 1,50,000 only (100 per MT x 1500 MT).

As also given above regarding Performance Standards for Concessionaire, liability for penalty shall be capped at 50% of Royalty payable by Concessionaire for cargo carried by vessel which was unable to pass due to LAD shortfall.

For avoidance of doubt, it may be stated that the maximum liability for penalty as calculated above shall be the upper cap of Royalty that the Concessions Authority shall forgo.

Amount of liability for penalty shall be calculated based on performance shortfall induced by unsuccessful vessel passage due to insufficient LAD as validated by Independent Surveyor. An illustration of the same is given below.

Calculation of induced performance shortfall

Assuming that the vessel has bulk cargo for which threshold average handling rate has been defined as 150 MT per hour for the Concessionaire. Accordingly it would have taken 10 (ten) hours to unload cargo. Due to vessel delay the time for unloading cargo will increase by 24 (twenty four) hours and total actual time for unloading cargo will be 34 hours. Therefore, actual average handling rate for the vessel = $1500 / 34 = 44.12$ MT per hour
Induced performance shortfall for average handling rate = $(150 - 44.12)/150 = 70.59\%$
Assuming other KPIs remain unaffected, average induced performance shortfall = $0.25 \times 70.59 = 17.65\%$

Calculation of notional penalty corresponding to induced performance shortfall

Notional penalty for average induced performance shortfall of 17.65% = 12.5% of royalty as per bands stipulated in case of non-adherence to KPIs by Concessionaire.
Therefore, notional penalty = 12.5% of 1,50,000 = 18,750

Notional penalty of average induced performance shortfall of 17.65% = 18,750

As per above example used only for illustrative purpose, the Concessions Authority will be liable for penalty of INR 18,750 to the Concessionaire for a 24 hour period of delay in vessel passage due to LAD shortfall.

This amount shall be adjusted in the royalty payments by the Concessionaire to the Concesssioning Authority.

Before 2nd anniversary of the COD, the Concesssioning Authority shall not be liable to pay any penalty for shortfall in LAD.

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27. Annexure V: Terms of Reference for Independent Engineer and Independent Surveyor

1. Role and functions of the Independent Engineer

The Independent Engineer is expected to play a positive and independent role in discharging its functions, thereby facilitating the smooth implementation of the project. The role and functions of the Independent Engineer shall include the following:

- (i) review of DTR;
- (ii) review, inspection and monitoring of Development/Equipment Works;
- (iii) conducting tests on completion of development/equipment and issuing Completion/Provisional Certificate;
- (iv) determining, as required under the Agreement, the costs of any works or services and/or their reasonableness;
- (v) determining, as required under the Agreement, the period or any extension thereof, for performing any duty or obligation;
- (vi) assisting the parties in resolution of disputes as regards the designs & drawings; and
- (vii) undertaking all other duties and functions as envisaged under the Agreement.

2. Review of DTR

- (i) The Independent Engineer shall undertake a detailed review of the DTR to be furnished by the Concessionaire along with supporting data. The Independent Engineer shall complete such review and send its comments in accordance with the Agreement. In particular, such comments shall specify the conformity or otherwise of such DTR with the Scope of Work and Standards.
- (ii) The Independent Engineer shall review the detailed design, development methodology, quality assurance procedures and the procurement, engineering and development time schedule sent to it by the Concessionaire and furnish its comments. The Independent Engineer shall take into account comments and suggestions of the Concessioning Authority, if any while furnishing the comments.
- (iii) The Independent Engineer shall review the monthly progress reports as regards the Construction Works.
- (iv) The Independent Engineer shall inspect the Development/Equipment Works once every Month, preferably after receipt of the monthly progress report from the Concessionaire, but before the 20th (twentieth) Day of each month in any case, and make out a report of such inspection (“**Inspection Report**”) setting forth an overview of the

status, progress, quality and safety of construction, including the work methodology adopted, the materials used and their sources, and conformity of Development/Equipment Works with the Standards. In a separate section of the Inspection Report, the Independent Engineer shall describe in reasonable detail the lapses, defects or deficiencies observed by it in the Development/Equipment Works.

(v) The Independent Engineer may inspect the Development/Equipment Works more than once in a month if any lapses, defects or deficiencies require such inspections

(vi) For determining that the Development/Equipment Works conform to Standards, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests on a sample basis, to be specified by the Independent Engineer in accordance with Good Industry Practice for quality assurance. The Independent Engineer shall issue necessary directions to the Concessionaire for ensuring that the tests are conducted in a fair and efficient manner, and shall monitor and review the results thereof.

(vii) The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Concessionaire for its own quality assurance in accordance with Good Industry Practice.

(viii) In the event that the Concessionaire carries out any remedial works for removal or rectification of any defects or deficiencies, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests to determine that such remedial works have brought the Construction Works into conformity with the Standards.

(ix) In the event that the Concessionaire fails to adhere to the Project Schedule and complete the Development/Equipment Works on the specified Milestone Dates, the Independent Engineer shall undertake a review of the progress of development/equipment works and identify potential delays, if any. If the Independent Engineer shall determine that completion of the Project is not feasible within the time specified in the Agreement, it shall require the Concessionaire to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project shall be completed. Upon receipt of a report from the Concessionaire, the Independent Engineer shall review the same and send its comments to the Concessions Authority and the Concessionaire forthwith.

(x) If at any time during the Terminal Equipment Phase, the Independent Engineer determines that it is not safe to carry on Development/Equipment Works for any reason whatsoever including if the Concessionaire has not made adequate arrangements for the safety of workers or other third parties or that any work is being carried out in a manner that threatens such safety, it shall make a recommendation to the Concessions Authority forthwith, identifying the whole or part of the Development/Equipment Works that should be suspended for ensuring safety in respect thereof.

(xi) Upon remedial measures being taken by the Concessionaire for securing the safety of suspended works, the Independent Engineer shall inspect the safety measures for adequacy and recommend whether or not such suspension may be revoked by the Concessions Authority.

(xii) If suspension of Development/Equipment Works is for reasons not attributable to the Concessionaire, the Independent Engineer shall determine the extension of time for completion, to which the Concessionaire is reasonably entitled, and shall notify the Concessioning Authority and the Concessionaire of the same.

(xiii) The Independent Engineer shall carry out, or cause to be carried out, all the Tests specified in the Annexure hereto and issue a Completion Certificate or Provisional Certificate, as the case may be, in accordance with the provisions of the Agreement.

3. Role and functions of the Independent Surveyor

The Independent Surveyor is expected to play a positive and independent role in discharging its functions, thereby facilitating the smooth implementation of the project. The role and functions of the Independent Surveyor shall include the following:

3.1 Validating occasions of unsuccessful vessel passage due to insufficient LAD. The Independent engineer shall validate/ certify that unsuccessful passage is not due to Concessionaire default subject to the following conditions:

- i. Concessionaire has taken an informed decision about the size of the vessel and volume of cargo that can pass through the waterway by checking the LAD information updated weekly by the Authority on their website or any other source of information used in the future.
- ii. Concessionaire has adhered to the waterway channel as declared by the Authority in their navigational charts updated periodically.

3.2. Validating penalty payable by Concessioning Authority in case of occasions of insufficient LAD

28. Annexure VI: ESCROW Agreement

THIS ESCROW AGREEMENT is entered into on this the [●] Day of [●] 20[●].

By and Amongst:

1. [●], a company incorporated under the provisions of the Companies Act, 2013 and having its registered office at [●] (hereinafter referred to as the “Concessionaire” which expression shall, unless repugnant to the context or meaning thereof, include its successors, permitted assigns and substitutes);
2. [● (name and particulars of Senior Lenders' Representative)] and having its registered office at [●] acting for and on behalf of the Senior Lenders as their duly authorised agent with regard to matters arising out of or in relation to this Agreement (hereinafter referred to as the “Senior Lenders' Representative” which expression shall, unless repugnant to the context or meaning thereof, include its successors and substitutes);
3. [● (name and particulars of the Escrow Bank)] and having its registered office at [●] (hereinafter referred to as the “Escrow Bank” which expression shall, unless repugnant to the context or meaning thereof, include its successors and substitutes); and
4. **INLAND WATERWAYS CONCESSIONING AUTHORITY OF INDIA**, a statutory body established by the Government of India under the provisions of Inland Waterways Concessioning Authority of India Act, 1985, having its head office at, A-13, Sector -1, Noida – 201 301, Uttar Pradesh, represented by its [Chairman] (hereinafter referred to as the “**Concessioning Authority**”, which expression shall, unless repugnant to the context or meaning thereof, include its successors and assigns).

WHEREAS:

- (i) The Concessioning Authority has entered into a Concession Agreement dated [●] with the Concessionaire (the “**Concession Agreement**”) for undertaking the Project (as defined in the Concession Agreement) on EOT basis. The Senior Lenders have agreed to finance the Project in accordance with the terms and conditions set forth in the Financing Documents.
- (ii) The Concession Agreement requires the Concessionaire to establish an Escrow Account, inter alia, on the terms and conditions stated therein.

NOW IT IS HEREBY AGREED as follows:

1. Definitions and Interpretations

1.1 Definitions

In this Agreement, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them:

“**Agreement**” means this Escrow Agreement and any amendment thereto made in accordance with the provisions contained herein;

“**Budget**” means the budget for development/implementation expenses relating to the Project/Project Facilities and Services and operation and maintenance Expenses submitted by the Concessionaire in accordance with the provisions contained herein;

“**Concession Agreement**” means the Agreement dated with the Concessionaire for undertaking the Project on EOT basis Concession Agreement and shall include any amendments made thereto in accordance with the provisions contained in this behalf therein;

“**Escrow Account**” means an escrow account established in terms of and under this Agreement, and shall include any sub accounts thereof;

“**Escrow Default**” shall have the meaning ascribed thereto in Article 6.1;

“**Senior Lenders' Representative**” means the person referred to as the Senior Lenders' Representative in the foregoing Recitals;

“**Parties**” means the parties to this Agreement collectively and “**Party**” shall mean any of the Parties to this Agreement individually;

“**Payment Date**” means, in relation to any payment specified in Article 4.1, the date(s) dates specified for such payment; and

“**Quarter**” means, any three month period from 1st April to 30th June, 1st July to 30th September, 1st October to 31st December or 1st January to 31st March.

1.2 Interpretation

1.2.1 References to Senior Lenders' Representative shall, unless repugnant to the context or meaning thereof, mean references to the Senior Lenders' Representative, acting for and on behalf of Senior Lenders.

1.2.2 The words and expressions beginning with capital letters and defined in this Agreement shall have the meaning ascribed thereto herein, and the words and expressions used in this Agreement and not defined herein but defined in the Concession Agreement shall, unless repugnant to the context, have the meaning ascribed thereto in the Concession Agreement.

1.2.3 References to Articles are, unless stated otherwise, references to Articles of this Agreement.

1.2.4 The rules of interpretation stated in Articles 1.3, 1.4 and 1.5 of the Concession Agreement shall apply, mutatis mutandis, to this Agreement.

2. Escrow Account

2.1 Escrow Bank to act as trustee

2.1.1 The Concessionaire hereby settles in trust with the Escrow Bank a sum of INR 100 (Rupees Hundred Only) appoints the Escrow Bank to act as trustee for the Concessioneing Authority, the Senior Lenders, the Senior Lenders' Representative and the Concessionaire in connection herewith and authorises the Escrow Bank to exercise such rights, powers, authorities and discretion as are specifically delegated to the Escrow Bank by the terms hereof together with all such rights, powers, authorities and discretion as are reasonably incidental hereto, and the Escrow Bank accepts such appointment pursuant to the terms hereof.

2.1.2 The Concessionaire hereby declares that all rights, title and interest in and to the Escrow Account shall be vested in the Escrow Bank and held in trust for the Concessioneing Authority, the Senior Lenders, the Senior Lenders' Representative and the Concessionaire, and applied in accordance with the terms of this Agreement. No person other than the Concessioneing Authority, the Senior Lenders/Senior Lenders' Representative and the Concessionaire shall have any rights hereunder as the beneficiaries of, or as third party beneficiaries under this Agreement.

2.2 Acceptance of Escrow Bank

The Escrow Bank hereby agrees to act as such and to accept all payments and other amounts to be delivered to and held by the Escrow Bank pursuant to the provisions of this Agreement. The Escrow Bank shall hold and safeguard the Escrow Account during the term of this Agreement and shall treat the amount in the Escrow Account as monies deposited by the Concessionaire, Senior Lenders or the Concessioneing Authority with the Escrow Bank. In performing its functions and duties under this Agreement, the Escrow Bank shall act in trust for the benefit of, and as agent for, the Concessioneing Authority, the Senior Lenders' Representative and the Concessionaire or their nominees, successors or assigns, in accordance with the provisions of this Agreement.

2.3 Establishment and operation of Escrow Account

2.3.1 Within 30 (thirty) Days from the date of this Agreement, and in any case prior to the Date of Award of Concession, the Concessionaire shall open and establish the Escrow Account with the [(name of Branch)] Branch of the Escrow Bank. The Escrow Account shall be denominated in Rupees.

2.3.2 The Escrow Bank shall maintain the Escrow Account in accordance with the terms of this Agreement and its usual practices and applicable regulations, and pay the maximum rate of interest payable to similar customers on the balance in the said account from time to time.

2.3.3 The Concessionaire shall submit to the Escrow Bank a Budget within 7 (seven) Days of the commencement of each Financial Year. Till the pendency of the financing Documents, such Budget shall be approved by the Senior Lenders/Senior Lenders Representative and thereafter by the Concessioneing Authority.

2.3.4 The Escrow Bank and the Concessionaire shall, after consultation with the Senior Lenders' Representative, agree on the detailed mandates, terms and conditions, and operating procedures for the Escrow Account, but in the event of any conflict or inconsistency between this Agreement and such mandates, terms and conditions, or procedures, this Agreement shall prevail.

2.4 Escrow Bank's fee

The Escrow Bank shall be entitled to receive its fee and expenses in an amount, and at such times, as may be agreed between the Escrow Bank and the Concessionaire. For the avoidance of doubt, such fee and expenses shall form part of the operating and maintaining expenses and shall be appropriated from the Escrow Account in accordance with Article 4.1.1 (c).

2.5 Rights of the parties

The rights of the Concessioneing Authority, the Senior Lenders (through the Senior Lenders' Representative) and the Concessionaire in the monies held in the Escrow Account are set forth in their entirety in this Agreement and the Concessioneing Authority, the Senior Lenders' and the Concessionaire shall have no other rights against or to the monies in the Escrow Account.

2.6 Substitution of the Concessionaire

The Parties hereto acknowledge and agree that upon substitution of the Concessionaire with the Selectee, pursuant to the Substitution Agreement, it shall be deemed for the purposes of this Agreement that the Selectee is a Party hereto and the Selectee shall accordingly be deemed to have succeeded to the rights and obligations of the Concessionaire under this Agreement on and with effect from the date of substitution of the Concessionaire with the Selectee.

3. Deposits into Escrow Account

3.1 Deposits by the Concessionaire

3.1.1 The Concessionaire agrees and undertakes that it shall deposit into and/or credit the Escrow Account with:

- (a) all monies received in relation to the Project from any source, including the Senior Lenders;
- (b) all funds received by the Concessionaire from its share-holders, in any manner or form;
- (c) all Fee levied and collected by the Concessionaire;
- (d) any other revenues from or in respect of the Project/Project Facilities and Services accruing to the Concessionaire including termination payments; and
- (e) all proceeds received pursuant to any insurance claims.

For avoidance of doubt, all amounts received by the Concessionaire in respect of the Project/Project Facilities and Services excepting any amounts in respect of cesses and duties collected by it from the users on behalf of the Concessions Authority or such other Concessions Authority in accordance with the Concession Agreement or pursuant to any other instructions in respect thereof shall be deposited in the Escrow Account.

4. Withdrawals from Escrow Account

4.1 Withdrawals during Concession Period

4.1.1 At the beginning of every month, or at such shorter intervals as the Senior Lenders' Representative and the Concessionaire may by written instructions determine, the Escrow Bank shall withdraw amounts from the Escrow Account and appropriate them in the following order by depositing such amounts in the relevant Sub-Accounts for making due payments in a month:

- (a) all taxes due and payable by the Concessionaire;
- (b) towards License Fee;
- (c) towards Royalty and other sums payable to the Concessions Authority and liquidated damages, if any;
- (d) towards its debt service obligations under the Financing Documents;
- (e) all development/implementation expenses relating to the Project/Project Facilities and Services, in accordance with the Budget and subject to limits if any set out under the Financing Documents;
- (f) all expenses relating to operations and management of the Project/Project Facilities and Services, in accordance with the Budget and subject to limits if any set out under the Financing Documents;

- (g) towards any reserve requirements in accordance with the Financing Documents;

and the Concessionaire shall be at liberty to withdraw any sums outstanding in the escrow account after all the aforesaid payments due in any Quarter have been made and/or adequate reserves have been created in respect thereof for that Quarter.

4.1.2 Not later than 60 (sixty) Days prior to the commencement of each Accounting Year, the Concessionaire shall provide to the Escrow Bank, with prior written approval of the Senior Lenders' Representative, details of the amounts likely to be required for each of the payment obligations set forth in this Article 4.1; provided that such amounts may be subsequently modified, with prior written approval of the Senior Lenders' Representative, if fresh information received during the course of the year makes such modification necessary.

4.2 Withdrawals upon end of Concession Period

4.2.1 All amounts standing to the credit of the Escrow Account at the end of the Concession Period including amounts credited to the Escrow Account towards compensation payable in accordance with Article 16 of the Concession Agreement shall be appropriated in the following order of priority:

- (a) towards taxes and statutory dues payable by the Concessionaire;
- (b) compensation to Senior Lenders in terms of the Financing Documents towards discharge of the Concessionaire's liability under such Financing Documents;
- (c) all amounts due to the Concessioning Authority and amounts payable towards transfer of the Project Facilities and Services by the Concessionaire in accordance with this Agreement;

and the Concessionaire shall be at liberty to withdraw any sums outstanding in the Escrow Account after all the aforesaid payments due have been made and/or adequate reserves have been created in respect thereof to the satisfaction of the Senior Lenders and the Concessioning Authority and the Escrow Agent has received a confirmation of final settlement by the Senior Lenders and/or Concessioning Authority.

4.3 Application of insurance proceeds

Notwithstanding anything in this Agreement, the proceeds from all insurance claims, except life and injury, shall be deposited into and/or credited to the Escrow Account and utilised for any necessary repair, reconstruction, reinstatement, improvement, delivery or installation of the Project/Project facilities and Services, and the balance remaining, if any, shall be applied in accordance with the provisions contained in this behalf in the Financing Documents.

4.4 Withdrawals during Suspension

Notwithstanding anything to the contrary contained in this Agreement, in case the Escrow Bank receives a notice in writing from the Concessioneing Authority that the rights of the Concessionaire are suspended in accordance with the Concession Agreement or a Termination Notice is issued, the Escrow Bank shall until such notice is withdrawn, act only on the instructions of the Concessioneing Authority.

5. Obligations of the Escrow Bank

5.1 Segregation of funds

Monies and other property received by the Escrow Bank under this Agreement shall, until used or applied in accordance with this Agreement, be held by the Escrow Bank in trust for the purposes for which they were received, and shall be segregated from other funds and property of the Escrow Bank.

5.2 Notification of balances

7 (seven) business Days prior to each Payment Date (and for this purpose the Escrow Bank shall be entitled to rely on an affirmation by the Concessionaire and/or the Senior Lenders' Representative as to the relevant Payment Dates), the Escrow Bank shall notify the Senior Lenders' Representative of the balances in the Escrow Account as at the close of business on the immediately preceding business Day.

5.3 Communications and notices

5.3.1 In discharge of its duties and obligations hereunder, the Escrow Bank:

- (a) may, in the absence of bad faith or gross negligence on its part, rely as to any matters of fact which might reasonably be expected to be within the knowledge of the Concessionaire upon a certificate signed by or on behalf of the Concessionaire;
- (b) may, in the absence of bad faith or gross negligence on its part, rely upon the authenticity of any communication or document believed by it to be authentic;
- (c) shall, within 5 (five) business Days after receipt, deliver a copy to the Senior Lenders' Representative of any notice or document received by it in its capacity as the Escrow Bank from the Concessionaire or any other person hereunder or in connection herewith; and
- (d) shall, within 5 (five) business Days after receipt, deliver a copy to the Concessionaire of any notice or document received by it from the Senior Lenders' Representative in connection herewith.

5.4 No set off

The Escrow Bank agrees not to claim or exercise any right of set off, banker's lien or other right or remedy with respect to amounts standing to the credit of the Escrow Account. For the avoidance of doubt, it is hereby acknowledged and agreed by the Escrow Bank that the monies and properties held by the Escrow Bank in the Escrow Account shall not be considered as part of the assets of the Escrow Bank and being trust property, shall in the case of bankruptcy or liquidation of the Escrow Bank, be wholly excluded from the assets of the Escrow Bank in such bankruptcy or liquidation.

5.5 Regulatory approvals

The Escrow Bank shall use its best efforts to procure, and thereafter maintain and comply with, all regulatory approvals required for it to establish and operate the Escrow Account. The Escrow Bank represents and warrants that it is not aware of any reason why such regulatory approvals will not ordinarily be granted to the Escrow Bank.

6 Escrow Default

6.1 Escrow Default

6.1.1 Following events shall constitute an event of default by the Concessionaire (an “**Escrow Default**”) unless such event of default has occurred as a result of Force Majeure or any act or omission of the Concessions Authority or the Senior Lenders' Representative:

- (a) the Concessionaire commits breach of this Agreement by failing to deposit /cause the deposit of any receipts into the Escrow Account;
- (b) the Concessionaire causes the Escrow Bank to transfer funds to any account of the Concessionaire in breach of the terms of this Agreement; or
- (c) the Concessionaire commits or causes any other breach of the provisions of this Agreement.

6.1.2 Upon occurrence of an Escrow Default, the consequences thereof shall be dealt with under and in accordance with the provisions of the Concession Agreement.

7. Termination of Escrow Agreement

7.1 Duration of the Escrow Agreement

This Agreement shall remain in full force and effect so long as any sum remains to be advanced or is outstanding from the Concessionaire in respect of the debt, guarantee or financial assistance received by it from the Senior Lenders, or any of its obligations to the Concessions Authority remain to be discharged, unless terminated earlier by consent of all the Parties or otherwise in accordance with the provisions of this Agreement.

7.2 Substitution of Escrow Bank

The Concessionaire may, by not less than 45 (forty five) Days prior notice to the Escrow Bank, the Concessioneing Authority and the Senior Lenders' Representative, terminate this Agreement and appoint a new Escrow Bank, provided that the new Escrow Bank is acceptable to the Senior Lenders' Representative and arrangements are made satisfactory to the Senior Lenders' Representative for transfer of amounts deposited in the Escrow Account to a new Escrow Account established with the successor Escrow Bank. The termination of this Agreement shall take effect only upon coming into force of an Escrow Agreement with the substitute Escrow Bank.

7.3 Closure of Escrow Account

The Escrow Bank shall, at the request of the Concessionaire and the Senior Lenders' Representative made on or after the payment by the Concessionaire of all outstanding amounts under the Concession Agreement and the Financing Documents including the payments specified in Article 4.2, and upon confirmation' of receipt of such payments, close the Escrow Account and pay any amount standing to the credit thereof to the Concessionaire. Upon closure of the Escrow Account hereunder, the Escrow Agreement shall be deemed to be terminated.

8. Supplementary Escrow Agreement

8.1 Supplementary escrow agreement

The Senior Lenders' Representative and the Concessionaire shall be entitled to enter into a supplementary escrow agreement with the Escrow Bank providing, inter alia, for detailed procedures and documentation for withdrawals from Escrow Account, creation of sub-accounts pursuant to Article 4.1.1 and for matters not covered under this Agreement such as the rights and obligations of Senior Lenders, investment of surplus funds, restrictions on withdrawals by the Concessionaire in the event of breach of Financing Documents, procedures relating to operation of the Escrow Account and withdrawal therefrom, reporting requirements and any matters incidental thereto; provided that such supplementary escrow agreement shall not contain any provision which is inconsistent with this Agreement and in the event of any conflict or inconsistency between provisions of this Agreement and such supplementary escrow agreement, the provisions of this Agreement shall prevail.

9. Indemnity

9.1 General indemnity

9.1.1 The Concessionaire will indemnify, defend and hold the Concessioneing Authority, Escrow Bank and the Senior Lenders, acting through the Senior Lenders' Representative, harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of any breach by the Concessionaire of any of its obligations under this Agreement or on account of failure of the Concessionaire to comply with Applicable Laws and Applicable Permits.

9.1.2 The Concessioneing Authority will indemnify, defend and hold the, Concessionaire harmless against any and all proceedings, actions and third party claims for any loss,

damage, cost and expense arising out of failure of the Concessing Authority to fulfill any of its obligations under this Agreement materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement or this Agreement other than any loss, damage, cost and expense arising out of acts done in discharge of their lawful functions by the Concessing Authority, its officers, servants and agents.

9.1.3 The Escrow Bank will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Escrow Bank to fulfill its obligations under this Agreement materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Escrow Bank, its officers, servants and agents.

9.2 Notice and contest of claims

In the event that any Party hereto receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under Article 9.1 or in respect of which it is entitled to reimbursement (the "Indemnified Party"), it shall notify the other Party responsible for indemnifying such claim hereunder (the "Indemnifying Party") within 15 (fifteen) Days of receipt of the claim and shall not settle or pay the claim without the prior approval of the Indemnifying Party, which approval shall not be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim, it may conduct the proceedings in the name of the Indemnified Party and shall bear all costs involved in contesting the same. The Indemnified Party shall provide all cooperation and assistance in contesting any claim and shall sign all such writings and documents as the Indemnifying Party may reasonably require.

10. Miscellaneous Provisions

10.1 Governing law and jurisdiction

This Agreement shall be construed and interpreted in accordance with and governed by the laws of India, and the Courts at [●] shall have jurisdiction over all matters arising out of or relating to this Agreement.

10.2 Waiver of sovereign immunity

10.2.1 The Concessing Authority unconditionally and irrevocably:

- (a) agrees that the execution, delivery and performance by it of this Agreement constitute commercial acts done and performed for commercial purpose;
- (b) agrees that, should any proceedings be brought against it or its assets, property or revenues in any jurisdiction in relation to this Agreement or any transaction contemplated by this Agreement, no immunity (whether by

reason of sovereignty or otherwise) from such proceedings shall be claimed by or on behalf of the Concessing Authority with respect to its assets;

- (c) waives any right of immunity which it or its assets, property or revenues now has, may acquire in the future or which may be attributed to it in any jurisdiction; and
- (d) consents generally in respect of the enforcement of any judgement or award against it in any such proceedings to the giving of any relief or the issue of any process in any jurisdiction in connection with such proceedings (including the making, enforcement or execution against it or in respect of any assets, property or revenues whatsoever irrespective of their use or intended use of any order or judgement that may be made or given in connection therewith).

10.3 Priority of agreements

In the event of any conflict between the Concession Agreement and this Agreement, the provisions contained in the Concession Agreement shall prevail over this Agreement.

10.4 Alteration of terms

All additions, amendments, modifications and variations to this Agreement shall be effectual and binding only if in writing and signed by the duly authorised representatives of the Parties.

10.5 Waiver

10.5.1 Waiver by any Party of a default by another Party in the observance and performance of any provision of or obligations under this Agreement:

- (a) shall not operate or be construed as a waiver of any other or subsequent default hereof
- (b) or of other provisions of or obligations under this Agreement shall not be effective unless it is in writing and executed by a duly authorised representative of the Party; and
- (c) shall not affect the validity or enforceability of this Agreement in any manner.

10.5.2 Neither the failure by any Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement or any obligation thereunder nor time or other indulgence granted by any Party to another Party shall be treated or deemed as waiver of such breach or acceptance of any variation or the relinquishment of any such right hereunder.

10.6 No third party beneficiaries

This Agreement is solely for the benefit of the Parties and no other person or entity shall have any rights hereunder.

10.7 Survival

10.7.1 Termination of this Agreement:

- (a) shall not relieve the Parties of any obligations hereunder which expressly or by implication survive termination hereof; and
- (b) except as otherwise provided in any provision of this Agreement expressly limiting the liability of either Party, shall not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of, or caused by, acts or omissions of such Party prior to the effectiveness of such termination or arising out of such termination.

10.7.2 All obligations surviving the cancellation, expiration or termination of this Agreement shall only survive for a period of 3 (three) years following the date of such termination or expiry of this Agreement.

10.8 Severability

If for any reason whatever any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to dispute resolution under Article 10.1 of this Agreement or otherwise.

10.9 Successors and assigns

This Agreement shall be binding on and shall inure to the benefit of the Parties and their respective successors and permitted assigns.

10.10 Notices

Unless otherwise stated, notices to be given under this Agreement including but not limited to a notice of waiver of any term or related or breach of any term of this Agreement shall be in writing and shall be given by hand delivery, recognized international courier, mail, telex or facsimile transmission and delivered or transmitted to the Parties at their respective addresses set forth below:

The Concessions Authority:

CHAIRMAN

Fax No:

Email:

The Concessionaire:

The MANAGING DIRECTOR

_____ Ltd

Fax No.

Email:

The Senior Lenders/Senior Lenders representative:

_____ Ltd

Fax No:

Email:

The Escrow Bank:

_____ Ltd

Fax No:

Email:

or such other address, telex number, or facsimile number as may be duly notified by the respective Parties from time to time, and shall be deemed to have been made or delivered (i) in the case of any communication made by letter, when delivered by hand, by recognized international courier or by mail (registered, return receipt requested) at that address and (ii) in the case of any communication made by telex or facsimile, when transmitted properly addressed to such telex number or facsimile number.

10.11 Language

All notices, certificates, correspondence and proceedings under or in connection with this Agreement shall be in English.

10.12 Authorised representatives

Each of the Parties shall, by notice in writing, designate their respective authorised representatives through whom only all communications shall be made. A Party hereto shall be entitled to remove and/or substitute or make fresh appointment of such authorised representative by similar notice.

10.13 Original Document

This Agreement may be executed in four counterparts, each of which when executed and delivered shall constitute an original of this Agreement.

IN WITNESS WHEREOF THE PARTIES HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED

For and on behalf of CONCESSIONAIRE by: (Signature)

(Name)

(Designation)

(Address) (Fax No.)

SIGNED, SEALED AND DELIVERED

For and on behalf of SENIOR LENDERS by the Senior Lenders' Representative: (Signature)

(Name) (Designation)

(Address) (Fax No.)

SIGNED, SEALED AND DELIVERED For and on behalf of ESCROW BANK by: (Signature)

(Name)

(Designation)
(Address) (Fax No.)

SIGNED, SEALED AND DELIVERED

For and on behalf of Concessioneing Authority by: (Signature) (Name)
(Designation) (Address) (Fax No.) In the presence of:

1.

2.

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29. Annexure VII: Expert Committee

Dispute resolution through the Expert Committee can be resorted to if either of the parties exercises its right for dispute resolution through the Expert Committee as provided for explicitly in this Agreement

- (i) In the event a party issues a notice (Expert Committee Notice) to refer the dispute to the Expert Committee, the parties may finalise a choice of an independent expert in the field of port and harbour engineering and/or financial and cost accounting as the case warrants within one week of such notice, failing which, each party shall appoint such an independent expert within two weeks of the Expert Committee Notice.
- (ii) Such independent experts shall have adequate experience in the design, construction, operation and maintenance of Terminal facilities and/or finances, accounting, costing and valuation practices as the case warrants.
- (iii) The two experts will jointly appoint a third expert with similar experience within one week of their appointment.
- (iv) The party issuing the Expert Committee Notice will provide the Experts with written submission of the nature of the dispute and the claim of the other party along with supporting documents within 1 (one) week of the constitution of the Expert Committee. Within one week of the furnishing of such submission, the other party may choose to provide written submissions defending its position.
- (v) The Expert Committee may call on either party to furnish additional information as deemed necessary to solve the dispute.
- (vi) The Expert Committee shall give the majority decision to both parties within three weeks of the receipt of written submission from the contracting parties.
- (vii) The decision of the Expert Committee shall be final and binding on the contracting parties unless either of the parties issues an Arbitration Notice.
- (viii) The costs of the engagement of the Expert Committees shall be shared equally by the parties.

30. Annexure VIII: Standards

1. Construction Standards

Concessionaire shall ensure compliance with the civil construction standards set out in the DPR given in Annexure XVI.

2. Operations and Maintenance Standards

2.1 Repairs and Maintenance

The Concessionaire at its own cost promptly and diligently maintain or restore any of the project facilities or part thereof which may be lost, damaged, destroyed or worn out.

While carrying out the repairing and maintaining the project facilities, the Concessionaire acknowledges and accepts that it is holding and maintaining the EOT or assets, project facilities in trust for eventual transfer to the Concessioning Authority on termination of the agreement and therefore, will not do any act as a result of which the value of Terminal's Assets and Project Facilities and Services is diminished.

The Concessionaire shall, at all times during the Concession Period, at its own risk, cost, charges and expenses, performance and pay for maintenance repairs, and renewals of various type of assets and equipment in the Concessionaire premises and /or the project or any parts thereof, whether due to use and operations or due to deterioration of materials and /or parts, so that on the expiry or termination of Concession Period, the same shall except normal wear and tear be in good working condition as it were at the time of commencement of the Concession Period.

While carrying out the repair and maintenance of the project facilities, the Concessionaire shall carry out the work in accordance with the manufacturer's recommendations and the relevant latest Indian Standards or in its absence ISO/OISD Standards. In the event that the Concessionaire, by necessity or otherwise need to follow any other country standard and it shall be equal or superior to the standard specified above.

The repairs and maintenance shall generally conform to the following specifications.

S No	Standards	Description
1	Maintenance	
1.1	ISO 4308-1-2003	Maintenance of lifting appliances
1.2	ISO 4309-2004	Cranes wire rope care, maintenance and discard
1.3	IS 13367: Part 1 : 1992	Safe use of cranes – Code of Practice Part 1: General
1.4	BS 7121-2-2003	Code of Practice for safe use of cranes, inspection, testing & examination
1.5	BS 7121-4-1997	Code of Practice for safe use of cranes (Lorry Loaders)
1.6	BS 7121-5-2006	Code of Practice for safe use of cranes (Tower Cranes)
2	Painting	
2.1	IS 144 : 1950	Ready mixed paint, brushing, petrol resisting, air-drying, for interior painting of tanks and container, red oxide (colour unspecified)
2.2	IS 145 : 1950	Ready mixed paint, slushing, petrol resisting, air-drying for interior painting of tanks and containers, red oxide (colour unspecified)

2.3	IS 146 : 1950	Specification for ready mixed paint, brushing, petrol resisting, stoving, for interior painting of tanks and containers, red oxide (colour unspecified)
2.4	IS 147 : 1950	Specification for ready mixed paint, brushing, petrol resisting, stoving, for interior painting of tanks and containers, red oxide (colour unspecified)
2.5	IS 164 : 1981	Specification for Ready mixed paint for road marking (first revision)
2.6	IS 1419 : 1989	Antifouling paint, brushing for ship's bottom and hulls- Specification (second revision)
2.7	IS 6714 : 1989	Ready mixed paint, finishing, non-slip, deck – Specification (first revision)
2.8	IS 6948 : 1973	Specification for Ready mixed paint, undercoat, synthetic for ships
2.9	IS 6951 : 1973	Specification for Ready mixed paint, finishing, exterior for ships
2.10	IS 1477 : Part I : 1971	Code of Practice for Painting of Ferrous Metals in Buildings - Part I : Pretreatment
2.11	IS 1477 : Part 2 : 1971	Code of practice for painting of ferrous metals in buildings: Part2 Painting
2.12	IS 9954 : 1981	Pictorial Surface Preparation Standards for Painting of Steel Surfaces

3. Safety Standards

The Concessionaire shall ensure compliance with the safety standards set out under Applicable Law/international conventions, as relevant, from time to time including those required under the following:

- 3.1. Dock Workers (Safety, Health and Welfare) Act, 1986 & Regulations framed thereunder of 1990.
- 3.2. The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.
- 3.3. The Petroleum Act, 1934 along with the Petroleum Rules, 2002.
- 3.4. The Explosives Act, 1884 along with The Explosive Substance Act, 1983 & The Explosive Rules, 1983
- 3.5. Guidelines by Fire Advisor, CCE & DG FASLI, Government of India
- 3.6. National Fire Codes (National Fire Protection Association – USA)
- 3.7. Drill Manual for the Fire Services of India.
- 3.8. International Safety Guide for Oil Tankers & Terminals.

4. Safety Guidelines

4.1 Safe movement

In the design, construction and operation of the facility, particular care shall be taken to ensure safety of Users. This shall include facilities for safe and efficient evacuation in case of emergency.

4.2 System integrity

In the design of power supply, lighting, signalling, communication and security equipment, particular care shall be taken to minimise the likely incidence of failure.

4.3 Restoration of services

The facility shall be designed such that in the event a fault occurs, a limited service can be provided within a few minutes by isolation of the affected area or equipment, to the extent possible.

4.4 Contingency and safety management

4.4.1 The Concessionaire shall procure and ensure that appropriate contingency arrangements are in place at the Terminal to deal with the following events in accordance with applicable guidelines of IWAI:

- (a) removal of disabled vessel from channel;
- (b) bomb threat to the Terminal, or any acts of terrorism;
- (c) vessel accidents in and around the vicinity of the Terminal;
- (d) non-scheduled vessel forced to berth at the terminal;
- (e) fires at the Terminal;
- (f) natural calamities and disasters;
- (g) strikes at the Terminal;
- (h) unlawful interference with IWAI; and
- (i) any other emergency at the Terminal.

4.4.2 The Concessionaire shall procure and ensure that the emergency alarm bells are installed and operated to link the terminal control Facility to the Terminal in charge and to all emergency services located at the Terminal, including but not limited to fire services, medical services, the Security Agency etc.

4.4.3 A safety statement shall be prepared by the Concessionaire once every quarter to bring out clearly the system of management of checks and maintenance tolerances for various assets, and the compliance thereof. The statement shall also bring out the nature and extent of staff training and awareness in dealing with such checks and tolerances. During the Terminal Equipment Period, two copies of the statement shall be sent to the Independent Engineer within 15 (fifteen) days of the close of every quarter.

4.5 Safety equipment

The following safety equipment shall be provided at the Terminal:

- (a) Fire extinguishers and fire alarms at appropriate locations on the Terminal;
- (b) Adequate number of stretchers and standard first aid boxes; and
- (c) Such other equipment as may be required in conformity with relevant IWAI guidelines and Good Industry Practice.

4.6 Emergency

A set of emergency procedures shall be formulated to deal with different emergency situations and the operations staff shall be trained to respond appropriately during such emergency through periodic simulated exercises, as laid down in a manual for management of disasters ("**Disaster Management Manual**"), to be prepared and published by the Concessionaire prior to COD. The Concessionaire shall provide 5 (five) copies each of the Disaster Management Manual to the Authority no later than 30 (thirty) days prior to COD.

4.7 Fire safety

4.7.1 The Concessionaire shall conform to the standards specified under safety standard in Annexure VIII.

4.7.2 Emergency exit should be accessible without any obstructions and the exit doors should be kept locked in the ordinary course. The exit doors shall be easy to open from inside the Terminal Building in case of emergency.

4.7.3 Escape routes shall be clearly marked by arrows in the correct direction and no cryptic symbols shall be used. In complying with the provisions of this Clause, the possibility of poor visibility due to smoke shall be duly taken into account. All notices and signages shall be uniform and standardised.

4.7.4 Appropriate categories of rescue and fire-fighting services shall be made available and maintained in accordance with safety standards in Annexure VIII.

31. Annexure IX: Substitution Agreement

THIS SUBSTITUTION AGREEMENT is entered into on this the ----- Day of -----
----- (Month) ---- (Year) at -----.

AMONGST,

INLAND WATERWAYS CONCESSIONING AUTHORITY OF INDIA, a statutory body established by the Government of India under the provisions of Inland Waterways Concessioning Authority at the time of Financial Close.

Note: Such format of the Financing Plan shall also identify the respective threshold limit of the above parameters and the basis of further projections and the detailed requirements that would need to be stratified with respect to each line item.

NOW, THEREFORE, THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. Definitions and Interpretations

1.1 Definitions

In this Agreement the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereafter respectively assigned to them.

“**Agreement**” means this agreement and includes any amendment or modification made to this agreement in accordance with the provisions hereof.

“**Financial Assistance**” means the financial assistance set forth in Schedule A hereto, agreed to be provided by the Senior Lenders to the Concessionaire for financing the Project.

“**Financial Default**” means occurrence of a material breach of the terms and conditions of the Financing Documents or a continuous default in servicing debt there under by the Concessionaire for a minimum period of 3 (three) months.

“**Senior Lenders**” means the financial institutions/banks whose names and addresses are set out in Schedule A hereto and shall include the financial institutions/banks who may replace the same by way of a refinance/subrogation, as may be notified by the Senior Lenders’ Representative to the Concessionaire, from time to time.

“**Residual Concession Period**” means the period which shall be the remainder of the Concession Period computed from the date of issuance of Termination Notice in terms of Article 15.3.5. of the Concession Agreement.

“**Selectee**” means a Person proposed by the Senior Lender/Senior Lender’s Representative pursuant to this Agreement and approved by the Concessioning Authority for substituting the Concessionaire for the residual Concession Period, in accordance with the provisions of this Agreement.

“**Suspension Period**” means the Termination Notice period as defined in Article 15.3.7. of the Concession Agreement at the end of which all formalities connected with substitution of the Concessionaire by the Selectee including handing over of Project Site/Project Facilities and

Services, in accordance with this Agreement are completed and the substitution has become effective.

1.2 Capitalized terms used in this Agreement but not defined shall have the meaning assigned to them respectively in the Concession Agreement.

2. Assignment

2.1 Assignment of rights and title

The Concessionaire hereby agrees to assign its rights, title and interest in the EOT to, and in favour of, the Senior Lenders pursuant to and in accordance with the provisions of this Agreement and the Concession Agreement by way of security in respect of financing by the Senior Lenders under the Financing Documents.

3. Substitution of the Concessionaire

3.1 Rights of substitution

3.1.1 Pursuant to the rights, title and interest assigned under Article 2.1, the Senior Lenders shall be entitled to substitute the Concessionaire by a Selectee under and in accordance with the provisions of this Agreement and the Concession Agreement.

3.1.2 The Concessioneing Authority hereby agrees to substitute the Concessionaire by endorsement on the Concession Agreement in favour of the Selectee selected by the Senior Lenders in accordance with this Agreement (For the avoidance of doubt, the Senior Lenders shall not be entitled to operate and maintain the Project/Project Facilities and Services).

3.2 Substitution upon occurrence of Financial Default

3.2.1 Upon occurrence of a Financial Default, the Senior Lenders/Senior Lenders' Representative may issue a notice to the Concessionaire (the "Notice of Financial Default") along with particulars thereof, and send a copy to the Concessioneing Authority for its information and record. A Notice of Financial Default under this Article 3 shall be conclusive evidence of such Financial Default and it shall be final and binding upon the Concessionaire for the purposes of this Agreement.

3.2.2 Upon issue of a Notice of Financial Default hereunder, the Senior Lenders/Senior Lenders' Representative may, without prejudice to any of its rights or remedies under this Agreement or the Financing Documents, substitute the Concessionaire by a Selectee in accordance with the provisions of this Agreement.

3.2.3 At any time after the Senior Lenders/Senior Lenders' Representative has issued a Notice of Financial Default, it may by notice require the Concessioneing Authority to suspend all the rights of the Concessionaire and undertake the operation and maintenance of the Project/Project Facilities and Services, and upon receipt of such notice, the Concessioneing Authority shall suspend the rights of the Concessionaire. Provided, such suspension shall be revoked upon substitution of the Concessionaire by a Selectee, and in the event such substitution is not completed within 180 (one hundred and eighty) days from the date of such suspension, the Concessioneing Authority may terminate the Concession Agreement forthwith by issuing a Termination Notice in accordance with the provisions of the Concession Agreement; provided that upon written request from the Senior Lenders/Senior Lenders' Representative and the Concessionaire, the Concessioneing Authority may

extend the aforesaid period of 180 (one hundred and eighty) days by a period not exceeding 90 (ninety) days.

3.3 Substitution upon occurrence of Concessionaire Default

3.3.1 Upon occurrence of a Concessionaire Default, the Concessions Authority shall by a notice inform the Senior Lenders/Senior Lenders' Representative of its intention to issue a Termination Notice and grant 15 (fifteen) days' time to the Senior Lenders/Senior Lenders' Representative to make a representation, stating the intention to substitute the Concessionaire by a Selectee.

3.3.2 In the event that the Senior Lenders/ Senior Lenders' Representative makes a representation to the Concessions Authority within the period of 15 (fifteen) days specified in Article 3.3.1, stating that it intends to substitute the Concessionaire by a Selectee, the Senior Lenders/ Senior Lenders' Representative shall be entitled to undertake and complete the substitution of the Concessionaire by a Selectee in accordance with the provisions of this Agreement within a period of 180 (one hundred and eighty) days from the date of such representation, and the Concessions Authority shall either withhold termination and/or suspend the rights of the Concessionaire for the aforesaid period of 180 (one hundred and eighty) days; provided that upon written request from the Senior Lenders/ Senior Lenders' Representative and the Concessionaire, the Concessions Authority shall extend the aforesaid period of 180 (one hundred and eighty) days by a period not exceeding 90 (ninety) days.

3.4 Procedure for substitution

3.4.1 The Concessions Authority and the Concessionaire hereby agree that on or after the date of Notice of Financial Default or the date of representation to the Concessions Authority under Article 3.2.2, as the case may be, the Senior Lenders/Senior Lenders' Representative may, without prejudice to any of the other rights or remedies of the Senior Lenders, invite, negotiate and procure offers, either by private negotiations or public auction or tenders from potential Selectees for substituting the Concessionaire and taking on the rights and obligations under the Concession Agreement.

3.4.2 To be eligible for substitution in place of the Concessionaire, the Selectee shall be required to fulfil the eligibility criteria that were laid down by the Concessions Authority for shortlisting the bidders for award of the Concession Agreement; provided that the Senior Lenders/ Senior Lenders' Representative may represent to the Concessions Authority that all or any of such criteria may be waived in the interest of the Project, and if the Concessions Authority determines that such waiver shall not have any material adverse effect on the Project, it may waive all or any of such eligibility criteria.

3.4.3 Upon selection of a Selectee, the Senior Lenders/Senior Lenders' Representative shall request the Concessions Authority to:

- (a) accede to transfer to the Selectee the rights and obligations of the Concessionaire under the Concession Agreement; and
- (b) novate the Concession Agreement to the Selectee such that the Selectee replaces the Concessionaire and becomes entitled/obligated to all the rights and obligations of the Concessionaire, for the residual Concession Period.

3.4.4 If the Concessing Authority has any objection to the transfer of the Concession Agreement in favour of the Selectee in accordance with this Agreement, it shall within 7 (seven) days from the date of proposal made by the Senior Lenders/Senior Lenders' Representative, give a reasoned order after hearing the Senior Lenders/Senior Lenders' Representative. If no such objection is raised by the Concessing Authority, the Selectee shall be deemed to have been accepted. The Concessing Authority thereupon shall novate the Concession Agreement within 7 (seven) days of its acceptance/deemed acceptance of the Selectee; provided that in the event of such objection by the Concessing Authority, the Senior Lenders' Representative may propose another Selectee whereupon the procedure set forth in this Article 3.4 shall be followed for substitution of such Selectee in place of the Concessionaire.

3.5 Selection to be binding

The decision of the Senior Lenders/Senior Lenders' Representative and the Concessing Authority in selection of the Nominated Company shall be final and binding on the Concessionaire. The Concessionaire irrevocably agrees and waives any right to challenge the actions of the Senior Lenders' Representative or the Senior Lenders or the Concessing Authority taken pursuant to this Agreement including the transfer/novation of the Concession Agreement in favour of the Selectee. The Concessionaire agrees and confirms that it shall not have any right to seek revaluation of assets comprised in the Project or the Concessionaire's shares. It is hereby acknowledged by the Parties that the rights of the Senior Lenders/Senior Lenders' Representative are irrevocable and shall not be contested in any proceedings before any court or Concessing Authority and the Concessionaire shall have no right or remedy to prevent, obstruct or restrain the Concessing Authority or the Senior Lenders/Senior Lenders' Representative from effecting or causing the transfer by substitution and endorsement of the EOT as requested by the Senior Lenders/Senior Lenders' Representative.

4. Transaction Documents

4.1 Substitution of Selectee in Transaction Documents

The Concessionaire shall ensure and procure that each Transaction Documents contains provisions that entitle the Selectee to step into such Transaction Documents, in its discretion, in place and substitution of the Concessionaire in the event of such Selectee assumption of the liabilities and obligations of the Concessionaire under the Concession Agreement.

5. Termination of Concession Agreement

5.1 Termination upon occurrence of Financial Default

At any time after issue of a Notice of Financial Default, the Senior Lenders/Senior Lenders' Representative may by a notice in writing require the Concessing Authority to terminate the Concession Agreement forthwith, and upon receipt of such notice, the Concessing Authority shall terminate the EOT in accordance with the Concession Agreement.

5.2 Termination when no Selectee is selected

In the event that no Selectee acceptable to the Concessing Authority is selected and recommended by the Senior Lenders/Senior Lenders' Representative within the period of 180 (one hundred and eighty) days or any extension thereof as set forth in Article 3.3.2, the Concessing

Authority may terminate the Concession Agreement forthwith in accordance with the provisions thereof.

5.3 Realisation of Debt Due

The Concessing Authority and the Concessionaire hereby acknowledge and agree that, without prejudice to their any other right or remedy, the Senior Lenders are entitled to receive from the Concessionaire, without any further reference to or consent of the Concessionaire, the Debt Due upon termination of the Concession Agreement.

6. Duration of the Agreement

6.1 Agreement duration

6.1.1 This Agreement shall come into force from the date hereof and shall expire at the earliest to occur of the following events:

- (a) Termination of the Agreement; or
- (b) no sum remains to be advanced, or is outstanding to the Senior Lenders, under the Financing Documents.

7. Indemnity

7.1 General indemnity

7.1.1 The Concessionaire will indemnify, defend and hold the Concessing Authority and the Senior Lenders/Senior Lenders' Representative harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense of whatever kind and nature arising out of any breach by the Concessionaire of any of its obligations under this Agreement or on account of failure of the Concessionaire to comply with Applicable Laws and Applicable Permits.

7.1.2 The Concessing Authority will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Concessing Authority to fulfil any of its obligations under this Agreement, materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement or this Agreement, other than any loss, damage, cost and expense, arising out of acts done in discharge of its lawful functions by the Concessing Authority.

7.1.3 The Senior Lenders/Senior Lenders' Representative will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Senior Lenders/Senior Lenders' Representative to fulfil its obligations under this Agreement, materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement, other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Senior Lenders/Senior Lenders' Representative.

7.2 Notice and contest of claims

In the event that any Party hereto receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under Article 7.1 or in respect of which it is entitled to reimbursement (the “Indemnified Party”), it shall notify the other Party responsible for indemnifying such claim hereunder (the “Indemnifying Party”) within 15 (fifteen) days of receipt of the claim and shall not settle or pay the claim without the prior approval of the Indemnifying Party, such approval not to be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim, it may conduct the proceedings in the name of the Indemnified Party and shall bear all costs involved in contesting the same. The Indemnified Party shall provide all cooperation and assistance in contesting any claim and shall sign all such writings and documents as the Indemnifying Party may reasonably require.

8. General

8.1 General conditions

8.1.1 The Parties hereto expressly represent and warrant that they are duly empowered to sign and execute this Agreement.

8.1.2 Notices under this Agreement shall be sent to the Addresses first hereinabove mentioned. Any change in the address of any Party shall be duly notified by registered post acknowledgement due and delivered to the other parties.

8.1.3 The expressions “Concessioneing Authority”, the “Concessionaire”, the “Senior Lender” and the “Senior Lenders’ Representative”, “Selectee” herein used shall unless there be anything repugnant to the subject or context include the respective successors and assigns.

8.1.4 This Agreement shall not be affected by reorganisation of any Senior Lender, the Concessionaire or Concessioneing Authority, “Selectee” and the successor in interest of the Senior Lender or Concessioneing Authority shall have the benefit of this Agreement.

8.1.5 Failing amicable settlement and/or settlement with the assistance of legal Expert, the dispute or differences or claims as the case may be, shall be finally settled by binding arbitration under the Arbitration and Conciliation Act, 1996. The arbitration shall be by a panel of three Arbitrators, one each to be appointed by the Concessioneing Authority and the Senior Lenders/Senior Lender’s Representative and the third to be appointed by the two arbitrators. If any Party entitled to do so, fails to appoint a second Arbitrator within 30 (thirty) days of from the receipt of the request for such appointment, then the single Arbitrator appointed in accordance with this provision shall adjudicate the disputes as Sole Arbitrator.

8.1.6 This Agreement and rights and obligations of the Parties hereunder shall remain in full force and effect pending the Award in any arbitration proceeding hereunder. The courts having territorial jurisdiction over the Project alone shall have jurisdiction over all matters arising out of or relating to the arbitration agreement contained herein or proceedings arising out of or relating to the arbitration proceedings thereunder.

8.1.7 The consultation, recommendation or approval of the Senior Lenders’ Representative under this Agreement shall always be deemed as consultation, recommendation or approval of every concerned Senior Lender and each such Senior Lender shall be bound by the same.

8.1.8 This Agreement shall be in addition to and shall not be in derogation of the terms of the Financing Documents.

8.1.9 The Concessionaire agrees and acknowledges that it shall not be necessary for the Senior Lender(s) or the Senior Lenders' Representative to enforce or exhaust any other remedy available to them before invoking the provisions of this Agreement.

8.1.10 No amendment, variation or modification to this Agreement shall be valid and effectual unless made in writing and executed by the duly authorized representatives of all the Parties hereto.

8.1.11 All stamp duties or other imposts and charges as are applicable on this Agreement or on amendment of the Concession Agreement or execution of fresh Concession Agreement for the purpose of substitution as aforesaid, irrespective of the Senior Lenders making such payment for the time being, shall be borne by and be to the account of the Concessionaire.

8.1.12 The Parties hereby expressly agree that for the purpose of giving full and proper effect to this Agreement, the Concession Agreement and this Agreement shall be read together and construed harmoniously. The terms of this Agreement shall prevail in the event of any inconsistency with the Concession Agreement.

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Schedule A

Particulars of Financial Assistance

Name and Address of the Lender Nature and Amount of Financing Assistance

IN WITNESS WHEREOF THE PARTIES HERETO HAVE SET THEIR HANDS HEREUNTO
ON THE DAY, MONTH AND YEAR HEREINABOVE MENTIONED.

SIGNED AND DELIVERED ON BEHALF OF
-----LIMITED BY:

Name: Title:

SIGNED AND DELIVERED ON BEHALF OF GOVERNMENT OF INDIA
BY:

Name: Title:

SIGNED AND DELIVERED ON BEHALF OF
----- ON BEHALF OF THE SENIOR LENDERS SETFORTH IN

SCHEDULE BY:

Name:

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32. Annexure X: Monitoring Arrangement

(Name of the Terminal)

Operation Stage Monitoring Report of for the month
ended.....

Compliance of Obligations of the Concessionaire

S No.	Obligations of the Concessionaire	Whether any action required (Yes/ No)	If yes, give details of action taken *
1	Prompt commencement of operations after “Ready for Operation” declaration		
2	Operation of Project Facilities as per “Project Requirement”		
3	Achieving Performance Standards		
4	Compliance of O&M and Safety Standards		
5	Rapid & Effective response in the event of accident/ emergency		
6	Repair of project facilities in a timely manner		
7	Manage & Operate Project Facilities on “First Come First Served” basis except for Priority & Preferential berthing as per GOI guidelines		
8	Maintenance of Proper Records relating to Revenue and operation of Project Facilities		
9	Obtaining, Maintenance of Applicable Permits and Compliance of Applicable laws		
10	Prevention of encroachment / unauthorized use of Project Facilities		
11	Repair & Maintain all Project Facilities as per Agreement provisions & Good Industry Practice at all times during the Concession Agreement.		
12	Repair, or Restore the damaged Project Facilities at its own costs.		
13	Obtaining prior written permission of Concessioneering Authority for removal of assets		

14	Compliance with Monthly Reporting Requirements		
15	Cooperation to safety experts appointed by concession authority in access for inspection for safety audit once in a year		
16	Cooperation to Terminal representatives for inspection and review of operations also to compliance with requirements of Agreement		
17	Installation & Operation of specified computer system and Network as specified by Concession Authority		
18	Ensuring the prescribed Security Arrangements conforming to ISPS code		
19	Employment of personnel of foreign origin only after requisite approvals from Government of India		
20	Employ qualified and skilled personnel.		
21	Meeting Minimum Guaranteed Cargo requirements		
22	To recover tariff from users of the project facilities as per Tariff Order Notification and deposit all Tariff in Escrow Account		
23	If requested by CA, collect the cess and charges from the users on behalf of Concessioning Authority		
24	Make timely payments to Concessioning Authority viz. Royalty & Licence fees		
25	To operate Escrow Account as per priority of payments		
26	Meeting any claim/ action/ suit etc. alleging loss/ destruction of goods		
27	Inform Concessioning Authority if any Direct or indirect change of management of concessionaire		
28	Payment of all taxes/ duties/ levies etc., to the Government Authorities		
29	Purchasing and Maintaining of Insurance requirements in accordance with the Agreement and Good Industry Practice		

30	Providing copies of insurance policies to the Terminal		
31	Utilisation of money received under insurance policies as per terms of Agreement		
32	Engagement of Management Contractor as envisaged in RFP		
33	Ensuring conduct of Conditional Survey by an industry expert appointed by mutual consent and compliance of remedies thereof before expiry of concession period.		
34	Submit bank guarantee two years prior to expiry of concession period for repairs if any for condition survey		
35	Issue of consultation notice and compliance of remedial process in case of Event of Default on the part of Terminal		

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(Name of the Terminal)

**Operation Stage Monitoring Report of for the month
ended.....**

Compliance of Obligations of the Concessioneing Authority

S No.	Obligations of the Concessioneing Authority	Whether any action required (Yes/ No)	If yes, give details of action taken *
1	To get from the concessionaire copies of “as built” design and drawings (for Terminal Equipment Phase) maintenance schedule of equipments etc. as reviewed by Independent Engineer		
2	Release of Performance Security after 6 months from the date of commercial operation		
3	Maintenance of LAD		
4	Grant approvals/ consents sought by the Concessionaire as required under the agreement		
5	Evolve mutually acceptable mechanism for sharing the common costs by existing and future terminal operators		
6	Provide access to all applicable infrastructure facilities and utilities including water, electricity etc.		
8	Review performance standards from the monthly report submitted by concessionaire and take remedial action including recovery of liquidated damages		
9	To operate escrow account as per priority of payments		
10	Whether shareholding requirements are met by lead member/ members of the Bidder consortium		
11	Assistance to concessionaire by giving recommendation letter for getting applicable permits		
12	Shall not operationalise competing facility		
13	Issue notice of Force Majeure In the event of occurrence of any Force Majeure event		
14	Extension of time for performing obligations due to occurrence of Force majeure		
15	Compliance of provisions of Article 14 in the event of force majeure continuing beyond 120 days		

16	Payment of compensation in the event of termination due to force majeure event Payment of compensation in the event of termination due to concessionaire event of default Payment of compensation in the event of termination due to Concessioneing Authority event of default		
17	Authorize the concessionaire to collect cesses and charges including infrastructure cess if required and remit the same to Concessioneing Authority if required		
18	Initiate action for amicably resolution of disputes		
19	Any other observation, complaint or suggestion		
20	Payment of Compensation to Senior Lenders		
21	Issue of Consultation Notice and Compliance of remedial process in case of Event of Default on the part of Concessionaire		
22	Informing Senior Lenders of intent of termination by issuing a copy of Termination Notice to them on occurrence of force Majeure/ Event of Default		

Key Performance Indicators (KPI)/Performance Standards

S. No.	Maintenance/ Performance Standards	Indicative norms	Actual during the month	Shortfall, if any	Action taken to remedy shortfall
1	Average container moves				
2	Average handling rate				
3	Average turnaround time of trucks				
4	Equipment reliability				
5	Equipment availability				

(Name of the Terminal)

Operation Stage Monitoring Report of (Name of the Project) for the month ended.....

I. Basic Data of the project

S No.	Project Parameters	Details
1.	Name of the concessionaire	
2.	Percentage of equity holding in case of consortium	
3.	Payment of Royalty	
4.	Date of Issue of Letter of acceptance by the Concessioneing Authority to concessionaire	
5.	Date of signing of Concession Agreement	
6.	Time duration for fulfilling the condition precedent as per concession agreement (a) By Concessionaire (b) By Concessioneing Authority	
7.	Actual Date of award of concession after fulfilling condition precedent	
8.	Date of starting of commercial operation	
9.	Estimated cost	
10.	Actual Cost	
11.	Capacity	
12.	Project details like length of berth, design vessel size can be handled,	
13.	Present tariff rate	
14.	MGT if any as per concession agreement	
15.	Cargo handled during this month	
16.	Cumulative cargo handled during the financial year	
17.	Any other remarks	

33. Annexure XI: Performance Guarantee

(Proforma of Bank Guarantee)

THIS DEED OF GUARANTEE executed on this the ---- Day of ---- at ----- by -----
----- (Name of the Bank) having its Head/Registered office at -----
----- herein after referred to as “**Guarantor**” which expression shall unless it be repugnant to the subject or context thereof include its successors and assigns;

In favour of:

INLAND WATERWAYS CONCESSIONING AUTHORITY OF INDIA, a statutory body established by the Government of India under the provisions of Inland Waterways Concessioning Authority of India Act, 1985, having its head office at A-13, Sector -1, Noida – 201 301, Uttar Pradesh, represented by its [Chairman] (hereinafter referred to as the “**the Concessioning Authority**”, which expression shall, unless repugnant to the context or meaning thereof, include, its successors and assigns.

WHEREAS:

- (a) The Concessioning Authority, vide its Request for Proposal dated [●] (“the RFP”) invited bidders to implement a project envisaging (more particularly described in Annexure I and hereinafter referred to as “**Project**”);
- (b) After evaluation of the bids received in response to the RFP, the Board accepted the bid of the consortium comprising of and (“the Consortium”) OR the Board accepted the bid of _____ (“**Bidder**”) and issued the Letter of Intent No (“**LOI**”) dated to the Consortium/Bidder requiring, inter alia, the execution of the Concession Agreement, (“the Concession Agreement”) the draft whereof was provided in the RFP;
- (c) Pursuant to the LOI the Bidder/Consortium has promoted and incorporated a special purpose company (“the Concessionaire”), to enter into the Concession Agreement for undertaking, inter alia, the work with respect to the Project referred to in Recital (a) above and to perform and discharge all its obligations thereunder.
- (d) In terms of the LOI and the Concession Agreement, the Concessionaire is required to furnish to the Board, a Performance Guarantee being an unconditional and irrevocable Bank Guarantee from a Scheduled Bank for a sum of Rs. [●] (Rupees [●] only) as security for due and punctual performance/discharge of its obligations under the Concession Agreement during the Terminal Equipment Phase,
- (e) At the request of the Concessionaire, and for valid consideration the Guarantor has agreed to provide guarantee, being these presents guaranteeing the due and punctual performance/discharge by the Concessionaire of its obligations under the Concession Agreement during the Terminal Equipment Phase.

NOW THEREFORE THIS DEED WITNESSETH AS FOLLOWS:

1. Capitalized terms used herein but not defined shall have the meaning assigned to them respectively in the Concession Agreement.
2. The Guarantor hereby irrevocably and unconditionally guarantees the due execution and punctual performance by M/s. (‘‘the Concessionaire’’) of all its obligations under the Concession Agreement during the Terminal Equipment Phase.
3. The Guarantor shall, without demur or protest, pay to the Board sums not exceeding in aggregate Rs. [●] (Rupees [●] only) within five (5) calendar days of receipt of a written demand therefor from the Board stating that the Concessionaire has failed to meet its performance obligations under the Concession Agreement during the Terminal Equipment Phase. The Guarantor shall not go into the veracity of any breach or failure on the part of the Concessionaire or validity of demand so made by the Board and shall pay the amount specified in the demand notwithstanding any direction to the contrary given or any dispute whatsoever raised by the Concessionaire or any other Person before any court, tribunal, expert, arbitrator or similar proceedings. The Guarantor’s obligations hereunder shall subsist until all such demands of the Board are duly met and discharged in accordance with the provisions hereof. Any such demand made on the Guarantor by the Board shall be conclusive, absolute and unequivocal as regards the amount due and payable by the Guarantor under this Agreement. The Concessions Authority shall at all times at its sole discretion have the absolute and unconditional right to call upon the Guarantor to pay the amount under the Guarantee.
4. In order to give effect to this Guarantee, the Board shall be entitled to treat the Guarantor as the principal debtor. The obligations of the Guarantor shall not be affected by any variations in the terms and conditions of the Concession Agreement or other documents or by the extension of time for performance granted by the Board or postponement/non- exercise/ delayed exercise of any of its rights by the Board or any indulgence shown by the Board to the Concessionaire and the Guarantor shall not be relieved from its obligations under this Guarantee on account of any such variation, extension, postponement, non-exercise or delayed exercise by the Board of any of the Board’s rights or any indulgence shown by the Board; provided nothing contained herein shall enlarge the Guarantor’s obligation hereunder.
5. This Guarantee shall be unconditional and irrevocable and shall remain in full force and effect until Scheduled Project Completion Date and for a period of twelve months thereafter unless discharged/released earlier by the Board in accordance with the provisions of the Concession Agreement. The Guarantor’s liability in aggregate shall be limited to a sum of Rs. [●] (Rupees [●] only).
6. This Guarantee shall not be affected by any change in the constitution or winding up, insolvency, bankruptcy, dissolution or liquidation of the Concessionaire/ the Guarantor or any absorption, merger or amalgamation of the Concessionaire/the Guarantor with any other Person.
7. Any payment made hereunder shall be made free and clear of, and without deduction for or on account of taxes, levies, imposts, duties, charges, fees, deductions, or withholding of any nature whatsoever.
8. The Guarantor hereby irrevocably and unconditionally undertakes, agrees and acknowledges that its obligations as a Guarantor hereunder:
 - (a) shall not be affected by the existence of or release or variation of any other guarantee or security for any of the obligations of the Concessionaire under the Concession Agreement;

- (b) shall not be affected by any failure by the Concessioneing Authority to perform any of its obligations under the Agreement;
- (c) shall not be affected by any failure or delay in payment of any fee or other amount payable to the Guarantor in respect hereof;
- (d) shall not be affected by any exercise or non-exercise of any right, remedy, power or privilege of any person under or in respect of any payment obligations of the Concessionaire under the Concession Agreement;
- (e) shall not be affected by any failure, omission or delay on the Concessioneing Authority's part to enforce, assert or to exercise any right, power or remedy conferred on the Concessioneing Authority in this Guarantee;
- (f) shall not be affected by any act, omission, matter or thing which, but for this article would reduce, release or prejudice the Guarantor from any of the obligations under this Guarantee or prejudice or diminish the obligations in whole or in part.

9. The obligations, covenants, agreements and duties herein shall not be subject to any counterclaims, cross claims, set offs, deductions, withholdings, diminutions, abatements, recouments, suspensions, deferments, reductions or defence for any reason whatsoever and the Guarantor, shall have no right to terminate this Guarantee or to be released, relieved or discharged from any of its obligations, covenants, agreements and duties hereunder for any reason whatsoever.

10. The Guarantor has power to issue this guarantee and discharge the obligations contemplated herein, and the undersigned is duly authorized to execute this Guarantee pursuant to the power granted under .

11. This Guarantee shall be governed by and construed in accordance with the laws of India. The Guarantor hereby irrevocably submits to the exclusive jurisdiction of the Court of _____ for the purposes of any suit, action, or other proceeding arising out of this Guarantee, or the subject matter hereof, brought by the Concessioneing Authority or its successors or assigns. To the extent permitted by Applicable Law, the Guarantor or its successors or assigns hereby waive, and shall not assert, by way of motion, as defence, or otherwise, in any such suit, action, or proceeding any claim that such suit, action, or proceedings is brought in an inconvenient forum, or that the value of such suit, action, or proceeding is improper, or that the subject matter hereof may not be enforced in or by such court.

IN WITNESS WHEREOF THE GUARANTOR HAS SET ITS HANDS HEREUNTO ON THE DAY, MONTH AND YEAR FIRST HEREINABOVE WRITTEN.

SIGNED AND DELIVERED by

_____ Bank by the hand of Mr. _____ its

_____ and authorized official.

34. Annexure XII: Certificates

Completion Certificate

1. I, [●] (Name of the Independent Engineer), acting as Independent Engineer, under and in accordance with the Agreement dated [●], for the [●] Project on equip, operate and transfer (EOT) basis, through [(Name of Concessionaire)], hereby certify that the Tests specified in Article [●] and Schedule-[●] of the Agreement have been successfully undertaken to determine compliance of the Project with the provisions of the Agreement, and I am satisfied that the Project can be safely and reliably placed in commercial service of the users thereof.

2. It is certified that, in terms of the aforesaid Agreement, all works forming part of the Project have been completed, and the Project is hereby declared fit for entry into commercial operation on this the [●] Day of [●] 20[●].

SIGNED, SEALED AND DELIVERED For and on behalf of the INDEPENDENT ENGINEER by:

(Signature) (Name) (Designation) (Address)

Provisional Certificate

1. I, [[●] (Name of the Independent Engineer)], acting as Independent Engineer, under and in accordance with the Agreement dated [●], for the Project on equip, operate and transfer (EOT) basis through [● (Name of Concessionaire)], hereby certify that the Tests specified in Article [●] and Schedule-[●] of the Agreement have been undertaken to determine compliance of the Project with the provisions of the Concession Agreement.
2. Development/Equipment Works that were found to be incomplete and/or deficient have been specified in the Punch List appended to the Provisional Certificate, and the Concessionaire has agreed and accepted that it shall complete and/or rectify all such works in the time and manner set forth in the Agreement. [Some of the incomplete works have been delayed as a result of reasons attributable to the Concessing Authority or due to Force Majeure and the Provisional Certificate cannot be withheld on this account. Though the remaining incomplete works have been delayed as a result of reasons attributable to the Concessionaire,] I am satisfied that having regard to the nature and extent of such incomplete works, it would not be prudent to withhold commercial operation of the Project, pending completion thereof.
3. In view of the foregoing, I am satisfied that the Project can be safely and reliably placed in commercial service of the users thereof, and in terms of the Concession Agreement, the Project is hereby provisionally declared fit for entry into commercial operation on this the [●] Day of [●] 20[●].

ACCEPTED, SIGNED, SEALED AND
DELIVERED For and on behalf of
CONCESSIONAIRE by:

(Signature)

(Name and Designation)

(Address)

SIGNED, SEALED AND DELIVERED
For and on behalf of INDEPENDENT
ENGINEER by:

(Signature)

(Name and Designation)

(Address)

35. Annexure XIII: Applicable Permits

The following are the key applicable permits:

1. Approval under Section 13 of the IWAI Act, for the execution and delivery of this Contract;
2. Compliance of all the conditions (General, specific and other) laid down by the MoEF&CC for granting CRZ clearance for the Haldia MMT vide Letter No. 11-14/2017-IA.III dated 06.11.2017.
3. Fire Safety recommendations/Provisional no-objection certificate in respect of MMT Haldia from the Fire and Emergency Services, Government of West Bengal.
4. Consent to Operate for terminal operation in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and Control of Pollution) Act, 1974 and Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016 and amendments thereon.
5. Registration certificate under Merchant Shipping Act, 1958 (cargos are required to register in India under this act).
6. License to store petroleum beyond prescribed quantity as per the provisions of Petroleum Rules, 2002 and amendments thereon.
9. No-objection certificate in respect of the building from the West Bengal Fire Service Directorate;

36. Annexure XIV: Schedule I, II and III of Inland Waterways Concessions Authority of India Amendment Regulations 2018

(Refer article 8.1.1)

In exercise of the powers conferred by section 35 read with section 17 of the Inland Waterways Authority of India Act, 1985 (82 of 1985), the Authority, with the previous approval of the Central Government, hereby makes the following regulations further to amend the Inland Waterways Authority of India (Levy and Collection of fees and charges) Regulations, 2011, namely:

1. These regulations may be called the Inland Waterways Authority of India (Levy and Collection of fees and charges) Amendment Regulations, 2018.
2. It shall come into force on the date of its publication in the Official Gazette.
3. In the Inland Waterways Authority of India (Levy and Collection of fees and charges) Regulations, 2011 (herein after referred to as the said regulations), in regulation 2, for articles (b),(c) and (d), the following articles shall be substituted, namely:
 - (b) “Authority” means Inland Waterways Authority of India;
 - (c) “fees and charges” means the fees and charges as provided in regulation 4 payable for the services provided to the vessel or cargo owners for usage of infrastructure created by the Authority and for use of national waterways and includes the charges for services provided to the vessel or cargo owners by any operator duly authorized by the Authority;
 - (ca) “Operator” means a company registered under the Companies Act, 2013 (18 of 2013) which has entered into a contract with the Authority for operation and maintenance of an inland waterways terminal and is authorized by the Authority to collect fees and charges for its services as specified in these regulations;
 - (d) “Schedule” means a Schedule annexed to these regulations;
4. In the said regulations, in regulation 3, in the opening portion, for words “the Authority shall be classified”, the words “the Authority or by any operator duly authorized by the Authority, as the case may be, shall be classified” shall be substituted.
5. In the said regulations, for regulation 4, the following regulation shall be substituted, namely:

Payment of fees and charges - Every vessel or cargo owner shall pay to the Director of Regional Office of the Authority or to any operator duly authorized by the Authority, as the case may be, the fees and charges as specified below:

 - (a) Payment of fees and charges related to Waterways usage charges, Vessel related charges and Composite charges for all terminals shall be made as specified in Schedule I;
 - (b) Payment of fees, other than Waterways usage charges, vessel related charges and Composite charges, shall:

- (i) for all terminals, except the terminals at Kolkata (Garden Reach Jetty –I, Garden Reach Jetty-II and British Indian Steamer Navigation Jetty) and Kalughat (District Saran) be made as per Schedule II;
- (ii) for the terminals at Kolkata (Garden Reach Jetty –I, Garden Reach Jetty-II and British Indian Steamer Navigation Jetty) and Kalughat (District Saran) be made as per Schedule III;

6. In the said regulations, for regulation 5, the following regulation shall be substituted, namely:

“Maintenance of Accounts – Director of Regional Office of the Authority shall maintain an account of the fees and charges received by the Authority, or as the case may be, received from any operator duly authorized by the Authority”.

7. In the said regulations, for Schedule, the following Schedules shall be substituted, namely:

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Schedule I

[See regulation 4 (a)]

(For Waterways usage charges, Vessel related charges and Composite charges for all terminals)

(I) Waterway usage charges

Sl. No	Name of the service	Charges (in rupees)
1.	Movement of cargo vessels	0.02 per gross registered tonnage (GRT) per kilometer for use of National Waterways and Indo-Bangladesh Protocol Route
2.	Movement of cruise vessels	Nil for use of National Waterways and Indo-Bangladesh Protocol Route up to a distance of fifty kilometers (One-way distance). (i) 0.05 per gross registered tonnage (GRT) per kilometer for use of National Waterways and Indo-Bangladesh Protocol Route beyond a distance of fifty kilometers.
3.	Movement of any other vessel not covered in above categories	0.02 per gross registered tonnage (GRT) per kilometer for use of National Waterways and Indo-Bangladesh Protocol Route within Indian territory.

(II) Vessel related charges

Sl. No.	Name of the service	Charges (in rupees)
1.	Berthing charges	(i) 1000/- for Kolkata/Haldia for twenty-four hours or part thereof – 6AM to 6AM next day. (ii) 500/- for Patna/Guwahati and terminals on National Waterway-3 for twenty-four hours or part thereof – 6AM to 6AM next day. (iii) 100/- for temporary pontoons for twenty-four hours or part thereof – 6AM to 6AM next day.
2.	Towage	On specific request as per actual cost.
3.	Pilotage	750/- per day or part thereof per pilot.

(III) Composite charges

Sl. No	Name of the service	Charges (in Rupees)
1.	Movement of Over Dimensional Cargo (ODC)	1.50/- Per metric ton per kilometer*

*A user paying ODC charges would be exempt from payment of waterway charges and vessel related charges.

Schedule II

[See regulation 4 (b) (i)]

{Fees (other than Waterways usage charges, Vessel related charges and Composite charges) for terminals other than those specifically mentioned in Schedule III}

(I) Cargo related charges

Sl. No.	Name of the service	Charges (in rupees)
1.	Terminal Charges	
(i)	Dry cargo	1/- per ton part thereof
(ii)	Liquid cargo	1/- per ton or part thereof
(iii)	Containerised cargo	50/- per twenty-foot equivalent unit (TEU) and 75/- per forty-foot equivalent unit (FEU)
2.	Transit shed charges	(a) Free for first seven days (b) 5/- per metric ton (MT) per day or part thereof for next fourteen days (c) 10/- per metric ton (MT) per day or part thereof for further fourteen days (d) 40/- per metric ton (MT) per day or part thereof after thirty-five days and the cargo shall be caused to be removed without notice and disposed off by the Authority at the risk and cost of the owner to vacate the covered area/transit shed/premises and to recover due payment. (Per day – 6AM to 6AM next day)
3.	Open storage charges	
(i)	Hard stand	(a) Free for first seven days (b) 2/- per metric ton (MT) per day or part thereof for next fourteen days (c) 4/- per metric ton (MT) per day or part thereof for further fourteen days (d) 16/- per metric ton (MT) per day or part thereof after thirty-five days and the cargo shall be caused to be removed without notice and disposed off by the Authority at the risk and cost of the owner to vacate the hard stand/premises and to recover due payment. (Per day – 6AM to 6AM next day)
(ii)	On open area	(a) Free for first seven days (b) 1/- per metric ton (MT) per day or part thereof for next fourteen days

		<p>(c) 2/- per metric ton (MT) per day or part thereof for further fourteen days</p> <p>(d) 8/- per metric ton (MT) per day or part thereof after thirty-five days and the cargo shall be caused to be removed without notice and disposed off by the Authority at the risk and cost of the owner to vacate the open area/premises and to recover due payment. (Per day – 6AM to 6AM next day)</p>
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(II) Miscellaneous charges

Sl. No.	Name of the service	Charges (in rupees)
1.	Crane (including pontoon crane) hire charges	<p>800/- per shift of eight hours for the cranes of the capacity up to five metric tons.</p> <p>2000/- per shift of eight hours for the cranes of the capacity up to twenty metric tons.</p> <p>2500/- per shift of eight hours for the cranes of the capacity of more than twenty metric tons.</p>
2.	Container crane	1100/- per hour or part thereof
3.	Fork lift	600/- per shift of eight hours for the fork lift of the capacity up to three metric tons.
4.	Electric supply to the vessel	As per the actual rates of the Electricity Board/Authority including surcharge.
5.	Bunkering of fuel/petroleum oil lubricants	As per market rate and surcharge, transport etc.
6.	Water supply	300/- per kilolitre
7.	Sewage disposal	100/- per kilolitre
8.	Weighing scale	<p>5/- per metric ton (MT).</p> <p>Minimum 50/-</p> <p>Issue of weight certificate : Rupees twenty five per vehicle</p>

Schedule III

[See regulations 4 (b) (ii)]

{Fees (other than Waterways usage charges, Vessel related charges and Composite charges) for terminals at Kolkata (Garden Reach Jetty –I, Garden Reach Jetty-II and British Indian Steamer Navigation Jetty) and Kalughat (District Saran)}

(I) Cargo related charges

Sl. No	Name of the service	Charges (in Rupees)
1.	Terminal Charges	
(i)	Dry cargo	21/- per tonne or part thereof
(ii)	Liquid cargo	21/- per tonne or part thereof
(iii)	Containerised cargo	420/- per twenty-foot equivalent unit (TEU) and 800/- per forty-foot equivalent unit (FEU)
2.	Handling charges - Break Bulk Cargo (Export and Import)	
(a)	Bagged Cargo	
(i)	Discharging charges from ship to shore and vice-versa using GRT crane	160/- per metric tonne (MT) or part thereof
(ii)	Movement from jetty to storage yard / warehouse and vice-versa	50/- per metric tonne (MT) or part thereof
(b)	Cargo in wooden box or cartons	
(i)	Discharging charges from ship to shore and vice-versa using GRT crane	250/- per metric tonne (MT) or cubic meters (CBM) whichever is higher
(ii)	Movement from jetty to storage yard / warehouse and vice-versa	80/- per metric tonne (MT) or cubic meters (CBM) whichever is higher
(c)	Iron and steel	
(i)	Discharging charges from ship to shore and vice-versa using GRT crane	300/- per metric tonne (MT) or part thereof
(ii)	Movement from jetty to storage yard / warehouse and vice-versa	100/- per metric tonne (MT) or part thereof
3.	Truck loading/ unloading charges	
(i)	Truck loading/unloading	50/- per metric tonne (MT) or cubic meter (CBM)

4.	Storage	
(i)	Warehouse	<ul style="list-style-type: none"> a. Free for first three days b. 15/- per metric tonne (MT) or cubic meter or part thereof for next twelve days c. 27/- per metric tonne (MT) or cubic meter (CBM) or part thereof for further fifteen days d. 54/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof after thirty days
(ii)	Open Yard	<ul style="list-style-type: none"> a. Free for first three days b. 12/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof for next twelve days c. 22/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof for further fifteen days d. 44/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof after thirty days
5.	Handling charges for Bulk Cargo (Export and Import)	
(a)	Stone chips	
(i)	Composite charge for loading/unloading on to vessel by mechanical means, movement to yard or truck and loading/unloading on/from Truck	170/- per tonne
(b)	Fly Ash	
(i)	Composite charge for loading/unloading on to vessel by pneumatic means, movement to yard or truck and loading/unloading on/from Truck	45/- per metric tonne (MT)
6.	Container - Terminal Service	
(a)	Loaded container, Loading or Discharging	4500/- per twenty-foot equivalent unit (TEU) container, 6000/- per forty-foot equivalent unit (FEU) container and 6800/- per forty-foot equivalent high cube unit container
(b)	Empty container, Loading or Discharging	1800/- per twenty-foot equivalent unit (TEU) container, 2200/- per forty-foot equivalent unit (FEU) container and 2500/- per forty-foot equivalent high cube unit container

(c)	Transportation of containers from Jetty to GRT storage yard and stacking or vice versa	850/- per twenty-foot equivalent unit (TEU) container, 1000/- per forty-foot equivalent unit (FEU) container and 1200/- per forty-foot equivalent high cube unit container
7.	Container – Export	
(a)	Pick up of empty container from GRT storage yard, placement for stuffing, cargo receiving from truck, Customs examinations, stuffing in container and transportation of the loaded container up to GRT jetty	5500/- per twenty-foot equivalent unit (TEU) container, 11000/- per forty-foot equivalent unit (FEU) container and 13000/- per forty-foot equivalent high cube unit container
(b)	Lift-On / Lift-Off*	700/- per twenty-foot equivalent unit (TEU) container, 1300/- per forty-foot equivalent unit (FEU) container and 1300/- per forty-foot equivalent high cube unit container
<p>For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers. RBI declared exchange rate for the conversion of currency applicable for the day shall be applied.</p> <p>*for any additional movement if requested by exporters</p>		
	Laden containers	
(c)	Storage for export laden containers	<ul style="list-style-type: none"> a. Free for first three days b. 6 (USD equivalent in Rupees) per TEU for next six days c. 12 (USD equivalent in Rupees) per TEU for next six days d. 24 (USD equivalent in Rupees) per TEU per day for the next six days e. 48 (USD equivalent in Rupees) per TEU per day after 21 days
<p>For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers. RBI declared exchange rate for the conversion of currency applicable for the day shall be applied.</p>		
8.	Container – Import	
(a)	Removal of laden container from GRT storage yard to un-stuffing yard, Custom examinations, un-stuffing of container and transportation of empty container from un-stuffing yard to GRT empty yard	5500/- per twenty-foot equivalent unit (TEU) container, 11000/- per forty-foot equivalent unit (FEU) container and 13000/- per forty-foot equivalent high cube unit container

(b)	Storage of Import laden containers	<ul style="list-style-type: none"> a. Free for first three days b. 6 (USD equivalent in Rupees) per TEU for next six days c. 12 (USD equivalent in Rupees) per TEU for next six days d. 24 (USD equivalent per TEU per day for the next six days e. 48 (USD equivalent in Rupees) per TEU per day after 21 days
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For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers. RBI declared exchange rate for the conversion of currency applicable for the day shall be applied.

9.	Container - Empty Container	
(a)	Lift-On / Lift-Off	350/- per twenty-foot equivalent unit (TEU) container, 550/- per forty-foot equivalent unit (FEU) container and 550/- per forty-foot equivalent high cube unit container
(b)	Ground Rent	70/- per twenty-foot equivalent unit (TEU) container, 140/- per forty-foot equivalent unit (FEU) container and 140/- per forty-foot equivalent high cube unit container

For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers.

10.	Container – Transportation	
(a)	Laden and empty transportation to and from GRT to NSD/KPT	1500/- per twenty-foot equivalent unit (TEU) container, 2500/- per forty-foot equivalent unit (FEU) container and 2500/- per forty-foot equivalent high cube unit container

For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers.

11.	Container - Reefer Container	
(a)	Container power plug	750/- per twenty-foot equivalent unit (TEU) container and 1500/- per forty-foot equivalent (FEU) container for 8 hours or part thereof
(b)	Power monitoring	750/- for 8 hours or part thereof

(II) Miscellaneous charges

Sl. No	Name of the service	Charges (in Rupees)
1.	Electric supply to the vessel	As per the actual rates of the Electricity Board/Authority including surcharge

2.	Bunkering of fuel/petroleum oil lubricants	As per market rate and surcharge
3.	Water supply	500/- per kiloliter
4.	Weighing scale	15/- per metric tonne (MT). (Minimum 500/-) Issue of weight certificate: 50/-per vehicle
5.	Weighment	400/- per twenty-foot equivalent unit (TEU) container and 600/- per forty-foot equivalent unit (FEU) container
6.	Verified gross mass(VGM)	1000/- per container
7.	Mooring and ancillary functions	4000/- for 8 hours or part thereof
8.	Berthing and unberthing assistance services (per Berth/Voyage)	2000/-
9.	Berthing and unberthing assistance services for Ro-Ro (per berth/Voyage)	1500/-
10.	Seal cutting charge/ Seal fixing charge	100/- per container
11.	Loaded Container s.urvey charge	300/- per twenty-foot equivalent unit (TEU) container and 600/- per forty-foot equivalent unit (FEU) container
12.	Cargo survey charge	300/- per twenty-foot equivalent unit (TEU) container and 500/- per forty-foot equivalent unit (FEU) container
13.	Container entry	150/- per twenty-foot equivalent unit (TEU) container and 300/- per forty-foot equivalent unit (FEU) container
14.	Sweeping for spill over cargo	150/- per container
15.	Bagging charge (In pp bags in case of bulk cargo)	13/- per kg
16.	Customs appraisalment charges in case of multiple shipping bills	750/- per shipping bill/ bill of entry
17.	Internal shifting of loaded container	700/- per twenty-foot equivalent unit (TEU) container and 1225/- per forty-foot equivalent unit (FEU) container
18.	Truck entry	50/-
19.	Truck weighment	200/- per truck

20.	Terminal charges Ro-Ro truck	150/- for empty truck 200/- up to 12 tonnes 300/- above 12 tonnes
21.	Truck parking	100/- per hour Truck arriving at terminal via RORO vessel will be allowed to move out free of charge.

(III) Discount

The operator of terminals included in this schedule may offer a discount, if any, on prescribed rates. However, the discount has to be from the revenue share of operator only and the revenue share of Authority shall not get affected due to such discounts.

[FILE NO.IWAI/PR-17/IFC(INTG)/2015/Vol.IV]

(Ajay Kumar Gupta, Secretary)

Foot Note:

Inland Waterways Authority of India (Levy and Collection of fees and charges) Regulations, 2011, published in Gazette of India on July 16, 2011 vide no. IWAI/Cargo/184/2009 are the principal regulations.

Proposed Schedule IV

{Fees (other than Waterways usage charges and Composite charges) for terminals at Haldia, West Bengal

(I) Cargo related charges

Sl. No	Name of the service	Charges (in Rupees)
1.	Terminal Charges	
(i)	Dry cargo	21/- per tonne or part thereof
(ii)	Liquid cargo	21/- per tonne or part thereof
(iii)	Containerised cargo	420/- per twenty-foot equivalent unit (TEU) and 800/- per forty-foot equivalent unit (FEU)
2.	Handling charges - Break Bulk Cargo (Export and Import)	
(a)	Bagged Cargo	
(i)	Discharging charges from ship to shore and vice-versa using GRT crane	160/- per metric tonne (MT) or part thereof
(ii)	Movement from jetty to storage yard / warehouse and vice-versa	50/- per metric tonne (MT) or part thereof
(b)	Cargo in wooden box or cartons	
(i)	Discharging charges from ship to shore and vice-versa using GRT crane	250/- per metric tonne (MT) or cubic meters (CBM) whichever is higher
(ii)	Movement from jetty to storage yard / warehouse and vice-versa	80/- per metric tonne (MT) or cubic meters (CBM) whichever is higher
(c)	Iron and steel	
(i)	Discharging charges from ship to shore and vice-versa using GRT crane	300/- per metric tonne (MT) or part thereof
(ii)	Movement from jetty to storage yard / warehouse and vice-versa	100/- per metric tonne (MT) or part thereof
3.	Truck loading/ unloading charges	
(i)	Truck loading/unloading	50/- per metric tonne (MT) or cubic meter (CBM)
4.	Storage	

(i)	Warehouse	<ul style="list-style-type: none"> e. Free for first three days f. 15/- per metric tonne (MT) or cubic meter or part thereof for next twelve days g. 27/- per metric tonne (MT) or cubic meter (CBM) or part thereof for further fifteen days h. 54/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof after thirty days
(ii)	Open Yard	<ul style="list-style-type: none"> e. Free for first three days f. 12/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof for next twelve days g. 22/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof for further fifteen days h. 44/- per metric tonne (MT) or cubic meter (CBM) per day or part thereof after thirty days
5.	Handling charges for Bulk Cargo (Export and Import)	
(a)	Stone chips	
(i)	Composite charge for loading/unloading on to vessel by mechanical means, movement to yard or truck and loading/unloading on/from Truck	170/- per tonne
(b)	Fly Ash	
(i)	Composite charge for loading/unloading on to vessel by pneumatic means, movement to yard or truck and loading/unloading on/from Truck	45/- per metric tonne (MT)
6.	Container - Terminal Service	
(a)	Loaded container, Loading or Discharging	4500/- per twenty-foot equivalent unit (TEU) container, 6000/- per forty-foot equivalent unit (FEU) container and 6800/- per forty-foot equivalent high cube unit container
(b)	Empty container, Loading or Discharging	1800/- per twenty-foot equivalent unit (TEU) container, 2200/- per forty-foot equivalent unit (FEU) container and 2500/- per forty-foot equivalent high cube unit container
(c)	Transportation of containers from Jetty to GRT storage	850/- per twenty-foot equivalent unit (TEU) container, 1000/- per forty-foot equivalent unit (FEU)

	yard and stacking or vice versa	container and 1200/- per forty-foot equivalent high cube unit container
7.	Container – Export	
(a)	Pick up of empty container from GRT storage yard, placement for stuffing, cargo receiving from truck, Customs examinations, stuffing in container and transportation of the loaded container up to GRT jetty	5500/- per twenty-foot equivalent unit (TEU) container, 11000/- per forty-foot equivalent unit (FEU) container and 13000/- per forty-foot equivalent high cube unit container
(b)	Lift-On / Lift-Off*	700/- per twenty-foot equivalent unit (TEU) container, 1300/- per forty-foot equivalent unit (FEU) container and 1300/- per forty-foot equivalent high cube unit container
For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers. RBI declared exchange rate for the conversion of currency applicable for the day shall be applied. *for any additional movement if requested by exporters		
	Laden containers	
(c)	Storage for export laden containers	<ul style="list-style-type: none"> f. Free for first three days g. 6 (USD equivalent in Rupees) per TEU for next six days h. 12 (USD equivalent in Rupees) per TEU for next six days i. 24 (USD equivalent in Rupees) per TEU per day for the next six days j. 48 (USD equivalent in Rupees) per TEU per day after 21 days
For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers. RBI declared exchange rate for the conversion of currency applicable for the day shall be applied.		
8.	Container – Import	
(a)	Removal of laden container from GRT storage yard to un-stuffing yard, Custom examinations, un-stuffing of container and transportation of empty container from un-stuffing yard to GRT empty yard	5500/- per twenty-foot equivalent unit (TEU) container, 11000/- per forty-foot equivalent unit (FEU) container and 13000/- per forty-foot equivalent high cube unit container

(b)	Storage of Import laden containers	<ul style="list-style-type: none"> f. Free for first three days g. 6 (USD equivalent in Rupees) per TEU for next six days h. 12 (USD equivalent in Rupees) per TEU for next six days i. 24 (USD equivalent per TEU per day for the next six days j. 48 (USD equivalent in Rupees) per TEU per day after 21 days
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For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers. RBI declared exchange rate for the conversion of currency applicable for the day shall be applied.

9.	Container - Empty Container	
(a)	Lift-On / Lift-Off	350/- per twenty-foot equivalent unit (TEU) container, 550/- per forty-foot equivalent unit (FEU) container and 550/- per forty-foot equivalent high cube unit container
(b)	Ground Rent	70/- per twenty-foot equivalent unit (TEU) container, 140/- per forty-foot equivalent unit (FEU) container and 140/- per forty-foot equivalent high cube unit container

For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers.

10.	Container – Transportation	
(a)	Laden and empty transportation to and from GRT to NSD/KPT	1500/- per twenty-foot equivalent unit (TEU) container, 2500/- per forty-foot equivalent unit (FEU) container and 2500/- per forty-foot equivalent high cube unit container

For 45 feet containers, the fees shall be 1.25 times higher than Fee for FEU containers and ground rent shall be twice the rent for FEU containers.

11.	Container - Reefer Container	
(a)	Container power plug	750/- per twenty-foot equivalent unit (TEU) container and 1500/- per forty-foot equivalent (FEU) container for 8 hours or part thereof
(b)	Power monitoring	750/- for 8 hours or part thereof

(II) Vessel related charges

Sl. No.	Name of the service	Charges (in rupees)
1.	Berthing charges	<ul style="list-style-type: none"> (i) 1000/- for Kolkata/Haldia for twenty-four hours or part thereof – 6AM to 6AM next day. (ii) 100/- for temporary pontoons for twenty-four hours or part thereof – 6AM to 6AM next day.

2.	Towage	On specific request as per actual cost.
3.	Pilotage	750/- per day or part thereof per pilot.

(III) Miscellaneous charges

Sl. No	Name of the service	Charges (in Rupees)
1.	Electric supply to the vessel	As per the actual rates of the Electricity Board/Authority including surcharge
2.	Bunkering of fuel/petroleum oil lubricants	As per market rate and surcharge
3.	Water supply	500/- per kiloliter
4.	Weighing scale	15/- per metric tonne (MT). (Minimum 500/-) Issue of weight certificate: 50/-per vehicle
5.	Weighment	400/- per twenty-foot equivalent unit (TEU) container and 600/- per forty-foot equivalent unit (FEU) container
6.	Verified gross mass(VGM)	1000/- per container
7.	Mooring and ancillary functions	4000/- for 8 hours or part thereof
8.	Berthing and unberthing assistance services (per Berth/Voyage)	2000/-
9.	Berthing and unberthing assistance services for Ro-Ro (per berth/Voyage)	1500/-
10.	Seal cutting charge/ Seal fixing charge	100/- per container
11.	Loaded Container survey charge	300/- per twenty-foot equivalent unit (TEU) container and 600/- per forty-foot equivalent unit (FEU) container
12.	Cargo survey charge	300/- per twenty-foot equivalent unit (TEU) container and 500/- per forty-foot equivalent unit (FEU) container
13.	Container entry	150/- per twenty-foot equivalent unit (TEU) container and 300/- per forty-foot equivalent unit (FEU) container
14.	Sweeping for spill over cargo	150/- per container
15.	Bagging charge (In pp bags in case of bulk cargo)	13/- per kg

16.	Customs appraisal charges in case of multiple shipping bills	750/- per shipping bill/ bill of entry
17.	Internal shifting of loaded container	700/- per twenty-foot equivalent unit (TEU) container and 1225/- per forty-foot equivalent unit (FEU) container
18.	Truck entry	50/-
19.	Truck weighment	200/- per truck
20.	Terminal charges Ro-Ro truck	150/- for empty truck 200/- up to 12 tonnes 300/- above 12 tonnes
21.	Truck parking	100/- per hour Truck arriving at terminal via RORO vessel will be allowed to move out free of charge.

(IV) Discount

The operator of terminals included in this schedule may offer a discount, if any, on prescribed rates. However, the discount has to be from the revenue share of operator only and the revenue share of Authority shall not get affected due to such discounts.

(V) Revision

The above tariffs shall be revised every year based on a variation in the Wholesale Price Index ("WPI"). WPI shall be as published by Reserve Bank of India. Such revision shall be based on indexation against 60% (sixty percent) of the variation in the WPI for a relevant year beginning 1st January and ending 31st December.

Such revised Ceiling tariff will become applicable after the same has been notified by the Concessioneing Authority.

37. Annexure XV: Environment Management Plan

DRAFT

INLAND WATERWAYS AUTHORITY OF INDIA

Ministry of Shipping, Government of India

“CAPACITY AUGMENTATION OF NATIONAL WATERWAY.1”

(Jal Marg Vikas Project)

ENVIRONMENTAL IMPACT ASSESSMENT REPORTS

VOLUME - 6: Environmental Management Plan (EMP) for Haldia Terminal

May 2016

(Revised September 2016)



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EQMS India Pvt. Ltd.

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Table of Contents

1.1.	Introduction	3
1.2.	Brief On Haldia Terminal	4
1.3.	Description of Environment	4
1.4.	Environmental Management and Monitoring Plan	8
1.5.	Environment Health and Safety Cell	8
1.6.	Reporting Requirements:	9

List of Tables

Table 1.1 : Salient Environmental Features of Haldia Terminal Site	5
Table 1.2 : Environment Management Plan Haldia Terminal During Construction Phase	10
Table 1.3 : Environment Management Plan Haldia Terminal During Operation Phase	38
Table 1.4 : Environment Monitoring Plan of Haldia Terminal for Construction & Operation Phase ..	59

List of Figures

Figure 1.1 : Location Map	3
---------------------------------	---

List of Annexure

Annexure 1.1: Green Belt Development Plan	62
Annexure 1.2: Occupational Health & Safety Management Plan	66
Annexure 1.3: Construction Debris Management Plan	69
Annexure 1.4: Construction and Labour Camp Management Plan	72
Annexure 1.5: Borrow Area Management Plans	77

Chapter 1. EMP FOR HALDIA TERMINAL

1.1. Introduction

Inland waterways Authority of India (IWAI) has proposed to augment the navigation capacity of waterway NW-1 (Haldia to Allahabad) and continue to maintain the entire stretch. Under this project, IWAI has proposed to develop the infrastructure facility like Multimodal 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 Dredging of the navigation channel, to augment the navigation capacity of the waterway.

An inland water terminal at Haldia is proposed to be developed within Haldia Dock Complex at River Hooghly (NW-1) under this project to enhance the navigation facility of the NW-1. The project is also requirement of Haldia Dock Complex for its economy, better serviceability to end customer and to improve the primary / secondary logistic cost. Location map of the project is given in **Figure 1.1** below.



Figure 1.1 : Location Map

1.2. Brief On Haldia Terminal

Project involves development of an inland water terminal at River Hooghly (NW-1) proposed to be located at Haldia industrial area, near Durgachawk, Haldia, District Purbi Medinipur, West Bengal. Geographical coordinates of the centre of site are 22°03'38.34"N & 88°08'29.49"E. River Hooghly flows in South direction of the terminal site. Terminal site is well connected by the roads. Site is connected to NH-41 through 7 m paved road in North direction. Durgachak Railway Station is about 0.6 km away from the site towards North direction and Haldia railway station is about 12 km away towards west direction. Nearest Airport is at Kolkata which is about 135 km away from the site in north direction. River Hooghly in this stretch is navigable and local ferries are currently operating in the river for transportation of men and material. Internal roads of width 17 m & 10 m will be developed at project site.

Total area of terminal site is 61.0 acres. The identified land belongs to Haldia Dock Complex. Site is low lying area with elevation ranging from 4-9 m amsl. It is required to fill the site to achieve finished level of 7 m, i.e. 2.54 m above HFL. Soil required for filling is 3.3 lakh cum.

Terminal facility is designed to handle 3.18 MTPA of cargo. Cargo comprises of fly ash, fertilizer, stone aggregate, coal, edible oil & POL. These materials will be stored, loaded, unloaded and transported from the terminal site.

Facilities to be developed at terminal site include both onshore and off-shore facilities. Onshore facilities include 16 nos. of silos for fly ash storage, stockyards for stone aggregates, fertilizers & edible oil/POL, internal roads, administration building, worker's amenity building, lighting tower, power supply system, fire-fighting system, sewerage system, storm water management system, waste management system and green belt (3 acres). Off-shore facilities include 4 nos. of berths & approach trestles and water approach channel. The proposed terminal project will be developed in phases, i.e. phase 1A & 1 B. Phase 1 A will comprises of all the proposed developments except 8 nos. of fly ash storage silos and its conveyors out of proposed 16 nos. of silos, stockyard development area (future storage) and railway siding.

1.3. Description of Environment

The baseline environmental data generation has been done for the period of 15th September to 15th October 2015. The study area within a 10 km radius around the proposed terminal site has been considered as general impact zone and 2 Km radius as specific impact zone for EIA study. Primary and secondary data has been collected for both the zone however focus of primary data generation has been more for 2 Km radius. Data was generated by following the monitoring plan approved by IWAI and World Bank in line with prescribed TOR by IWAI.

The Salient Environmental Features of Haldia Terminal Project within 500m, 2 Km and 10 Km radius is summarised at **Table 1.1**.

Table 1.1 : Salient Environmental Features of Haldia Terminal Site

S. No.	Environmental Features	Within 500 m area around Proposed terminal site	Within 2 km area around Proposed terminal site	Within 10 km area around Proposed terminal site
1	Ecological Environment			
A	Presence of Wildlife Sanctuary/ National Park/Biosphere Reserves	None	None	None
B	Reserved /Protected Forests	None	None	None
C	Wetland of state and national interest	None	None	None
D	Migratory route for wild animals	None	None	None
E	Migratory routes for birds	None	None	None
F	Presence of Schedule-I Terrestrial Fauna	None	None	None
G	Presence of Schedule-I Aquatic Fauna	None	None	None
H	Tree cover	Yes General road side plantation	Yes General road side plantation	Yes General sparse vegetation and road side plantation.
I	Critically polluted Area	Haldia was declared by CPCB a "Critically Polluted Area (CPA's) by Advt. No. B-29012/ESS/CPA/2010. However, the moratorium has now been lifted vide MoEF Office Memorandum N. J - 11013/5/2010 -IA. II (i) dated 17.09.2013. The proposed project is identified as vital infrastructure requirement of the Haldia Dock complex for its economy, better serviceability to end customer and to improve the primary / secondary logistic cost		
J	CRZ Area	The project area falls within CRZ		
2.	Physical Environment			
K	Road connectivity	The site is well connected by roads	Haldia Mecheda Road.	Kolkata-Haldia National Highways (NH-41 about 6 km W) starts at Haldia near the Haldia refinery and meets NH-6 linking Kolkata to Mumbai at Mecheda.
L	Rail connectivity	Railway line is app. 200 m distance from terminal site in North direction	Durgachak railway Station about 600 m in NW of site	Durgachak railway Station about 600 m in NW of the site & Haldia Railway Station is at 12 km distance from terminal site

S. No.	Environmental Features	Within 500 m area around Proposed terminal site	Within 2 km area around Proposed terminal site	Within 10 km area around Proposed terminal site
M	Defence Installation	None	None	None
N	Densely Populated Area/Industrial Area	Haldia Dock Industrial Complex	Haldia town	Haldia town
O	Topography	Mainly flat with ground elevation ranging between 2-9 meters above mean sea level	Mainly flat with ground elevation ranging between 1-14 meters above mean sea level.	Mainly flat with ground elevation ranging between 0-16 meters above mean sea level.
P	Seismicity	Falls in Zone-IV high damage risk zone as per Seismic Zonal Map of India	Falls in Zone-IV high damage risk zone as per Seismic Zonal Map of India	Falls in Zone-IV high damage risk zone as per Seismic Zonal Map of India
Q	Surface Water Resources (Rivers)	Hooghly River passes along the southern boundary of the Terminal Green Belt Canal is flowing along the western boundary of the terminal site	Hooghly River passes along the southern boundary of the Terminal Green Belt Canal is flowing along the western boundary of the terminal site	Hooghly River passes along the southern boundary of the Terminal Haldi river is located about 9.5 km west of the proposed terminal. Green Belt Canal is flowing along the western boundary of the terminal site
R	Groundwater	Ground water in Haldia region occurs under confined condition. Pre-monsoon piezometric level -7-15 m bgl. Annual withdrawal - 24.63-MCM. Annual ground water recharge through the confined aquifer- 5.348-MCM leaving an annual deficit of 18.282-MCM.		
S	Soil and Land-use	Sandy clay Land use in 500m of site is under road, industrial use, and Settlements.	Sandy lay Land use in 2 km area of site is under road, industrial use, and Settlements.	Sandy lay Land use in 10 km of site: about 29.41% of the land is under agriculture. 10.76% of the land is under settlement, about 38.16% land is under water bodies and rest of the land is under other uses
3.	Social Environment			

S. No.	Environmental Features	Within 500 m area around Proposed terminal site	Within 2 km area around Proposed terminal site	Within 10 km area around Proposed terminal site
T	Physical Setting	Industrial /Urban	Industrial / Urban	Urban / Rural /Industrial Settings
U	Physical Sensitive Receptors	None	Yes (Temples, Schools, College, Hospital)	Yes (Temples, Schools, College, Hospital)
V	Archaeological Monuments	None	None	None

Meteorology: Climate of the study area is typically moderate as it is located in coastal area. Dominant wind direction of the study area is S & SE during post-monsoon and N & NW during pre-monsoon period.

Air Quality: As per air quality monitoring study, it is found that ambient air quality of the site is within permissible limits as per NAAQS, 2009. However, levels of PM10 are observed to be higher. Project site is located in the Haldia Industrial Area. The area was classified as Critically Environmentally Polluted Area by CPCB and further exploitation of air & water quality was restricted in the area. However, moratorium has now been lifted from Haldia.

Noise Quality: Noise level monitoring was done in 3 location including project site, connecting road and nearest habitation "Durgachak". Noise levels at the site and in nearby areas are also found to be within the permissible limits as per CPCB standards for Industrial area.

Water Quality: As per CPCB, it is also found that the area is classified as notified zone for extraction of ground water. No ground water extraction is proposed in the project in both construction and operation phase. Ground water in the shallow aquifers, i.e. to depth of 120-300 mbgl are brackish to saline. Ground water in deeper aquifers is fresh and potable for drinking purpose with some treatment. However, Fe levels in ground water is higher in some part of district. Water quality of the River Hooghly is found to be equivalent to D Class Water body as per CPCB classification and is fit for propagation of Wildlife & Fisheries.

Soil Quality: Soil of the area is Clayey sand and slightly alkaline in nature and is moderately fertile with low to medium NPK value.

River Bed Sediments: River bed sediments of the River Hooghly were also studied along the stretch near the terminal site and they are found to be non-toxic with very low concentration of pesticides and other chemicals like DDT, Endosulphan, Lindane & methyl Parathion.

Flora and Fauna: Site lies within the Industrial area thus no significant vegetation or habitat for wildlife is present in the study area. Vegetation mainly comprises of the road side vegetation and some of the commonly found fauna species are Albizzia lebbeck, Casuarina equisetifolia, Phoenix sylvestris, Delonix regia, Acacia spp, Azadirachta indica, Delbergi sisso, Xanthium strumarium, Nerium indicum, Parthenium spp. Calotropis procera, Lantana camara, Casia tora, Vitex negundo, Zizyphus mauritiana, Cannabis sativa, Argemon maxicana, Sida spp etc. No significant wildlife was observed at site and in study area.

Hooghly River is rich in flora and fauna and varied variety of planktons, fishes and other aquatic life is present in the River. However, no RET species was found to be present at terminal site or in study area

Sensitive Ecosystem: No sensitive eco-system including national parks, wildlife sanctuaries, migratory routes of wildlife, Biosphere reserve, tiger reserve, elephant reserve, wetlands under Ramsar convention are present within 10 km distance of the project site.

Land use: As per the land use analysis within the 10 km radius zone about 38.16% of the land is under water body, about 29.41% of the land is under agriculture, about 13.43% land is under vegetation, 10.76% land is under settlement and rest of the land falls under other uses

Sensitive Ecosystem: No sensitive eco-system including national parks, wildlife sanctuaries, migratory routes of wildlife, Biosphere reserve, tiger reserve, elephant reserve, wetlands under Ramsar convention are present within 10 km distance of the project site.

Socioeconomic Data: The proposed terminal site is located in Haldia Industrial area, Tehsil Haldia and District Purbi Medinipur, West Bengal. Administratively the villages and settlements within 10 km area around the proposed Haldia terminal site fall in Purbi Medinipur and South Twenty-Four Parganas district of West Bengal. Maximum part of the study area falls in Purbi Medinipur District. There are 2 Municipality/town i.e. Haldia and Satahata and 50 village falls within 10 km Area of the terminal site. According to 2011 census the total population of the 10 km study area including Haldia and Satahata town is 301702 comprising 156769 males and 144933 females. The total population of Haldia and Satahata Town is 205982 comprising 107458 males and 98524 females. Male female ratio of the study area is 925 female / 1000 males. Total no. of households is 66281. Total SC population in 10 km area is 70446 comprising of 36729 males and 33717 females. Total ST Population in the study area is 1804 comprising of 959 males and 845 females. Out of the total population the SC and ST population of the study area is 23% and 1% respectively. . Out of the total population about 68% and 70% population is non-working population in 2 km and 10 km area.

1.4. Environmental Management and Monitoring Plan

Effective measures are required to be proposed and implemented during design, preconstruction, construction and operation stage to eliminate or minimize the impact of the project development. **Table 1.2 & 1.3** provides details of mitigation measures with implementation and supervision responsibility.

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 1.4**.

It will be essential for contractor to comply with applicable regulations and World Bank safeguard requirements. Contractor will also have to comply with applicable standards with respect to Water, air, Noise, Dredge Material, soil and biodiversity as applicable to this project.

1.5. Environment Health and Safety Cell

It is essential to establish environment health and safety cell for the project by contractor to ensure the health & safety of workers and environmental management of study area

through effective implementation of EMP. 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.

1.6. Reporting Requirements:

It is required that contractor will submit quarterly compliance report to Project Management Consultants (PMC) as well as to PMU (Project Management Unit) of IWAI. PMC will analyse the report and notify the corrective action if any required to contractor under intimation to IWAI.

Table 1.2 : Environment Management Plan Haldia Terminal During Construction Phase

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
DESIGN AND CONSTRUCTION PHASE							
1. Climate							
❖ Project is unlikely to cause negative effect on climate. However, project can contribute positively for climate	<ul style="list-style-type: none"> Dense green belt in 3-acre area shall be developed along the project premises. Tree species high in organic content like Neem, gulmohar, shisham, pongamia, siris Mango etc should be planted. Provision of alternative energy options like solar energy Adoption of best practices to cut down resources and energy requirement All terminal buildings should have energy efficient design. It should follow GRIHA guidelines and aim for highest ratings under GRIHA. 	Kyoto Protocol, National Water Policy, 2012, Forest Conservation Rules & National Forest Policy	Construction site	During Design, and construction stage.	Plantation for 1200 trees	Contractor,	IWAI/PMU/PMC ¹
2. Natural & Man-made Hazard							
❖ Earthquake- Seismic Zone –	<ul style="list-style-type: none"> Relevant IS code for structures shall be adopted for designing the civil structures to sustain the earthquake of high to very high 	NBC, 2005, local building bye laws, state factory rules,	Construction site & Navigation	During Design and construction	Part of Project Costs	Contractor	IWAI/PMU/PMC

¹ It is proposed to set up Project Unit (PMU) in IWAI to manage social and environmental aspect of NW1 augmentation. PMC (Project Management Consultants) anticipated to be appointed for project management and quality check.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Ill damage risk zone ² ❖ Risk of flood& Cyclones ❖ Risks due to occupational hazards and fire	intensity <ul style="list-style-type: none"> All facilities developed shall be above HFL of River Hooghly Regular maintenance and strengthening of the embankments to prevent the erosion and flooding Emergency preparedness plan should be prepared for situations of cyclone, flood, earthquake and fire and should be available at the site all the time. This plan should be inline with and integrated with the off-site emergency plan prepared for the area. Employee shall be given training to handle the emergency situation Site should be vacated in case of cyclone alerts Location of nearest cyclone shelters shall be located in the map and shall be displayed at the site. Coordination should be done with IMD to receive the cyclone threat and in case of cyclone threats the site should be vacated. Mock drills to handle the emergency 	Petroleum Rules and MSIHC Rules, 1989	Channel	stage.			

²IS: 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.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>situation shall be conducted for workers</p> <ul style="list-style-type: none"> • Emergency collection area should be provided at the site near the exit gate of the site and all workers should be aware about this collection point and shortest route to reach this place • Availability of the first aid boxes and necessary medicine as per State Factory Rules • Compulsion for workers to wear PPE while working to prevent injury due to accidents while working • Only skilled/trained person should be allowed to do the tasks involving the risk of accidents with due permission of site supervisor/safety officers • Separate work procedures and safety procedures should be prepared, if any night time working is involved 						
3. Site Preparation: Levelling Terminal Site, Construction Camp, Construction Works							
❖ Levelling of terminal site & Removal of vegetation	<ul style="list-style-type: none"> • Excavation and filling operations should be carried out in parallel so as to minimize the soil erosion • Compaction of soil shall be undertaken by sprinkling the water to minimize the erosion • Water sprinkling to be carried out for dust suppression • Top soil (15 cm) should be stripped and preserved under covered conditions for landscaping purpose in later stage. This should be stored in the form of the heap with the slide slopes covered with grass. Excavated soil should be used within the site for levelling purpose (1.5 lakh cum to be used for levelling). However most of the soil will be used for levelling within the site if 	<p>Municipal Solid Wastes (Management and Handling) Rules, 2015</p> <p>Hazardous Waste (Management, Handling & Transboundary) Rules, 2008</p> <p>Forest (Conservation) Act</p> <p>Social Impact Assessment</p>	Construction site	During design and Construction Stage	Part of Project Costs	Contractor.	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>remains any it should be used for realignment (diversion) of the existing road.</p> <ul style="list-style-type: none"> • Dredge soil should be either utilised for construction activity or disposed off along with excavated soil to the identified debris disposal site • Green belt (area of 3 acres) should be developed at the site and as per the Green Belt Management Plan (Annexure 1.1) • Survival rate of tree should be regularly monitored. It is should be minimum 70%. • Work timings should be restricted from 6:00 AM to 10:00 PM. Adequate illumination should be 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 1.2 and other tools such as OSHAS 18001 • Movement of construction vehicles shall be restricted to the designated haulage roads only to prevent compaction of soil in other areas • The earth stockpiles to be provided with gentle slopes to prevent soil erosion. • 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 • Existing river bank protection is sufficient for shore protection. • Wash-off from concrete mixing tanks and wash from washing area shall not be allowed to enter the soil. This wash shall be collected 	requirements					

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>through drains into tanks and concrete shall be settled, collected, dried and re-used in the site again</p> <p>Solid Waste Management:</p> <ul style="list-style-type: none"> • Arrangement should be made for segregation of waste into recyclable and non-recyclable waste • Non-recyclable waste generated should be disposed regularly through authorized agency. Recyclable waste should be sold to authorized vendors. • Construction waste generated should be segregated at site into recyclable, reusable & rejected fraction. Recyclable should be sold to authorized vendor, reusable waste should be stored at site for usage and rejected fraction and debris should be disposed at waste disposal site of Haldia Development Authority. (Annexure 1.3) • Any waste oil generated from construction machinery that should be stored on concrete platform and disposed off to authorized recyclers. 						
❖ Setting of Labour Camps: contamination of land and water resources from municipal waste from Camps, worker's health, Pressure on natural resources due to establishment	<p>Location of Camp:</p> <ul style="list-style-type: none"> • Construction camp sitting, establishment, location and management should be as per proposed Construction & Labour Camp Management Plan (Annexure 1.4) • Labour camps should be located within the construction sites to the extent possible <p>Sanitation and Worker's Health & Safety:</p> <ul style="list-style-type: none"> • Hygiene in the camps should be maintained by providing good sanitation and cleaning facilities. Soak Pits can be provided only if labour camp is located away from river. • Camp should be well ventilated. It should have adequate provision for illumination, 	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and Cess Act of 1996 and The Water (Prevention & Control of Pollution) Act, 1974 and amendments	Labour Camp Locations	During design and Construction Stage	For camp for sanitation and health facilities.	Contractor.	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
of labour camps	<p>kitchen and safe drinking water facility. Proper drainage to be maintained around the sites to avoid water logging leading to disease</p> <ul style="list-style-type: none"> • Proper sanitation facility like toilet and bathing facility should be provided at site and labour camps. Wastewater generated from these facilities should be disposed off through septic tanks and soak pit • Preventive medical care to be provided to workers • Segregated, collection and disposal of solid waste on regular basis at municipal solid waste disposal location of Haldia development Authority. • Provision should be made essential material supply like cooking fuel (gas) • Provision should be made for day crèche for 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 anywhere • Working hours of labour should not exceed than standard norms as per state factory law • 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 • 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 	<p>thereof. Municipal Solid Wastes (Management and Handling) Rules, 2000</p>					

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	water at site and thus breeding of mosquitoes/flies						
❖ Setting up Concert Mix Plant, Hot Mix Plant, Mechanical Workshop, Fuel storages, Lubricant storages	<ul style="list-style-type: none"> All these facilities shall be installed at proposed terminal site itself. All maintenance facilities, hot mix plant and concrete mixing plant shall be established with prior consent to be obtained from WBSPCB. All such equipment/plant shall be fitted with air pollution control system and shall comply with condition of consent to establish. Periodic monitoring shall be carried as per consent conditions. 	Air (Prevention and Control of Water Pollution) Act, 1981 and Water (Prevention and Control of Water Pollution) Act, 1974	Site construction Camp	During design and construction Stage	For camp for waste management facilities.	Contractor	IWAI/PMU/PMC
4. Site Preparation: Power supply, Water Supply, and Drainage, disposal of piling muck and debris							
❖ Power supply and Energy Conservation: Air Pollution, energy loss	<ul style="list-style-type: none"> Power shall be sourced from State electricity board during construction stage as well as operation 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 Solar energy shall be used in common lighting area on 1:2 basis. Energy Conservation Building Code shall be used as applicable to various office and other structures. 	Air (Prevention and Control of Water Pollution) Act, 1981 & ECBC Norms, 2007	Construction Sites and Labour Camp Locations	During design and construction stage	Part of Project Costs	Contractor.	IWAI/PMU/PMC
❖ Water Supply, Drainage and effluent discharge	<ul style="list-style-type: none"> Construction water requirement shall be sourced from municipal supply and necessary permission should be taken from concerned authority. No ground water or river water should be used because the CGWB has already classified the Haldia as Notified area. Caution signage shall be placed at site for optimal use of water Garland storm water temporary drains shall 	Central Ground Water Board, Water (Prevention and Control of Water Pollution) Act, 1974	Construction Sites and Labour Camp Locations	During design and construction stage	For construction of grease traps and de-siltation chambers	Contractor.	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>be provided around the excavated or activity area so as to divert rainfall run-off away from these locations. These pits shall be covered during rainy season to the extent possible. Excavation shall be avoided during monsoon season.</p> <ul style="list-style-type: none"> Storm water drains shall be connected to sedimentation tank for arresting the sediments before discharging into the river All washing and maintenance effluent from the workshop area of vehicle maintenance area should be directed 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 in to river at all. Vehicle washing and maintenance workshops shall be located away from river Rain water should be collected into rain water harvesting ponds which should be used for various construction activities and dust suppression. 						
❖ Disposal of piling earth, muck and debris: uncontrolled disposal may lead to increased sedimentation of the river.	<ul style="list-style-type: none"> Top soil (15 cm) should be stripped and preserved under covered conditions. This should be stored in the form of the heap with the slope covered with grass. Excavated soil should be used within the site for levelling purpose (3.3 lakh cum to be used for levelling). All the soil will be used for levelling within the site. Provision shall be made for collection and draining of water for the piling earth. Possibility should be explored for using it for filling land. If not feasible it should be disposed off to TSDF. Piling earth or dredged soil shall not be disposed off on the River bank as they are 	Solid Waste (Management & Handling) Rules, 2015	River Bank along the terminal site	Pre-Construction and construction Stage	Part of Project Costs	Contractor.	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	critical habitats especially during the breeding and spawning season. <ul style="list-style-type: none"> Provision shall be made for geo Synthetic Screen or turbidity traps for arresting silt flowing down stream. 						
5. Embankment Design and Construction, Drainage Pattern							
❖ River Bank Erosion Protection: Construction of Embankment and construction of berths may lead to accumulation of sediments on the updrift side and erosion of the downdrift side.	<ul style="list-style-type: none"> The existing river bank protection work is adequate to prevent river bank erosion. Erosion monitoring shall be carried out periodically downstream as well. River Bed material/dredged soil 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 location of Haldia Dock complex. 	Water (Prevention and Control of Water Pollution) Act, 1974	River banks along the terminal site	During design, Pre-Construction and construction Stage	Part of Project Costs	Contractor.	IWAI/PMU/PMC
❖ Dredging activities: Impacts on fishes, and benthic organisms	<ul style="list-style-type: none"> 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. The Dredging Plan shall comply with the following: <ul style="list-style-type: none"> Roles and Responsibilities. Define roles and responsibilities for implementing and adhering to the commitments made within this Dredge Management Plan. 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 	Part of EMP/Wild Life Protection Act, 1972	In river stretch along the terminal	During design and construction stage	Part of Project Costs	Contractor.	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>international practice will apply.</p> <ul style="list-style-type: none"> Studies on the existing Environment: Contractor shall carry out supplementary EIA study including Key Environmental Sensitivities, Physical Freshwater 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. 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 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: <ul style="list-style-type: none"> 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 fishes etc. 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 far below levels that can cause injury to aquatic animals and other wildlife. The 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>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.</p> <ul style="list-style-type: none"> • Appropriate protocols and procedures must be prepared for sighting of endangered wildlife species (migratory birds, reptiles etc.) 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 piled on the River banks 						
❖ Drainage Pattern	<ul style="list-style-type: none"> • Natural Drainage pattern of area around shall be maintained. • Storm water management drains shall be provided at site for management of storm water management 		Construction Sites and Labour Camp Locations	During construction stage	Part of Project Costs	Contractor.	IWAI/PMU/PMC
6. Construction Material Sourcing							
❖ Borrow areas for sourcing earth for filling as required (erosion, loss of productive land, land degradation, air pollution)	<ul style="list-style-type: none"> • Earth will be required only for filling of land to achieve finished level of 7 m amsl. Sand may be required to be brought from borrow areas. Borrow areas should be established as per the borrow area management plans attached as Annexure 1.5. Following guidelines should be followed for establishment and closure of borrow areas • Non-productive lands, barren lands, raised lands; wastelands shall be used for borrowing earth with the necessary permissions/consents. • Agricultural areas not to be used as borrow areas unless requested by the landowner 	<p>IRC Guidelines on borrow areas and for quarries.</p> <p>EIA Notification 2006 (under Environmental Protection Act and Rules, 1986;)</p>	All Identified Borrow sites	During design and construction stage	Part of Project Costs	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>for lowering the land for making it cultivable.</p> <ul style="list-style-type: none"> • Environmental Clearance from State Environmental Impact Assessment Authority under EIA Notification, 2006 and required permission from District Magistrate shall be obtained prior to excavation. Copy of this permission shall be submitted to IWAI before start of excavation. • Record of location, area, accessibility to the location and photograph of borrow area should be maintained prior to excavation • Site selected for borrow area should be approved by PMC/PMU & IWAI expert prior to excavation • Ridges of not less than 8m width will be left at intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage. • The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). • Topsoil to be stockpiled and protected for use at the rehabilitation stage. • Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon. • Unpaved surfaces used for the haulage of borrow materials to be maintained. • Transportation of earth materials shall be through covered vehicles. • Borrowing should be carried out within 20 kms area of the project site so as to minimize the emission due to earth transportation. Dredged soil and debris resulting from realignment of road should be used for the site filling to the extent 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	possible.						
❖ 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 style="list-style-type: none"> Aggregates required for construction of terminal shall be sourced from nearby quarries 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. Material shall be transported in covered vehicles only. Each Quarry shall be visited prior to its selection to ensure its compliance with lease conditions, EC and consent conditions. 	EIA Notification 2006(under Environmental Protection Act and Rules, 1986;)	Quarry Site	During design and construction stage	Part of Project Costs	Contractor	IWAI/PMU/PMC
7. Protection of Flora and Fauna							
❖ Protection of terrestrial flora & fauna	<ul style="list-style-type: none"> No significant flora is present at the site except some shrubs and herbs. Some trees are existing along the road to be diverted which will be retained as part of green belt. Project layout design shall be in a way to minimize tree cutting along the road. At present no tree cutting is envisaged No terrestrial fauna is present in site except common avifauna. Permission shall be obtained from forest department if tree cutting is required. Thick green belt (3 acres) shall be developed as per the CPCB guideline at the periphery and along the roads on the project site which will prevent spread of dust and reduce noise propagation. Areas reserved for future development at site shall also be made green by growing grass and shrubs and herbs 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
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	<ul style="list-style-type: none"> • Provision shall be made for strict penalty for hunting/harming any animal • Construction activities shall be restricted to 6:00 Am-10:00 Pm especially noise generating activities. • Workers should not use any timber or firewood as fuel for any purpose. LPG should be made available to workers in construction camp. • No hazardous material or waste shall be disposed off in the other land or nearby area as it may harm the animals, if consumed accidentally. • Speed limit will be regulated to prevent any leakage of oil so as to prevent pollution of the soil and impact on fauna and flora dependant on soil. • Regular Water Sprinkling shall be carried out to minimize dust generation and settling the dust on surface of flora. • Construction activities and vehicle washing should not be undertaken at the river or any other water body or close to the water body • Site should be barricaded to prevent entry of the animal in the site • Hunting, poaching and harming any animal (wild or domestic) by any worker or project related person should be strictly prohibited and monitored • Illumination at the night time should be reduced during the night time (if no activity is going on) as it may disturb the nocturnal animals • Noise generating activity should not be undertaken during night time to minimize disturbance to animals. Noise levels should be maintained within the prescribed CPCBs 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
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	limits to the extent possible during the day time. <ul style="list-style-type: none"> Workers should not use any timber or firewood as fuel for any purpose 						
❖ Protection of Aquatic Fauna from high sound generation during piling	<ul style="list-style-type: none"> The area in which the construction of the Berth (jetty) is planned, advisable to carefully determine drop sites before anchor placement to ensure that fish and other aquatic faunal communities that could locally still be present in the area are not unnecessarily damaged. Before starting piling allow some time to aquatic fauna to displace from the piling area. Bubble curtains can be provided at the time of piling so as to displace the aquatic fauna prior start of construction activities The piling activities must be carried out in shortest possible timeframe as possible All the debris shall dispose away from river course as per debris management plan of the project. 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 aquatic life. Noise reducing devices like mufflers, enclosures shall be fitted with the equipments as much as feasible. Erecting barriers shall also be installed Fish exclusion devises shall be installed in water column around the pile driving area to prevent fish access Geo Textile synthetic sheet curtain & turbidity traps shall be placed around piling 	Wild (Protection) Life Act, 1972	Around Pilling Area	During design and construction stage	Part of project costs	PMU through DFO	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility		
						Implementation	Supervision	
	and construction area to prevent movement of sediments and construction waste							
❖ Protection of Aquatic Fauna from increased sedimentation in water body during piling & dredging and other construction activities	<ul style="list-style-type: none"> 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. Geo-Textile synthetic sheet curtain can act silt screen which should be placed around piling 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. 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 In addition to silt screens, building guidelines of the Bonaire National Marine Park require that storage areas for sand and soil, and all work areas, must be at least 20 meters away from the high water mark and construction equipment must not be cleaned or washed within 50 meters of the high water mark. Piling and dredging activities should be carried out rapidly. Piling should not be carried out during breeding and spawning season means during rainy season. It should be carried out in low water season, i.e. pre-monsoon Equipments shall be maintained in good condition to prevent leaks or spills of potentially hazardous materials like hydraulic fluid, diesel, gasoline and other 	Wild (Protection) Act, 1972	Life Act,	Around Pilling Area	During design and construction stage	Part of project costs	PMU through DFO	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>petroleum products</p> <ul style="list-style-type: none"> Excavation and filling activities onshore should not be undertaken during monsoon season so as to minimize sediment load of run-off Workers should be trained to handle the equipment and material at site so as to minimize the spillage of materials and contamination of water All workers should be made aware of not throwing any waste in the river or any drain No construction debris/ already accumulated solid waste at site or waste generated from labour camp should be thrown in river or any drain Sewage generated from labour camp should not be directed into river but should be disposed off through septic tank/soak pit 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. All construction and operation equipment shall be maintained in good condition shall be checked for oil & grease leakage Dredged soil shall not be disposed off in river or its banks especially during breeding spawning seasons of aquatic organisms 						
8. Air Quality							
❖ Fugitive Dust Generation due to construction activities and Exhaust gas emissions from machinery and	<ul style="list-style-type: none"> Barricading the site to prevent dust dispersion to nearby areas Excavation and filling to be carried out in parallel and in phases. Water spraying on earthworks, unpaved haulage roads, other dust prone areas and construction yard. Flow of water sprinklers 	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of	Construction sites, Loading areas, storage areas,	During the Construction phase	Part of project Costs	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
vehicular traffic	<p>shall be maintained to avoid water accumulation.</p> <ul style="list-style-type: none"> • Proper servicing and maintenance of excavators/levellers/loaders and other machinery to minimize the emission generation • Top soil stripping before excavating the soil and storage under covered conditions for usage in landscaping at later stages • Storage of surplus excavated soil in covered conditions for its use for construction of roads and railways or for filling the depressions areas. • Plantation to be undertaken as per Green belt development plan • Transport of loose and fine materials in covered conditions only • Loading and unloading of construction materials in covered area. • Make Provision of PPEs like face masks to workers. • Raw materials like cement, sand and construction debris should be stored under covered conditions • Development of green belt should be started in the construction stage only within the identified 3 acres of area. • LPG should be used as fuel source in construction camps instead of wood. Tree cutting shall not be allowed for fuel wood. • 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 • Loading and unloading of construction materials shall be made at designated 	Pollution) Act, 1981 and amendments thereof					

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>locations in project area with provisions of water fogging around these locations</p> <ul style="list-style-type: none"> • Low sulphur diesel should be used for operating DG sets and construction equipment. • Regular maintenance shall be carried out of machinery and equipment. • Diesel Generating (DG) sets shall be fitted with stack of adequate height as per regulations (Height of stack = height of the building + 0.2 $\sqrt{\text{KVA}}$) • Monitoring of air quality for PM₁₀, PM_{2.5}, SO₂, NO_x, and CO shall be carried out quarterly at construction site • Efforts shall be made to move construction material early morning and late evening period. • Transportation vehicle shall strictly adhere to the designated routes and timings and shall avoid the peak traffic hours • 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. 						
❖ Emissions at access road: avoidance of traffic Jams	<ul style="list-style-type: none"> • Efforts shall be made to move construction material early morning and late evening period. • No construction, material, equipment or vehicle shall be stored or parked at any road or the non-project area • Transportation vehicle shall strictly adhere to the designated routes and timings and shall avoid the peak traffic hours • 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 	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	Part of project Costs	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
9. Noise and Vibration							
❖ Noise from construction vehicle, equipment and machinery.	<ul style="list-style-type: none"> Barricading (Temporary noise barrier) the construction site to minimize the noise level outside the site boundary Restriction on Honking at the project site Hearing test for the workers prior to deployment at site and high noise areas followed by periodic testing every six months. Job rotations systems for workers, working in high noise level areas Restriction of high noise generating activity between 6:00 AM to 10:00 PM. Periodic monitoring (monthly level) of noise levels to check the level of pollutants and effectiveness of proposed EMP Protection devices (earplugs or earmuffs) shall be provided to the workers operating near high noise generating machines. Construction equipment and machinery shall be fitted with silencers and maintained properly. Noise measurements should be carried out to ensure the effectiveness of mitigation measures and develop a mechanism to record and respond to complaints on noise. All equipment shall be fitted with silencers/noise mufflers and will be properly maintained to minimize its operational noise. Noise level will be one of the considerations in equipment selection, which will favour lower sound power levels 	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Terminal site	During the Construction stage	Part of project Costs	Contractor	IWAI/PMU/PMC
10. Land-use and Landscape							
❖ Loss of agricultural land and productive	<ul style="list-style-type: none"> No agriculture land will be lost for terminal construction. The land is industrial land. However, 15 cm of top soil layer shall be 	Design requirement	Around project site area	During construction Stage		Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
top soil	<p>stripped off prior to excavation and shall be stored separately in covered condition and used for landscaping purpose within the site</p> <ul style="list-style-type: none"> • Agriculture land should be avoided for establishing borrow areas and waste land preferably be considered for borrowing earth required for filling the terminal site 						
❖ Soil erosion due to construction activities, earthwork	<ul style="list-style-type: none"> • The earth stockpiles to be provided with gentle slopes to prevent soil erosion. • 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 • Provision of cross drainage structure like culverts shall be made in the access road if required to maintain the natural drainage pattern and prevent soil erosion. • Provision of side drain shall be made in access road if required to prevent water logging. • The existing bank protection work is adequate for shore protection. 	Municipal Waste Rules, 2015, Hazardous Waste Rules, 2008	Terminal site and river bank	During construction Stage	Part of project costs	Contractor	IWAI/PMU/PMC
• Compaction and contamination of soil due to movement of vehicles and equipment	<ul style="list-style-type: none"> • Excavation, filling and levelling work should be carried out in parallel so as to minimize the soil erosion. Unusable debris material should be suitably disposed off at pre designated disposal locations, with approval of the concerned authority. • Levelling activity shall not be carried out during monsoon season. Levelled areas shall be compacted. • Compaction of soil shall be undertaken by sprinkling the water to minimize the surface runoff and erosion. • Excavated soil shall be used for levelling purpose and left if any shall be stored in covered conditions for use in existing road 	Municipal Waste Rules, 2015, Hazardous Waste Rules, 2008	Terminal site	During Design & Construction stage.	Part of project costs	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>diversion.</p> <ul style="list-style-type: none"> • Dredge soil shall also be either utilised for construction activity or disposed off. • Fuel shall be stored in HDPE containers on paved surfaces with provision of catchment pit to prevent soil contamination from oil spillages. • Municipal waste likely to be generated at site shall be collected in segregated manner with the use of two bin system at site. It shall be segregated into biodegradable and non-biodegradable waste. Provision of bio composter shall be made at site. The biodegradable material shall be decomposed for production of compost for use at site. The non-biodegradable waste shall be disposed off to predefined land fill site of Haldia Development Authority. • Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp. • Aggregates will be sourced from existing licensed quarries. Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be obtained by contractor and submitted to IWAI. • 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. • Movement of construction vehicles shall be restricted to the designated haulage roads only. • Wash-off from concrete mixing tanks and 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	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.						
11. Water Resources							
❖ Depletion of Groundwater resources due to unregulated abstraction for construction purpose	<ul style="list-style-type: none"> No ground water should be used for construction purpose. However, the rain water shall be stored in rain water harvesting pond and shall be utilized for dust suppression and watering the greenbelt No waste water should be stored on the site in unlined ponds 	Water Act, 1972		During Construction stage	Part of project costs	Contractor,	IWAI/PMU/PMC
❖ Increase in water Siltation levels due to construction of terminal and contamination due to disposal of domestic waste	<ul style="list-style-type: none"> Washing of vehicle and equipment shall not be carried out at river, green belt canal or any water body. Washing area should be provided with the storm water drains fitted with oil & grease trap. Piling of the raw materials & 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. Site should be cleaned regularly 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 & bathrooms shall be provided to prevent open defecation. Wherever septic tanks are not provided mobile toilets with anaerobic digestion facility shall be provided and no domestic waste shall be discharged in to river. 	Water Act, 1972	Terminal Site	During Construction stage	Part of project costs	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<ul style="list-style-type: none"> • 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 for water conservation and regular inspections at site to monitor the leakages in water storage area • 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 • 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 construction of temporary roads at site. • Wastewater generated from the washing/cleaning area after passing through oil & grease trap & 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. • The piling work in river shall be undertaken during low flow period. • Drains along with turbidity traps/curtains should be provide 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 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>the river. Sedimentation tanks will trap the sediments in the run-off</p> <ul style="list-style-type: none"> • Provision shall be made for geo Synthetic Screen for arresting silt flowing down stream. • 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 • Natural Drainage pattern of area around shall be maintained • Dredged soil shall be tested for toxicity & contamination, if toxic/contaminated 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 						
12. Socio-economy, Accident and Safety Risks							
❖ Impact on Social life	<ul style="list-style-type: none"> • Separate SIA is being carried out to anticipate the impact on socio-economy of the area which can be referred to understand the impact on socio-economy on the project in detail. • Skill training and assistance should be given to local people so as they can preferably be employed at the site • Local labour should preferably be employed for construction purpose • Site should be barricaded and should have entry guarded by security guard. Register should be maintained for entry of outsiders. No unauthorized person should be allowed to enter the site. 	Labour Laws	Construction sites and labour camps	During construction period	Included in project design	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<ul style="list-style-type: none"> • 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. • Fishermen should be consulted prior restricting fishing activity in the activity area • 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. • Implementation of EMP adequately so as to prevent environmental pollution and its impact on socio-economy due to project development 						
❖ Accident risk from construction activities and health & safety of workers	<ul style="list-style-type: none"> • Adequate illumination should be provided at site during evening and night time till the work is being carried out. • Rest area should be provided at site in which workers can rest after the lunch hours • Workers should wear the personal protective equipment like helmet, gum boots, safety shoes, safety jackets, ear plugs, gloves etc. while working. • Noise level in the work zone should be maintained and followed as per OSHAS norms • Contractors should adopt and maintain safe working practices. SOPs should be prepared for each and every activity and all activities should be undertaken as per SOPs under supervision of site engineer. • Training should be given to workers to handle the heavy equipment so as to 	Central Motor and Vehicle Act 1988 EP Act 1986 Noise Rules 2002	Construction sites	Construction period	Part of project costs	Contractor	IWAI/PMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<p>prevent accidents</p> <ul style="list-style-type: none"> • Training should be given to workers to handle emergency situation like fire, earth quake, cyclone and flood. • Emergency preparedness plan should be available at the site all the time and mock drills for workers should be conducted from time to time • Complete medical check-up should be done for workers prior to joining and after six months of joining. • 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 • List of emergency nos., hospital contacts, ambulance contacts and doctors contacts should be displayed in first aid room, rest area and at all required location • Working hours of labour should not exceed than standard norms as per state factory law • Labour camps should be located at neat and clean location with no water logging issues and should be well ventilated with adequate illumination, kitchen and safe drinking water facility • Construction labour camps and site should be properly cleaned and hygiene should be maintained • Proper sanitation facility like toilet and bathing facility should be provided at site and labour camps. Wastewater generated from these facilities should be disposed off through septic tanks and soak pit • LPG should be provided as fuel for cooking to workers and open burning of fuel should not be allowed 						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	<ul style="list-style-type: none"> • 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 • Safety officers should be appointed at site so as to ensure all safety measures are taken at the site • 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 • Crèche facility should be provided for kids if female workers are employed • Speed limit of vehicles should be restricted at site to prevent any accidents and fines should be imposed on vehicles if same is not maintained. All construction vehicles should follow the designated routes & timings only. • Dustbins should be provided at labour camps for collection of waste and waste should be regularly disposed off through the concerned agency • Arrangement of fire-fighting should be made at site and workers should be trained to use the system in case of fire • Sprinkling of water should be carried out in haul road to minimize dust generation due to movement of construction vehicles. 						

Table 1.3 : Environment Management Plan Haldia Terminal During Operation Phase

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
OPERATION AND MAINTENANCE STAGE								
1. Climate								
1.1 Impact on Climate	<ul style="list-style-type: none"> Ensuring survivability of trees planted under greenbelt minimum 70% survival rate and create additional GHG sink by planting additional trees Adopting all energy efficiency measures e.g. the terminal building should have a platinum rated for Green building provisions 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. 	Kyoto Protocol, National Water Policy, 2012, Forest Conservation Rules & National Forest Policy	Terminal site	Survival rate of trees and monitoring performance of energy conservation equipments	<ul style="list-style-type: none"> Observations and inspections 	Aftercare & Monitoring of 1200 trees	IWAI	IWAI
2. Air Quality								
2.1 Air pollution due to due to vehicular movement& loading and unloading areas	<ul style="list-style-type: none"> Construction raw material and debris shall be transported and stored in covered condition Transportation vehicle shall be properly serviced and maintain and shall carry PUC certificate Thick green belt shall be developed as per the 	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981	Throughout the project area	<u>MI</u> : Ambient air quality (PM ₁₀ , CO, SO ₂ NO _x) <u>PT</u> : Levels are equal to or below	<ul style="list-style-type: none"> As per CPCB requirements Site inspection 	Included in Operation / Maintenance cost	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>provision already made in the design (3 acres green belt area) and maintained all along the periphery and along the roads. The green belt shall be developed in canopy shape with local species of broad leaf variety. Species selected for development of green belt shall also be tolerant to expected pollutants and shall have the ability to adsorb the pollutants. Suggested species are suitable for different areas are also listed under CPCB guidelines for green Belt development.</p> <ul style="list-style-type: none"> • Water sprinkling should be carried out during all loading and unloading activities and in storage yards. Further dust suppression measures should be taken at the site like vacuum collectors at dust generation areas. • Fly ash will be stored in ash silos with dust extraction system and pneumatic conveying system shall be used for loading unloading • Moisture should be maintained in coal to prevent the fire in coal. Also the fire-fighting facility where coal 			baseline levels given in the EIA report				

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>storage, loading & unloading is done</p> <ul style="list-style-type: none"> • Fire-fighting facility should be provided at the edible oil/POI storage area so as fire can be controlled immediately • Mechanical conveying system with provision of dust collection should be provided for barge loading for stone aggregates & fertilizers • Green belt planted should be maintained and survival rate of plantation should be maintained to minimum 70% • Monitoring of air quality shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP • It is recommended to provide mechanical conveying system with provision of dust collection system for loading/unloading material from barges. Pneumatic transfer only should be preferred for flyash transportation • Minimizing free fall of materials to reduce the dust generation • Minimizing dry cargo pile heights and containing piles 							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	with perimeter walls <ul style="list-style-type: none"> • Removing materials from the bottom of piles to minimize dust re-suspension • Regularly sweeping docks and handling areas, truck / rail storage areas, and paved roadway surfaces • Keeping transfer equipment (e.g. cranes, forklifts, and trucks) in good working condition³ • Upgrading the land vehicle fleet with less-polluting trucks and vehicles, and using alternative fuels and fuel mixture 							
2. Noise Quality								
2.1 Noise due to operation	<ul style="list-style-type: none"> • Site boundary should be provided which can act as noise barrier • Provision of thick green belt along the boundary and roads which will act as noise buffer • Earplugs should be provided to workers involved in unloading operations • Provision of thick green belt along the boundary and roads which will act as noise buffer 	Noise Rules, 2000	Site and Nearby areas	<u>MI</u> : Noise levels–day & night <u>PT</u> : Levels are equal to or below baseline levels given in the EIA report	Measuring by noise meter 24 hourly	Included in Operation / Maintenance cost	IWAI	IWAI

³IFC Environmental, Health & Safety Guidelines-Ports, Harbors and Terminals

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<ul style="list-style-type: none"> 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 Honking shall be prohibited at the project site Hearing test for the workers shall be undertaken before employing them and thereafter shall be done after every six months Job rotations should be practised for people, working in high noise level areas No noise generating activity shall be carried out between 6:00 AM to 10:00 PM DG sets shall be provided with acoustic enclosure Monitoring of Noise levels shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP 							
3. Land and Soil								
3.1 Soil erosion at embankment during heavy rainfall.	<ul style="list-style-type: none"> Periodic checking to be carried to monitor the soil erosion along the River Banks at and near terminal area 	Project requirement	Along river bank	MI: Existence of soil erosion sites	On site observation	Included in Operation / Maintena	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<ul style="list-style-type: none"> Necessary maintenance should be undertaken wherever it is required 			Number of soil erosion sites <u>PT:</u> Zero or minimal occurrences of soil erosion		nce cost		
3.2 Soil contamination	<ul style="list-style-type: none"> Fuel shall be stored in HDPE containers on paved surfaces only to prevent spillage of fuels on the soil and thus soil contamination. Edible oil and POL shall be stored in HDPE drums on paved surface. Dustbins shall be provided at all the required locations at the site for collection of recyclable and non-recyclable waste. 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. Used oil from DG sets and other equipment shall be stored in HDPE containers in isolated location on paved surfaces and shall be 	Project requirement	Terminal site, access road 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 Operation / Maintenance cost	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>disposed through authorized vendors only and shall not be dumped in open.</p> <ul style="list-style-type: none"> • Room shall be provided for storage of E-waste at site and this waste shall be sold to authorized vendors periodically and shall not be dumped in open. • Bio- medical waste likely to be generated at first aid centre shall be disposed of following the bio medical waste disposal rules • Dredged soil 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 of Haldia Dock Complex • Municipal waste generated at terminal should either be sent for landfilling through authorized agencies or shall be composted within the terminal site and manure should be used for maintaining the green area within the site • Vessel waste reception facility should be available at the terminal site incase maintenance facility is not in place. The waste should be received from the vessel in 							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	proper segregated and packed form. This waste should be treated and disposed within the terminal site only but in case it is not feasible, tie ups with Government and authorized private agencies can be made for handling, treatment, storage and disposal of this waste. Also fee can be imposed on the vessel operator for letting them dispose their waste at terminal/maintenance facilities.							
4. Water resources/Flooding and Inundation								
4.1 Siltation	<ul style="list-style-type: none"> Regular checks shall be made for bank protection works so as to check the bankerosion and increased sediment level in the river 	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	Included in Operation/ Maintenance cost	IWAI	IWAI
4.2 Water logging due to blockage of drains, culverts or streams	<ul style="list-style-type: none"> Regular visual checks and cleaning of drains provided at site shall be done to ensure that flow of water is maintained and prevent water logging. Drains and cross drainage structures 	Project requirement	Near surface Water bodies	<u>MI:</u> Presence/ absence of water logging along the	Site observation	Included in Operation/Maintenance	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>shall be regularly cleaned and de-silted</p> <ul style="list-style-type: none"> • Drains shall be regularly cleaned and de-silted • Monitoring of water borne diseases due to stagnant water bodies • Storm water drains provided in parking & road areas shall be provided with oil & grease traps 			<p>approach road/terminal area</p> <p><u>PT</u>: No record of overtopping/ Water logging</p>		cost		
4.3 Waste Water treatment and conservation	<ul style="list-style-type: none"> • Provision of storm water harvesting system at site. Surface storm water shall be collected in collection pond at the site and will be retained for 30 min. This water can be again used for dust suppression purpose within the site. Roof top rain water should be collected in separate collection pond and should be used for horticulture and cleaning purpose at site. • Sludge from the dump pond for storm water shall be sent for disposal along with other municipal waste • Toilets to be provided with running water facility to prevent open defecation. • Sewage generated at terminal site shall be treated in house. STP of 30 KLD 	Project requirement	Project area	<p><u>MI</u>: proper treatment</p> <p><u>PT</u>: treated water quality check</p>	Treatment parameter, ph, BOD, TDS etc.	Included in Operation/Maintenance cost	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>shall be provided for treatment of sewage and treated water shall be reused in green belt development and dust suppression. No waste/wastewater shall be discharged in river or dumped into the ground</p> <ul style="list-style-type: none"> • Water conservation fixtures shall be installed in toilets and kitchen area. Some of the water conservation fixtures which can be installed are dual flushing cisterns, sensor taps, low water urinals etc. • No wastewater shall be received from vessels and vessels should not be allowed to discharge their wastewater and solid waste in river • Fuel shall be stored in leak proof containers and containers shall be placed on paved surfaces • Dredged soil shall be tested for toxicity, if toxic shall not be disposed off back in water or river banks and should be send for disposal to approved TSDF of Haldia Dock Complex. • Monitoring of surface water quality shall be carried out 							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>on monthly basis to check the level of pollutants and effectiveness of proposed EMP</p> <ul style="list-style-type: none"> Oil should be stored in leak proof containers and storage area should be provided with facility of collecting the oil in case of spillage. The storage facility should be so designed that spilled oil shall not enter the storm water and sewage drains or storm water storage pits. Oil storage facility should be contained. Oil & grit seperators should be provided in the storm water drains in these areas. Fuelling of vessels is not proposed at terminal facility but in case fuelling is carried out then Fuel dispensing equipment should be equipped with "breakaway" hose connections that provide emergency shutdown of flow. Fuelling equipment should be inspected daily to ensure all components are in satisfactory condition 							
5. Flora & Fauna								
a. Terrestrial Flora & fauna	<ul style="list-style-type: none"> Thick green belt in area of 3 acres will be developed at site by the time operation 	Forest Conservatio	Project tree	MI: Tree/plants	Records and field	Operatio n/	IWAI/Forest	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>starts at the project site. This will improve the ecology of the area and will provide the habitat to avifauna.</p> <ul style="list-style-type: none"> • 70% survival of the plantation shall be maintained. The tree survival audit to be conducted at least once in a year to assess the effectiveness • Dustsuppression should be carried out • Water sprinkling should be carried out on internal as well as existing approach road to the site • Stack height in DG set shall be provided as per the CPCB norm. • Native plant species should preferably be planted at site • Shed leaves, branches and flowers should be composted and should be used as manure within the site • STP sludge should also be used as manure at the site. No chemical fertilizers, pesticides or insecticides should be used at site as it may wash-off with run-off and may enter the river impacting aquatic ecology • Possibilityof composting the 	n Act 1980, Wild Life Protection Act, 1972	plantation sites.	<p>survival rate</p> <p><u>PT</u>: Minimum rate of 70% tree survival</p>	observations. Information from Forestry Department	Maintenance Cost	Department	

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>food waste within the site should be explored and composted waste should be used as manure within the site</p> <ul style="list-style-type: none"> • Instruction should be given to all the workers and visitors that no harm to the plantation at the site or any animal should be done within the project premises • 							
<p>b. Impact on Aquatic Flora & Fauna due to vessel movement & discharge of waste</p> <p>c. Impact Due to Oil spillage</p>	<ul style="list-style-type: none"> • Water sprinkling should be carried out at the storage yards to minimize the dust generation and settling the dust on the River surface • Stone aggregates and fertilizers should preferably be loaded or unloaded from barges through mechanical covered conveyor system than through pay loaders/trucks/barge loaders • Moisture should be maintained in coal to reduce coal dust generation during loading/unloading at berth. • The solid wastes, sewage, oily ballast, bilge water and bunker fuel bottoms generated from barge should not be discharged directly and it should be discharged as per the norms. Cargo Operators 	Bio-diversity conservation rules, Wildlife Protection Act, 1972	River stretch along the terminal	<p><u>MI</u>: Aquatic species</p> <p><u>PT</u>: Should and similar to baseline</p>	Surveys	For Aquatic Ecology Survey	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>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 terminal site hence chances of oil spillage is almost negligible due to maintenance activities.</p> <ul style="list-style-type: none"> • No wastewater or waste should be disposed off in river from terminal site or from vessel into the water. Penalty should be imposed on the vessels reported of disposing waste/wastewater in the river • Surface run-off from site should be collected and re-used at site for dust suppression. Run-off from building should be collected separately and should be used for plantation and cleaning purpose. • STP should be provided at site for treatment of sewage generated. No sewage should be allowed to enter in the river. Treated water from STP should be reused completely at site and should not be discharged into river 							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<ul style="list-style-type: none"> • Dredged sand should not be disposed off in river or dumped near the river banks. • Dredging should be avoided during the breeding and spawning seasons • Instruction should be given to all vessels and all employee and staff that no aquatic faunal species should be harmed due to any reason • Waiting time of ships should be reduced at the terminal by providing the adequate loading and unloading equipment and vehicles. • Ships should be instructed for not using sharp lights and sounds as they may disturb aquatic organisms • Propeller guards should be provided for all the vessels to minimize the propeller inflicted injuries and scars to the aquatic organisms. • No developments should be brought up on other bank of river opposite to terminal site so as to provide the ground to aquatic organisms for their activities • Nesting grounds, breeding & spawning grounds shall be identified and project 							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>activities shall be minimized in those areas</p> <ul style="list-style-type: none"> • Time schedule and the quantity of material allowed shall be strictly checked and monitored for each ship. This will prevent overcrowding of the vessels at terminal site and thus no obstruction will be there on movement of the aquatic organisms due to ships. • Waiting time of ships shall be reduced at the terminal by providing the adequate loading and unloading equipment and vehicles. • Ships shall be instructed for not using sharp lights and sounds as they may disturb aquatic organisms • Ship design (of capacity >5000 dwT) should be as per MARPOL and should be provide with double hulls/double bottoms. Speed of oil carrying vessels should be maintained to prevent accidents due to high speed. Sensors and hooters should be fitted with ships which can notify the closeness of another ship or any other potential matter which can cause accident. • Immediate/quick clean-up of 							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>such spills shall be undertaken and ship owners should be liable for the same.</p> <ul style="list-style-type: none"> • Crew of the ships carrying the oil should be competent and experienced so as they can prevent the accidents to happen as much as possible • IWAI should carry out the inspections of the vessels which are transporting the material to and fro from the terminal. • Aquatic ecology monitoring should be carried out yearly so as to assess the impact of terminal activities on aquatic life. 							
6. Safety								
6.1 Accident risks associated with traffic movement.	<ul style="list-style-type: none"> • Traffic control measures, including speed limits should be forced strictly. • Monitor/ensure that all safety provisions included in design and construction phase are properly maintained • Movement of traffic shall be restricted to designate hours and routes. • Adequate illumination should be provided at the site during evening • Separation of people from 	IRC:SP:55	Throughout the Project route	<p><u>MI</u>: Number of accidents</p> <p>Conditions and existence of safety signs, rumble strips etc. on the road</p> <p><u>PT</u>: Fatal and non-fatal accident rate is reduced after</p>	<p>Review accident records</p> <p>Site observations</p>	<p>Included in operation /Maintenance cost</p>	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>vehicles and making vehicle passageways one-way, to the extent practical.</p> <ul style="list-style-type: none"> • Existence of spill prevention and control and emergency responsive system at the site. Preparation of spill control and management plan for the terminal facilities & jetties • Locating means of access to ensure suspended loads do not pass overhead, to the extent practical • Constructing the surface of terminal areas to be: of adequate strength to support the heaviest expected loads; level, or with only a slight slope; free from holes, cracks, depressions, unnecessary curbs, or other raised objects; continuous; and skid resistant • Providing safe access arrangements suitable for the sizes and types of vessels calling at their facilities. These access arrangements should include guard rails and / or properly secured safety nets to prevent workers from falling into the water between the vessel side and the adjacent quay. 			improvement				

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<ul style="list-style-type: none"> Inspecting and approving all slings before use Clearly marking (indicating its own weight) all lifting beams and frames, vacuum lifting, or magnetic lifting device which does not form an integral part of a lifting appliance and every other item of loose gear weighing more than 100 kilograms (kg) Inspecting disposable pallets and similar disposable devices before use and avoiding re-use of such disposable devices, Equipping lifting appliances with means of emergency escape from the driver's cabin and a safe means for the removal of an injured or ill driver Risk of free fall of materials should be minimized by installing telescoping arm loaders and conveyors Materials handling operations should follow a simple, linear layout to reduce the need for multiple transfer points 							
6.2. Transport of Dangerous Goods	<ul style="list-style-type: none"> Existence of spill prevention and control and emergency responsive system. Emergency plan for vehicles 	-	Throughout the project	MI: Status of emergency system –	Review of spill prevention	Included in operation	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	carrying hazardous material should be available at the site and be implemented if required		stretch	whether operational or not <u>PT</u> : Fully functional emergency system	and emergency response plan Spill accident records	n/Maintenance cost.		
6.4 Accidents Risks Due to Movement of Vessels and other hazards associated with site	<ul style="list-style-type: none"> Emergency preparedness plan for natural (flood, earthquake & cyclone) and other hazards like fires, fall/trip, electric shocks etc shall be prepared and should be implemented during emergency condition. Mock drills should be conducted for workers to handle such emergency situation Emergency collection area should be designated at the site which is safe. All workers should be directed to collect at this area in case of emergency. Implementation of the environment management plan as proposed to prevent the environmental pollution during operation phase Ships should comply with safety norms and should maintain the speed so as to 	-	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	Included in operation/Maintenance cost.	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	<p>prevent the accidents like oil spillage. In case of accidents, ship owner should be responsible for clean-up operations</p> <ul style="list-style-type: none"> • Employment should preferably be given to local people. Women should be given equal opportunity for work. • Safety norms should be followed for all operational phase activities at terminal • Development activities should be carried out in the nearby areas for development of area • Fishing activity should not be restricted in the river. • Alternate provision for fishermen should be given in case fishing activity is restricted. • Firefighting facility should be provided at site and trained personnel should be available at site that can operate the fire extinguishers and other fire-fighting equipment. Fire-fighting facility should be as per the norms for oil/POI & coal storage area, buildings, berth and other facility at the site 							

Table 1.4 : Environment Monitoring Plan of Haldia Terminal for Construction & Operation Phase

S. No.	Aspect	Parameters to be monitored	No of sampling locations & frequency	Standard methods for sampling and analysis	Role & Responsibility	
					Implementation	Supervision
Construction Period						
1.	Air Quality (Ambient & Stack)	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO	Three Locations up wind and downwind direction including project site. Once in two months	<ul style="list-style-type: none"> • Fine Particulate Samplers for PM_{2.5} • Respirable Dust Sampler for PM₁₀ fitted with Gaseous sampling arrangements for SO₂ and NO_x, • CO analyser; 	Contractor	IWAI & PMC
2.	Surface Water Quality	Physical, chemical and biological	Hooghly river u/s and d/s of terminal Once a month	Grab sampling and analysis by using standard methods	Contractor	IWAI & PMC
3.	Drinking water Quality	Physical, chemical and biological	Drinking water for labour camps Once a month	Grab sampling and analysis by using standard methods	Contractor	IWAI & PMC
4.	Noise Level	Day time and night time noise level (max, min & Leq levels)	Construction labour camp, construction site and nearest habitation Once a month	Noise meter	Contractor	IWAI & PMC
5.	Soil Quality	Soil texture, type, Electrical conductivity, pH, infiltration, porosity, etc.,	Construction site, labour camps and debris disposal site Once in 6 months	Collection and analysis of samples as per IS 2720	Contractor	IWAI & PMC
6.	River Bed Sediment	Texture, type, Electrical conductivity, pH, infiltration, porosity, etc., and biological compounds	River bed near site Once in 6 months	Collection and analysis of samples as per IS 2720	Contractor	IWAI & PMC
7.	Green Belt	Plantation survival rate	All along the premises of Terminal site Once in year	Survey, counting, recording & reporting	Contractor	IWAI & PMC

8.	Soil Erosion	---	Upstream & downstream of project site near river bank-- Once a month	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	Contractor	IWAI & PMC
9.	Aquatic ecology	Phytoplankton, Zooplankton and species diversity index	River Hooghly (u/s and d/s of the site) Six monthly	Plankton net of diameter of 0.35 m, No.25 mesh size 63 and analysis by using standard methods.	Contractor	IWAI & PMC
10.	Integrity of embankment	---	Upstream & downstream of terminal site along River Banks- Once a month	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	Contractor	IWAI & PMC
Operation Phase						
1.	Air Quality (Ambient & Stack)	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , HC and CO	Three Locations upwind and downwind direction including project site, Six monthly	<ul style="list-style-type: none"> • Fine Particulate Samplers for PM_{2.5} • Respirable Dust Sampler for PM₁₀ fitted with Gaseous sampling arrangements for SO₂ and NO_x • CO analyser 	NABL accredited Lab to be contracted by IWAI	IWAI
2.	Surface Water Quality	Physical, chemical and biological	River Hooghly Once in quarter & (Upstream & Downstream)	Grab sampling and analysis by using standard methods	NABL accredited Lab to be contracted by IWAI	IWAI
3.	Drinking water Quality	Physical, chemical and biological	Drinking water for staff Once a quarter	Grab sampling and analysis by using standard methods	NABL accredited Lab to be contracted by IWAI	IWAI
4.	Noise Level	Day time and night time noise level (max, min & Leq levels)	Two locations: Project site & nearest habitation -Once in quarter	Noise meter	NABL accredited Lab to be contracted by IWAI	IWAI
5.	Wastewater Management	Physical, chemical and biological of sewage and	Terminal site, testing of sewage and STP	--	NABL accredited Lab to be	IWAI

		STP treated water	treated water Once in quarter		contracted IWAI	by
6.	Plantation	Plantation survival rate of 70%	Maintenance and survival loss of existing - Once in year	Survey, counting, recording & reporting	IWAI	IWAI
7.	Soil Erosion	---	Upstream & downstream of project site near river Bank- Monthly	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	IWAI	IWAI
8.	Aquatic ecology	Phytoplankton, Zooplankton and species diversity	River Hooghly (u/s and d/s of the terminal site) Six monthly	Plankton net of diameter of 0.35 m, No.25 mesh size 63 and analysis by using standard methods.	IWAI	IWAI
9.	River Bed Sediments	Physio-Chemical Parameters	Once in Six Month at Terminal Site Area	Depth Sampler	IWAI	IWAI
10.	Integrity of embankment	---	Upstream & downstream of terminal site- Once in six month	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	IWAI	IWAI

Annexure 1.1: Green Belt Development Plan

1.0 Introduction

Site for terminals/jetty/lock may support vegetation such as trees, shrubs herbs etc. Sahibganj site is the one out of four sites selected for terminals/locks support significant vegetation, i.e. mango orchards and other trees. Remaining sites supports some trees which may be required to cut or can be retained. Other sites which are not finalized may also support the vegetation which will be required to remove. Tree cutting shall be required at such sites and it should be carried out only after obtaining clearance from forest department. Only identified & permitted tree species shall be cut.

As per state forest policy compensatory afforestation should be carried out in ratio of at least at 1:2 ratios. Compensatory afforestation shall be carried out by forest department. It is preferable that compensatory afforestation is carried out in nearby land patch. Survival rate of the afforestation carried out by forest department shall be monitored by IWAI.

Apart from above compensatory plantation as part of environmental management, it is proposed to develop 15-20 m thick green belt all along the site boundary and along the roads within the site. 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, SO₂, NO_x& CO shall be generated at site. Also there is potential of generation of coal dust while unloading the materials at stock piles. 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.	Termanilia catappal	Jagali Badam	Tree
2.	Anthocephalus cadamba	Kadam	Tree
3.	Ficus bengalensis	Badh	Tree
4.	Magnifera indica	Aam	Tree
5.	Tectona grandis	Teak	Tree
6.	Ficus religiosa	Peepal	Tree
7.	Hibiscus rosa sinensi	Hibiscus	Shrub
8.	Wrightia arboriea	Dudhi	Shrub
9.	Tabernaemontana	Chandani	Shrub

	divaricata		
10.	Bougainvillea glavra	Bougainvillea	Shrub
11.	Codium variegates	Cockscomb	Herb
12.	Celosia argentea	Croton	Herb
13.	<i>Ilex rotunda</i>	Kurogane holly	Tree
14.	<i>Cassia surattensis</i>	Golden Senna	Tree
15.	<i>Cinnamomum camphora</i>	Camphor tree	Tree
16.	Lagerstroemia flos-reginae	Lagerstroemia	Tree
17.	Alstonia scholaris	Devil tree	Tree
18.	Cassia fistula	Golden shower	Tree
19.	Delonix regia	Gulmohar	Tree
20.	Pongamia pinnata	Indian beech	Tree
21.	Terminalia arjuna	Arjun	Tree
22.	Terminalia belerica	Baheda	Tree
23.	Butea superb	Tesu	Tree
24.	Cassuarina sp.	Cassuarina	Tree
25.	Bahunia acuminata	White orchid green	Tree
26.	Swetania mohogini	Cuban Mahagony	Tree
27.	Azadiracta indica	Neem	Tree
28.	Artocarpus integrifolia	Jackfruit	Tree
29.	Gmelina arborea	Gamhar	Tree
30.	Putranjiba roxburghii	Putranjiba	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 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 x 1m x 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 carried out by forest department. Survival rate of plantation shall be inspected of the by IWA. Plantation within the terminal/jetty/lock site shall be carried out by IWA and shall be monitored by IWA.

Annexure 1.2: Occupational Health & Safety Management Plan

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 IWA/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	<ul style="list-style-type: none"> ▪ Civil structures
Bulk spillage	<ul style="list-style-type: none"> ▪ Hazardous substance / inflammable liquid storage ▪ Vehicular movement on highway
Fire and explosion	<ul style="list-style-type: none"> ▪ Inflammable Storage Areas ▪ Gas Cylinder Storage Areas ▪ Electrical Circuits ▪ Isolated Gas Cylinders (LPG / DA) ▪ Welding / Gas Cutting Activity
Electrical Shock	<ul style="list-style-type: none"> ▪ HT line ▪ LT distribution ▪ Electrically Operated Machines / Equipment / Hand Tools / Electrical Cables
Gaseous Leakage	<ul style="list-style-type: none"> ▪ Gas Cylinder Storage Areas ▪ Gas Cylinder used in Gas Cutting / Welding Purposes
Accidents due to Vehicles	<ul style="list-style-type: none"> ▪ Heavy Earth Moving Machinery ▪ Cranes ▪ Fork Lifts ▪ Trucks ▪ Workman Transport Vehicles (cars / scooters / motor cycles / cycles) ▪ Collapse, toppling or collision of transport equipment
Slips & Falls (Man & Material)	<ul style="list-style-type: none"> ▪ Work at Height (Roof Work, Steel Erection, Scaffold, Repair & Maintenance, Erection of equipment, Excavation etc.) ▪ Slips (Watery surfaces due to rain) ▪ Lifting tools & Tackles (Electric Hoist & Forklifts)
Collision with stationary/ moving objects	<ul style="list-style-type: none"> ▪ Vehicular movement

Emergency conditions / situations	Sources
Other Hazards	<ul style="list-style-type: none"> ▪ Cuts & Wounds ▪ Confined Space (under & inside machinery etc.) ▪ Hot Burns ▪ Pressure Impacts (Plant contains several Pressure Vessels & pipefitting containing CO₂, air, water, product & steam, which can cause accidents & injuries to person around.)

1.2. 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.

1.3. 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)

1.4. 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

1.5. Reporting

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

1.6. 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 1.3: Construction Debris Management Plan

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.

Excavated Soil

Site is undulating and thus will require cut & fill for levelling. Finished level of the soil will be 37 m. Top excavated soil of 15 cm shall be stripped and shall be stored separately under covered sheds. This soil shall be used for green belt plantation.

Lower layers of excavated soil shall be re-used within the site for filling purpose, construction of approach & internal roads & railway link. If any extra soil is remained, then that should be disposed of to the approved debris disposal site

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 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 disposed at disposal site but if toxic & contains heavy metals, then it should be disposed to TSD 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 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 through authorized agency in area responsible for waste collection and management.

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

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, notified forest areas, wildlife/bird/dolphin sanctuaries or any other sensitive locations.
- Disposal sites shall not contaminate any water sources, rivers etc so the site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the village/local community is to be obtained for the Disposal 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 debris only to the identified places or at other places only with prior permission of Engineer-in-Charge of works.
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Engineer-in-Charge of works.
- The Contractor will at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Engineer-in-Charge of works.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it. The debris should not be disposed along the bridges & culverts and near the water bodies.
- While disposing debris / waste material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems.
- Contractor should display the board at disposal site stating the name of project, usage of the site and type of debris being disposed.
- A guard shall be kept at disposal site to prevent any unauthorized disposal of waste at the debris disposal site
- Material should be disposed through covered vehicles only
- No contaminated/hazardous/e-waste shall be disposed at the debris disposal site

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 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 upto 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 Redressal mechanism should be in place for taking note and action on such complaints.

Annexure 1.4: Construction and Labour Camp Management Plan

1.0 Objective of the Plan

The objective of this plan is to provide guidance to the contractor or other agency involved in setting up of the construction and labour camp for keeping the health & Safety of workers and impacts of setting up such camps on the local community in consideration while developing and establishing such camp. This plan is prepared in reference to the Workers accommodation: processes and standards (A guidance note by IFC and EBRD). The plan aims to promote “safe and healthy working conditions, and to protect and promote the health of workers.”

2.0 Selection and layout of construction camp

Labour camps, plant sites and debris disposal site shall not be located close to habitations, schools, hospitals, religious places and other community places. A minimum distance of 500 m shall be maintained from the habitations, sensitive locations like temple, school & hospitals, forest areas and other eco-sensitive zones for setting up such facilities.

3.0 Facilities at workers' camps

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

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

3.1 Attendance & Working hours

Supervisor of the camp should take the attendance of the employee at each camp twice in a day (morning and evening) and should maintain the record. Further work hours of the workers should be maintained in accordance to the labour law and as mentioned in the labour licence. All workers should be provided with ID card and entry to the site should be through ID card only and should be ensured by security guard.

3.2 Site Barricading

Site should be completely barricaded from all the sides to prevent entry of outsiders and animals into the site. Entry gate should be provided at the site and labour camp which should

be guarded by security guard. All workers should be issued ID cards and entry of outsiders shall be maintained in the register at the gate. Board should be displayed at the site and the labour camp, the name of project, capacity of project, authority carrying our projects, restriction of entry without authorization, no smoking zone and associated risks. Plant operation shall be restricted to 6:00 Am to 10:00 PM

3.3 Clean Water Facility

Potable water shall be provided for construction labour for drinking & cooking purpose. Clean water shall be provided for bathing, cleaning and washing purpose. Water quality testing for drinking water provided for workers shall be carried out on monthly basis. Water dispensers should be cleaned on monthly basis. Adequate water per person should be provided at site for drinking, cooking, barhing, cleaning and other use purpose

3.4 Clean Kitchen Area

Provision of clean kitchen area for cooking and storage of eatables shall be provided. Clean fuels like LPG shall be provided for cooking purpose. Burning of firewood, garbage, paper and any other material for cooking or any other purpose shall strictly be prohibited at the site. Separate utensil washing area should be provided with proper drainage system. Kitchen waste should be daily cleaned and disposed off. Water storage facility at kitchen should be covered and cleaned on monthly basis. Kitchen area should be away from washing, toilets and bathing area.

Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

3.5 Clean Living Facility for the Workers

Workers should be provided with proper bedding facility. Single bed should be provided to each workers and each bed should be atleast 1 m apart from another. Double deck bedding should be avoided, in case provided, adequate fire-fighting facility should be provided. Bed linen should be washed regularly and should be applied with repellent and disinfectants so as to manage the diseases caused due to pests. Facilities for storage of personal belongings for workers should be provided in form of locker, shelf or cupboard. A separate storage area for the tools, boots, PPE should be provided. Proper ventilation through mechanical systems and lighting system should be ensured in construction camps.

3.6 Sanitation Facilities

Construction camps shall be provided with sanitary latrines and urinals. Toilets provided should have running water availability all the time. Bathing, washing & cleaning areas shall be provided at the site for construction labour. Washing and bathing places shall be kept in clean and drained condition. Adequate nos. of bathing & toilet facility should be provided at site and should not exceed 1 unit per 15 person. Toilets and bathing facility should be closed to the camps. Workers shall be hired especially for cleaning of the toilets and bathing area. Septic tanks and soak pits shall be provided at site for disposal of the sewage generated. The toilets should be cleaned on daily basis. These tanks should be evacuated through authorized vendors if filled and at the time of closure. Pest management should be carried out at the camps if the

area is infected by any pests. Adequate lighting should be ensured in camp area especially during night time. The area should be guarded by security guard to minimize the crime and thefts.

3.7 Waste Management Facilities

Waste generated should be segregated at the site by providing the different colour bins for recyclable and non-recyclable waste. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be handed over to authority responsible in area for waste management. Waste management for construction site shall be as per waste management plan proposed in EMP. Waste management area should be cleaned on regular basis to avoid germination of flies, mosquitoes, rodents and other pests.

3.8 Rest Area for Workers at Site

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

3.9 Adequate Illumination & Ventilation

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

3.10 Safe Access Road for Labour Camps

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

3.11 Health care Facilities:

First aid box, first aid room and personnel trained in first aid (certified first-aiders) shall be available at labour camp and site all the time (24X7). Equipment in first-aid box shall be maintained as per State Factory's Law. Ambulance/ 4 wheeler motorized vehicle shall be available at the site for carrying injured to the nearby hospital. Tie-ups should be made with nearby hospital to handle emergency, if any. Nos. of ambulance, doctors and nearby hospitals shall be displayed in first-aid room, site office & labour camps. List of contact nos. of emergency personnel, hospitals, fire brigade and other emergency contact should be displayed at camp site, guard's room and first aid room. Workers shall be made aware about the causes, symptoms and prevention from HIV/AIDS through posters and awareness programs. Workers shall have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

3.12 Crèche Facility & Play School

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

3.13 Fire-Fighting facilities

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

3.14 Emergency Assembly Area

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

4.0 Activities prohibited at site

Activities which should be strictly prohibited at site shall include

- Open burning of wood, garbage and any other material at sit for cooking or any other purpose
- Disturbance to the local community.
- Adoption of any unfair means or getting indulgence in any criminal activity
- Non-compliance of the safety guidelines as communicated be safety officials and during the trainings
- Adoption and proper usage of PPEs all the time as required
- Operation of the plant and machinery between 10 pm to 6 am unless approved by team leader
- No animal (wild or domestic or bird) shall be harmed by any construction worker in any condition at site and nearby areas
- Cutting of tree without permission of team leader/authorized person
- No indigenous population shall be hurt or teased

5.0 Guidelines for night time working at the site.

No activity generating noise shall be carried out at the site after 10:00 PM. Night working protocol should be followed (if required) as per guidelines prepared by 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.

6.0 Record keeping & Maintenance

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

7.0 Auditing & Inspection

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

8.0 Grievance redressal System

CA complaint register and a complaint box should be provided at the site so any person from local community can register their complaint, if any due o the camp, workers and other facilities. The system shall be communicated to local communities through consultations. Open house meetings should be conducted with workers on monthly basis to identify their problems and issues if any related p health, hygiene, safety, comfort and other issues.

9.0 Security System

Site should be barricaded and should be guarded by security guards at all the gates. Security guards should allow only authorized personnel to the campsite. Guards should be available during both morning and night time. Guard should allow entry of workers to the site only be seeing the ID cards. Guard should report if any unusual or unfair practise happening at site and nearby area. Guards should be trained to handle emergency situations like fire-fighting and should be responsible to contact the emergency personnel in case of any emergency.

10.0 Closure of the Construction Site and Construction labour Camps

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

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

Annexure 1.5: Borrow Area Management Plans

1.0 Introduction

Borrow areas will be finalized as identified by Contractor as agreed by the PMC and IWA as per the requirements of the contract. Environment clearance under EIA Notification, 2006 from competent authority and NOC from state pollution control board under Air Act, 1981 as applicable shall be obtained by contractor prior excavation. Consent from land owners and DC of the area shall also be taken prior undertaking any excavation. The Contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations. Contractor should submit borrow area establishment plan along with the locations marked in map and the environmental settings of the planned area to PMC/IWA for approval of the "Engineer" through RFI.

- 1) The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
- 2) The borrow pits should not be located along the roads, close to project site
- 3) The loss of productive and agricultural land should be minimum.
- 4) The loss of vegetation is almost nil or minimum.
- 5) Sufficient quality of soil is available.
- 6) The Contractor will ensure the availability of suitable earth.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme as approved by the concerned Engineer. It shall be ensured that the fill material compacted to the required density. The Contractor shall submit the following information to the Engineer for approval at least 7 working days before commencement of compaction.

- The values of maximum dry density and optimum moisture content obtained in accordance with ARE: 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
- A graph of density plotted against content from which, each of the values in (i) above of maximum dry density and optimum moisture content are determined.

After identification of borrow areas based on guidelines and full filling the following requirements are to be fulfilled

- Quantification of Earth
- Land Agreement
- Clearance from local authorities
- Environmental Clearances from SEIAA should be obtained. All EC conditions are to be followed by contractor and contractor should submit EC to IWA/PMC/PMU

After receiving the approval Contractor will begin operations keeping in mind following:

- Haulage of material to the areas of fill shall proceed only when sufficient spreading and compaction plants are operating at the place of deposition.

- No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then he shall make good any consequent deficit of material arising there from.
- Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
- The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

1.1 Borrow Area Management

Borrow areas located in different land will require different management. Management measures to be taken in different land types are given below.

1.1.1 Borrow Areas located in Agricultural Lands

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
- Borrowing of earth will not be done continuously throughout the stretch.
- Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- The slope of the edges will be maintained not steeper than 1:4 (Vertical: Horizontal).

1.1.2 Borrow Areas located in Agriculture Land in un-avoidable Circumstances:

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

1.1.3 Borrow Areas located on Elevated Lands

- The preservation of topsoil will be carried out in stockpile

- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- At location where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields.

1.1.4 Borrow Areas near Riverside

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is more.

1.1.5 Borrow Areas near Settlements

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow pit location will be located at least 0.75 km from villages and settlements. If unavoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
- Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF&CC/CPCB guidelines.

1.1.6 Borrow Pits along the Roads

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow pits along the road shall be discouraged.
- If permitted by the Engineer; these shall not be dug continuously.
- Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- Small drains shall be cut through the ridges of facilitate drainage.
- The depth of the pits shall be so regulated that its bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.
- Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.
- Minimum distance from road/ railway should be 50 metres.

1.1.7 Re-development of Borrow Areas

The objective of the rehabilitation programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit approximately to the road level.

Re-development plan will be prepared by the Contractor before the start of work in line with the owner's will and to the satisfaction of owner.

The Borrow Areas will be rehabilitated as follows

- Borrow pits will be backfilled with rejected construction wastes (unserviceable materials) compacted and will be given a turfing or vegetative cover on the surface. If this is not possible, then excavation slope should be smoothed and depression is filled in such a way that it looks more or less like the original ground surface.
- Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post-use restoration and Environment Expert of Supervision Consultant will certify the post-use redevelopment.
- The Contractor will keep record of photographs of various stages i.e. before using materials from the location (pre-project), for the period borrowing activities (Construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

38. Annexure XVI: Detailed Project Report

DRAFT



INLAND WATERWAYS AUTHORITY OF INDIA

(Ministry of Shipping, Government of India)

Detailed Feasibility Study for Capacity Augmentation of National Waterway-1 and Detailed Engineering for its Ancillary Works and Processes between Haldia to Allahabad (Jal Marg Vikas Project)

Detailed Project Report Haldia Multimodal Terminal

February 2020



In JV with



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		<h2 style="color: purple;">INLAND WATERWAYS AUTHORITY OF INDIA</h2> <p>(Ministry of Shipping, Government of India)</p>						
PROJECT:		Detailed Feasibility Study for Capacity Augmentation of National Waterway-1 and Detailed Engineering for its Ancillary Works and Processes between Haldia to Allahabad (Jal Marg Vikas Project)						
TITLE:		Detailed Project Report – Haldia Terminal						
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Table of Contents

EXECUTIVE SUMMARY	11
1 INTRODUCTION	17
1.1 Project Background	17
1.2 Need of the Project.....	17
1.3 Scope of Work	18
1.4 Present Submission	19
2 PROJECT SITE ENVIRONMENT.....	20
2.1 Project Location.....	20
2.2 Land Availability.....	20
2.3 Infrastructure at the Project Site	20
2.3.1 Road Connectivity	20
2.3.2 Rail Connectivity.....	21
2.3.3 Air Connectivity	21
2.3.4 Sea link	21
2.3.5 Nearest Towns.....	21
2.4 Meteorological Parameters	21
2.4.1 Temperature	21
2.4.2 Wind	22
2.4.3 Relative Humidity	22
2.4.4 Rainfall.....	23
2.4.5 Depressions and Cyclones	23
2.4.6 Visibility	24
2.5 Oceanographic / River Conditions	24
2.5.1 Tides	24
2.5.2 Current	24
2.5.3 Waves	24
2.5.4 Discharge.....	24
2.5.5 Morphological condition	25
2.5.6 Existing Navigational Channel	26
2.6 Natural Hazards	26
2.6.1 Seismicity.....	26
2.7 Pipeline Corridor.....	26
3 FIELD SURVEYS AND INVESTIGATIONS	27
3.1 Topographic Surveys.....	27
3.2 Geotechnical Investigations.....	27
3.2.1 Landside Soil Profile	27
3.2.2 Riverside Soil Profile	28
3.3 Bathymetry Survey	28
4 TRAFFIC FORECAST.....	29
5 VESSEL SIZES	30
5.1 Vessel Sizes Recommended by IWAI	30
5.2 Vessel Sizes at Haldia Terminal.....	30
6 FACILITY REQUIREMENT	31

6.1	Traffic Forecast	31
6.2	Marine infrastructure	31
6.2.1	Navigational and Operational requirements.....	31
6.2.2	Turning circle dimensions and depth at Berth	34
6.2.3	Holding area	34
6.2.4	Berth Requirements	34
6.3	Shoreside Infrastructure	46
6.3.1	Storage Area Requirements	46
6.3.2	Utilities and Services	46
7	ALTERNATIVE LAYOUTS	49
7.1	Alternative Terminal Layouts.....	49
7.1.1	Alternative I.....	49
7.1.2	Alternative II.....	50
7.1.3	Alternative Layout III	50
7.1.4	Alternative I V.....	51
7.1.5	Alternative V.....	51
7.2	Multi Criteria Analysis of Alternative Terminal Layouts	52
7.3	Recommended Terminal Layout.....	53
8	DEVELOPMENT PLAN	54
8.1	Marine Facilities.....	54
8.1.1	Berths and Approach Trestles	54
8.1.2	Manoeuvring Area & Approach Channel	54
8.2	Onshore Facilities	54
8.2.1	Storage Areas	54
8.2.2	Fuel Bunkering.....	55
8.2.3	Buildings	55
8.2.4	Onshore Utilities.....	55
8.2.5	Mechanical Equipment.....	55
8.3	Layout Plan	55
9	PRELIMINARY ENGINEERING – CIVIL WORKS.....	56
9.1	Berthing Facilities	56
9.1.1	Deck Elevation	56
9.1.2	Water Levels.....	56
9.1.3	Design Dredged Level	56
9.1.4	Scour Depth.....	57
9.1.5	Geotechnical Criteria for Design of Jetties and Approach Trestles	57
9.1.6	Loads Considered for Design of Jetty	57
9.1.7	Load Combinations.....	61
9.1.8	Minimum Cover.....	61
9.1.9	Design Life	61
9.1.10	Serviceability Criteria	61
9.1.11	Materials and Material Grades.....	62
9.1.12	Proposed structural arrangement of berth	62
9.1.13	Approach Trestle	64
9.2	Site Grading & embankment of approach trestle.....	65
9.3	Dredging	65
9.3.1	Initial dredging	65

9.3.2	Annual Maintenance Dredging.....	65
9.3.3	Dredging Management	65
9.4	Storage Areas.....	69
9.4.1	Stockyard for Flyash, Natural Aggregates and POL	69
9.4.2	Storage Sheds	70
9.5	Terminal Buildings	70
9.5.1	Terminal Administration Building.....	70
9.5.2	Security Office	70
9.5.3	Weigh Bridge Building	70
9.5.4	Electrical Sub-station.....	70
9.5.5	Worker’s Amenity Building.....	71
9.5.6	RIO Compressor Room	71
9.5.7	Overhead water tank and Underground reservoir.....	71
9.5.8	Gate house complex, Emergency exit Gate, Access Gate, Boundary Wall and Fencing	71
9.5.9	Design Criteria	71
9.6	Boundary Wall / Fencing	74
9.7	Internal roads	75
9.8	Water Supply	75
9.8.1	Assumptions.....	76
9.9	Sewerage System.....	76
9.10	Storm Water Drainage.....	77
9.11	Fire Fighting Facilities	77
9.12	Dust control	77
9.13	Navigational Aids	77
10	PRELIMINARY ENGINEERING - MATERIAL HANDLING SYSTEM/ EQUIPMENTS	79
10.1.1	Fly Ash Silos	79
10.1.2	Belt Conveyor / Pipe Conveyor System	81
10.1.3	Fixed Type Barge Loader	85
10.1.4	Mobile Harbour Cranes (MHC).....	86
10.1.5	Front End Loader /Pay Loader & Dumpers.....	89
10.1.6	Road Weigh Bridge	90
10.1.7	Dumper trucks and Forklift	91
10.1.8	Flyash Handling	91
10.1.9	Rail yard.....	91
11	PRELIMINARY ENGINEERING - ELECTRICAL AND CONTROL SYSTEM	92
11.1	Electrical Power Requirement	92
11.1.1	Source of Power Supply.....	92
11.1.2	System Description.....	92
11.1.3	Utilization Voltages	92
11.1.4	Electrical Substation (ESS)	93
11.1.5	Power Factor Correction	93
11.1.6	Distribution Transformer.....	93
11.1.7	Motors.....	94
11.1.8	HT Power Distribution System	94
11.1.9	LT Power Distribution System	94
11.1.10	Standby Power Supply.....	95
11.1.11	Illumination	95

11.1.12	Cables	96
11.1.13	Cable Trays & Accessories	96
11.1.14	Earthing & Lightning Protection	96
11.1.15	Ventilation and Air Conditioning (AC) System	97
11.1.16	Battery and Battery Charger	98
11.1.17	Closed Circuit TeleVision (CCTV) System	98
11.1.18	Control System	98
11.1.19	Safety Switches.....	100
11.1.20	3D Level Scanners.....	100
11.1.21	Communication System	101
12	FIRE FIGHTING	104
13	SEWAGE TREATMENT PLANT.....	105
13.1	General	105
13.2	Process Description	105
13.3	Blowers and Aeration System.....	106
13.4	Special Notes	107
14	EXTERNAL CONNECTIVITY	108
14.1	External Rail Connectivity	108
14.1.1	Existing Rail Connectivity.....	108
14.1.2	Proposed Rail Connectivity.....	108
14.2	External Road Connectivity.....	108
14.2.1	Existing Road Connectivity	108
14.2.2	Proposed road connectivity	109
15	ENVIRONMENTAL IMPACT ASSESSEMENT (EIA) & ENVIRONMENT MANAGEMENT PLAN (EMP)	110
16	COST ESTIMATE	115
16.1	Basis of Cost Estimates	115
16.2	Capital Cost Estimates	115
16.3	Detail Cost Estimates	Error! Bookmark not defined.
16.4	Cost for Fly ash Silos	123
16.5	Cost for Rail Yard	123
16.6	Operation and maintenance (O&M) costs	123
17	PROJECT IMPLEMENTATION SCHEDULE	125
17.1	General	125
17.2	Basic consideration for Implementation	125
17.3	Pre-development activities.....	125
17.4	Construction activities.....	125
18	FINANCIAL AND ECONOMIC ANALYSIS.....	128
18.1	Introduction	128
18.2	General Assumptions.....	128
18.3	Construction Period and Project Life	128
18.4	Means of Finance	128
18.5	Income Tax Calculations	128
18.6	Project Cost.....	129
18.7	Revenue Estimation	129

18.8	Expenses	130
18.9	Key Results - Financial Analysis.....	130
18.10	Economic Analysis	132
18.10.1	Approach and Methodology	132
18.10.2	Economic Factors considered.....	132
18.10.3	Energy Consumption	132
18.10.4	External Costs	135
18.10.5	Economic IRR.....	144

List of Tables:

Table 0.1: Haldia MMT - 2020 to 2045 cargo forecast by cargo type (tons)	11
Table 0.2 : Design Vessel Size.....	12
Table 2.1 Recorded Mean Daily and Extreme Temperatures.....	21
Table 2.2 Mean Relative Humidity.....	22
Table 2.3 Annual Rainfall Data.....	23
Table 2.4 No. of Storms.....	23
Table 2.5 Tide Levels near Haldia.....	24
Table 2.6 Morphological Changes in Hugli River	26
Table 3.1 Landside Soil Profile	27
Table 3.2 Riverside Soil Profile.....	28
Table 4.1 Haldia MMT - 2020 to 2045 cargo forecast by cargo type (tons)	29
Table 5.1 Vessels that can Ply in Inland Waterways with LAD of 3.0 m	30
Table 5.2 Vessels Sizes for Various Commodities	30
Table 6.1 Traffic Forecast for the year 2020 to 2045.....	31
Table 6.2 Design Vessel Sizes	32
Table 6.3 Dredge depths required	32
Table 6.4 Considerations for Channel Width.....	33
Table 6.5 Channel Width.....	33
Table 6.6 Dimensions of Turning Circle	34
Table 6.7 Average Parcel Size	35
Table 6.8 Cargo Handling Rates	39
Table 6.9 Norms for Berth Occupancy.....	40
Table 6.10 Recommended Berth Occupancy Factors for Haldia Terminal	40
Table 6.11 Requirement of Berths for Phase-1.....	41
Table 6.12 Overall Requirement of Berths for Phase-2	41
Table 6.13 Overall Requirement of Berths for Master Plan	42
Table 6.14 Berth Length – Phase-1	43
Table 6.15 Berth Length – Phase-2	43
Table 6.16 Berth Length – Master Plan.....	43
Table 6.17 Target Traffic	44
Table 6.18 Berth Requirement for Target Traffic.....	45
Table 6.19 Berth Capacity	45
Table 6.20 Berth Length for Berth Capacity.....	45
Table 6.21 Norms Adopted for Calculating Storage Area at IWT Terminal	46
Table 7.1 Maximum Throughput – Alternative I.....	49

Table 7.2 Maximum Throughput – Alternative II.....	50
Table 7.3 Maximum Throughput – Alternative III.....	50
Table 7.4 Maximum Throughput – Alternative IV	51
Table 7.5 Maximum Throughput – Alternative V	51
Table 7.6 Multi-Criteria Analysis of Alternatives	52
Table 9.1 Water Levels Considered.....	56
Table 9.2 Dimensions of Self-Propelled Motor Vessels	56
Table 9.3 Basis for Design Dredge Level	56
Table 9.4 Safety Factors.....	57
Table 9.5 Berth Load Parameters for 3000 DWT vessel	59
Table 9.6 Permissible Crack Width	62
Table 9.7 Material specification.....	62
Table 9.8 Details of internal roads.....	75
Table 9.9 Water Demand for Terminal (Litre/per day).....	76
Table 9.10 Capacity of U/G sumps, and OHT for Terminal development.....	76
Table 10.1 Summary of Mechanical Equipments	79
Table 10.2 Specification Data Sheet - Road Weigh Bridge	90
Table 11.1 Summary of Load Calculations.....	92
Table 15.1 Environmental Management Cost	112
Table 16.1 Capital Cost Estimate for Haldia Terminal	115
Table 16.2 Detail Cost Estimate for Berth – Haldia Terminal	117
Table 16.3 Detail Cost Estimate for Approach trestle – Haldia Terminal	119
Table 16.4 Detail cost estimate for Conveyor Gallery – Haldia Terminal	121
Table 16.5 Electrical distribution system & IT communication	122
Table 16.6 O&M Cost Estimates	124
Table 18.1 Project Development Schedule.....	128
Table 18.2 Project Cost	129
Table 18.3 Storage Charges	129
Table 18.4 Cargo Handling Charges	129
Table 18.5 Berthing Charges	130
Table 18.6 Financial IRR for development of Haldia Terminal.....	131
Table 18.7 Energy Consumption - Waterways, Road and Rail.....	133
Table 18.8 Energy Consumption – Economical Benefit	134
Table 18.9 External Costs of Air Pollution - Waterways, Roadways and Railways	135
Table 18.10 Air Pollution – Economical Benefit.....	137
Table 18.11 External Cost of Noise Pollution.....	138

Table 18.12 Noise Pollution – Economical Benefit	139
Table 18.13 External Cost of Soil and Water Pollution	140
Table 18.14 Soil & Water Pollution – Economical Benefit	141
Table 18.15 Accident Cost - Waterways, Roadways and Railways	142
Table 18.16 Reduction in Accident Cost– Economical Benefit	143
Table 18.17 Economical IRR for development of Haldia Terminal	145

List of Figures:hetan

Figure 0.1: Location of Site for Haldia Multimodal Terminal.....	11
Figure 0.2: Haldia MMT - Layout Plan of Terminal Facilities	13
Figure 2.1 Location of Site for Haldia Multimodal IWT Terminal	20
Figure 2.2 Morphological changes in Hugli River.....	25
Figure 10.1 Typical Details of Mobile Harbour Crane.....	89
Figure 17.1 Project Implementation Schedule	127

List of Drawings:

S. No.	DWG. No.	TITLE
1	I-525/HT/201	Layout of Topography survey
2	I-525/HT/202	Layout of Bathymetry survey
3	I-525/HT/203	Location plan of Boreholes
4	I-525/HT/204	Layout plan of terminal facilities at Haldia Alternative-1 Recommended layout
5	I-525/HT/205	Layout plan of terminal facilities at Haldia Alternative-2
6	I-525/HT/206	Layout plan of terminal facilities at Haldia Alternative-3
7	I-525/HT/207	Layout plan of terminal facilities at Haldia Alternative-4
8	I-525/HT/208	Layout plan of terminal facilities at Haldia Alternative-5
9	I-525/HT/209	Layout plan of terminal facilities at Haldia
10	I-525/HT/210	Rail connectivity
11	I-525/HT/211	Layout of Manoeuvring area
12	I-525/HT/212	General arrangement of Jetty and Approach trestle
13	I-525/HT/213	Cross section of Jetty and Approach trestle (Sheet 1-2)
14	I-525/HT/213	Cross section of Jetty and Approach trestle (Sheet 2-2)
15	I-525/HT/214	Typical layout of Terminal Administration building
16	I-525/HT/215	Elevations of Terminal Administration building
17	I-525/HT/216	Typical layout & section of Worker's amenity building
18	I-525/HT/217	Typical layout & elevations of Security office and Weigh bridge control room
19	I-525/HT/218	Typical details of Covered storage shed
20	I-525/HT/219	General arrangement of Gate Complex
21	I-525/HT/220	Typical plan & elevation of Silo
22	I-525/HT/222	Typical plan and cross section of proposed bridge over 'Green belt canal'
23	I-525/HT/223	Typical cross sections of Roads
24	I-525/HT/224	Schematic layout of Water supply system
25	I-525/HT/225	Layout of Storm water drainage
26	I-525/HT/226	Cross section of Fixed type barge loader
27	I-525/HT/227	Cross section of Mobile harbour crane
28	I-525/HT/228	Flow diagram of cargo handling system (Sheet - 1 of 2)
29	I-525/HT/228	Ga of fly ash silo & profile of pipe conveyor pc-1/pc-2 (Sheet - 2 of 2)
30	I-525/HT/229	Power single line diagram
31	I-525/HT/230	Sub-station equipment layout
32	I-525/HT/231	High mast & cable layout
33	I-525/HT/232	Control architecture
34	I-525/HT/233	Typical detail of boundary wall, fencing & boulder pitching

EXECUTIVE SUMMARY

1 PROJECT LOCATION

The site proposed for the development of Haldia MMT is located on Hugli River at Latitude 22° 03' 30" North and Longitude 88° 8' 40" East, at Haldia in Purba Medinipur district of West Bengal.



Figure 0.1: Location of Site for Haldia Multimodal Terminal

2 TRAFFIC POTENTIAL

The traffic potential of Haldia MMT as provided by M/s Hamburg Port Consulting GmbH, the traffic consultant is presented below.

Table 0.1: Haldia MMT - 2020 to 2045 cargo forecast by cargo type (tons)

Cargo Type	2020		2025		2035		2045	
	<i>Loaded</i>	<i>Discharged</i>	<i>Loaded</i>	<i>Discharged</i>	<i>Loaded</i>	<i>Discharged</i>	<i>Loaded</i>	<i>Discharged</i>
Bagged (Fertilizer)			72,484		251,222		268,562	
Bagged (Food grains)		50,608		53,061		90,608		96,359
Container					335,762		437,585	
Dry bulk (Coal)	766,264		1,746,915		2,653,339		2,807,585	
Dry Bulk (Fly ash)	1,381,163		1,662,129		2,187,851		2,708,878	
Dry Bulk (Stone chips)		162,716		205,119		273,917		318,430
Dry bulk (Iron ore)						30,960		32,910
Neo-bulk	394,453	139,640	508,903	494,287	743,080	767,133	885,947	886,688
Total (tons)	2,541,880	352,964	3,990,431	752,467	6,171,254	1,162,618	7,108,557	1,334,387

Source: HPC report on Infrastructure requirement of individual terminals along National Waterways 1, dated 26th April 2016.

3 DESIGN VESSEL SIZE

The principal dimension of the design vessel considered to be handed at Haldia multimodal terminal is mentioned below:

Table 0.2 : Design Vessel Size

Vessel Type	Vessel Size (DWT)	LOA (m)	Beam (m)	Loaded Draft (m)
Barge	3,000	95	15	2.5

However, for flyash the design vessel has been considered as 1500 DWT, since these vessels will be primarily used for flyash export to Bangladesh via Sundarbans.

4 TARGETED TRAFFIC AND TERMINAL CAPACITY

Considering the restriction in the availability of water front, maximum of four berths can be developed. Therefore, alternate layouts have been worked out based on various cargo mixes and with subsequent discussion held with IWAI, the following commodities has been considered as the targeted cargoes and the individual berth capacities for handling the targeted commodities have been worked out based on mechanized handling method as described below:

4.1 Flyash

Fly ash shall be coming to the terminal through bulkers and loaded to the silos pneumatically by pumps. Then it will be loaded to barges by barge loaders through pipe conveyor system. The handling of fly ash shall be carried out using bulkers discharging fly ash either into the silos or directly into the barges.

4.2 Fertilizer

Fertilizer in bags shall be coming to the terminal through trucks and stored in the proposed covered shed. Then it will be transported to the berth through trucks and loaded on to the barges using mobile harbour crane.

4.3 Natural aggregates

Natural aggregate shall be coming to the terminal in barges which will be unloaded into trucks using mobile harbour cranes and then transported to the storage yard. Later it will be loaded onto the trucks using pay loader and transported to the hinterland by trucks.

4.4 Petroleum products and Edible oil (in drums)

Petroleum products in drums shall be coming to the terminal in barges which will be unloaded onto the berth using mobile harbour crane. The unloaded drums will be loaded onto trucks using forklifts and will be transported to the storage yard. Then it will be unloaded from trucks using forklifts and stored in the storage yard. Later, the drums will be loaded onto the trucks using forklift and transported to the hinterland. It is to be noted that edible oil being the export commodity, reverse handling process will be followed.

Accordingly, the berth capacity has been worked out and presented below in Table 3.

Table 3 : Terminal Capacity

Commodity	No. of Berths	Berth Capacity in MTPA
Flyash	2	2.71
Fertilizer	2	0.11
Natural aggregates		0.16
Petroleum products and Edible oil (in drums)		0.10
Total	4	3.08

In addition, provision has been kept to handle containers in the future by using mobile harbour cranes.

5 LAYOUT OF HALDIA MMT

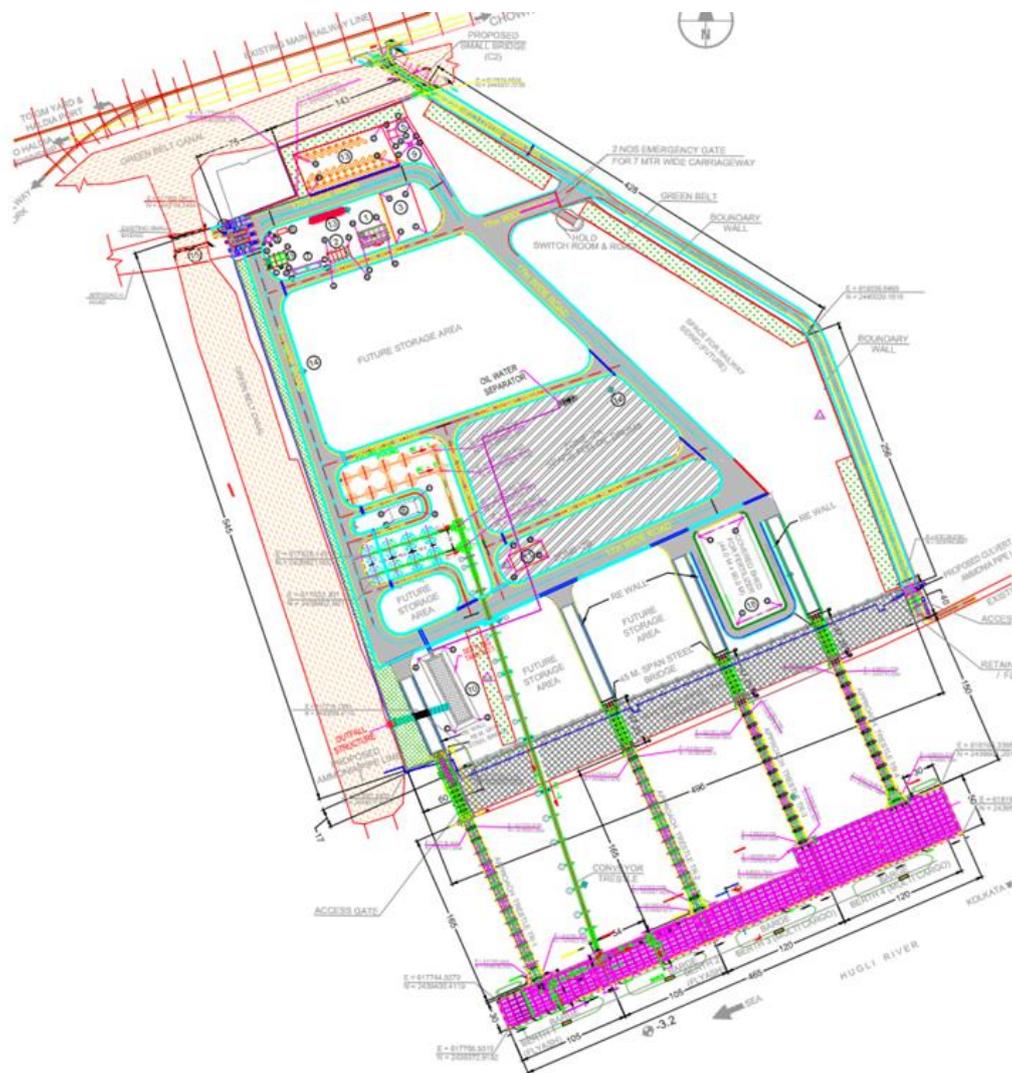


Figure 0.2: Haldia MMT - Layout Plan of Terminal Facilities

6 DEVELOPMENT PLAN – MARINE FACILITIES

6.1 Berthing Structures Including All Associated Facilities

There shall be 4 berths which are continuous with a total quay length of 465m. Out of the 4 berths, two berth (Berth no.-01 & Berth no.-02) are for handling flyash and the other two berths are multi-cargo berths. Cargo vessels shall be berthed on the front side and survey vessels shall be berthed on the rear side ends of the berth. The top level of deck shall be +8.7 m with respect to CD. Berth no. 4 shall have provision for handling container cargo in future.

6.2 Approach Trestles

There shall be 4 approach trestles to connect the berths to the back-up area. The proposed approach trestles have to cross a pipeline corridor of 40 m comprising of ammonia pipelines and other commodity/utility pipelines, outside the terminal boundary. A minimum vertical clearance of 0.8 m has to be maintained between the top level of the ammonia pipelines and the soffit level of the approach trestle.

6.3 Conveyor System / Structures

Conveyor system is proposed to carry flyash from silos to the berth area so as to finally discharge the flyash into the barges using the barge loader. Conveyor gallery shall be 8.40 m wide.

6.4 Dredging

Based upon survey details from 2015, it is assessed that at the terminal about 0.3Mm³ of initial dredging will be required to provide the berthing box, the turning/manoeuvring area for the berths and holding areas for barges anchored fore and aft adjacent to the channel leading into the turning area. The maintained width of this channel between the toe of the slopes is proposed to be 45m. The initial dredge volume for the approach channel which joins the terminal with the main NW1 deep water channel is about 0.5Mm³.

It is considered that to maintain the turning/berthing/holding area at about 3.2m below CD, the further annual maintenance dredging will be about 0.5Mm³/year. Similarly the further annual maintenance dredging requirement for the access channel is assessed to be about 1.8Mm³/year. The dredging methodology to be adopted assumes permission will be granted for disposal to the existing offshore disposal site of KoPT at Sagar which is approximate 65km from the proposed terminal location.

7 DEVELOPMENT PLAN – ONSHORE FACILITIES

7.1 Site Grading

The existing ground level varies from +4.95 m CD to +8.21 m CD. It is proposed to provide the formation level of +7.80m CD within the terminal area.

7.2 Stockyard

Stockyard shall be developed to 4 m high stockpiling of stone aggregate and 3 high stacking of oil drums. The stockyard shall have the provision to stack containers in future. Ground improvement shall be carried out to achieve required bearing capacity accordingly.

7.3 Terminal Buildings

The following terminal buildings are proposed for the Haldia terminal:

S. No.	Building	Type	Total Built up Area (m ²)
1	Terminal Administration Building	Two storey building	660
2	Worker's Amenity Building	Single storey building	121
3	Security Office	Single storey building	25
4	Electrical Substation	Two storey building	1,089
5	Weigh Bridge Building	Single storey building	25
6	RIO Control Room	Single storey building	40

7.4 Other Onshore Facilities

Other onshore facilities such as green belt development, internal roads and vehicle parking area, gate house complex, emergency exit gate & access gates, diversion of existing road, storm water drainage system, sewerage system, water supply system, firefighting system, electrical, communication & IT system shall be also developed to facilitate the flawless operation of the proposed terminal.

7.5 Material Handling System / Equipments

The mechanical equipment proposed for the terminal are given below:

S. No.	Equipment	No. of Equipment
1.	Mobile harbour crane	2
2.	Silo with Conveyor system	8
3.	Fixed barge loader	2
4.	Road Weigh Bridge	2
5.	Dumper truck	10
6.	Fork lift	2
7.	Front end loader	1

7.6 External Road Connectivity

The existing approach road to the terminal will be retained. However, the existing riverside road leading to Tata chemicals factory will fall under the terminal area. It will have to be closed for terminal operation. Therefore, it is proposed to develop a 15 m wide diversion road for the same, on the western side of the terminal.

7.7 Rail Siding

As per the traffic projection provided by M/s HPC, no rail borne traffic is envisaged but IWAI intends to develop rail siding to attract the future rail borne traffic. Accordingly, railway siding is proposed. The wagon unloading / loading system has to be developed based on the rail borne traffic in the future.

8 IMPLEMENTATION SCHEDULE

The time frame for implementation of development of the terminal is 30 months.

9 COST ESTIMATES

9.1 Capital Costs

The capital cost estimates for the Terminal considering the base year rate is worked out to be **Rs. 495 crores**. The above cost is excluding the cost paid to KoPT towards land lease rent and cost to be paid to the local authorities for obtaining electrical & water supply connection. The dredging cost for terminal and approach channel along with navigational aids is included in the overall cost of fairway development and therefore not included under this terminal cost.

9.2 Operation and Maintenance Costs

The annual operation and maintenance cost of the facilities for the terminal is worked out to be **Rs. 16.45 crores** considering the base year rate.

10 FINANCIAL AND ECONOMIC ANALYSIS

10.1 Financial Analysis

Based on the capital cost and operating expenditure, the financial analysis has been carried out considering 30 years of operation. The financial IRR is worked out to be **6.40%** for terminal development.

10.2 Economic Analysis

The economic analysis for Haldia MMT is carried out considering various economic factors from the projects and the economic IRR is worked out as **20.82%**.

1 INTRODUCTION

1.1 Project Background

Inland Waterways Authority of India (IWAI), an autonomous organization under Ministry of Shipping (MoS), Govt. of India was constituted for development and regulation of inland waterways of the country.

Before 2016, five waterways namely (i) the Ganga-Bhagirathi-Hooghly river system from Haldia to Allahabad (1620 km), (ii) the Brahmaputra from Dhubri to Sadiya (891 km), (iii) West Coast canal from Kottapuram to Kollam along with Champakara and Udyogmandal canals (205 km), (iv) Kakinada-Pondicherry canals integrated with rivers Godavari and Krishna (1095 km) and (v) East Coast canals along with river Brahmani and Mahanadi (621 km), were declared as National Waterway No. 1,2,3,4 & 5 respectively. Recently, 106 new National Waterways (NW) are also notified vide National Waterways Bill-2016.

In this connection, IWAI has appointed M/s Howe Engineering Projects (India) Pvt. Ltd. (HOWE) as Consultant for carrying out detailed feasibility study for capacity augmentation of NW-1 and detailed engineering for its ancillary works and processes between Haldia to Allahabad (Jal Marg Vikas Project).

1.2 Need of the Project

An efficient transport sector is vital for development of the economy of any country and to stimulate competitive business environment. Indian transport system comprises various modes, viz. Railways, Roadways, Inland Waterways, Coastal Shipping and Airways. The main modes of transport are rail and road which are overburdened and experiencing congestion.

India has large number of inland waterways consisting of rivers, canals, backwaters, creeks, and lakes etc. which have the potential for development of efficient waterways transport network. Inland Water Transport (IWT) is a fuel efficient, environment friendly and cost effective mode of transport having potential to supplement the overburdened rail and congested roads. Hence, it is proposed to develop inland water ways and terminals at certain locations for loading and unloading of cargo.

Haldia, being a riverine port location with good connectivity by Road and Rail, has tremendous potential for attracting traffic through IWT. It is favourably located to attract transshipment of import cargo to feed the requirements of Power Plants, Steel Plants and various industries in West Bengal, Bihar and UP located near NW1 route from Haldia to Allahabad. It has a favourable location for transporting Bangladesh cargo and linking NW-2 through which IWT traffic passes via Bangladesh as per Indo-Bangladesh Protocol.

With the above background the development of a multimodal terminal at Haldia has been initiated by IWAI to interlink IWT through NW1 with Hugli estuarine system.

1.3 Scope of Work

The broad scope of work for the project is to carry out a technical analysis together with Front-end Engineering and Design work, economic and financial analysis, procurement assessment, operation & management and monitoring & evaluation guideline.

The scope for preparation of the Detailed Project Report is as follows:

- Collection and review of the available data / reports.
- Undertake surveys to ensure adequacy and completeness of data and record details after physical verification, wherever necessary.
- Prepare detailed multimodal terminal layout plan, shore side infrastructure plan, bank protection work, land development plan along with design and structural drawings, specifications, cost estimates for all structures like berthing jetty, approach jetty, covered and open storage along with all allied structures / buildings / facilities like Administrative Buildings, Residential Accommodation, security office, customs enclosure, bunkering of fuel, water supply, electricity supply, firefighting including lighting, requirement of power, water supply, emergency and standby power supply, communication system, Drainage & Sewerage system, boundary wall, fencing, gates, internal roads, etc. Layout developed should permit expansion of terminals to cater to projected traffic beyond the assessed value for the projected time frame.
- Every estimate shall be duly supported by the justification of rates adopted / basis of rates adopted like CPWD rates / market rates / lowest offers / rates received etc.
- Preparation of realistic construction schedule for the ancillary structures indicating the sequence of activities duly considering the river characteristics in different seasons and priority and phasing of work along with phasing of expenditure.
- Preparation of specifications, bill of quantities, estimates and tender documents containing General condition of contract, special condition of contract, technical specification and NIT etc. to facilitate implementation of works after the finalization of Detailed Project Report.
- Preparation of Environment Management Plan
- Preparation of Resettlement Action Plan
- Work out cost benefit analysis, Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR) of the project based on current Indian/International norms including SWOT analysis with detailed back up calculations, basis, assumption, justification etc. along with their source of information.

1.4 Present Submission

Howe submitted Detailed Project Report during February, 2017. Subsequently, during execution of project facilities, the main electrical sub-station, covered shed for fertilizer, security office, weigh bridge room etc. were relocated against the places which were envisaged in the DPR dated February 2017.

The present submission is the revised Detailed Project Report taking into account above mentioned facilities erected at site. It spells out the project requirement, traffic projection, assessment of project facilities, development of facilities, engineering of civil works and material handling system, onshore infrastructure, cost estimates and financial analysis etc.

This report is organised in the following sections:

- Chapter 1 - Introduction
- Chapter 2 - Project Site Environment
- Chapter 3 - Field Surveys and Investigations
- Chapter 4 - Traffic Forecast
- Chapter 5 - Vessel Sizes
- Chapter 6 - Facility Requirements
- Chapter 7 - Alternative Layouts
- Chapter 8 - Development Plan
- Chapter 9 - Preliminary Engineering – Civil Works
- Chapter 10 - Preliminary Engineering – Material Handling System/ Equipments
- Chapter 11 - Preliminary Engineering – Electrical and Control System
- Chapter 12 - External Connectivity
- Chapter 13 - Environmental Impact Assessment (EIA) & Environment Management and Monitoring (EMP)
- Chapter 14 - Cost Estimates
- Chapter 15 - Project Implementation Schedule
- Chapter 16 - Financial and Economic Analysis

2 PROJECT SITE ENVIRONMENT

This chapter provides information on location, meteorological, oceanographic parameters, connectivity and existing features to have a complete understanding on the site conditions and to enable proper planning and design of terminal facilities.

2.1 Project Location

The site is located on Hugli River at Latitude 22° 03' 30" North and Longitude 88° 8' 40" East, at Haldia in Purba Medinipur district of West Bengal. Google image of the proposed terminal is shown in figure below:



Figure 2.1 Location of Site for Haldia Multimodal IWT Terminal

2.2 Land Availability

The multi-cargo Inland Water Transport (IWT) terminal is proposed in an area of 61 acres adjacent to Haldia Dock. The land belongs to Kolkata Port Trust and has already been handed over to IWAI on a long term lease basis.

2.3 Infrastructure at the Project Site

The infrastructure near the project site is as follows:

2.3.1 Road Connectivity

The terminal has a good connectivity with national highway network. The nearest national highway from the terminal is NH-41, which connects Haldia Port to Kolaghat on NH-6 (part of Golden Quadrilateral). The terminal is about 6 km from NH-41 and is connected by a two lane road. Kolaghat is connected to Orissa, Jharkhand, Kharagpur, Bankura, Purulia and Durgapur through NH-6 and to North Bengal, Bangladesh via Petrapole and Bhojadanga Land Custom Stations through NH-34. A state highway connecting Haldia with Kolaghat via Tamluk town, the district headquarters, can also serve as an alternate connectivity. A 4-Lane

expressway linking Haldia to Kolkata via Raichak-Kukrahati is going to be developed. The land acquisition for this road is nearing completion.

2.3.2 Rail Connectivity

The terminal has a good connectivity with railway network. The nearest railway head is Durgachowk Railway Station, which is about 3 km from the terminal. The siding to Haldia terminal is about 0.2 km from the project site.

2.3.3 Air Connectivity

The nearest airport is Netaji Subhash International Airport in Kolkata which is about 130 km from the project site.

2.3.4 Sea link

The terminal is located about 60 km from the Bay of Bengal and is connected to the sea by Hugli River. Haldia dock, which is a major port, is adjacent to the project site.

2.3.5 Nearest Towns

The nearest towns are Haldia and Durgachowk, which are about 8 km and 0.5 km from the project site, respectively.

2.4 Meteorological Parameters

The meteorological data of the project site is obtained from the Climatological Handbook of India, 1971 to 2000 published by Indian Meteorology Department. The nearest IMD observatory to Haldia is Ulberia, which is located at 22° 30' N latitude and 87° 57' E longitude. The various meteorological observations of the same are presented below.

2.4.1 Temperature

The temperatures vary from 7.2°C to 41°C. The mean daily maximum and minimum air temperatures along with the extremes for each month are as given below:

Table 2.1 Recorded Mean Daily and Extreme Temperatures

Month	Recorded Temperature (°C)			
	Mean Daily Maximum	Mean Daily Minimum	Highest Maximum	Lowest Minimum
January	25.7	12.7	33.2	7.8
February	28.6	15.9	36.4	7.2
March	33.0	20.7	40.3	12.2
April	35.0	24.1	41.0	12.9
May	35.0	25.4	38.7	17.8
June	33.7	26.2	40.0	19.3

Month	Recorded Temperature (°C)			
	Mean Daily Maximum	Mean Daily Minimum	Highest Maximum	Lowest Minimum
July	32.2	26.0	36.1	16.2
August	31.8	26.1	36.7	16.4
September	32.0	25.8	36.1	17.6
October	31.8	23.9	34.0	17.2
November	29.3	18.6	32.9	12.2
December	26.6	13.8	32.9	9.4

Source: IMD

2.4.2 Wind

The mean wind speed at the project site is found to be in the range of 0.72 m/s to 2.14 m/s. The wind direction is mostly from south-east to south-west. The basic wind speed at 10 m height for the project site is 55 m/s (198 km/h) as per IS 875 (Part 3).

2.4.3 Relative Humidity

The humidity is moderate to high throughout the year with the mornings being more humid than evenings. The mean relative humidity for each month of the year measured during mornings and evenings is as tabulated below:

Table 2.2 Mean Relative Humidity

Month	Mean Relative Humidity (%)	
	Morning (0830 hrs)	Evening (1730 hrs)
January	85	63
February	81	58
March	80	58
April	80	70
May	80	74
June	84	79
July	88	84
August	88	84
September	88	83
October	84	78
November	83	71
December	84	66

Source: IMD

2.4.4 Rainfall

The area is dominated by south-west monsoon during June to September and north-east monsoon during December to March. The area received almost 74% of the rainfall during south-west monsoon. The average annual rainfall in the region is about 1618.1 mm. The month-wise distribution of the average rainfall recorded for each month of the year is as follows:

Table 2.3 Annual Rainfall Data

Month	Monthly Total (mm)	Number of Rainy Days	Heaviest Fall in 24 Hours (mm)	Year
January	11.3	0.9	59.9	1977
February	23.7	1.5	44.6	1992
March	33.9	2.1	86.6	1981
April	52.8	3.6	54.1	1971
May	126.1	6.4	85.9	1973
June	242.6	11.7	266.8	1984
July	343.8	15.0	186.8	1990
August	332.5	15.8	255.0	1971
September	307.5	12.1	409.3	1978
October	97.5	5.5	80.0	1973
November	33.4	1.4	199.8	1986
December	13.0	0.6	91.6	1981
Total	1618.1	76.7		

Source: IMD

2.4.5 Depressions and Cyclones

The Hugli estuary is located at the apex of the Bay of Bengal and is prone to storm surges caused by tropical cyclones that take place between May and December. A total number of 346 storms occurred within 100 km of the mouth of the Hugli estuary during 1936 to 2006.

Table 2.4 No. of Storms

Storm Type	Wind Speed (kmph)	Number of Occurrences
Depressions	< 63 kmph	266
Cyclonic storms	63 - 87 kmph	39
Severe cyclonic storms	> 87 kmph	41
Total		346

2.4.6 Visibility

The visibility in the project area is generally good throughout the year, except for a few days during the winter season and during periods of heavy rain. On an average, the visibility is less than 4 km for about 110 days in a year.

2.5 Oceanographic / River Conditions

2.5.1 Tides

Hugli River experiences semi-diurnal tide with two high and two low tides in a day. The following are the tidal levels at the site.

Table 2.5 Tide Levels near Haldia

Highest High Water	(+) 7.26 mCD
Mean High Water Spring	(+) 5.70 mCD
Mean High Water	(+) 5.01 mCD
Mean High Water Neap	(+) 4.26 mCD
Local Mean Water Level	(+) 3.23 mCD
Mean Sea Level	(+) 2.80 mCD
Mean Low Water Neap	(+) 2.10 mCD
Mean Low Water	(+) 1.34 mCD
Mean Low Water Spring	(+) 0.80 mCD
Chart Datum	0.46 m below K.O.D.S. (Khirdirpur Old Dock Sill)
Lowest Low Water	(-) 0.07 mCD

Source: Hugli River Tide Table 2015 published by Survey of India

The tidal effect is noticeable up to a distance of 300 km from the mouth of the Hugli River.

2.5.2 Current

Maximum ebb current of 4 knots and flood tide current of 6 knots occur in the river.

2.5.3 Waves

The sea waves mostly approach the Hugli River from SSW to WSW and wave heights near the terminal site would be 0.5 m and 3.0 m during the operating and storm conditions respectively.

2.5.4 Discharge

The fresh water discharge into the Hugli River ranges from a peak of 4,250 m³/s to almost zero during the dry season. The average values of fresh water discharge are 3,000 m³/s during southwest monsoon season and 1,000 m³/s during November to May. Normally fresh

water discharges are regulated by Farakka Barrage situated upstream of Hugli River to maintain water levels at Kolkata. The Hugli River discharges a sediment load of about 20 to 25 million tons per annum.

2.5.5 Morphological condition

Hugli River is characterized by the presence of a large number of tidal bars and tidal islands of which Sagar island, Ghormara Island, Balari bar and Nayachara Island are the most important. The formation of the islands, shoals, mud flats, etc. restrict the navigation channel to a draft less than 6 m. The morphological changes in Hugli River from 1904 to 2008 are shown in figure below.

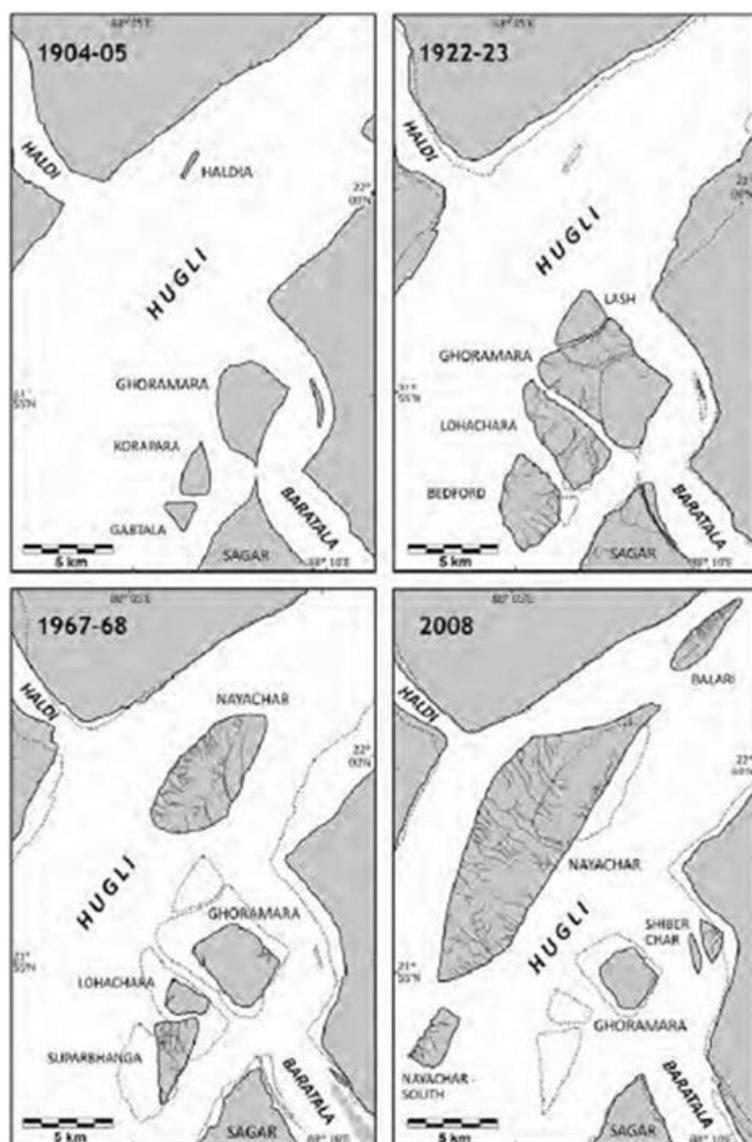


Figure 2.2 Morphological changes in Hugli River

From the above figure, it can be seen that there are significant morphological changes in the Hugli River. Few islands like Lohachara, Korapara, Gabtala, Bedford, and Suprabhanga have vanished completely and new islands like Nayachara Island and Balari bar have formed.

Table 2.6 Morphological Changes in Hugli River

Year	Area in Sq. km			
	Sagar Island	Ghoramara	Nayachara Island	Balari Bar
1951	285.40	38.23	30.16	
1973	244.00	13.41	27.43	
1990	236.95	6.67	42.11	
2000	247.47	5.52	53.74	1.10
2011	239.23	4.37	45.86	6.70
2015	235.00	4.30	64.00	7.00

2.5.6 Existing Navigational Channel

The existing navigation channel from Bay of Bengal to Kolkata Port in the Hugli River shifts erratically. In an estuary like Hugli with high tidal range supported by persistent flood and ebb flows and charged with sediment load and river discharges, the bed configuration changes drastically under differing flow regimes. The position of the channel in rivers like Hugli shifts back and forth as large as 900m. The movement of sand bars and shoals occur most frequently during the abrupt falling stage of the river (October and November) and the shift is quite sudden and erratic.

2.6 Natural Hazards

2.6.1 Seismicity

The terminal falls under the seismic Zone III as per IS: 1893 – 2000.

2.7 Pipeline Corridor

Two ammonia pipelines of M/s Tata Chemical, being maintained by M/s Sanjana Cryogenic, pass through the proposed terminal site. It is proposed to relocate these pipelines into a 40 m wide pipeline corridor adjacent to the river bank. The pipeline will be laid above ground in the pipeline corridor.

3 FIELD SURVEYS AND INVESTIGATIONS

The secondary data on the topography of the terminal site, landside as well as riverside geotechnical data and bathymetric data of the river was not available. These details were collected by carrying out field surveys and investigations.

3.1 Topographic Surveys

The topographic survey of site was carried out by M/s Ocean Science and Surveying Pvt. Ltd during August 2015. The results of the topographic survey are as follows:

- The existing ground level in the terminal area varies from (+) 5.07 mCD to (+) 8.38 mCD.
- About 80% of the terminal area has a ground level between (+) 6.00 mCD and (+) 7.00 mCD
- About 10% of the terminal area near the south-west corner has ground level varying between (+) 5.00 m CD and (+) 6.00 mCD
- The ground level near the north-west and western boundaries is more than (+) 7.00 mCD

The topographic survey data is enclosed as **Drawing I-525-HT-201**.

3.2 Geotechnical Investigations

The landside and riverside geotechnical investigations were carried out by M/s Xplorer Consultancy Services Pvt. Ltd. during December 2015. The borehole locations are shown in **Drawing I-525-HT-203**. The boreholes were driven up to a depth of about 60 m below the ground / bed level and soil samples were collected at regular intervals.

3.2.1 Landside Soil Profile

The soil profile comprises of layers of silty sand / silty clay of varying properties. A typical summary of the landside soil profile is given below (Borehole No. 4).

Table 3.1 Landside Soil Profile

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thickness (m)			
		From	To				
—	Fill consisting of silty clay with sand, kankar, brick pieces etc.	+98.6 (G.L.)	+96.6	2.0	—	§1.800	—
I	Soft/firm silty clay with occasional laminations of silt / fine sand	+96.6	+87.6	9.0	2	1.815	$c=1.6t/m^2$
		+87.6	+82.1	5.5	4 & 6	1.833	$c=2.4t/m^2$
II	Medium dense silty fine sand with a thin band of firm silty clay from 18.6m to 20.0m depth	+82.1	+80.0	2.1	*19	§1.900	§ $\Phi=32.5^\circ$
		+80.0	+78.6	1.4	7	§1.850	§ $c=3.5t/m^2$
		+78.6	+75.6	3.0	*11	§1.780	§ $\Phi=30^\circ$

III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+75.6	+62.6	13.0	6 to 9	1.754	$c=3.5t/m^2$
IV	Stiff to very stiff silty sandy clay	+62.6	+58.6	4.0	18 & 20	1.988	$\xi c=9.5t/m^2$
V	Dense to very dense silty sand	+58.6	+54.1	4.5	ξ^*30	$\xi 2.020$	$\xi \Phi=35.5^\circ$
VI	Stiff / very stiff silty clay with brown spots	+54.1	+48.6	5.5	22 to 24	1.965	$\xi c=11.5t/m^2$
		+48.6	+42.6	6.0	13 to 16	1.929	$\xi c=7.0t/m^2$
VII	Medium dense / dense silty fine sand	+42.6	+38.4 (T.L.)	4.2	ξ^*30	$\xi 2.020$	$\xi \Phi=35.5^\circ$
G.L.= Ground Level, T.L.= Termination Level, * = Corrected N value, ξ = Suggested Value							

3.2.2 Riverside Soil Profile

The soil profile comprises of layers of silty sand / silty clay of varying properties. A typical summary of the riverside soil profile is given below (Borehole No. 12).

Table 3.2 Riverside Soil Profile

LAYER DETAILS					Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Brief Description	RL (m)		Thickness (m)			
		From	To				
I	Very soft / soft to firm silty clay with occasional laminations of silt / fine sand; medium dense silty fine sand with clay as binder observed from 12.0m to 14.0m depth	+91.0 (B.L.)	+85.0	6.0	1	$\xi 1.700$	–
		+85.0	+79.0	6.0	5 & 8	1.837	$c=3.0t/m^2$
		+79.0	+77.0	2.0	*17	$\xi 1.870$	$\xi \Phi=32^\circ$
		+77.0	+76.0	1.0	–	1.919	$c=5.6t/m^2$
III	Firm silty clay with varying percentage of decomposed / semi-decomposed wood	+76.0	+61.0	15.0	6 to 9	1.775	$c=3.1t/m^2$
IV	Very stiff sandy silty clay with kankars	+61.0	+59.0	2.0	18	1.974	$\xi c=9.0t/m^2$
V	Dense / very dense silty sand	+59.0	+54.0	5.0	ξ^*30	$\xi 2.020$	$\xi \Phi=35.5^\circ$
VI	Very stiff silty clay with yellow spots	+54.0	+51.0	3.0	28	1.994	$\xi c=14.0t/m^2$
		+51.0	+44.0	7.0	15 to 19	1.948	$\xi c=8.5t/m^2$
		+44.0	+39.3	4.7	21 to 28	1.986	$\xi c=12.5t/m^2$
VII	Medium dense to dense / very dense silty fine sand	+39.3	+36.0	3.3	*28	$\xi 2.010$	$\xi \Phi=35^\circ$
		+36.0	+30.7 (T.L.)	5.3	ξ^*30	$\xi 2.020$	$\xi \Phi=35.5^\circ$
B.L = Bed Level, T.L.= Termination Level, * = Corrected N value, ξ = Suggested Value							

3.3 Bathymetry Survey

The bathymetry survey of site was carried out by M/s Ocean Science and Surveying Pvt. Ltd during December 2015. The existing river bed level near the proposed terminal varies from (-) 1.10 mCD to (-) 2.50 mCD. The bathymetric survey data is enclosed as **Drawing I-525-HT-202**.

4 TRAFFIC FORECAST

IWAI has appointed M/s Hamburg Port Consulting, GmbH and M/s Universal Transport Consulting, GmbH as consultants for carrying out market analysis of Multi-modal terminal at Haldia.

On the basis of the collected origin-destination pairs (O/D-pairs), the Consultants forecasted the traffic for Haldia MMT from base year 2015 until 2045 as mentioned in the below table.

Table 4.1 Haldia MMT - 2020 to 2045 cargo forecast by cargo type (tons)

Cargo Type	2020		2025		2035		2045	
	<i>Loaded</i>	<i>Discharged</i>	<i>Loaded</i>	<i>Discharged</i>	<i>Loaded</i>	<i>Discharged</i>	<i>Loaded</i>	<i>Discharged</i>
Bagged (Fertilizer)			72,484		251,222		268,562	
Bagged (Food grains)		50,608		53,061		90,608		96,359
Container					335,762		437,585	
Dry bulk (Coal)	766,264		1,746,915		2,653,339		2,807,585	
Dry Bulk (Fly ash)	1,381,163		1,662,129		2,187,851		2,708,878	
Dry Bulk (Stone chips)		162,716		205,119		273,917		318,430
Dry bulk (Iron ore)						30,960		32,910
Neo-bulk (Steel, Textile, Petroleum, Project cargo)	394,453	139,640	508,903	494,287	743,080	767,133	885,947	886,688
Total (tons)	2,541,880	352,964	3,990,431	752,467	6,171,254	1,162,618	7,108,557	1,334,387

Source: HPC report on Infrastructure requirement of individual terminals along National Waterways 1, 26th April 2016.

5 VESSEL SIZES

The size of vessels that would call at any terminal will generally be governed by the following aspects:

- The trading route
- Availability of a suitable vessel in the market
- Available facilities mainly navigational channel and manoeuvring areas including the draft
- The available facilities for loading & unloading
- Volume of annual traffic to be handled and the likely parcel size as per the requirements of the user agency.

5.1 Vessel Sizes Recommended by IWAI

The size of vessels calling at the proposed IWT terminal at Haldia is restricted by the availability of draft in the navigation channel of National Waterway-1. It is assured that LAD of 3.0 m shall be maintained by IWAI for movement of vessels in Haldia-Farakka stretch. Based on the LAD of 3.0 m in the navigational channel, IWAI recommended that self-propelled barges of sizes presented in table below can ply in the inland waterways.

Table 5.1 Vessels that can Ply in Inland Waterways with LAD of 3.0 m

Tonnage (T)	Length (m)	Beam (m)	Draft (m)
650 - 1000	60 - 80	8.20	2.20
1000 - 1500	80 - 85	9.50	2.20
1500 - 3000	85 - 95	15.00	2.50

5.2 Vessel Sizes at Haldia Terminal

The following main cargo commodities for proposed terminal at Haldia have been identified:

- Fly ash
- Other Cargo such as fertiliser, natural aggregates, petroleum products.

The vessel sizes in which various commodities will be transported are considered as follows:

Table 5.2 Vessels Sizes for Various Commodities

Vessel Type	Vessel Size (DWT)	LOA (m)	Beam (m)	Loaded Draft (m)
Flyash export to Bangladesh	1,500	85	9.50	2.2
Fertiliser / Natural aggregates/ Petroleum products through NW1	3,000	95	15.00	2.5

6 FACILITY REQUIREMENT

The marine infrastructure and shore based infrastructure shall be planned and developed to cater to the cargo forecast. Development of the terminal infrastructure shall also be suitably phased in such a way that the initial phases integrate well with subsequent phases.

6.1 Traffic Forecast

As the IWT sector is in a nascent stage, the diversion of traffic to IWT would depend on the government policies and several other factors. Hence on a conservative side, the traffic projection for the base case is considered for the terminal development. The traffic forecast as per the traffic report by M/s Hamburg Port Consulting GmbH and M/s Universal Transport Consultancy GmbH is as follows:

Table 6.1 Traffic Forecast for the year 2020 to 2045

Cargo Type	2020		2025		2035		2045	
	Loaded	Discharged	Loaded	Discharged	Loaded	Discharged	Loaded	Discharged
Bagged (Fertilizer)			72,484		251,222		268,562	
Bagged (Food grains)		50,608		53,061		90,608		96,359
Container					335,762		437,585	
Dry bulk (Coal)	766,264		1,746,915		2,653,339		2,807,585	
Dry Bulk (Fly ash)	1,381,163		1,662,129		2,187,851		2,708,878	
Dry Bulk (Stone chips)		162,716		205,119		273,917		318,430
Dry bulk (Iron ore)						30,960		32,910
Neo-bulk (Steel, Textile, Petroleum, Project cargo)	394,453	139,640	508,903	494,287	743,080	767,133	885,947	886,688
Total (tons)	2,541,880	352,964	3,990,431	752,467	6,171,254	1,162,618	7,108,557	1,334,387

Source: HPC report on Infrastructure requirement of individual terminals along National Waterways 1, 26th April 2016.

6.2 Marine infrastructure

The marine infrastructure comprises of jetties and manoeuvring areas like approach channels, turning circle, berthing pockets, holding area, etc.

6.2.1 Navigational and Operational requirements

The basic navigational and operational requirements to service the vessels calling at a port / terminal are:

- Sufficient depth in manoeuvring area and at the berths
- Sufficient depth and width in approach channel
- Adequate berthing infrastructure including berth fixtures like fenders

- Mooring system
- Navigational aids

Dimensions of navigable water ways generally comply with guidelines provided in the BIS Code of Practice IS: 4651– 1980 “Code of Practice for Planning and Design of Ports and Harbours - Part V - Layout and Functional Requirements” and as per PIANC guidelines for Design guidelines for Harbour approach channels.

6.2.1.1 Design Vessels

The dimensions of manoeuvring areas are dependent on the design vessels arriving at the terminal and details of the same is presented in table below.

Table 6.2 Design Vessel Sizes

Vessel Type	Vessel Size (DWT)	LOA (m)	Beam (m)	Loaded Draft (m)
Barges	3,000	95	15	2.5

6.2.1.2 Availability of Sufficient Depths

The depth available near the water front of terminal varies from (-) 0.80 mCD to (-) 1.50 mCD at a distance of 200 m from the river bank. The water depths downstream of the terminal up to Haldia Dock vary from (-) 1.00 mCD to (-) 9.00 mCD.

Generally, the depth in the manoeuvring areas is determined by:

- Vessel’s loaded draft
- Water level and tidal variations
- Sedimentation pattern in the region

As per IS 4651 (Part V), under keel clearance to be provided is 20% in unsheltered areas. Considering the design vessels the required depths are as follows:

Table 6.3 Dredge depths required

Description	Barge
Draft (m)	2.5
Under keel clearance (@20%) (m)	0.5
Allowance for siltation (m)	1
Channel depth required (m)	4
Tidal window (MLWS) (m)	0.8
Dredge level below CD	3.2

The development at Haldia terminal is planned for barges only. The barges are assumed to have a loaded draught of 2.5 m requiring a depth of 4 m on the berth for safe passage (including allowance for under keel clearance & siltation).

By considering the tidal advantage (MLWS) of 0.8 m, a draft of 3.2 m water level is required for the safe passage of barges and to ensure continuous terminal operations, dredging shall be carried out in the turning circle, berth pockets, holding area and approach channel.

IWAI desires that dredging is to be carried out along with the terminal construction to avoid idling of terminal operations for want of access channel.

6.2.1.3 Channel Alignment

The alignment of the approach channel is in the W-E direction with a bearing of 28° with respect to north for 0.60 km and then the channel alignment changes to 34° with respect to north. The two legs of the channel will be connected by a curve having a radius of 150 m towards Salukhali channel.

6.2.1.4 Channel Length

The length of the approach channel is approximately 7.00 km.

6.2.1.5 Channel Depth

The proposed depth of the approach channel is (-) 3 mCD excluding any siltation allowances.

6.2.1.6 Channel Width

The channel width for a one way channel is arrived based on the following considerations as per PIANC guidelines:

Table 6.4 Considerations for Channel Width

Basic manoeuvring lane	1.5 B
Bank Clearance (both sides sloping)	2 x 0.3 B
Allowance for currents	0.7 B
Allowance for depth	0.1 B
Allowance for channel bottom	0.1 B
Total	3.0 B

Based on the above, the channel width in the straight leg of the channel for 3,000 DWT vessel is as follows:

Table 6.5 Channel Width

	Straight leg
Channel Width (m)	45 (3 x 15*)

* The beam of 3000 DWT vessel is 15 m.

6.2.2 Turning circle dimensions and depth at Berth

6.2.2.1 Turning Circle

The turning circle, required to swing and berth the vessels, is very important and must have proper configuration, dimensions and access. As per IS: 4651 (Part V) – 1980, the minimum diameter of the turning circle should be 1.7 to 2.0 times (1.7 for protected locations and 2.0 for exposed locations) the length of the largest vessel.

Keeping these requirements in view, the dimensions of the turning circles would be as hereunder:

Table 6.6 Dimensions of Turning Circle

Vessel Size	LoA (m)	Draft (m)	Diameter (m) 2.0 x LoA	Dredged Depth (m w.r.t. CD)
3,000 DWT	95	2.50	190	(-) 3.2

6.2.2.2 Depth at Berths

Based on Table 6.3, the dredge level at berth location is as follows:

- Barge jetties : (-) 3.20 mCD

6.2.3 Holding area

The holding area is proposed adjacent to the channel leading into the turning circle having two patches of about 360 m x 30 m on either side of the access channel to accommodate 6 barges (3 barges in one patch) and also an additional holding area in the main river to the North of Balari Bar as shown in **Drawing I-525-HT-211**.

6.2.4 Berth Requirements

In order to work out the berth requirements to meet the projected traffic, it is necessary to define the following governing parameters:

- Average parcel size
- Cargo handling arrangement
- Cargo handling rates
- Number of operational days per year
- Number of working hours per day
- Effective working hours per day
- Time required for peripheral activities

Each of the above parameters are discussed below.

6.2.4.1 Average Parcel Size

Though the design vessel size is the guiding parameter in arriving at the dimensions of the navigable water ways, in actual practice vessels of various sizes will arrive at the IWT terminal. For ascertaining the requirement of number of berths, it is prudent to consider the average parcel size for each commodity and details of the same are presented below.

Table 6.7 Average Parcel Size

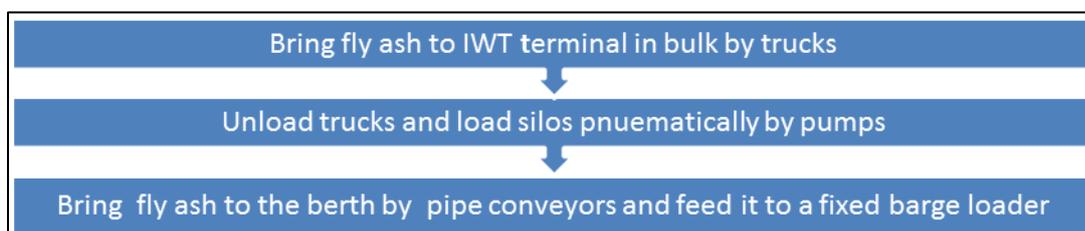
Commodity	Average Parcel Size (T)
Flyash	1,000
Fertiliser	1,500
Natural Aggregate	1,500
Petroleum Products	500
Iron Ore	1,000
Project Cargo	500
Gypsum	1,000
Coal	1,500

6.2.4.2 Cargo Handling Arrangements

For estimating the required number of berths, the handling arrangements assumed for various commodities of the IWT terminal at Haldia are described below:

6.2.4.2.1 Fly Ash

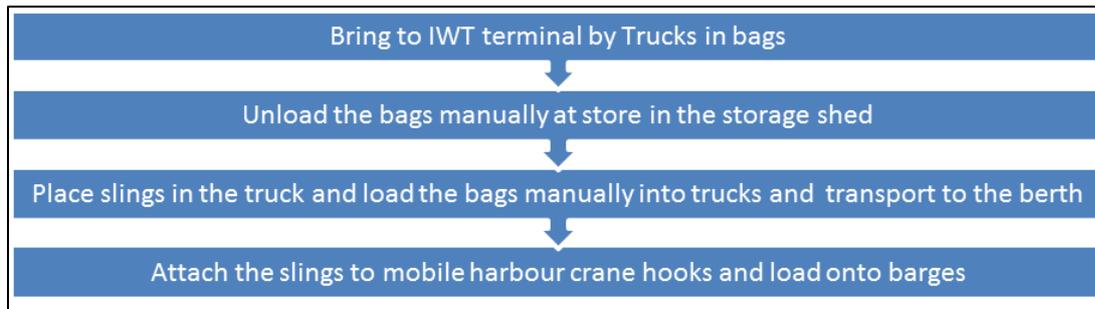
Fly ash will come in to the terminal by trucks and loaded to the silos pneumatically by pumps. Then it will be loaded to barges by barge loaders through pipe conveyor system.



It is expected that with the above handling arrangement about 8,000 T of fly ash can be handled per day at one berth.

6.2.4.2.2 Fertiliser

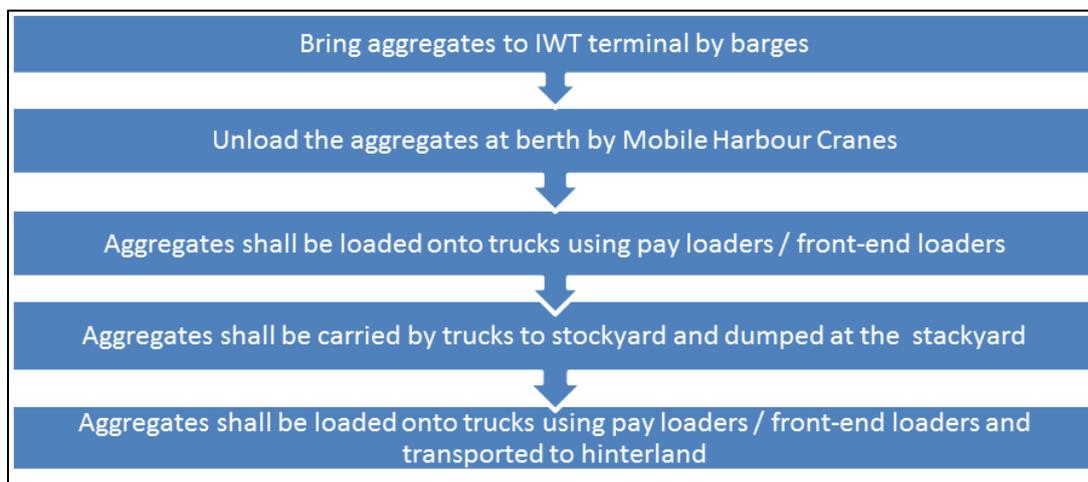
Fertiliser will come into the terminal by trucks in bags and stored in a covered shed. Then it will be transported to jetty by trucks and loaded on to the barges by mobile harbour crane.



It is expected that with the above handling arrangement about 3000 T of fertiliser can be handled per day at one berth.

6.2.4.2.3 Natural Aggregates

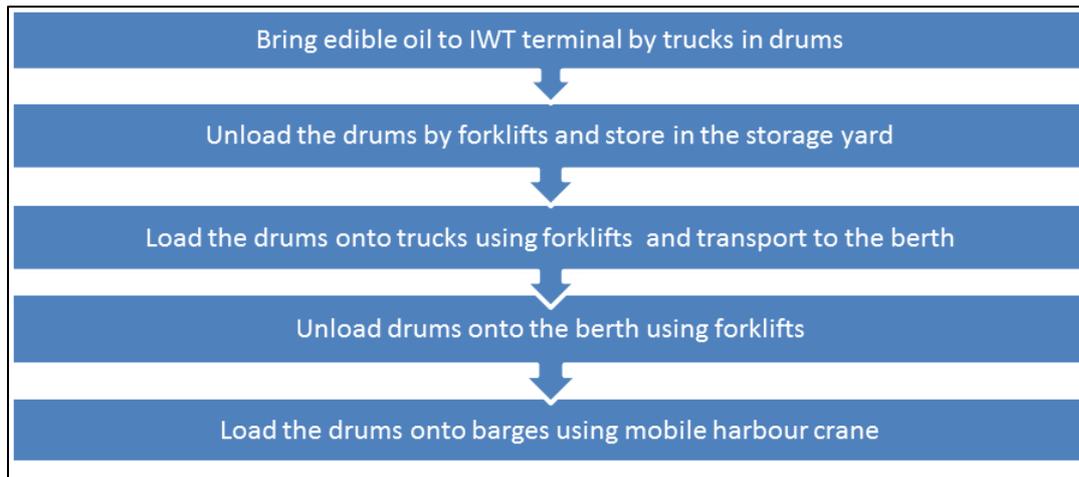
Natural aggregate will come to the terminal by barges and unloaded by mobile harbour crane into trucks and transported to the storage yard. Then it will be loaded to trucks by pay loader and transported to the hinterland by trucks.



It is expected that with the above handling arrangement about 1,600 T of aggregates can be handled per day at one berth.

6.2.4.2.4 Edible Oil

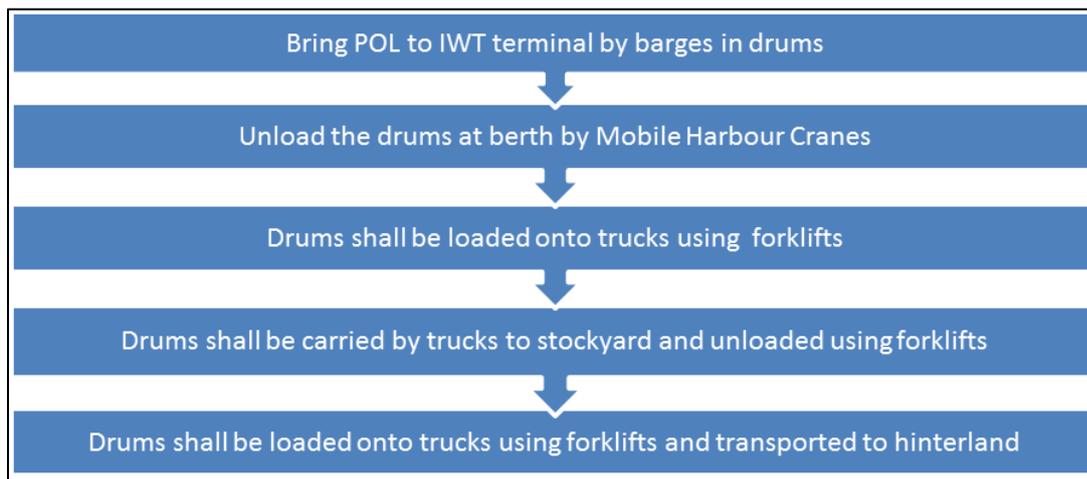
Edible Oil will come into the terminal by trucks in drums and stored in an open area. Then it will be transported to jetty by trucks and loaded on to the barges by mobile harbour crane.



It is expected that with the above handling arrangement about 320 T of edible oil can be handled per day at one berth.

6.2.4.2.5 POL

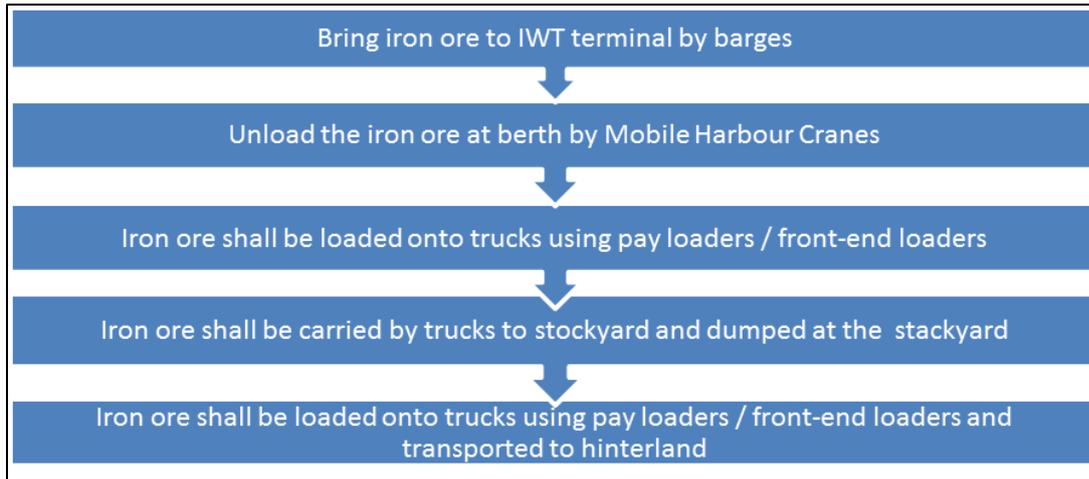
POL will come to the terminal by barges in drums and unloaded by mobile harbour crane onto berth. Drums will be loaded onto trucks with the help of forklifts and transported to the storage yard. Then it will be unloaded from trucks by forklifts and stored in the storage yard. At the storage yard, it will be loaded onto trucks with a forklift and transported to the hinterland.



It is expected that with the above handling arrangement about 320 T of POL can be handled per day at one berth.

6.2.4.2.6 Iron ore

Iron ore will come to the terminal by barges and unloaded by mobile harbour crane into trucks and transported to the storage yard. Then it will be loaded to trucks by pay loader and transported to the hinterland by trucks.



It is expected that with the above handling arrangement about 3,000 T of iron ore can be handled per day at one berth.

6.2.4.2.7 Project Cargo

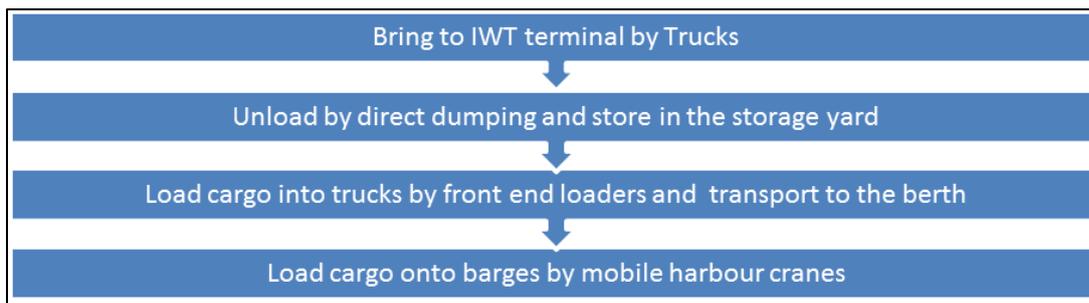
Project cargo will come into the terminal by trucks and stored in open area. Then it will be transported to jetty by trucks and loaded on to the barges by mobile harbour crane.



It is expected that with the above handling arrangement about 1,000 T of project cargo can be handled per day at one berth.

6.2.4.2.8 Gypsum

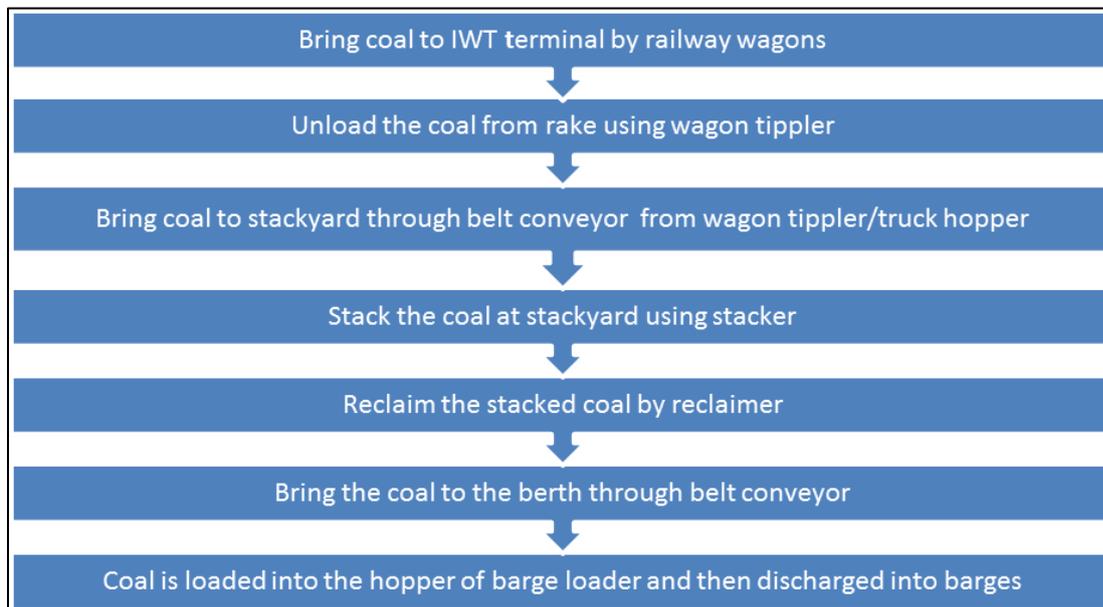
Project cargo will come into the terminal by trucks and stored in open area. Then it will be transported to jetty by trucks and loaded on to the barges by mobile harbour crane.



It is expected that with the above handling arrangement about 2,400 T of gypsum can be handled per day at one berth.

6.2.4.2.9 Coal

Coal would arrive at the terminal in railway wagons, unloaded by a wagon tippler and conveyed to the stockyard by conveyor. The coal will be stacked in the stockyard by means of a stacker. From the stockyard, the coal will be reclaimed by a reclaimer and conveyed to the berth by means of conveyor and loaded to barges by means of barge loader.



It is expected that with the above handling arrangement about 20,000 T of coal can be handled per day at one berth.

6.2.4.3 Cargo Handling Rates

Based on the above cargo handling arrangements for various commodities, the cargo handling rates assumed are presented in table below:

Table 6.8 Cargo Handling Rates

S. No.	Cargo	Handling Rate (TPH)
1.	Coal	1,000
2.	Fly Ash	400
3.	Fertilizer	150
4.	Natural Aggregates	150
5.	Petroleum Products	16
6.	Other Cargo	
a.	Iron Ore	150
b.	Project Cargo	50
c.	Steel	50
d.	Textile	50

6.2.4.4 Number of Operational Days

It is assumed that Haldia Terminal will work seven days a week, which brings the effective number of working days to 315 days per year, allowing for 50 non-operational days due to weather and other reasons.

6.2.4.5 Number of Operational Hours

The productive cargo handling hours on an average in a day when the vessels are at berth has been taken as 20 hours to account for shift changes, equipment position changes and for any unplanned stoppages.

6.2.4.6 Time Required for Peripheral Activities

Apart from the actual time for loading / unloading cargo, additional time is required for other activities such as berthing, un-berthing and other incidental activities, for which 1 hour has been considered per barge.

6.2.4.7 Allowable Levels of Berth Occupancy

Berth occupancy is expressed as the ratio of the total number of days per year that a berth is occupied by a vessel (including the time spent in peripheral activities) to the number of terminal operational days in a year. High levels of berth occupancy will result in bunching of vessels resulting in undesirable pre-berthing detention. For limited number of berths and with random arrival of vessels, the berth occupancy levels have to be kept optimized to reduce this detention. The norms generally followed for planning the number of berths, in ports worldwide and in Indian ports are indicated in the table below:

Table 6.9 Norms for Berth Occupancy

No. of Berths	International Standards	Indian Practice	
		Bulk Cargo	General Cargo
1	40 %	60 %	70 %
2	50 %	70 %	70 %
3	55 %	70 %	70 %
4	60 %	70 %	75 %
5	65 %	70 %	75 %
6 and above	70 %	70 %	75 %

Source: UNCTAD Publication

In the IWT, random arrival of vessels can be reduced by regulation of the vessel movements. The following berth occupancy factors are recommended while planning of Haldia Terminal:

Table 6.10 Recommended Berth Occupancy Factors for Haldia Terminal

No. of berths	Recommended Berth Occupancy (%)
1	70
2	70

3	70
4 or more	75

6.2.4.8 Berth Requirements

Based on the considerations discussed above, the requirements of cargo handling berths for Haldia Terminal in Phase-1, Phase-2 and Master Plan Phase have been calculated as shown in tables below.

Table 6.11 Requirement of Berths for Phase-1

S. No.	Description	Unit	Flyash	Coal	Food grains	Natural aggregate	Petroleum	Other Cargo	
								Project Cargo	Textile
1	Cargo volume	Million T	1.38	0.77	0.05	0.16	0.47	0.01	0.06
2	Average parcel size	T	1,000	1,500	1500	1,500	500	500	500
3	Number of vessels	Nos.	1,381	511	34	108	941	13	114
4	Effective working hours	Hours	20	20	20	20	20	20	20
5	Average cargo handling rate	T per hr	400	1,000	150	80	16	50	50
6	Service time per vessel	Hours	2.50	1.50	10.00	18.75	31.25	10.00	10.00
7	Addl. time for peripheral activities	Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	Total time per vessel	Hours	3.50	2.50	11.00	19.75	32.25	11.00	11.00
9	Total berth days reqd.	Days	230	60	18	106	1,510	7	62
10	Number of berths	Nos.	1	1					7
11	Operational days	Days	315	315					315
11	Total berth days available	Days	315	315					2,205
12	Berth occupancy	%	73.02	19.05					77.23

Thus the number of berths required for Phase-1 traffic is 9 nos.

Table 6.12 Overall Requirement of Berths for Phase-2

S. No.	Description	Unit	Flyash	Coal	Fertiliser	Food grains	Natural aggregate	Container	Iron ore	Petroleum	Other Cargo		
											Project Cargo	Steel	Textile
1	Cargo volume	Million T	2.19	2.65	0.25	0.09	0.27	0.34	0.03	1.29	0.01	0.01	0.20
2	Average parcel size	T	1,000	1,500	1,500	1,500	1,500	1,200	1,000	500	500	500	500
3	Number of vessels	Nos.	2,188	1,769	167	60	183	280	31	2,581	20	22	397
4	Effective working hours	Hours	20	20	20	20	20	20	20	20	20	20	20
5	Average cargo handling rate	T per hr	400	1,000	150	150	80	20	150	16	50	50	50
6	Service time per vessel	Hours	2.50	1.50	10.00	10.00	18.75	60.00	6.67	31.25	10.00	10.00	10.00
7	Addl. time for peripheral activities	Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	Total time per vessel	Hours	3.50	2.50	11.00	11.00	19.75	61.00	7.67	32.25	11.00	11.00	11.00
9	Total berth days	Days	365	206	90	33	179	852	12	4,140	11	12	215

S. No.	Description	Unit	Flyash	Coal	Fertiliser	Food grains	Natural aggregate	Container	Iron ore	Petroleum	Other Cargo		
											Project Cargo	Steel	Textile
	reqd.												
10	Number of berths	Nos.	2	1									23
11	Operational days	Days	315	315									315
11	Total berth days available	Days	630	315									7,245
12	Berth occupancy	%	57.94	65.40									76.52

Thus the number of berths required for Phase-2 traffic is 26 nos.

Table 6.13 Overall Requirement of Berths for Master Plan

S. No.	Description	Unit	Flyash	Coal	Fertiliser	Food grains	Natural aggregate	Container	Iron ore	Petroleum	Other Cargo		
											Project Cargo	Steel	Textile
1	Cargo volume	Million T	2.71	2.81	0.27	0.10	0.32	0.44	0.03	1.49	0.01	0.01	0.25
2	Average parcel size	T	1,000	1,500	1,500	1,500	1,500	1,200	1,000	500	500	500	500
3	Number of vessels	Nos.	2,709	1,872	179	64	212	365	33	2,984	26	28	508
4	Effective working hours	Hours	20	20	20	20	20	20	20	20	20	20	20
5	Average cargo handling rate	T per hr	400	1,000	150	150	80	20	150	16	50	50	50
6	Service time per vessel	Hours	2.50	1.50	10.00	10.00	18.75	60.00	6.67	31.25	10.00	10.00	10.00
7	Addl. time for peripheral activities	Hours	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
8	Total time per vessel	Hours	3.50	2.50	11.00	11.00	19.75	61.00	7.67	32.25	11.00	11.00	11.00
9	Total berth days reqd.	Days	452	218	97	35	208	1,110	12	4,787	14	15	275
10	Number of berths	Nos.	2	1									28
11	Operational days	Days	315	315									315
11	Total berth days available	Days	630	315									8,820
12	Berth occupancy	%	71.75	69.21									74.30

Thus the number of berths required for Master plan Phase traffic is 31 nos.

6.2.4.9 Length of the Berths

The requirement of the berth length for various commodities is estimated below:

Table 6.14 Berth Length – Phase-1

Commodity	Vessel Length	Clearance	Berth Length (m)	No. of Berths	Total Length (m)
Flyash	80	25	105	1	105
Coal	95	25	120	1	120
Food grains	95	25	120	7	840
Natural aggregate					
Petroleum products					
Project Cargo					
Textile					
Total				9	1,065

Table 6.15 Berth Length – Phase-2

Commodity	Vessel Length	Clearance	Berth Length (m)	No. of Berths	Total Length (m)					
Flyash	80	25	105	2	210					
Coal	95	25	120	1	120					
Fertilizer	95	25	120	23	2,760					
Food grains										
Natural aggregate										
Container										
Iron ore										
Petroleum products										
Project Cargo										
Steel										
Textile										
Total									26	3,090

Table 6.16 Berth Length – Master Plan

Commodity	Vessel Length	Clearance	Berth Length (m)	No. of Berths	Total Length (m)
Flyash	80	25	105	2	210
Coal	95	25	120	1	120
Fertilizer	95	25	120	28	3,360
Food grains					
Natural aggregate					
Container					

Commodity	Vessel Length	Clearance	Berth Length (m)	No. of Berths	Total Length (m)
Iron ore					
Petroleum products					
Project Cargo					
Steel					
Textile					
Total				31	3,690

However, the water front available at the Haldia terminal is 495 m and the berths are to be planned within the available water front. The maximum berth length that can be accommodated within the waterfront considering the unit berth lengths mentioned above is 480 m and the number of berths is 4 nos. Hence the cargo volume that can be handled at the terminal will be limited by the berth capacity and all commodities cannot be handled at the terminal.

6.2.4.10 Target Commodities

Considering the hinterland proximity, the target commodities considered are as follows.

- Fly ash
- Fertiliser
- Natural aggregates
- Petroleum products

6.2.4.11 Target Traffic

The target traffic for target commodities is as follows:

Table 6.17 Target Traffic

Commodity	Traffic (MTPA)
Flyash	2.71
Fertilizer	0.11
Natural aggregates	0.16
Petroleum products	0.10
Total	3.08

6.2.4.12 Berth Requirement for Target Traffic

The berth requirement for the target traffic is as follows:

Table 6.18 Berth Requirement for Target Traffic

Commodity	UOM	VALUE			
		Fly Ash	Fertilizer	Natural Aggregate	Petroleum Products
Cargo/Annum	MMTPA	2.71	0.11	0.16	0.10
Total Cargo/Annum	MMTPA	3.08			
Average Parcel Size	T	1000	1500	1500	500
Vessel Call per Annum	Nos.	2710	73	107	200
Loading Rate (Rated)	TPH	400	150	150	16
Loading Time	Hrs./Vessel	2.50	10.00	10.00	31.25
Peripheral Time	Hrs./Vessel	1.00	1.00	1.00	1.00
Total Time per Vessel	Hrs/Vessel	3.50	11.00	11.00	32.25
Required Days	Days/Annum	452	40	58	321
Total Working Days Allowed	Days/Annum	315	315		
Berth Occupancy	%	143.4%	132.8%		
Allowed Berth Occupancy	%	70%	70%		
Days as per allowed Berth occupancy	Days/Annum	220.5	220.5		
Calculated Berths	Nos.	2.05	1.90		
Berth Provided	Nos.	2	2		

6.2.4.13 Berth Capacity

In view of the water front availability and cargo handling rate and other parameters, the berth capacity that can handle target commodities is given below.

Table 6.19 Berth Capacity

Commodity	Berth Capacity (MTPA)
Flyash	2.71
Fertilizer	0.11
Natural aggregates	0.16
Petroleum products	0.10
Total	3.08

Table 6.20 Berth Length for Berth Capacity

Commodity	Berth Length (m)	No. of Berths	Total Length (m)
Flyash	105	2	210
Natural aggregates	120	2	240
Petroleum products			
Total		4	450

6.3 Shoreside Infrastructure

The shore based infrastructure comprises of cargo storage areas, terminal buildings, road networks, conveyor and pipeline networks, utilities and services such as power and water supply, drainage, sewerage, etc.

6.3.1 Storage Area Requirements

As per industry practice, the storage capacity at terminal for a particular commodity should at least cater to the higher of the following:

- Upto 5% of the annual cargo throughput or
- 1.5 times the maximum parcel size.

Other factors to be taken into account in determining the size of the terminal storage areas are material densities, angle of repose, average stacking height, etc. The norms adopted for calculating the storage areas in Haldia terminal for various commodities are given below:

Table 6.211 Norms Adopted for Calculating Storage Area at IWT Terminal

S. No.	Commodity	Parcel Size (T)	Criteria for providing storage area		
			% of Annual Throughput Considered	Storage Capacity (T)	Material Density T/m ³
1.	Flyash	1,000	9 to 10 barge loads	9,600	1.4
2.	Fertiliser	1,500	Upto 5%	5,500	-
3.	Natural aggregates	1,500	Upto 5%	8,000	1.6
4.	Petroleum products	500	Upto 5%	5,000	0.8

** Storage capacity of flyash is kept minimum, since the source of flyash is from nearby power plants. The provision has been kept to increase the storage capacity subsequently when traffic will increase.*

6.3.2 Utilities and Services

6.3.2.1 Buildings

Various buildings envisaged in the terminal will be as follows:

- Terminal administration building
- Worker's amenity building
- Electrical substation building
- Security office
- Weigh bridge control room
- RIO / Air compressor room for ash handling
- Gate house complex

6.3.2.2 Bunkering

Fuel oil bunkering is proposed in the terminal for supplying fuel to the barges and a space provision is made for the same. The bunkering facility will be developed by agencies experienced in operation and maintenance of such facilities.

6.3.2.3 Communications

IWT terminal will be provided with modern telecommunication system consisting of telephone, telefax, e-mail etc.

6.3.2.4 Water Supply

Total water demand is broadly classified in the following categories:

- Potable water for consumption of terminal personnel.
- Potable water for vessels calling at the terminal.
- Water for dust suppression.
- Other uses like greenery etc.

Water supply system details are provided in Chapter 9.

6.3.2.5 Power Supply

The power is required at the terminal for the following activities:

- Mechanised cargo handling equipment and other equipment
- Lighting of the terminal area
- Offices and transit sheds
- Miscellaneous

Based on the above requirements the power demand is calculated and presented in Chapter 11. The power will be drawn from the nearest substation to the terminal and internal electrical distribution system shall be planned according to required HT and LT supply.

6.3.2.6 Road Network

As the mode of transport of the commodities to / from the terminal is by road, a well-developed internal and external road network is required. Adequate area is provided for internal road network running throughout the whole terminal.

A diversion road of 15 m wide corridor is provided on the North-East side of the terminal and an approach road of 20 m wide will provide access to the terminal.

6.3.2.7 Rail Network

The mode of transport of the commodities to / from the terminal is by road only. Space provision is made for development of rail yard to accommodate new / emerging business needs in future.

6.3.2.8 Green Belt

A 10 m wide green belt is proposed along the boundary of the proposed IWT terminal.

6.3.2.9 Storm Water Drainage

A network of covered storm water drain with setting pond will be provided. Run off from the storage areas will be routed through collection pits.

6.3.2.10 Sewerage System

Sewerage from toilets, bathrooms, kitchens etc. will be collected and treated in sewage treatment plant.

7 ALTERNATIVE LAYOUTS

This chapter outlines the alternative layouts considered for development of the berthing facilities at IWT terminal. The alternatives were evaluated considering traffic mix, operational, navigational, environmental, cost aspects, etc. to arrive at the optimum layout. The following sections provide a description of the alternatives and their evaluation.

7.1 Alternative Terminal Layouts

In order to have flexibility in handling barges of different sizes and optimize terminal efficiency, continuous berth is considered for the alternatives. In the proposed layouts, the berths are located 200 m from the river bank where 1.4 m – 1.5 m LAD is available. Looking into the bathymetry in front of the terminal location there is no option of extending the jetty sufficiently far off shore to find acceptable natural depth in the order of 3 m LAD. This means that a dredged berth pocket will be required which will be a sediment trap and will require frequent dredging. In such a case it is sensible to locate the dredged berth box (i.e. quay line) away from the shoreline to allow space for the river bed bathymetry to evolve after the berth box has been constructed and avoid the potential for erosion of the shore line. A further advantage is that the tidal currents will be higher and better aligned further offshore and hence some degree of natural scour of the berth box may occur. There is also space to accommodate extending the berth box to either end of the quay line to provide an opportunity for trapping sediment at either end of the berth box away from the active berths. Accordingly the positions of the berths are kept same in the alternate layouts. Five (5) alternative terminal layouts are conceptualized, which are as follows:

7.1.1 Alternative I

In this alternative, four jetties (berths 1 to 4) are proposed – two jetties (berths 1 & 2) for handling fly ash and two jetties (berths 3 & 4) for handling other cargo like fertilizer, POL, stone aggregate. The jetties are aligned parallel to the river bank, which are connected to the backup area by approach trestles. The maximum cargo that can be handled at the terminal is as follows:

Table 7.1 Maximum Throughput – Alternative I

Commodity	Throughput (MTPA)
Fly ash	2.71
Fertilizer	0.11
Natural Aggregates	0.16
POL	0.10
Total	3.08

Adequate area is provided for storage of fly ash, POL, fertilizer and aggregate. The layout has some flexibility by keeping provision of adequate space for open / covered storage area and development of rail yard to accommodate new/ emerging business needs in future.

The layout of Alternative I is presented in **Drawing I-525/HT/204**.

7.1.2 Alternative II

In this alternative also, four jetties (berths 1 to 4) are proposed – two jetties (berths 1 & 2) for handling fly ash, one jetty (berth 3) for domestic coal and one jetty (berth 4) for handling other cargo like POL, fertilizer & stone aggregate. The arrangement of jetties is same as in Alternative I. The cargo volume that can be handled at the terminal is as follows:

Table 7.2 Maximum Throughput – Alternative II

Commodity	Throughput (MTPA)
Fly ash	2.71
Coal	2.40
Fertilizer	0.11
Natural Aggregates	0.16
POL	0.04
Total	5.42

Adequate area is provided for storage of domestic coal, fly ash, POL, fertilizer and aggregate. The layout does not have flexibility as compared to Alternative I since most of the storage space is occupied by fly ash silos, coal stackyard and wagon unloading system. Rail yard is provided for receipt of domestic coal.

The layout of Alternative II is presented in **Drawing I-525/HT/205**.

7.1.3 Alternative Layout III

In this alternative also, four jetties (berths 1 to 4) are proposed – one jetty (berth 1) for handling coal, three jetties (berths 2, 3 & 4) for handling other cargo like fertilizer, POL, stone aggregate. The jetties are aligned parallel to the river bank and are connected to the backup area by approach trestles. The cargo volume that can be handled at the terminal is as follows:

Table 7.3 Maximum Throughput – Alternative III

Commodity	Throughput (MTPA)
Coal	2.80
Fertilizer	0.11
Natural Aggregates	0.16
POL	0.17
Total	3.24

Adequate area is provided for storage of domestic coal, POL, fertilizer and aggregate. Rail yard is provided for receipt of domestic coal. Fly ash cannot be handled with the proposed

arrangement. The layout does not have flexibility to accommodate new / emerging business needs in future.

The layout of Alternative III is presented in **Drawing I-525/HT/206**.

7.1.4 Alternative IV

In this alternative, five jetties (Berths 1 to 5) are proposed – two jetties (Berths 1 & 2) for handling fly ash; two jetties (Berths 3 & 4) for handling other cargo like fertilizer, POL, stone aggregate; one jetty (Berth 5) for handling coal is proposed for transshipment of imported coal from costal vessel to IWT barge. The jetties (berth 1 to 4) are aligned parallel to the river bank, which are connected to the backup area by approach trestles. The berth 5 is placed parallel to berth 4 and connected by an approach trestle. The maximum cargo that can be handled at the terminal is as follows:

Table 7.4 Maximum Throughput – Alternative IV

Commodity	Throughput (MTPA)
Fly ash	2.71
Fertiliser	0.20
Natural Aggregates	0.30
POL	0.06
Coal	2.80
Total	6.07

Adequate area is provided for storage of fly ash, POL, fertilizer and aggregate. The layout has some flexibility by keeping provision of adequate space for open / covered storage area and development of rail yard to accommodate new / emerging business needs in future. The water front area to be extended for the coal transshipment in Berth 5 will be very expensive due to requirement of additional dredging to accommodate coastal vessel movement at this location.

The layout of Alternative IV is presented in **Drawing I-525/HT/207**.

7.1.5 Alternative V

In this alternative, five jetties (Berths 1 to 5) are proposed – two jetties (Berths 1 & 2) for handling fly ash; two jetties (Berths 3 & 4) for handling other cargo like fertilizer, POL, stone aggregate; one jetty (Berth 5) for handling coal as transshipment. The jetties (Berth 1 to 4) are aligned parallel to the river bank, which are connected to the backup area by approach trestles. The berth 5 is arranged perpendicular to berth 4. The maximum cargo that can be handled at the terminal is as follows:

Table 7.5 Maximum Throughput – Alternative V

Commodity	Throughput (MTPA)
Fly ash	2.71

Fertiliser	0.20
Natural Aggregates	0.22
POL	0.05
Coal	2.80
Total	5.98

Adequate area is provided for storage of fly ash, POL, fertilizer and aggregate. The layout has some flexibility by keeping provision of adequate space for open / covered storage area and development of rail yard to accommodate new / emerging business needs in future. The arrangement of coal transshipment berth is well exposed to current and not recommended from morphological considerations.

The layout of Alternative V is presented in **Drawing I-525/HT/208**.

7.2 Multi Criteria Analysis of Alternative Terminal Layouts

The alternative layouts have been evaluated to select the most suitable layout through a process of Multi Criteria Matrix (MCM) analysis considering the following criteria:

- a. Cargo Handling Capacity
- b. Environmental aspects
- c. Scope for accommodating new / emerging business
- d. Construction Cost

The comparison of these layouts is presented in Table below.

Table 7.6 Multi-Criteria Analysis of Alternatives

Criteria	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Cargo Handling Capacity	3.08 MTPA As per the traffic projections, the fly ash traffic is continuously increasing and will overtake coal in 2025. This layout can cater to the need of flyash handling till 2035.	5.42 MTPA Fly ash handling capacity will be similar to Alternative I. However, developing fully mechanized coal berth having some risks, if domestic coal traffic is not diverted from present rail mode.	3.24 MTPA Developing the terminal primarily for coal has some considerable risks if domestic coal traffic is not diverted from present rail mode.	6.07 MTPA Initially the terminal is ready to handle fly ash and multi cargo, the considerable risk is the same when domestic coal is not diverted from present rail mode.	5.98 MTPA This is the same as Alternative IV without a trestle. The considerable risk is the same when domestic coal is not diverted from present rail mode.

Criteria	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Environmental Aspects	Fly ash handling proposed through silo, piped conveyor and barge loader to minimize dust generation.	Even though pneumatic handling system for fly ash is proposed to minimize dust generation, there will be moderate dust generation due to coal storage and handling.	The impact will be similar to Alternative II.	The impact will be similar to Alternative II.	The impact will be similar to Alternative II.
Scope for accommodating new / emerging business	There is sufficient scope for accommodating new / emerging business	The scope for accommodating new / emerging business is moderate.	There is no scope for accommodating new / emerging business.	There is no scope for accommodating new / emerging business.	There is no scope for accommodating new / emerging business.
Capital Cost	The capital cost for development is approximately Rs. 450 crores.	The capital cost for development is approximately Rs. 550 crores.	The capital cost for development is approximately Rs. 520 crores.	The capital cost for development is approximately Rs. 635 crores.	The capital cost for development is approximately Rs. 610 crores.

7.3 Recommended Terminal Layout

Based on multi criteria matrix presented above, Alternative-I having moderate cargo handling capacity is selected as preferred alternative for development of IWT Terminal at Haldia to avoid risks for catering higher volume of diverted traffic. In the initial stage, during the discussions held with IWAI on the Alternative I, they desired that one jetty need to be added in the layout for transshipment of coal from 6000 T vessel to 3000 T barge and also provision has to be kept in one berth for container handling. Subsequently a decision was taken by IWAI to delete Coal transshipment berth and accordingly Alternative IV and V was not considered.

The length of jetties (berths 1 to 4) provided in Alternative I is about 465 m. The water front available at the Haldia terminal is 495 m and the jetties were planned within the available water front.

In the present scenario, the flyash traffic is considered as more assured than coal traffic at the Haldia multi modal terminal and accordingly Alternative-I having two (2) jetties (flyash handling out of 4 jetties) as shown in **Drawing I-525/HT/204** is recommended for further detailing in the present DPR.

8 DEVELOPMENT PLAN

This chapter describes the plan for development of the terminal infrastructure.

8.1 Marine Facilities

8.1.1 Berths and Approach Trestles

It is proposed to develop berths 1 to 4. Berths 1 and 2 have been dedicated for fly ash handling. Berths 3 & 4 are planned to handle any bagged / palletized / drum and bulk cargo except liquid bulk. The total length of berths 1 & 2 is 210 m (2 x 105 m) and width is 30 m. The length of berth 3 is 120 m and width is 30 m. Container handling provision is kept in berth 4 and its length and width are 135 m and 50 m, respectively. The berths will be connected by approach trestles for movement of trucks, vehicles and maintenance equipment.

8.1.2 Manoeuvring Area & Approach Channel

The manoeuvring area for development of terminal comprises of approach channel, turning circle and berthing area. It is proposed that the barges will move in 45 m wide channel, with 3 m LAD as per Table 6.5 and Table 6.3 respectively. To enable continuous operations of the terminal, the approach channel, turning circle and berth pockets will be dredged to (-) 3.2 m CD. The diameter of the turning circle is 190 m.

8.2 Onshore Facilities

8.2.1 Storage Areas

It is proposed to develop 8 silos for flyash storage. The storage area for fertilizer, aggregates and oil drums are as given in Table 8.1 will be developed.

Table 8.1 Storage Area

S. No.	Commodity	Storage Area (in m ²)
1	Flyash	4400
2	Fertiliser	3900
3	Natural aggregates	3000
4	Petroleum products in drums	19000
5	Future storage area	37500
	Total	105300

The above storage areas duly account for the circulation space within the storage area for effective stacking/removal of cargo.

8.2.2 Fuel Bunkering

It is proposed to provide an area of 1,500 sq.m. for bunkering of fuel so as to meet the fuel requirement of barges calling at the terminal.

8.2.3 Buildings

The following buildings are envisaged in the onshore area of the terminal.

- Terminal administration building
- Worker's amenity building
- Electrical substation building
- Security office
- Weigh bridge control room
- RIO / Air compressor room for ash handling
- Gate house complex, Emergency exit gates, access gates, boundary wall and fencing.

8.2.4 Onshore Utilities

Onshore facilities such as roads, drainage, sewerage, water supply, communication system will be developed.

8.2.5 Mechanical Equipment

The mechanical equipment proposed are as follows:

Table 8.2 Requirement of Mechanical Equipment

S.No.	Equipment	No. of Equipment
1.	Mobile harbour crane	2
2.	Silo with Conveyor system	8
3.	Fixed barge loader	2
4.	Road Weigh Bridge	2
5.	Dumper truck	10
6.	Fork lift	2
7.	Front end loader	1

8.3 Layout Plan

The layout plan is enclosed as **Drawing I-525/HT/209**.

9 PRELIMINARY ENGINEERING – CIVIL WORKS

9.1 Berthing Facilities

The design criteria for berthing facilities are provided in the following sections.

9.1.1 Deck Elevation

The deck of the jetty should be high enough so that during normal conditions it would be possible to inspect and repair the structural elements like deck and beams at all water levels. Based on the deck level of the berths in the surrounding areas, it is proposed to keep the deck elevation at (+) 8.70 mCD.

9.1.2 Water Levels

The following water levels have been considered at the Site.

Table 9.1 Water Levels Considered

Highest High Water	(+) 7.26 mCD
Mean High Water Spring	(+) 5.70 mCD
Local Mean Water Level	(+) 3.23 mCD
Mean Low Water Neap	(+) 2.10 mCD
Mean Low Water Spring	(+) 0.80 mCD

9.1.3 Design Dredged Level

The design dredged level for the structural design of the berths is considered for the maximum vessel size. From the list of self-propelled motor vessels shown in Table 9.2, the design vessel size considered is 3,000 DWT.

Table 9.2 Dimensions of Self-Propelled Motor Vessels

Vessel Size (DWT)	Length (m)	Beam (m)	Draft (m)
650 - 1,000	60 - 80	8.20	2.20
1,000 - 1,500	80 - 85	9.50	2.20
1,500 - 3,000	85 - 95	15.00	2.50

The basis for arriving at the design dredge level is as follows:

Table 9.3 Basis for Design Dredge Level

S. No.	Description	Draft (m)
A	Draft of design vessel size	2.50
B	Allowance for Under keel clearance (@20%)	0.50
C	Allowance for siltation	1.00

S. No.	Description	Draft (m)
D	Channel depth required (A + B + C)	4.00
E	Tidal window (MLWS)	0.80
F	Dredge level below CD (D - E)	3.20

9.1.4 Scour Depth

With reference to CWPRS model study report near to the proposed Haldia IWT terminal, the parameters for scour depth are as follows:

- Velocity of stream : 1.75 m/s
- Mean discharge : 3,000 m³/s
- Water level at highest discharge : (+) 4.00 mCD
- Scour level : (-) 25.53 mCD say (-) 25.00 mCD.

9.1.5 Geotechnical Criteria for Design of Jetties and Approach Trestles

The brief description of the existing geotechnical information at site has been provided in Section 3.2 of this report. Preliminary design of the jetties and approach trestles has been carried out based on the subsoil profiles discussed in Section 3.2.

The following safety factors are used to establish the safe geotechnical working load capacities of the piles given in Table below:

Table 9.4 Safety Factors

End Bearing	SF = 2.5
Skin Friction on compression piles	SF = 2.5
Skin Friction on tension piles	SF = 3.0
Lateral Load	SF = 2.0

The design pile penetration depths have been estimated based on the generalized soil profile in order to develop adequate capacity to resist the maximum computed axial bearing and pull out loads, if any.

9.1.6 Loads Considered for Design of Jetty

The major loads considered for the design of the various components of the jetty are:

- i. Dead Load
- ii. Live Load
- iii. Berthing Load

- iv. Mooring Load
- v. Current Load
- vi. Wind Load
- vii. Temperature Load
- viii. Earthquake Load
- ix. Wave load
- x. Slamming forces

9.1.6.1 Dead Load

The dead load comprising the self-weight of the structure plus superimposed loads of permanent nature are considered as per IS: 875 (Part-I) 1987. Following unit weights are used to assess the self-weights of the structural elements in design

- Reinforced Concrete : 25.0 kN/m³
- Mass Concrete : 24.0 kN/m³
- Structural Steel : 78.5 kN/m³
- Seawater density : 10.25 kN/m³

9.1.6.2 Live Load

The live load to be considered on the deck of jetty includes the following loads:

- Uniform distributed Live load of 3.5 T/m² for Berth No. 1, 2 & 3 and approach trestles
- Uniform distributed Live load of 5 T/m² for Berth No. 4
- IRC class A/AA /70 R vehicle for all berths and approach trestles
- Loads due to mobile crane with a 50 T lifting capacity on hook at 17 m radius for berths only

9.1.6.3 Berthing Load

9.1.6.3.1 Berthing Energy

The design vessels are assumed to approach the berths under difficult berthing conditions at an angular approach of 10°. Based on this criterion the approach velocity perpendicular to the berth has been calculated to arrive at the design berthing energy for various design vessels.

9.1.6.3.2 3000 DWT Vessel

Berthing loads are considered as per IS: 4651 Part III. The Berthing energy calculated for 3,000 DWT vessel using IS: 4651 as per details below:

Table 9.5 Berth Load Parameters for 3000 DWT vessel

Dead Weight Tonnage (DWT)	3,000
Displacement Tonnage (DT)	3,990
Overall Length, LOA (m)	95
Beam Width, B (m)	15
Loaded Draft, d (m)	2.5
Berthing Velocity (m/s)	0.45

The design berthing energy works out to 59 Tm considering required safety factors.

9.1.6.3.3 Fendering System

Considering the level variation of the order of 7.33 m between high water level and low water level at the site and also the variation in the sizes of vessels to be handled at the jetty, the fendering system is designed such that sufficient contact area between the hull of the vessel and the fender face is ensured at all water levels. It is required to provide a suitable fender system, not only to absorb the design berthing energy of the vessel but also to keep the vessel's hull pressure below the limit of 20 T/m².

9.1.6.3.4 3000 DWT vessel

Based on these criteria, arch fenders of AN 800, grade E3.0 of Trelborg make or equivalent are proposed at each fender pile.

9.1.6.4 **Mooring Load**

Mooring force of 30 T, as per Table-4, IS: 4651- Part III, shall be applied at any of the bollard location.

9.1.6.5 **Current Load**

The current loads on the structure shall be applied on the submerged parts of the structure as per IS: 4651 - Part III. The current velocities considered are as given below:

- Operation condition : 1 m/s
- Extreme condition : 3 m/s

9.1.6.6 **Wind Load**

The wind load on structure is considered as per IS: 875-Part III. The basic wind speed (V_b) for operational and extreme condition shall be 24 m/s and 55 m/s respectively.

9.1.6.7 Temperature Load

- Berth and approach trestles shall be designed for temperature variation of ($\pm 15^{\circ}$ C)
- Coefficient of thermal expansion for RCC structure is taken as $11.7 \times 10^{-6} / ^{\circ}\text{C}$.
- In temperature analysis, long term elastic modulus of the concrete is taken as half the instantaneous elastic modulus of the concrete.

9.1.6.8 Earthquake Load

Earthquake load shall be considered in design as applicable for the site as per IS 1893-Part I. The design horizontal seismic coefficient α_h is calculated based on the following parameters:

$$\alpha_h = Z I (S_a/g) / (2R), \text{ where}$$

$$Z = \text{Zone factor} = 0.16$$

$$I = \text{Importance factor} = 1.5$$

$$R = \text{Response reduction factor} = 5$$

$$S_a/g = \text{Average response acceleration coefficient, which depends on Time Period of the Structure}$$

The Time Period, T of the structure will be evaluated by STAAD Analysis considering Dead Load and 50% Live Load.

9.1.6.9 Wave Load

During the operation and storm condition, the wave height shall be considered as 0.50 m and 3.00 m respectively.

9.1.6.10 Slamming forces

The wave slamming forces are nothing but the uplift force experienced by the structure (horizontal member) when above water and subjected to oscillatory wave action. The same shall be calculated based on the Coastal Engineering Manual.

$$F_U = C_U A_Z \gamma_w w^2 / 2g, \text{ where}$$

$$F_U = \text{Uplift force}$$

C_U = Laboratory derived slamming co-efficient

A_z = Projected area of solid body in the horizontal plane

γ_w = Density of sea water

w = Vertical component of flow velocity at level of object

9.1.7 Load Combinations

The above loads with appropriate load combinations, as per IS 4651-Part IV have been applied on the different components of the jetty.

9.1.8 Minimum Cover

Clear cover to any reinforcement shall be as mentioned here under but shall not be less than the diameter of such reinforcement.

- Pile : 75 mm
- Top, bottom & side of footing (if any) : 75 mm
- Beams : 50 mm
- Slab : 50 mm

9.1.9 Design Life

The permanent works shall be designed and constructed to give the following design lives:

- Jetty and approach trestle - 50 years
- Fenders, Bollards and ladders - 8 years

9.1.10 Serviceability Criteria

9.1.10.1 Deflection Limit

The Deflection at the deck level is generally considered as $H/350$ in operating condition and $H/250$ in extreme condition. H is the distance from the average point of fixity to the top elevation of deck.

9.1.10.2 Crack Width

The crack width is calculated for service load combinations in accordance with IS: 4651-Part IV.

Table 9.6 Permissible Crack Width

Exposure Zone	Maximum Crack Width (mm)	
	Sustained Load	Transient Load
Atmospheric zone – above splash zone	0.2	0.3
Splash zone – zone between CD and design wave height above MHWS	0.1	0.2
Continuous sea immersion zone	0.2	0.3
Below seabed level	0.3	0.3

9.1.11 Materials and Material Grades

The specifications are given below:

Table 9.7 Material specification

Structural Concrete	M-40
Wearing coat	M-40 of 75 mm average thickness
Reinforcement	High corrosion resistant Thermo-mechanically treated bars of Fe-500 grade in accordance with IS:1786.
Cement	<p>Ordinary Portland Cement of minimum grade 53 as per IS: 12269. In addition, cement in accordance with IS:456 and IS:4651 Part 4 shall be considered. If Chloride & Sulphate content as per the soil investigation report are found on the higher side then the following measures shall be adopted:</p> <p>Chlorides</p> <ul style="list-style-type: none"> • Prestressed Concrete or grouting Mortar: 500mg/l • Concrete with reinforcement or embedded metal parts: 1000 mg/l • Concrete without reinforcement or embedded metal parts: 4500 mg/l <p>Sulphur</p> <p>The sulphur content of the water must not be more than 2000 mg/l else following measures shall be adopted:</p> <ul style="list-style-type: none"> • Use of Sulphate resistance cement • Low water/cement ratio • Curing suited to the structure
Structural Steel	As per IS:2062 (Grade-A) with minimum thickness of 10 mm
Protective coating to structural steel	Minimum DFT of 240 micron after sand blasting to SA 2.5 grade.

9.1.12 Proposed structural arrangement of berth

The proposed jetty having 4 berths is aligned parallel to the river bank and access to the bank for operations and maintenance is provided through an approach trestle connecting the jetty to the bank. Of the 4 berths, two berths (berth nos. 1 & 2) are for handling fly ash

and two berths (berth nos. 3 & 4) are for handling other cargo like fertilizers, natural aggregates, POL and container.

There shall be a continuous berth of 465 m length with suitable expansion joints for handling import / export cargo, which is at a distance of about 140 m from the river bank. Of the total length of 465 m of the berth, 330 m is of 30 m width and 135 m is of 50 m width. For handling containers, the width of the berth no. 4 for has been increased from 30 m to 50 m to accommodate storing two rows of container boxes and movement of vehicles. Cargo vessels will be berthed on the front side of Berth 1, 2, 3 & 4 and survey vessels will be berthed on the rear side ends of Berth 1 & 4. The top level of deck shall be (+) 8.70 m with respect to CD.

The berth is of open piled structure with deck slab. The substructure of the jetty consists of the following:

- For berths nos. 1, 2 & 3 - four rows of vertical bored cast-in-situ piles of 1.2 m diameter spaced at 7.5 m c/c in the longitudinal direction and at 7 m c/c in the transverse direction
- For berths nos. 1, 2 & 3 - One row of fender piles of 1.2 m diameter spaced at 7.5 m c/c in the longitudinal direction
- For berth no. 4 - seven rows of vertical bored cast-in-situ piles of 1.2 m diameter spaced at 6.25 m c/c in the longitudinal direction and at 7 m c/c in the transverse direction
- For berth no 4 - One row of fender piles of 1.2 m diameter spaced at 6.25 m c/c in the longitudinal direction on the front side of the jetty
- The founding of the piles will be at (-) 60.00 mCD

The superstructure for all the berths consists of the following:

- 1.2 m x 1.6 m cross beams over panel piles
- 1.0 m x 1.5 m longitudinal beam over cross beams
- Cast in situ deck slab of 500 mm thick

The general arrangement of proposed berth with trestles showing typical plan and section are presented in the **Drawing I-525/HT/212 & I-525/HT/213**.

The berth nos. 1 and 2 shall be designed and constructed to operate fixed barge loader. The berth nos. 3 and 4 shall be designed and constructed to operate mobile harbor crane. Berth no. 4 shall have provision for handling container cargo in future.

The jetty shall have utility trench/duct to carry pipe lines, cables etc., and it shall run all along the berth. The trench covers shall be seated properly and shall be intact with the trench side walls.

The jetty shall have all the required accessories/fixtures including but not limited to the following:

- Fenders including all its ancillaries
- Bollards
- Mooring rings on berth face
- Safety ladders
- Handrails
- Wooden / stainless steel rubbing strip for the protection of edges of berth from rubbing of mooring ropes.
- Drain pipes shall be embedded at regular intervals. The proposed jetty shall be provided with suitable slope to drain off storm water.
- Galvanized iron edge angles at various locations including on the sides of openings/pits.
- Marking on top of deck slab

9.1.13 Approach Trestle

The proposed approach trestles from backup area to berth nos. 1 to 4 have to cross a pipeline corridor of 40 m comprising of ammonia pipelines and other commodity / utility pipelines, outside the terminal boundary. A minimum vertical clearance of 0.8 m has to be maintained between the top level of the ammonia pipelines and the soffit level of the approach trestle.

The formation level of approach trestle increases from (+) 7.80 mCD at the backup area to (+) 10.90 mCD above the pipeline corridor and then it reduces to (+) 8.70 mCD at berth. The gradient of the formation level of the approach trestle shall be 1 in 30 from steel girder towards berth for a distance of 82 m and continues straight for a distance of 58 m reaching the berth.

The approach trestles (1 to 4) comprises of embankment, superstructure with one through type steel truss girder and remaining with RCC structure is conveyor trestle / conveyor gallery. The types of bearings for the approach trestles and conveyor trestle are as follows:

- Neoprene / Elastomeric
- POT-PTFE
- Roller-Rocker (only for through type steel girder and conveyor trestle)

Approach trestle is designed to cater to the movement of vehicular traffic IRC class AA, class 70R, etc. in addition to the movement of maintenance cranes, when necessary. The retaining structure of the embankment is of reinforced earth wall. The design shall be carried out as per IRS-SP-102-2014 and other applicable Indian Standards. The gradient of the embankment shall not be steeper than 1 in 30.

The typical span arrangement of the approach trestles (1 to 4) and dimensions of other structural elements are shown in **Drawing I-525/HT/213**.

9.2 Site Grading & embankment of approach trestle

The existing ground level in the terminal area varies from (+) 4.64 mCD to (+) 7.95 mCD. The proposed formation level of the terminal is (+) 7.80 mCD and therefore significant amount of filling would be required. The quantity of earthwork in filling is estimated as 3,85,000 cum. approx. To avoid formation of water pools and also enable proper drainage, there will be no phasing in site grading.

The embankments of approach trestle shall be made by earth fill with boulder pitching as shown in Drawing I-525-HT/233.

9.3 Dredging

9.3.1 Initial dredging

As adequate depth is not available at the proposed terminal location, dredging is required in the approach channel, turning circle and berthing areas. The dredging requirement for the terminal will be based on dredging in berth pocket, turning circle and approach channel up to (-) 3.2 m for 3,000 DWT barge, which is as follows:

- 8,00,000 cum

The dredging shall be carried out by means of cutter suction dredgers and shall be dumped at approved offshore dumping ground of HDC / KoPT at Sagar about 65 km from Haldia MMT.

9.3.2 Annual Maintenance Dredging

The annual maintenance dredging during the operation phase is very high, as the sediment deposition rates are very high at the proposed site. The quantity of annual maintenance dredging considered is as follows:

- 23,00,000 cum

The above figures are tentative and subject to validation by model studies.

9.3.3 Dredging Management

9.3.3.1 Layout

The Haldia MMT is for barges only and is to be operational 24 hours a day. The barges are assumed to have a loaded draught of 2.5m requiring a water depth of 3m on the berth and for safe passage (excluding any siltation allowance). The 24/7 operations require barges to be able to move on and off the terminal promptly after loading/unloading and sufficient space for vessels to move onto the terminal as soon as practical after a berth has been vacated. A nearby holding area facilitates this activity. A channel linking the terminal to the NW1 waterway to the north will further facilitate movement of the barges. It is proposed that up to three barges are held either side of the access channel, anchored fore and aft, leading away from the turning area to the north-north-east. This holding area can provide

accommodation for a total of up to six barges waiting to move onto the terminal. Additional holding capacity will be in the main river to the north of Balari Bar. Dredged depths are assumed to provide 3.2m of water depth at lowest water level, referred to as 3.2m below Chart Datum (CD).

9.3.3.2 Estimated initial dredge requirements

Based upon survey details from 2015, it is assessed that at the terminal about 0.3Mm³ of initial dredging will be required to provide the berthing box, the turning/manoeuvring area for the berths and holding areas for barges anchored fore and aft adjacent to the channel leading into the turning area. The access channel to join the terminal with the main NW1 deep water channel between Sagar and Tribeni is proposed to run north-north-east from the terminal inshore of Balari Island and then across the Balari Bar. The maintained width of this channel between the toe of the slopes is proposed to be 45m. The initial dredge volume for this channel is about 0.5Mm³. The greatest depth of dredging is required at the northern end of the channel where the channel crosses the high point over Balari Bar before joining the naturally deeper water of the main channel within which the NW1 waterway is located. A number of surveys have been undertaken over the Balari Bar (OSaS, IWAI and KoPT). These surveys indicate least depths over the Bar of between 0.3m above CD (where CD is 2.82 m below MSL) to drying at 0.5m.

In line with KoPT experience in terms of maintaining the approaches to Haldia Dock and the evidence of rapid morphological response to training works that have been constructed in this part of the estuary it must be recognised that siltation rates in dredged areas in this part of the river will be high. This means that during the initial dredging of the navigable area there will be a requirement to also remove natural infill as the initial works progress. Care will have to be taken when contracting this work to ensure that the dredge contractor has dredging plant of a suitable capacity to deliver the final project requirement. With high on-going infill it would also make sense that the contractor who installs the works is also contracted to maintain the works for a fixed period of time thereafter. Similarly the capital works should not be completed significantly in advance of the terminal construction to avoid unnecessary maintenance.

9.3.3.3 Estimated maintenance dredge requirements

It is considered that to maintain the turning/berthing/holding area at about 3.2m below CD the annual maintenance dredging will be about 0.5Mm³/year. By keeping the total width of the dredged area perpendicular to the flow to a minimum dimension the volume of infill should be limited in this area. This is why it is recommended to install the holding area upstream of the turning area and parallel to the access channel (i.e. in line with principal tidal flows) and anchoring of barges fore and aft so that there is no requirement to accommodate the barges swinging on the turn of the tide.

The annual maintenance dredging requirement for the access channel is assessed to be about 1.8Mm³/year. The part of the channel closest to the terminal is aligned slightly across the tidal flow but will be protected from wave action. The length of channel over the shoal is more exposed to wave action and here sediment should be more mobile resulting in higher infill rates. The total annual estimate for infill is about 2.3Mm³/year. This high rate

of infill would mean that left unmaintained the dredged areas would rapidly lose depth and probably be almost totally infilled within a year, noting that the rate of infill will reduce as the channel reduces in depth/extent. The high infill rate demonstrates the need for ongoing maintenance of the dredged areas.

These estimated rates of siltation make the access channel to the Haldia MMT the location of highest expected infill and maintenance on NW1 and justifies special attention of dredging methodology in this area.

9.3.3.4 Dredging options at the terminal

The dredging methodology at Haldia will be linked to disposal options and will be dependent upon the type of plant that a contractor has available. On first consideration the disposal options include:

- placement ashore;
- loading of barges/hoppers with disposal to a permitted offshore site;
- disposal via pipeline;
- side-casting; and
- Dispersion by water injection dredging.

It is understood that placement of material ashore is not a viable option in proximity to the Haldia MMT as there is no approved disposal area nearby.

The presently permitted sea disposal site is the Sagar Dump Ground site used by KoPT which is some 65km seawards of the Haldia MMT which is an option for shallow draught sea-going self-propelled barges loaded by CSD or a small trailer suction hopper dredger (TSHD) which could also load barges or operate independently.

Dredging with a CSD and disposal via a pipeline could be practical during the initial phase of the project but is less practical during near continuous operations as the pipeline and CSD may obstruct navigation in the 45m wide navigation channel. Permission would be required for disposal via pipeline.

Side-casting using a small TSHD is a potential form of maintenance operation but would result in some re-siltation of dredged material within the maintained areas. Permission would be required for side-casting.

Ploughing or bed levelling in conjunction with the use of a TSHD would improve efficiency allowing material to be picked up at the toe of the slopes to improve removal from the channel cross-section.

Water injection dredging could be viable on the flood tide at the northern end of the access channel with material mobilised from the access channel into the natural deep water to the north of the Balari Bar. Options for use of water injection dredging on the ebb tide in the southern part of the dredged areas are limited as there is no adjacent naturally deep area

into which to relocate the infilled material. Permission would be required for use of water injection dredging.

It is considered that the disposal option likely to be most acceptable is the use of the offshore disposal site near Sagar Island.

9.3.3.5 Recommended approach to initial dredging

It is considered that initial dredging at the terminal for the berth and manoeuvring area would be undertaken by a combination of cutter suction dredger (CSD) and back hoe dredger (BHD) with loading barges which dispose of material offshore to sea. Dredging could take place on two fronts: one from the terminal going northwards and one from the northern end of the access channel going southwards.

Sea-going self-propelled split hopper barges would be used to transport dredged material to the existing offshore disposal site some 65km offshore of the Haldia MMT. It is likely that the capacity of such a sea-going barge having a draught of 2.5 to 3m will be order 600m³. Some larger barges (1,000 to 1,500m³) could also be used, either partially laden or working with the tidal window. With a typical speed of 8 knots the average round trip to and from the offshore disposal site would take about 9 hours to complete.

CSD production rates are likely to be of the order of 800m³/hour of in-situ material when dredging. CSD operations at Haldia will likely be restricted by the periods of strong tidal currents. It may be more practical to cease dredging operations when the flow presents a risk of turning the CSD on the spud during the dredging cycle than to either re-orientate the CSD with respect to the tidal current or reduce the swing width.

To make for more efficient dredging and to dredge in some of the corners of the berthing area the use of a BHD loading barges is also proposed. The in-situ production rate of the BHD will likely be less than that of the CSD, say 100 m³/hour.

A combination of BHD and CSD working for 8 months with sea-going barge fleet (5 @ 1000m³ hopper capacity) disposing offshore could deliver the initial dredge volume. Practically speaking they may need to work for longer, including removal of some of the natural infill before other dredging plant can be used to manage the natural infill.

9.3.3.6 Recommended approach to maintenance dredging

There is expected to be a need for near continuous maintenance dredging of the approach channel, berth and turning area for the Haldia MMT. Typically navigation channels in tidal waters are maintained with trailer suction hopper dredgers (TSHD). The TSHD would dredge moving slowly against the tidal current. Once the hopper was full of water and sediment overflow would commence. Economic loading of the hopper would be completed within an hour. Only a small sea-going TSHD could be used for round the clock dredging of the Haldia access channel (with hopper capacities of up to about 1,000m³).

Five small TSHDs would have sufficient capacity to maintain the access channel and berth area and because of their manoeuvrability they would not present a significant disruption to barge traffic using the channel. They could be supported by a BHD loading barges and a plough working in the terminal area.

9.3.3.7 Summary

The dredging methodology to be adopted assumes permission will be granted for disposal to the existing offshore disposal site at Sagar. This will need confirmation.

Initial dredging is proposed to be undertaken with CSD and BHD loading sea-going self-propelled split hopper barges (600m³ to 1,500m³ capacity). One CSD working with a BHD could complete the work in 7-8 months.

For maintenance dredging it is proposed that a small TSHD is adapted so as to also be able to load the sea-going self-propelled split hopper barges. This would be supplemented with plough and BHD dredgers.

9.4 Storage Areas

9.4.1 Stockyard for Flyash, Natural Aggregates and POL

The flyash will be stored in silos which will be constructed on pile foundation.

The top 2m of the stockyard shall be heavily compacted in layers of 225 mm. The top 150 mm of stockyard area for natural aggregates and POL is proposed to be hard stand consisting of gravel / brick ballast / crushed stone packed properly, with interstices filled with sand.

Open stockyard shall be developed to 4 m high stockpiling of stone aggregate and 3 high stacking of oil drums. The stockyard should also have provision to stack 4 high containers in future. Ground improvement, shall be required to achieve required bearing capacity accordingly.

The stockyard area developed for stacking natural aggregates and oil drums shall be sufficient to handle this projected traffic volume. The open area embarked for future storage may be developed to have enhanced storage volumes in future.

The ground is well compacted for a depth of 2 m in layers of 225 mm with the road roller; in which the top layer of the ground is then compacted with stone aggregate of specified sizes in uniform thickness by a vibratory roller to proper grade and camber.

Density of stone aggregate : 1.6 T/cum

Cement concrete paver blocks with proper interlocking shall be provided at truck access areas near the flyash silos. The paver blocks shall be placed on 50 mm thick compacted bed of fine sand layer and the spacing between the blocks shall be filled with sand. The paver blocks shall be of M35 grade concrete with approved colour, design and pattern.

9.4.2 Storage Sheds

Bagged cargo / Fertiliser cannot be stored in open atmosphere and requires covered storage sheds. The sheds shall be mainly built using structural steel for the frames and galvanised sheets for roofing and cladding. Grade slab are provided for maintaining the finished floor level so as to give a plinth height of not less than 500 mm above Finished Ground level. Retaining wall of adequate height shall be provided around the shed for optimising the storage capacity.

Based on the review of geotechnical data it is assessed that pile foundations might be necessary. The proposed storage size is 130 m x 30 m to accommodate 5,760 tons of bagged cargo.

Details are shown in the **Drawing I-525/HT/218** which is only indicative and may undergo changes based on the design.

9.5 Terminal Buildings

The following terminal buildings are proposed for the Haldia terminal:

9.5.1 Terminal Administration Building

It will be 2-storied building housing the following:

- Administration wing of the terminal including documentation
- Terminal operations wing

It is assessed that the terminal administration building will have a total floor area of 660 sqm (330 sqm per floor). Typical Layout and Elevations of Terminal Administration Building are shown in **Drawings I-525/HT/214** and **I-525/HT/215** respectively.

9.5.2 Security Office

This will be a single storied building for security personnel with a storage shed of about 25 sqm, and shall be provided near the terminal entrance. Details of security office are shown in **Drawing I-525/HT/217**.

9.5.3 Weigh Bridge Building

This will be a single storied weigh bridge building with a storage shed of about 25 sqm, and shall be provided near the terminal entrance. Details of weigh bridge building are shown in **Drawing I-525/HT/217**.

9.5.4 Electrical Sub-station

The electrical sub-station shall be located near stockpile for aggregates. This will be a two storied building with a floor area of 1090 sqm (545 sqm per floor). The details of electrical sub-station are shown in **Drawing I-525/HT/230**.

9.5.5 Worker's Amenity Building

Worker's Amenity Building with bath and lavatory facilities shall be located near terminal administration building. This will be a single storied building with a floor area of 121 sqm. Details of Worker's Amenity Building are shown in **Drawing I-525/HT/216**.

9.5.6 RIO Compressor Room

The RIO (Remote Input Output) compressor room shall be located near silos. This will be a single storied building with a floor area of 40 sqm.

9.5.7 Overhead water tank and Underground reservoir

The overhead water tank and underground reservoir are of RCC structure catering to the supply of water. The minimum capacity of the overhead tank shall be 60 m³ and the minimum capacity of the underground sumps should be 200 m³.

The broad design parameters for water supply system are given below:

- Wastage and leakage in system: 15% of total theoretical demand
- Hydraulic design of the pipeline shall be using Hazen-Williams formula
- All pipelines shall be laid 1.2 m below ground

9.5.8 Gate house complex, Emergency exit Gate, Access Gate, Boundary Wall and Fencing

A gate house complex shall be provided in the western boundary of the terminal at the location shown in the overall layout. Typical details and dimensions of gate house complex is shown in **Drawing I-525/HT/219**.

The boundary wall, fencing, access gate and emergency exit gate shall be provided as mentioned in **Drawing No. I-525/HT/233**.

9.5.9 Design Criteria

All designs of RCC structures other than liquid retaining structures shall be carried out as per IS 456. The buildings shall be provided with adequate arrangements for plumbing, sanitary, electrical fittings, illumination, water distribution etc. The aspects considered for construction of buildings

- Floor to floor height of buildings is arrived considering the bylaws of National Building Code.
- Finished floor level of buildings is considered 500 mm above the finished ground level
- Grade Slab

All ground floors shall be of R.C.C. (M-20) with minimum thickness of 150 mm over 75mm thick P.C.C. (M-10) base. The sub base of 230 mm thick Stone/bolder soling over compacted earth is proposed. The floor finish of 40 mm thick including 13 mm thick metallic hardener topping is proposed. Floor top is proposed to be laid to slope minimum 1:100 towards floor drain for floor washing.

- A 750 mm wide plinth protection is proposed around each building.
- All external walls shall be of 230 mm thick, all partition walls shall be minimum 115 mm thick with 1:4 cement mortar
- Stair Case
- Clear width : 1.2 m
- Tread width : 250 mm
- Riser : 180 mm
- Continuous Hand rail is proposed.

9.5.9.1 Foundations

Based on the review of geotechnical data, it is assessed that pile foundations will be necessary for buildings.

9.5.9.2 Loads

9.5.9.2.1 Dead Load

The unit weight of all other materials shall satisfy the requirements of IS: 875.

9.5.9.2.2 Live Load

Live load shall be considered as given below and shall also satisfy the requirements of IS: 875.

Flat Roof	150 kg/m ² + Dust load of 50 kg/m ² hanging load for pipe shall be considered as 100 Kg/m ² and 50 Kg/m ² for electrical, ventilation & air conditioning (wherever applicable)
Non-accessible roof	75 kg/m ² + Dust load of 50 kg/m ²
Inclined roof	Roof slope upto 10 Deg.: 75 Kg/m ² +50 Kg/m ² Roof slope above 10 Deg.: [(75-(θ-10) x2] + 50 Subjected to a minimum of (40+50) =90 Kg/ m ² For sloping roofs with slope greater than 10°, members supporting the roof purlins, such as trusses, beams, girders etc. may be designed for two-thirds of live load stated above
MCC Floor	300 kg/m ² +1.2T/m of Panel

9.5.9.2.3 Seismic Load

- Zone factor : Corresponding to seismic zone-III
- Importance factor : 1.50
- Response reduction factor : 5

9.5.9.2.4 Equipment Load

The Substation building is to be designed to accommodate anticipated static and dynamic loading from electrical equipment. Where the uniform floor live load adequately accounts for the equipment weight, the weight of such equipment as a dead load need not be considered.

9.5.9.2.5 Impact Factor

- For Manual monorail/Hoist design an impact factor of 1.20 shall be considered in design.
- For Electrical monorail/Hoist design an impact factor of 1.25 shall be considered in design.

9.5.9.3 **Load Combinations**

The load combinations are in accordance with IS: 456, IS: 800.

9.5.9.4 **Minimum Cover**

Clear cover to main reinforcement shall be as mentioned hereunder but shall not be less than the diameter of such reinforcement.

Pile	75 mm
Top, bottom & side of footing (if any):	50 mm
Pedestal / column	
- Below ground	50 mm
- Above ground	40 mm
Beams	25 mm
Slab	20 mm
Face of walls & grade beam	50 mm (in contact with soil)
Face of walls not exposed to soil	25 mm (min.) or dia of main bar
At each end of reinforcing bar	20 mm or twice the dia of bar whichever is greater
Columns of max. dimension 200mm or under and with longitudinal reinforcement diameter not exceeding 12mm	25 mm

9.5.9.5 Serviceability Checks

Crack width of all the structural elements shall be calculated wherever necessary as per IS: 456.

9.5.9.6 Material Specification

The specifications are as given in this volume.

Structural Concrete	M-30
Levelling Concrete	M-10 of 100 mm thick
Reinforcement	Thermo-mechanically treated high corrosion resistant steel of grade equivalent to Fe-500
Cement	Ordinary Portland Cement of minimum grade 53 as per IS:8112. In addition, cement in accordance with IS:456 & IS:4651 Part 4 shall be considered.
Structural Steel	As per IS:2062 (Grade-A) with minimum thickness of 10 mm
Protective coating to structural steel	Minimum DFT of 240 micron after sand blasting to SA 2.5 grade.

If Chloride & Sulphate content as per the soil investigation report is found on the higher side. i.e.

- Chlorides
- Prestressed Concrete or grouting Mortar:-500mg/l
- Concrete with reinforcement or embedded metal parts:-1000 mg/l
- Concrete without reinforcement or embedded metal parts:-4500 mg/l
- Sulphur
- The Sulphur content of the water must not be more than 2000 mg/l
- Measures
 - Use of Sulphate resistance cement
 - Low water/cement ratio
 - Curing suited to the structure

9.6 Boundary Wall / Fencing

It is proposed to provide boundary wall of 2.4 m height using brick masonry with barbed wire fencing. The boundary wall shall be provided along the periphery of the terminal area except the water-front side.

It is to be noted that Tata chemical's 40m wide pipeline corridor passes between the terminal area and the existing river-side road. The river-side road also belong to IWAI.

Therefore, it is proposed to provide fencing on the river-side of the terminal as indicated in **Drawing I-525/HT/233** along with access gate on both sides to facilitate the access to the pipelines for Tata Chemical's personnel.

The boundary wall is classified under 3 types, i.e. Type - A, Type - B and Type – C. Type - A wall runs in the South side of the terminal between the access gates. Type - B wall runs in the West side of the terminal from the 40 m pipeline corridor to the entry / exit gate of the terminal proceeding to the north side up to bridge (C2). Type - C wall runs in the East side of the terminal till the access gate covering the periphery of the terminal. Details of the wall is as indicated in **Drawing I-525/HT/233**.

9.7 Internal roads

Based on the traffic study, it is implicit that both the import and export cargoes will be carried to and from the hinterland through road only. Therefore, providing well-planned internal road network is essential for effective functioning of the terminal. Accordingly, the internal roads were provided to cater the terminal capacity.

Along the periphery of the terminal area, a flexible pavement road of 4-lane road has been proposed and 2-lane road has been provided for the internal connecting roads having 2.5% cross slope and drains wherever necessary as shown in **Drawing I-525/HT/223**. The length and width of the internal roads are given below:

Table 9.8 Details of internal roads

Right of Way	Length
17 m	1500 m
10 m	1800 m

9.8 Water Supply

Fresh water supply required for terminal activities has been estimated based on the annual demand required for the flawless operation of the terminal. It is assumed that the water will sourced through water tankers which will be of potable quality. Water will be required at the terminal for the following activities:

- Supply to vessels (potable water used in vessels for drinking, cooking and ablution purposes).
- Supply to terminal users
- Environmental conservation and maintenance of greenery in the terminal area
- Miscellaneous purposes

9.8.1 Assumptions

The following assumptions have been considered to calculate the total water requirement.

- It is envisaged that about 150 persons will be working in Haldia MMT considering three shift operation.
- The total number of visitors including truck operators will be around 150 numbers per day.
- It is assumed that on an average two vessels in a day will avail the bunkering facility in Haldia MMT and the water requirement for a barge will be approx. 15 KLD.

The water requirement for the terminal are provided in Table 9.9 below:

Table 9.9 Water Demand for Terminal (Litre/per day)

S. No.	Facilities	Water Demand (KLD)
1	Terminal Personnel & Users	20
2	Supply to vessels	30
3	For miscellaneous activities including washing, cleaning, mobbing etc	5
	Total Potable Water Requirement (Litre / day)	55

Raw water received from source will be collected in an underground sump. Raw water pumps will be used to transfer water from the underground sump to the adjacent overhead tanks. From there, it will be transferred to administrative building, worker's amenity building, electrical substation and to the bunkering points on berth through gravity. The capacity of underground sump (U/G sump) and overhead tank (OHT) required for terminal development are shown in Table 9.10 below:

Table 9.10 Capacity of U/G sumps, and OHT for Terminal development

Description	Capacity (KL)
Capacity of U/G sump	200
Capacity of Over Head Tank	60

The STP (Sewage Treatment Plant) treated water will be used. The treated sewage shall be used for greenery.

9.9 Sewerage System

Based on the number of persons working in the terminal and water requirement mentioned in the above section, the quantity of sewage that is expected to be generated from Haldia MMT will be 18 KLD. Accordingly, it is proposed to provide a sewage treatment plant of capacity 20 KLD.

9.10 Storm Water Drainage

To facilitate the flawless disposal of storm water, covered storm water drains is proposed across the terminal as shown in **Drawing I-525/HT/225**. The storm water runoff from the drains will be collected into the settling pond which will allow the suspended particles to settle down before getting discharged into the 'Green Belt Canal'.

9.11 Fire Fighting Facilities

It is envisaged to provide fire extinguishers in the buildings and covered shed. In the oil drums storage area, foam type fire extinguishers and sand buckets will be provided and in emergency case, it is proposed to avail the fire tenders from the existing Haldia Dock Complex fire station which is located at Chiranjibpur or from other nearby fire stations. As the stone-chips are non-hazardous cargo, no firefighting system is envisaged in stone chip stockyard.

9.12 Dust control

Suitable dust extraction system will be provided for fly ash handling in silos and also in the conveyor system as mentioned in Chapter 10.

In case of stone chips, the volume that will be stacked in the terminal area will be comparatively trivial and therefore dust suppression can be carried out by spraying water through flexible hoses.

9.13 Navigational Aids

Navigational aids are required to be provided to ensure safe and efficient navigation of vessels while transiting in the navigational channel as well as in the manoeuvring areas near the terminal. Marker buoys will be provided alongside the channel and maneuvering areas to aid the navigation.

The navigation aids are detailed in paras below.

There will be a pair of marker buoys at the beginning on either side of the channel. Thereafter, pairs of Marker Buoys shall be provided along the 7 km long approach channel at a spacing of about 2.5 km and at the periphery of the maneuvering area near terminal. Provision of 8 buoys are kept for marking the channel and manoeuvring area. The channel marker buoys will be procured as part of the navigation channel for the entire NW1.

The channel marker buoys will have the following characteristics:

Material	Rotationally moulded in low density uv-stabilised virgin polyethylene
Body diameter	1800 mm
Day Mark	PE Module (as per IALA)
Radar reflector	To be provided
Light Range	3.5 – 4 nautical miles (T=0.74)
PLC Programmer all functions for monitoring of buoy and light	To be provided
Remote Monitoring Unit for buoy position and light	To be provided
Power	Solar plus backup battery for optimum autonomy
Mooring arrangement	250 kg M.S. stockless anchor with 26 mm dia chain

10 PRELIMINARY ENGINEERING - MATERIAL HANDLING SYSTEM/ EQUIPMENTS

As already discussed in Chapter 6, the commodities like Fly ash shall be handled at the terminal by using Flyash silos, Belt Conveyors, Belt Pipe Conveyors and Fixed type Barge Loaders. The other cargos like Aggregates / Fertilizer and Oil Drums shall be handled at jetty with the help of Mobile Harbour Cranes and trucks / dumpers.

The summary of mechanical equipments proposed in terminal is given below:

Table 10.1 Summary of Mechanical Equipments

S.No.	Equipment	No. of Equipment
1.	Mobile harbour crane	2
2.	Silo with Conveyor system	8
3.	Fixed barge loader	2
4.	Road Weigh Bridge	2
5.	Dumper truck	10
6.	Fork lift	2
7.	Front end loader	1

The flow diagram of cargo handling system that would be followed is presented in **Drawing I-525/HT/228**.

As presented in the flow diagram the details of Ash Silo and Mechanical Equipments including broad specifications are discussed below:

10.1.1 Fly Ash Silos

8 Nos. storage silos each to store 1200 MT of dry fly ash with plus 10% margin shall be provided. Storage silos shall be of conical bottom type with the provision of air slides / fluidizing pads at the bottom. Storage silos shall be provided to store precipitator fly ash with adequate air space. This silo shall be used to collect dry fly ash from the bulk carrier and further loaded to barges by conveyor system. It is envisaged that 4 silos can be loaded at a time by using one compressor. Accordingly 2 compressors with a common header shall be provided for flexibility in operation.

The silos shall be Steel constructed, water tight and relatively air tight with minimum 12 mm thick MS plate conforming to relevant Indian Standards and Specifications. The silo shall be completed in all aspect including stairs case, civil foundations, lugs, supporting structures etc. and designed for minimum 30 year life.

Design shall be as per IS: 9178 (Part 1 to Part 3)

All silo components shall have Zinc coating. ISO 12944 shall be followed for carrying out the painting job for taking care of Cleaning, Protective Coating and Painting designed for service life of 15 yrs.

The Silos are to be top loading and bottom discharge. The intake capacity of each Silo shall be minimum 40 Tons per Hour (TPH) and discharge capacity is about 200 Tons per Hour (TPH).

Each dry fly ash storage silo shall be provided with following arrangement for loading and unloading the fly ash.

1. There shall be pneumatic unloading fly ash facility consist of electrical operated compressor, pneumatic pipe up to silo top with all necessary fitting.
2. Dust Extraction System shall be fitted on each silo to collect dust from the silo. The system shall be complete in all respect, the system shall be capable to collect the dust from bottom discharge conveyor also.
3. Bag filters shall be provided on the storage silos for cleaning the aeration and displaced air before venting out.
4. The dust loading from the outlet of the bag filters shall not exceed 50 mg/Nm³ under any operating condition with 10 per cent bags plugged.
5. The provision of a proven dust collection system in the storage silos that separate out bulk of the ash from the conveying air shall be provided before the air is extracted through the bag filters.
6. Each storage silo shall be provided with a separate and dedicated floor aeration system. This aeration should only be required during silo unloading and should not be in operation during storage periods.
7. Chute along with rotary feeder for unloading the dry fly ash into corresponding belt conveyor
8. The pressure / vacuum relief valves in the storage silos shall be provided.
9. Flow controls for the ash shall be adjusted with the help of flap gate (electric operated).

10.1.1.1 Components of Silo

1. Manhole for men for maintenance to be provided at top of silo.
2. 3D level scanner shall be provided at each silo top to monitor the level of ash in silos.
3. Silo roof to be equipped with peripheral walkway with railing at eave height and middle of the roof.

4. Roof step ladder with railing to be provided and it should also have access with overhead walkway.

10.1.1.2 Instruments

Each silo shall be provided with following instruments as a minimum:

- | | | | |
|----|---|---|-------|
| a) | Silo ash level switches (High and Low) | : | 1 No. |
| b) | Differential pressure gauge across the bag filter | : | 1 No. |
| c) | Differential pressure switch across the bag filter | : | 1 No. |
| d) | Pressure gauge at the inlet of the bag filter | : | 1 No. |
| e) | Differential pressure gauge across the vent filter | : | 1 No. |
| f) | Differential pressure switch across the vent filter | : | 1 No. |
| g) | Pressure gauge at the inlet of the vent filter. | : | 1 No. |

The Ash Handling System shall be designed for operating at wind speed of 24 m/sec and at 45°C temperature.

10.1.2 Belt Conveyor / Pipe Conveyor System

10.1.2.1 Conveyor

- A) The conveyor shall have a sturdy, welded, structural steel frame and supports for mounting all the machinery. Frame shall be designed suitably for the belt tension, clearances etc. Frame shall be fabricated from steel conforming to IS: 2062. Anti-friction bearings with double labyrinth dust seals and easily accessible pressure gun lubrication fittings shall be provided.
- B) It shall be possible to operate the telescopic movement of the spout, within the operating range while the machine is operating at its full capacity.
- C) All bearings shall be Spherical roller bearings with plummer blocks lubricated by grease.

10.1.2.2 Belting

The belting for conveyor shall be of suitable EP belt for heavy duty application and shall have adequate number of plies to withstand the tension and support load, adequately; top and bottom cover thickness shall not be less than 8 mm and 3 mm respectively.

The rated maximum allowable tension shall be 140 per cent of the normal working tension.

The ratio of breaking strength to rated allowable working tension shall be minimum nine (9).

Belt shall be pre-stretched and cut edge type construction.

Belts supplied shall not blister or separate in the plies or at seams or stretch more than two and half per cent of their original length within one year of installation and normal operation. Belt construction shall be such that in the case of edge damage, ply separation and ingress of moisture shall not take place.

- (A) Belting shall conform to latest revision of IS: 1891 (Part I), IS: 11592-2000 and other relevant Indian Standards.
- (B) Belts shall have hot vulcanized joints after erection.

10.1.2.3 Idlers

All carrying idlers for shuttle conveyors carrying material in bulk shall be single roll flat type and shall be fitted on fixed type supports on the Shuttle conveyor stringer frame.

Carrying Idlers shall be suitable for required belt widths. All carrying Idlers shall be spaced at 550 mm centres. Carrying idlers shall have troughing up to 45 degree.

Outside diameters of normal carrying and impact rolls shall be 139.7 mm respectively.

Idler rolls shall be made of electric resistance welded (ERW) tube and minimum wall thickness shall be 4.85 mm. Mechanical properties of the idler tubes shall be equivalent or better than YSt 210 grade as per IS: 9295.

Return idlers shall be Flat type. Diameter of each return roll shall be 127 mm. Return idlers shall be placed at 3.3 m centres. The return idlers shall be fitted on fixed type supports on the Shuttle conveyors.

Brackets for the idlers shall be of fabricated steel and shall have ample strength and rigidity to operate under all conditions without vibration or chatter. Use of Cast Iron support brackets are not acceptable. The bases shall be provided with slotted holes with two bolts of min 16 mm on each end.

Bearing housing shall be made of min 3 mm cold deep drawn rolled carbon (CDDRC) pressed steel.

Idler shaft material shall be EN8 or better steel.

Idlers shall be easily removable type and designed for continuous duty.

All idler bearings shall be 'Sealed, lubricated for life' type. Deep groove ball bearings shall be used. The bearings shall be chosen for life L-10 equal to 50,000 hours minimum. All bearings shall be protected by double labyrinth seals. The bearing seals shall have minimum resistance to rotation. Lubrication fittings for the labyrinth seals shall be provided in the case of idlers provided at loading points, for the purpose of occasional greasing to keep the dirt and dust out. Felt seals will not be accepted.

All idlers and assemblies shall conform to latest edition of IS: 8598 or equivalent.

Internal rolling friction resistance of idler rolls shall not exceed 0.015 while testing.

10.1.2.4 Pulleys

Pulleys shall be made of welded steel and stress relieved in the furnace before machining. All hubs shall be of forged steel and end discs shall be accurately machined for concentricity.

Pulley shall be straight faced. Drive and discharge pulleys shall be of same diameter provided with 16 mm thick diamond type grooved rubber lagging. The rubber hardness shall be IRHD 60.

All pulleys shall be statically balanced. The balance weight shall not exceed 1% of the total weight of the pulley.

The pulleys shall have minimum rim and disc thickness of 12 mm. The face width of pulleys shall be as per relevant IS Standards suitable for belt. The face run-out on diameter shall not be more than 0.5 mm.

The run-out tolerance after lagging shall not be greater than 0.5 mm on diameter.

Bearings for all pulleys shall be antifriction double row, self-aligning, spherical roller bearings mounted on adapter sleeves. All Plummer blocks housings shall be of cast steel construction with double / triple labyrinth seals.

All pulley bearings shall have life of 50,000 hours.

10.1.2.5 Belt Weighers

Belt weigher shall be provided in the system at appropriate locations for measurement of cargo handled. The belt scale shall be load cell type and shall be continuous operating. Accuracy shall be 0.25%.

Provisions for local and remote measurement of instantaneous throughput and to falling shall be made. Signals for remote indication and overload alarm shall be provided. Local control panel including rate indicator and totalizer shall be provided. The load cells shall be completely sealed, water and dust proof, and maintenance free.

10.1.2.6 Belt Cleaners

Multiple blade spring operated belt scraper of proven design shall be provided at the discharge end of belt conveyors for effective cleaning of the belt and ensure no spillage of the material from return belt. The discharge from the belt scraper shall fall within the transfer chute. A V type Plough Scraper shall be provided on return belt at the discharge end.

10.1.2.7 Safety & Control Devices

All conveyors, unless mentioned otherwise, to be equipped, but not limited to the following:

One no. Belt side travel switches to stop drive units for protecting belt from rubbing the structural parts.

Motion (under speed) switches to stop the motor when the speed of the equipment drops below a specified value or if normal speed is not reached within a specified time, and to signal starting and stopping of preceding conveyor/equipment.

10.1.2.8 Drive Unit

Drive shall be through reversible Geared Motor/Motor & shaft mounted Gear box, flexible couplings and brake etc. Gear type shall be Bevel Helical of reputed make.

10.1.2.9 Dust Extraction System

- a) Dust control and abatement systems shall be provided to contain escape of dust into atmosphere while the facilities at the terminal are in operation. The systems shall be designed to conform to the permissible limit of dust emission by the concerned statutory pollution control authorities.
- b) However, the concentration of RSPM-10 shall be limited to an average 5 mg/normal cum over and above the ambient dust concentration measured at a circumferential distance of 5 m from the dust generation source.
- c) The filtering efficiency shall not be less than 95%.
- d) Dust Extraction System shall be designed in accordance with ACGIH & APPCB norms.

10.1.2.10 System Requirement

The following Dust Control System shall be provided

S. No	Facilities	Dust Control System
1.	At Transfer Towers	Insertable Pulse Jet compact bag filter
	At Towers	
	At Barge loader	

10.1.2.11 Design Requirements for Dust Extraction System

Dust control at discharge and receipt points in the transfer towers shall comprise of reverse pulse jet compact bag filters with independent fan. However, the reverse air jet shall be provided through a common air compressor for all the dust extraction units.

The Dust Extraction System shall consist of, but not limited to:

- i) Compact reverse pulse jet unit with Insertable bag filters suitable for working at the ambient conditions.
- ii) The filter media shall be of standard dimension using surface filtration technique so as to reduce the need of formation of primary cake for better reverse air jet cleaning process. The fabric shall be abrasion and static charge resistant, non-woven needle

felt made from polyester or polypropylene. The bag filters shall be suitably supported from within with steel cages.

- iii) The Air to Cloth ration shall be suitable maintained for the efficient working of filter
- iv) Filter bags under cleaning cycle shall be 25 – 30% depending upon the system design.
- v) Centrifugal air fans with backward curved blades. The capacities of the fans shall be as required at each potential dust generation point. The indicative particulars of transfer towers are given hereunder:
- vi) A common Air Compressor shall be provided for the supply of reverse air jet to each dust extraction unit in the dust control system. The air compressor shall be able to deliver air at the required pressure at the inlet to pulse jet valve but shall not be less than 7 Kg/Cm². The system provider may arrive at the capacities and operating pressure based on his system design. However, other parameters specified shall be adhered to.

10.1.3 Fixed Type Barge Loader

10.1.3.1 General

The Barge loader shall be fixed type machine conforming to the general arrangement and geometry shown on the **Drawing I-525/HT/226**. It shall be suitable for loading barges up to 1500 DWT at all load / ballast and tide conditions.

Barge loader shall comprise a main portal gantry supporting a Conveyor with a telescopic spout.

Equipment shall receive material from the conveyor BC-5 & BC-6.

10.1.3.2 Superstructure

- A. The Superstructure shall be of robust design and provide access for inspection, adjustment and maintenance of all mechanical equipment including idlers, etc.
- B. The conveyor may be designed as a built in dust proof enclosure and shall include walkways on both sides. The conveyor return idlers shall be located above the walkway and be accessible for replacement from the walkway.
- C. The conveyor shall discharge through a telescopic spout which shall be capable of being expandable in the vertical direction. The telescopic chute shall be provided with insertable bag filter to control the dust emission while loading into the barges.

The telescopic chute shall be electric power driven with suitable gear box, input/ output couplings.

The speed of telescopic chute shall be limited to maximum 5 m/min.

The spout shall be lined with durable and replaceable SS-304 Liners. Liner plate thickness shall not be less than 3 mm.

10.1.3.3 Technical Parameter

The following parameters shall be adhered to in the bid. Berth layout, travel rail span, Barge sizes and dimensions, clearances, berth conveyor details, etc., are given in the attached drawing. Those listed but not given here shall be supplied with the bid:

Cargo	Fly Ash
Barge loading Capacity	
Rated	400 TPH
Design	500 TPH
Barge Size	Up to 1,500 DWT
Conveyor Outreach	31 m (approx.) from the centreline of feeding point and minimum 7 m from the centreline of fender pile

10.1.3.4 Barge loading Operation

Barge loader shall be manually operated from the local Push Button Station have following interfaces:

- Conveyor shall start before the berth conveyor,
- The belt scale on the conveyor BC-5 & 6 shall be pre-set from the discharge of the required tonnage. The belt-scale shall be re-set to a fresh tonnage once the earlier target has been reached.

10.1.4 Mobile Harbour Cranes (MHC)

10.1.4.1 Operating Conditions

Mobile Harbour Crane shall be of rubber-tyred, self-contained construction and shall be equipped with a diesel engine as a prime mover for crane operation and travelling. The crane shall be of four-rope construction and shall be designed and equipped for multi-purpose operation like general cargo handling, bagged cargos, heavy lift operation as well as containers with automatic Spreader and bulk handling with suitable four rope grab. Crane will cater to barge up to 3,000 DWT size with the dimension of 95 m x 15 m x 2.5 m.

Being a new terminal and to have edge in the industry market, equipment should have maximum efficiency to perform highest in its class.

10.1.4.2 Main Technical Requirements

The following minimum operating characteristics are required:

10.1.4.3 Load Capacities

10.1.4.3.1 General Cargo Handling

The crane shall have a lifting capacity of minimum 50T on hook up to a radius of 17 m from crane centerline.

10.1.4.3.2 Four Rope Grab Operation

The crane shall have a lifting capacity of minimum 20T in grab mode up to a radius of 20 m from crane centerline.

10.1.4.3.3 For Container Handling

The crane shall have a lifting capacity of minimum 30T under spreader up to a radius of 20 m from crane centerline. Spreader weight is about 7.6 t.

Total weight of the loaded container is considered as 30 T.

10.1.4.4 Classification of Crane and Machinery

The crane and its machinery shall be classified according to the FEM 1.001 (Rules for the Design of Hoisting Appliances) and shall have the following minimum classifications:

10.1.4.4.1 Crane Classification

Heavy lift operation 50T on hook	– A3
Grab Operation	– A6
Container Operation	– A5

10.1.4.5 Operating Speeds

The following speeds shall be provided as a minimum:

Hoisting/ Lowering	0 - 50 m/min
Slewing	0 - 1.2 rpm
Luffing	0 - 40 m/min
Travelling	0 - 60 m/min

10.1.4.6 Main Dimensions

Minimum outreach of the boom from crane centerline	: 20 m
Height of boom pivot point above ground	: minimum 8 m
Height of eye level in tower cab	: minimum 13 m
Maximum hoisting height on hook above ground	: minimum 33.5 m
Minimum hoisting height on hook below ground	: 10 m

10.1.4.7 Quay Load Arrangements

Uniformly distributed load under pad	: 1.5 T/m ²
Max. Load per tyre	: 5 T

10.1.4.8 Environmental Conditions

The crane shall be designed to work safely and reliably under the following environmental conditions:

Daily temperature range variation	: ± 15 ⁰ C
Maximum operating wind speed	: 24 m/s
Maximum wind speed for travelling	: 24 m/s
Maximum wind speed out of operation with boom in steepest position	: 46 m/s
Maximum gradient for travelling	
- in direction of travel	: 6 %
- perpendicular to direction of travel	: 2.5 %

10.1.4.9 Safety Devices

The crane shall provide the following safety equipment as a minimum:

- Safe load indicator
- Mechanical interlock of chassis and superstructure during travelling
- Stabiliser monitoring
- State-of-the-art electronic limit switching system
- Safety valves at hydraulic cylinders
- Anemometer
- Emergency stop buttons at various locations of the crane

- Video camera at the boom tip
- Appropriate lighting system for night-time operation
- Crane management system (optional)



Figure 10.1 Typical Details of Mobile Harbour Crane

10.1.5 Front End Loader /Pay Loader & Dumpers

The front end loader / pay loader is used for heaping up the stone chips within the stockyard and loading in dumpers for transporting to Berth. The general technical parameters governing the design of the pay loader shall be as follows:

- Capacity of bucket : 3 cum
- Bucket width : About 3 m
- Static tipping load : About 13 T
- Operating height : Not less than 5.4 m
- Turning radius : Not more than 6.5 m
- Dump angle : Not less than 50
- Dump reach : Not less than 2.4 m

10.1.5.1 Dumpers

Dumpers of 20T capacity powered by diesel engine will be used for transferring cargo from Jetty to open / covered storage area and vice versa.

10.1.6 Road Weigh Bridge

The weigh bridge structure shall be robust in construction with ample safety margin above the rated capacity.

The lower structure of the platform shall comprise of wide flanged steel beams and high grade tested steel. The structure shall be sand blasted to SA 2½ grade and suitably painted with special anti-corrosion epoxy based paint.

The assembly shall be designed to compensate for expansion and contraction between the Weigh Bridge and foundation, caused by temperature variation.

The load cells shall be sealed and compression type suitable for pit less weigh bridge installation.

The load cells (6 nos.) shall be of rated capacity 23T (approx.) each having safe overload limit of 150% and breaking load of 300% of rated capacity.

Each load cell shall have safe temperature range 0-65 degree Celsius and shall be weather proof IP-68 protection.

Weigh bridge electronics shall be micro controller based with standard software capable of providing various kind of information on selectable basis.

The system shall be provided with communication facility with the main PIC in the control room and a real time clock to print date and time on the printouts.

The system shall be provided with suitable PC with software and dot matrix printer of latest technology. The specifications for same are as given below:

Table 10.2 Specification Data Sheet - Road Weigh Bridge

S. No.	Description	Data
1.	Type	Pit less, Static
2.	Capacity	60T
3.	Accuracy	± 0.05% of Full scale
4.	Platform size	15 m x 3 m
5.	Trucks to be weighed	Heavy duty Trucks / dumpers
6.	Operator interface	Menu driven
7.	PC & Printer	Required
8.	Auto zero & Auto Calibration	Required
9.	Anti-skid to plate	Required
10.	Stamping by W&M Inspector	Required

10.1.7 Dumper trucks and Forklift

Dumper trucks powered by a diesel engine shall be provided, to operate in all weather conditions. The minimum capacity of the dumper truck shall be 20 tons.

Forklift is powered by a diesel engine to operate in all weather conditions. The capacity of the equipment shall be 10 T and to be supplied with drum handling attachment. The drum handling equipment should be capable of handling 4 drums at a time.

The forklift shall conform to IS 4357 - 1974 for stability testing of fork lift trucks. The acceptance criteria of fork lift trucks shall conform to IS 10517 - 1983.

10.1.8 Flyash Handling

The handling of fly ash shall be carried out using bulkers discharging fly ash either into the silos or directly into the barges. As traffic for fly ash grows over a period of time, 8 nos. silos with associated Conveyor System (BC-1 & BC-2) and controls may be constructed for handling increased volume of flyash expected at the terminal in future.

10.1.9 Rail yard

As per the traffic projection provided by M/s HPC, no rail borne traffic is envisaged but IWAI intends to develop rail siding to attract the future rail borne traffic. Accordingly, railway siding is proposed. The wagon unloading / loading system has to be developed based on the rail borne traffic in the future.

Rail yard shall be developed as shown in **Drawing I-525/HT/210**. Storage and handling facilities for the rail borne traffic is not provided as the type of commodity and traffic is unknown. However, provision for future is considered.

11 PRELIMINARY ENGINEERING - ELECTRICAL AND CONTROL SYSTEM

11.1 Electrical Power Requirement

The main power requirement for electrical load in the Construction of IWT Terminal at Haldia on National Waterway-1 project shall be on account of Pipe Conveyors (2 Nos.), Belt Conveyors (4 Nos.), Barge Loaders (2 Nos.), Overhead Water Pump, Sewage Treatment Plant, Weigh Bridge, Belt Scale & Flap gates. Other infrastructure such as general lighting, power for auxiliary services like dust extraction system, etc. will also need their share of electric power.

In case of operational power, all the installed loads shall not be required simultaneously. For instance, in case of barge loader, Dust extraction System etc., all the loads shall not be operating simultaneously. Similarly all the running conveyors shall also not draw maximum power at the same time.

All Electrical and controls equipment shall be designed for an ambient temperature of 45°C.

Taking all such aspects and applying suitable diversity factors, the computation for estimated connected power and demand load are shown in the attached **Annexure-1**, summary of which is given below:

Table 11.1 Summary of Load Calculations

Description	Connected Load	Demand Load
Total Load (HT & LT)	2,773 kW	1,474 kW

11.1.1 Source of Power Supply

Power at 11kV shall be made available upto a DP (Double Pole) Structure adjacent or within the Project boundary by West Bengal State Electricity Distribution Company Limited (WBSEDCL). Beyond this DP structure, power shall be fed to the Metering cubicle of WBSEDCL through buried 11kV cable by WBSEDCL. DP structure shall also be provided by either WBSEDCL. 11kV cable from metering cubicle of WBSEDCL to 11kV switchgear Incomer shall be in the scope of the EPC contractor. Further Power distribution shall be as per the attached **Power Single Line Diagram I-525/HT/229**.

11.1.2 System Description

Power at 11kV received at the incomer of HT Switchgear shall be fed at the same voltage to High Power Consuming Equipment (> 110kW) like Pipe Conveyor, Barge Loaders, Transformers, Dust Extraction System and HT Capacitor Bank etc. as per requirement as also shown in attached **Power Single Line Diagram I-525/HT/229**.

11.1.3 Utilization Voltages

The particulars of Power Supply shall be as follows:

Voltage	11kV \pm 10% & 415V \pm 10%
Phase	11kV (3 Phase 3 Wires) 415V (3 Phase 4 Wires)
Frequency	50 Hz \pm 3%
Combined Voltage & Frequency Variation	10%
Fault Level	26.3kA for 3 second at 11kV 50kA for 1 second at 415V
System Earthing 415 V	Solidly Earthed
Control Circuits	
Circuit Breaker Protection & Tripping	110 V DC, 2 Wire grounded
Control System	
Server, PLC, FI (Intelligent) I/O VDU, Keyboard, Printer	240 V \pm 10%, AC, 50 HZ \pm 3%, 1 Ph, 2 Wire All equipment shall have internal close loop regulation & spike arrestors
UPS System, Field Hooters	240 V \pm 10%, AC, 50 HZ \pm 3%, 1 Ph, 2 Wire

11.1.4 Electrical Substation (ESS)

One number ESS is proposed to be located and constructed progressively as shown in the **Drawing I-525/HT/230**. Switchgear room on the Ground Floor shall be housing Metering Panel WBSEDCL, Transformers, Diesel Generator set, 11kV HT Switchgear Panel, 415V Power Control Center (PCC) and various distribution Boards etc.

Control room on the First Floor of ESS shall be housing Programming Station, Server Station, Operating Station, CCTV Control Station, PLC Panel, UPS & 64" LED Screen. First Floor shall also have facility of Store Room, Pantry, Conference Room and Toilet.

11.1.5 Power Factor Correction

11 kV & 415V capacitor banks with Automatic Power Correction Panels shall be provided at ESS as shown in the attached **Power Single Line Diagram I-525/HT/229** to achieve power factor of 0.95 lag on 11 kV & 415V bus respectively. One number capacitor bank each for 11kV & 415V shall be installed.

11.1.6 Distribution Transformer

11kV voltage is further stepped down to 415V through two numbers of distribution transformers, each capable of handling 100% load at a time. Transformer of rating 11kV/433V, 1250 KVA, indoor Dry type, having off circuit tapping of \pm 10%, in steps of 2.5%, winding temperature detectors with scanner for temperature alarm and trip, door safety limit switch and accessories is proposed for this project.

11.1.7 Motors

All Motors including and below 110 kW shall be 415V and all motors above 110 kW shall be 11 kV. Motors shall be energy efficient (IE3), squirrel cage induction type.

11.1.8 HT Power Distribution System

11kV HT Switchgear Panels are proposed at ESS as shown in the **Drawing I-525/HT/230**. All relays in these HT Switchgear Panels shall have intelligent type Multifunction relays (Numerical relays) and meters shall be of digital type with RS 485 communication port facility both for relays & meters. Lamps shall be LED type. Busbars shall be high conductivity Aluminium alloy @ 1.0 Amps/mm² current density for HT Switchgear panels. One of each type of feeder, shall be provided as spare. The enclosure protection shall be IP54 minimum for indoor installation and IP55 minimum for outdoor installation.

11kV HT Switchgear Panel shall be provided with Vacuum Circuit Breaker (VCB) and Vacuum Contactor (VC) with HT Fuse of suitable breaking capacities but not less than 26.3KA for 3 second.

All of the above panels are shown in the attached **Power Single Line Diagram I-525/HT/229**.

11.1.9 LT Power Distribution System

One number of 415V Power Control Centre (PCC) is proposed at ESS as shown in the **Drawing I-525/HT/230**. All relays in this LT Switchgear Panel shall have intelligent type Multifunction relays (Numerical relays) and meters shall be of digital type with RS 485 communication port facility both for relays & meters. Lamps shall be LED type. Busbars shall be high conductivity Aluminium alloy @ 1.0 Amps/mm² current density for PCC, ACDB & MLDB. Bus bar shall be of high conductivity electrolytic grade Copper @1.25 Amps/mm² current density for other distribution boards (like LDB, PDB, CDB etc.). PCC shall feed power at 415V to the various LT Loads such as Belt conveyor motors, ACDBs, MLDB/LDBs, Distribution Boards (DBs) etc. The enclosure protection shall be IP54 minimum for indoor installation and IP55 minimum for outdoor installation.

PCC shall be provided with Air Circuit Breaker (ACB) and moulded case circuit breaker (MCCB) of suitable breaking capacities but not less than 50KA for 1 second. The rupturing capacity of miniature circuit breaker (MCB) used in DB's/SB's/FP's for further distribution shall not be less than 10 KA.

Industrial power sockets 240V 15A, minimum 2 Nos. shall be installed at each floor of Electrical Substation, RIO/Compressor Room, Terminal Admin. Building, Worker's Amenity Building, Security Office, Weigh Bridge Building, Sewage Treatment Plant, Covered shed, Transfer towers etc. & at a distance of every 30m in case of Conveyors.

Welding socket 415V TPN and earth 63A, minimum 2 Nos. shall be installed at each floor of Electrical Substation, RIO/Compressor Room, Terminal Admin. Building, Worker's Amenity Building, Security Office, Weigh Bridge Building, Sewage Treatment Plant, Covered shed, Transfer towers etc. & at a distance of every 30m in case of Conveyors.

All of the above panels are shown in the attached **Power Single Line Diagram I-525/HT/229**.

11.1.10 Standby Power Supply

Silent Diesel generator (DG) set has been envisaged for feeding 100% indoor lighting & 20% High Mast Load requirements. One number 300 kVA DG set is proposed capable of handling emergency loads for the terminal.

11.1.11 Illumination

The illumination level in various areas to be maintained at the working plane are mentioned below and for other areas not mentioned below it shall be based on National Electric Code.

Location	Average lux level	Type of Luminaire
Stockpile and Jetty Area	30	2x400W HPSV twin lamp & 1x1000W Flood Light, weather proof, Heavy duty High Mast(30 m) light in die cast Aluminium alloy housing
Electrical Substation, Transformer, DG Room, Worker's Amenity Building, Sewage Treatment Plant, RIO/ Compressor Room, Waste Collection Center, Weigh Bridge Building & Security Office	200	General Purpose Industrial compact batten suitable for 2x20 W LED Tube Light fitted with Aluminium heat sink
Terminal Admin. Building & Control Room	300	34Watt LED Panel with ultramodern recess mounting luminaire suitable for armstrong/grid/POP ceiling complete with separate electronic driver & high brightness Surface Mounted Device (SMD) LEDs
Storage shed	100	Open type vertical Medium Bay LED luminaire with high power COB 50W LED as light source
Belt Conveyors walkways, Transfer Towers	50	Vertical/Horizontal surface mounting pressure die-cast aluminium well glass luminaires with high power 40W LED as light source
Electrical Substation, RIO/Compressor Room, Terminal Admin Building, Worker's Amenity Building, Security Office, Weigh Bridge, STP, Covered Shed, Transfer Towers, conveyor galleries, all exit / entry points etc.	10	Battery operated emergency lighting unit consist of aesthetically designed rechargeable 5 Watt LED lantern with dimming and SOS feature. Battery shall be rechargeable Li-ion type & 5V DC Li-ion charger with 1 hour battery backup

Wherever required poles of suitable height with fittings shall also be installed for outdoor lighting of the buildings.

One number of MLDB is proposed. MLDB shall receive dual power from respective PCC and DG supply, which in turn shall feed various LDBs as shown in attached **Power Single Line Diagram I-525/HT/229**. 1:1 Lighting trans-formers shall be placed at MLDB to maintain voltage drop within the permissible limits.

11.1.12 Cables

Power distribution at 11 kV shall be done through 11 kV (E), XLPE, stranded aluminium conductor, armoured, overall FRLS PVC sheathed cable laid on cable trays, ducts, directly buried in ground and in trenches, etc. as per site requirement.

LT power distribution to various LT motors and services such as illumination, firefighting, air conditioning, water supply etc. shall be done through 1.1 kV grade XLPE insulated, stranded aluminium conductor, armoured, overall FRLS PVC sheathed power cables. Laying of cables shall be done as per site requirement.

Internal wiring shall be done in recessed PVC conduit or on surface with GI conduit and single core PVC insulated FRLS copper wire.

11.1.13 Cable Trays & Accessories

FRP type cable trays & its accessories shall be considered for the project. Thickness of the various components shall be as per the calculations and these calculations shall be submitted by EPC Contractor for client approval before starting the manufacturing.

11.1.14 Earthing & Lightning Protection

An efficient earthing and lightning protection system shall be designed to ensure protection of men & material in worst of the weather conditions. Suitable Lightning protection system shall be installed as per the guide lines of the IS/IEC-62305:2010 (Superseding IS-2309: 1989).

All equipment of substation and various other services / equipment shall be earthed at two points. There shall be one earth grid formation using 75 x 8 mm GI strip and all equipment earthing shall be connected to this earth grid through Aluminium wire with PVC coating or GI strip as per the requirement. This grid shall be connected with number of pipe electrodes. However, the neutrals of transformers and DG sets shall be earthed separately. Each neutral shall be connected to 2 numbers separate pipe earth electrodes. Earthing system shall be designed in principle as per IS: 3043, however for chemical earthing IEEE: 80-2000 shall also be followed.

For lightning protection separate earth pits shall be provided. Exact number of earth pits shall be worked out after earthing and lightning protection calculation has been carried out measuring the soil resistivity at site.

Earth (chemical) pits shall be based on High Conductivity Technology. In this technology of chemical earthing, a compound of high electrical conductivity shall be filled up in the space around the ground electrode, so that the earth resistance value would decrease appreciably. Minimum Electrode size shall be as per the latest amendments of IS: 3043.

The high Conductive Compound shall be able to perform in any weather and soil Conditions and shall have following properties;

- 1) It shall have high electrical conductivity, which should remain constant and unaffected by changes in temperature & moisture.
- 2) It shall permanently remain embedded and should neither dissolve in and swept away by water.
- 3) It shall have an ability to absorb large amount of water and retain the same over a long periods of time.
- 4) It shall decreases earth pit resistance with passage of time.
- 5) Solubility: Shall be partly miscible; so that it does not dissolve fully like common salt and thus increasing the Earth Pit Life.
- 6) The pH value shall be near neutral so that it does not pollute soil or water and also does not corrode earth electrode.
- 7) It shall be maintenance free Compound so that there shall be no need of extra water pouring at regular interval as in conventional earthing material, because it should retain the moisture.
- 8) Chemical Compound shall be thermally conductive, in order to maintain a constant Earth resistance in temperature range of -50 to +60 degree Celsius.
- 9) The Compound shall have relatively High conductivity so that it can create very low resistance even in rocky areas.
- 10) It shall have low earth resistance, carries high peak current repeatedly.
- 11) It shall have a Long and reliable life.
- 12) It shall be easily installed in any soil conditions.

11.1.15 Ventilation and Air Conditioning (AC) System

Electrical Substation at Ground Floor, WBSECL metering room, Battery room RIO/ Compressor Room (Compressor Area), Worker's Amenity Building, STP (Pump room), all toilets & pantries shall be provided with exhaust fans for ventilation to ensure proper maintenance of temperature inside the panel room and removal of additional heat produced due to various switchgears.

Split AC shall be used for Control Room, RIO/Compressor Room (For Panel area), Security Office & Weigh Bridge building. The offices in the Terminal Admin. Building shall be Air-conditioned through centralized AC so as to maintain an inside temperature of 27°C.

Tentative layout of the various rooms is shown in the drawings mentioned below:

- a) Typical Layout of Terminal Administration Building, **I-525/HT/214**
- b) Typical Layout & Section of Worker's Amenities Building, **I-525/HT/216**
- c) Substation Equipment Layout, **I-525/HT/230**
- d) Typical Layout & Elevations of Security Office and Weigh Bridge Control Room, **I-525/HT/217**
- e) Layout Plan of Terminal Facilities at Haldia, **I-525/HT/209**

11.1.16 Battery and Battery Charger

One number dual Battery and Battery Charger with DC Distribution Board shall be provided for the control, protection, interlocks and indication of switchgear panels.

11.1.17 Closed Circuit TeleVision (CCTV) System

To ensure surveillance of required locations as well as create secured record for post event analysis, CCTV system is proposed. The system shall provide an online display of video images on LED monitors located in Control Room and PTZ (3600) cameras at various locations like Gate Complex, Terminal Administration building & at all berths etc. as per **Drawing I-525/HT/231**. The core of the surveillance system shall be Network Video recorder (NVR) server. System shall also have operating systems, appropriate software, networking equipment and other essential components.

11.1.18 Control System

The Control system shall be installed to ensure safe and reliable operation of conveyors, dust extraction system and others facilities. PLC system shall read the inputs, perform all system logic, conduct online diagnostics, sequencing control and control the outputs. The processor based central control system is envisaged to control and monitor the material handling operations in the IWT Terminal so as to carry out the operation in an integrated mode from "Control Room".

The Control Network shall be used for providing automation functions, interlocking, sequence starting, monitoring and supervisory functions with Belt Conveyors, Pipe Conveyors and Dust Extraction System for Fly Ash Handling Facility.

The Control Network shall also be used for providing monitoring and supervisory functions, interconnection with Equipment/Machines having its own Control Systems like Mobile Harbour Crane, Barge Loaders, Weigh Bridge etc.

The core of the system shall consist of an Operating station, Programming Station & Server station (all the computers shall be latest version of the Industrial PCs - IPC as on the date of bidding) with printer and along with centralized real-time redundant PLC system (One online and the other in hot standby excluding I/O modules), sharing a RAID 6 (redundant array of independent disk) data storage system and a data network, with shared high-

capacity data backup and off-site data archiving as per attached **Drawing, I-525/HT/232**, Control Architecture.

The control system would incorporate all safety interlocks to ensure complete safety to operating personnel and to avoid any damage to equipment due to mal-functioning.

The control system shall generally be based on the following principles:

- i) To start equipment in either of the two modes i.e. 'Local' or 'Remote'
- ii) To trip off minimum equipment in the desired sequence during abnormal operating conditions, leaving all the other equipment running, which may safely be permitted to continue the operations
- iii) To annunciate the fault which has tripped equipment along-with the cause for tripping
- iv) To prevent restarting of the equipment until safe conditions have been restored
- v) To retain maximum flexibility of operation consistent with safety
- vi) To prevent mal-operation of equipment on interruptions
- vii) To stop all the running equipment simultaneously by pressing Emergency Stop Push Button
- viii) To stop running equipment in the reverse order with time lag during normal stop.

Processor would perform all operational and control functions. Processor would collect all the field related data from local field devices like local push button station, pull chord switch, belt sway switch, zero speed switch, local control panels etc. via junction boxes by means of data bus cable.

The control network shall be real-time network, requiring long time continuous operation. During normal operations, the system cannot be shut off and it shall be possible to replace the components without shutting off the power. It shall be feasible to program the system online.

Proper care shall be taken in data transfer so as to achieve quick response while transmitting control and management information. The response time should not be more than one millisecond. The network system shall have fault clearance functions, secure transmission of data through error checking routines on all data transmitted. The networks shall use open systems (universal protocol) technology, support multiple industrial standards, allow a combination of multiple communication agreements, and shall have the capability to join wider networks in future through the server.

The analogue module system shall have provision to accept signals from other subsystems generating 4-20mA analogue signals. Proper conversion to standard units shall be done by control software.

Redundancy (100% hot standby) is provided in the PLC's so that in case of failure of any of the processors, the hot stand by processor shall take over automatically. The changeover shall be smooth. Redundancy shall be provided for complete processor subsystem including CPU, memory, power supply.

Input/output units shall be capable of accepting discrete, analogue and digital input and output devices. If the number of slots for input and output modules in the controller rack is not sufficient, expansion units shall be connectable to the CPU by means of interface modules.

Each Input and Output module shall be electrically isolated from the controllers through opto-couplers or isolation transformers and shall withstand severe voltage transients without damage or adverse effect on the controller. Output modules shall incorporate self-contained damping networks and voltage limiting devices to prevent false triggering of outputs and to suppress line voltage spikes.

PLC power supply units must have self-test facilities for detecting under voltage and also must be able to give alarm and switch over to UPS mode in case the output voltage is + 20% above the normal value.

A SCADA system shall be provided to control and monitor operation of the proposed facility.

11.1.19 Safety Switches

Safety switches for conveyors shall mainly consist of the Zero Speed Switches (ZSS), Belt Sway Switches (BSS), Pull Chord Switches (PCS) and Belt Take-up Switches (BTS).

PCS shall be installed @ 30m on both sides of each pipe/belt conveyor to stop the conveyor instantly when an accident happens. BSS shall be installed @ 50m to stop drive unit for protecting belt from rubbing against the structural parts on both sides of each pipe/belt conveyor. One number ZSS shall be provided to stop the motor when the speed of the equipment drops below a specified value or if normal speed is not reached within a specified time, and to signal starting and stopping of preceding conveyor/ equipment.

PCS and BSS shall be microprocessor based addressable type and shall be connected to the Master Unit for monitoring, which in turn shall communicate with the PLC. This Master unit shall be placed in the Field / Remote I/O panel as shown in the attached Control Architecture.

BTS switches shall be provided and installed so as to be actuated by an extreme movement of the conveyor belt take ups, should the belt tension not be adequate for any reason.

11.1.20 3D Level Scanners

3D Level Scanners are proposed to be installed in each of the Fly ash Silos. For power supply to the scanners and data communication from scanners to the PLC, local control panel (one number for 4 scanners as per **Drawing, I-525/HT/232, Control Architecture.**) is proposed to be installed below the Silos. Multicore cables shall carry data from these Local panels to the PLC.

11.1.21 Communication System

Telephone System

EPABX system of 200 lines is proposed for this project.

Public Address (PA) System

No PA system is proposed for this project.

Annexure - 1

11KV HT LOAD CALCULATION - PHASE 1						
S.NO.	Equipment	Connected load (KW)	Utilization Factor (%)	Maximum Demand (KW)	TOTAL CAPACITANCE LOAD	
1	Conv. PC-1	132	0.80	106	106	
2	Conv. PC-2	132	0.80	106	106	
5	DES FAN above Silo-1	175	0.8	140	140	
6	DES FAN above Silo-2	175	0.8	140	140	
7	DES FAN above Silo-3	175	0.8	140	140	
8	DES FAN above Silo-4	175	0.8	140	140	
9	DES FAN above Silo-5	175	0	0	0	
10	DES FAN above Silo-6	175	0	0	0	
11	DES FAN above Silo-7	175	0	0	0	
12	DES FAN above Silo-8	175	0	0	0	
13	LT LOAD	1109.2		703	771	
	Total HT & LT Load in kW	2773		1474	Capacitance Load PHASE-1A	771
					Capacitance Load PHASE-1B	560
					Total Capacitance Load	1331
					Multiplying Factor (0.75 to 0.95)	0.553
					Required Capacitance	736
					CAPACITOR BANK SELECTED	750 kVAR

LT LOAD CALCULATION - PHASE 1						
S.NO.	Equipment	Connected load (KW)	Utilization factor (%)	Maximum Demand (KW)	DG Rating (kVA)	TOTAL CAPACITANCE LOAD
1	Conv. BC-3	37	0.8	30	0	30
2	Conv. BC-4	37	0.8	30	0	30
3	Conv. BC-5	30	0.8	24	0	24
4	Conv. BC-6	30	0.8	24	0	24
5	Flap Gate(2x3.7kW)	7.4	0	0	0	0
6	Belt Scale (2x0.5kW)	1	0.8	1	0	1
7	Barge loader-1	37	0.70	26	0	26
8	Barge loader-2	37	0.70	26	0	26
9	Telescopic Chute for Winch Operation-1	15	0.70	11	0	11
10	Telescopic Chute for Winch Operation-2	15	0.70	11	0	11
11	DES Compressor for carrying Bulk Carrier Unloading and loading to SiLOs- Working	30	0.80	24	0	24
12	DES Compressor for carrying Bulk Carrier Unloading and loading to SiLOs-Standby	30	0	0	0	0
13	Root Blower/ Rotary Feeder (16 X 3.75 kW)	60	0.50	30	0	30
14	DES Transfer Tower/ Telescopic Chute(9x3.5kW)	31.5	0.8	25	0	25
15	DES Compressor Transfer Tower(3x5kW)	15	0.8	12	0	12
16	Overhead Water Pump	30	1	30	0	30
17	Sewage Treatment Plant	7.5	1	8	0	8
18	Electric Hoist (5 X 5.9kW)	29.5	0	0	0	0
19	Miscellaneous SILO (8x10kW)	80	0.5	40	0	40
20	DES LCP (Compressor) above Silo-1	5.5	0.8	4	0	4
21	DES LCP (Compressor) above Silo-2	5.5	0.8	4	0	4
22	DES LCP (Compressor) above Silo-3	5.5	0.8	4	0	4
23	DES LCP (Compressor) above Silo-4	5.5	0.8	4	0	4
24	DES LCP (Compressor) above Silo-5	5.5	0	0	0	0
25	DES LCP (Compressor) above Silo-6	5.5	0	0	0	0
26	DES LCP (Compressor) above Silo-7	5.5	0	0	0	0
27	DES LCP (Compressor) above Silo-8	5.5	0	0	0	0
28	Weigh Bridge(including control room) (2x3kW)	6	0.8	4.8	0	5
29	MLDB Load	326	1	326.3	198.0	326.3
30	ACDB (For Welding Socket Load)	168.0	0	0	0	0
31	Battery Charger	5.0	1	5.0	5.0	5.0
	LT Load in kW - PHASE- 1A	1109.2		703.2	203.0	703
	LT Load in kW - PHASE- 1B	374.2		177.8	7.0	Capacitance Load PHASE-1A 703
	Total LT Load (PHASE-1A + PHASE-1B)			881.0	210.0	Capacitance Load PHASE-1B 178
	Load in kW at 90% Diversity factor			792.9	189.0	Total Capacitance Load 881
	Load in kVA at .95 pf			834.6	236.3	Multiplying Factor (0.75 to 0.95) 0.553
	Load at 120% Overload			1001.5	283.5	Required Capacitance 487
	TRANSFORMER & DG RATING SELECTED			1250 kVA	300 kVA	CAPACITOR BANK SELECTED 600 kVAR

12 FIRE FIGHTING

The firefighting system that is to be installed in the buildings, covered shed and oil storage area shall consist of extinguishers having dry powder stored pressure by nitrogen gas with inbuilt pressure gauge to indicate pressure.

S. No.	Area	Class of fire	Classification of occupancy	System proposed
1	Buildings and covered shed	A, B & C	Ordinary hazard	Dry powder stored pressure confirming to IS:13849. Pressurized by nitrogen gas with in-built pressure gauge to indicate pressure.
2	Oil drum storage area	A & B	Ordinary Hazard	Foam type extinguisher conforming to IS:10204

13 SEWAGE TREATMENT PLANT

13.1 General

The sewage treatment plant of 20 KLD (FAB technology) shall be provided which should be compact, odour free and shall consume low power.

Plant shall be installed below ground level or at any desirable depth and shall generate minimum amount of excess sludge. Waste water after treatment below shall be suitable for A/C cooling towers irrigation and scrubber make-up.

Parameters for design of sewage treatment plant:

Natural of effluent	Domestic sewage
Daily average flow	18 cum/day
pH	6.0 - 8.8
BOD	280 - 380 Mg/L.
Suspended solids	200 - 480 Mg/L.
COD	600 - 800 Mg/L.
Oil & Grease	20 Mg/L.
Coliform count	< 106 - 107 (Assumed)

Standards of the effluent discharge after treatment shall be as follows:

Parameters	Value
pH	6.0 - 8.8
BOD	Less than 20 Mg/L.
Suspended solids	Less than 10 Mg/L.
COD	Less than 180 Mg/L.
Oil & Grease	Less than 10 Mg/L.
Coliform count	< 103 at the CCT outlet

13.2 Process Description

In order to conserve water, the treatment plant shall be designed to ensure that treated effluent (water) characteristics are well below the permissible limits, even under varying flow condition which are typical for such systems. The selected process shall be able to withstand the shock load situation. To achieve same plant room areas, it is proposed to better use the principle of aerobic attached growth process.

The treatment plant shall be designed with a capacity to handle 20kl/day of wastewater. Wastewater will flow via gravity collection system through a bar screen chamber to a sump

chamber. A bar screen shall be provided at the inlet point in the bar screen chamber and the wastewater will flow through this bar screen into the sump. Bar screen shall also be designed that it can be cleaned manually by going down to a platform in the chamber. Two horizontal centrifugal pumps shall be provided in the sump to pump the collected wastewater to the reactor. Air will be introduced in the sump through pipe grid, to avoid the sewage from becoming septic.

Wastewater from the sump shall be lifted by means of effluent lifting pumps into Equalized Reactors where BOD/COD reduction is achieved by virtue of aerobic microbial activity. Reactor would be running in series. Oxygen required will be supplied through coarse bubble air diffusers.

The excess bio-solids washed in the biological process are separated in the downstream Clarifier/Tube Settler Tank. The clear supernatant will be collected in the Chlorine water tank cum filter feed tank. The treated sewage is further pumped through filtration units. The sewage after CCT is disinfected and shall meet the coliform norms of <1000 counts with minimal dosage of sodium hypochlorite. The coliform count in the treated effluent shall be almost nil.

The tertiary treatment consists of removing the residual suspended solid load, by filtering through Dual Media Filter and passing the water through activated Carbon Filter so that traces of BOD/COD and excess chlorine are removed. The tertiary treated water is stored in the final holding tank and can be safely used for irrigation purpose.

For cooling tower make-up the treated sewage from final holding tank is further passed through softening plant for cooling tower makeup purpose.

The biological sludge generated from the reactor which is settled in the Clarifier/Tube settler, is pumped into sludge sump, the sludge shall be pumped and filled in a tanker for suitable disposal by client.

13.3 Blowers and Aeration System

The treatment plant shall be provided with rotary positive displacement blower with a common base and a central panel, belt drive system, drip proof induction type electric motors, necessary valves including a pressure relief valve and intake and discharge silencing. Each blower motor unit shall be housed in an enclosure. All piping and related accessories necessary to connect the blowers to the plant air header shall be provided by the plant manufacturer.

All air piping from the blower motor unit to the air header shall be approved steel pipe with malleable iron fittings. Flexible reinforced rubber connecting sleeves shall be provided wherever required.

Each air diffusion device shall be connected to the air header with individual 28-80 dia drop piping's in SS 304. The drop pipe assembly shall be connected to the air header in a manner to permit raising the dropping and diffusion device above the water surface quickly and without disturbing airflow to the other diffusers. Each diffuser drop pipe shall be equipped

with non-clog fine bubble diffusers of sufficient quantity to keep pressure loss through the drop pipe assembly to a minimum. The air diffusion devices shall be designed to distribute air over the entire length of the tank and to have efficiency such that an adequate supply of oxygen is maintained in the tanks of treat the sewage load for which the plant is designed. The blowers shall be coupled with VFD for optimizing the energy consumption depending on the oxygen demand which shall be coupled with a proportion type (DO) Dissolved Oxygen controller.

13.4 Special Notes

Cost of pump shall include provision of isolation valves at inlet and outlet, non-return valves at outlet, pressure gauge, and steel channel arrangement at base, power and control cable from and to electrical panel, level controllers and alarm system.

- Providing of air educator system shall be made for following through MS epoxy painted piping, fittings and valves
- Sludge recycle piping from clarifier
- Sludge waste piping from clarifier
- Skimmer return piping from clarifier
- Contractor to note that all submersible pipelines shall be in SS 304.

14 EXTERNAL CONNECTIVITY

14.1 External Rail Connectivity

14.1.1 Existing Rail Connectivity

There is an existing main railway line adjacent to the proposed Haldia terminal. It is a Broad gauge (BG) route running in directions to Haldia port through G.M. yard from Durga chowk. It has a spur line going to Haldia Dock Complex railway line network.

14.1.2 Proposed Rail Connectivity

The traffic projection for Haldia MMT indicates arrival of domestic coal only at the terminal by rail. No other cargo need rail connectivity. The domestic coal is considered as diverted cargo and development of handling facilities will be costly proposition and having risks if such cargo movement is not materialised through IWT in future. Hence rail connectivity is not planned but space provision has been kept in the terminal layout so that railyard can be developed if required in future.

Rail connectivity from the existing main railway line is proposed for future rail borne traffic as shown in **Drawing I-525/HT/210**. One rail bridge has to be provided over the existing green belt canal providing access from the existing main railway line to the Haldia terminal. Since the space inside terminal is not adequate to accommodate full rake length of 700 m, it is proposed to split the rake in two section for handling cargo and shunting purposes. The engine escape line has been kept accordingly.

Storage scheme and cargo handling equipment facilities are not provided in this layout as the commodity and traffic is unknown. Thus the cost estimate for proposed rail alignment along with the bridge is only taken into consideration and the cost for storage and cargo handling equipment is not worked out.

14.2 External Road Connectivity

14.2.1 Existing Road Connectivity

During the site visit and as per topography survey, it is observed that there is an existing approach road which is well connected from the round circle junction to the proposed Haldia terminal. The existing road is a two lane road for a stretch of 800m having a width of 7m.

There is an existing culvert which is 31 m in length and 13.80 m in width crossing through the green belt canal from the proposed terminal leading to the round circle junction and providing access to Haldia port, Bandar station, Mecheda chowk crossing and Tata Chemicals.

The existing road network leads to the Haldia Township in one direction and to Durga chowk in the other.

14.2.2 Proposed road connectivity

14.2.2.1 Approach Road

The truck traffic movement for Haldia MMT is expected to be initially 600 trucks / day which is expected to increase to 800 trucks / day. This will lead to queuing in the approach road of the terminal and hence the existing two lane road will not be sufficient to handle such truck movement. Therefore, the existing two lane road will be widened to four lane road along with the development of an additional bridge to cater the terminal traffic.

The proposed widening is recommended to cater the projected truck movements without affecting efficiency in evacuation rate and to avoid creating congestion in the entry point of the terminal.

The widening of approach road providing access to the terminal is planned considering the site flexibility:

- The bridge (C1) is proposed to the right side of the existing culvert with reference to vehicles inbound to the terminal as shown in the **Drawing I-525/HT/204**. In this scenario, the proposed approach road is well planned by not obstructing the existing UPL's boundary wall providing access to the terminal.

14.2.2.2 Diversion Road to Tata Chemicals

The existing riverside road leading to Tata chemicals factory will be closed in view of the development of the terminal. There is a 15 m wide corridor between east side boundary wall of Haldia MMT and Tata chemicals. In that corridor two lane road can be provide (7m carriage way) for the diversion of truck traffic for Tata chemicals and others. The road is connected to the main road through a bridge (C2) leading to Haldia township in the west and to Durga chowk in the east as shown in the **Drawing I-525/HT/223**.

15 ENVIRONMENTAL IMPACT ASSESSEMENT (EIA) & ENVIRONMENT MANAGEMENT PLAN (EMP)

The environmental impact assessment study has been carried out by M/s EQMS India Pvt. Ltd. and the summary of EIA and EMP study is summarised below.

Project involves development of a terminal at Haldia, West Bengal on River Hugli. Terminal is being developed with designed capacity to handle the cargo. Capacity of the terminal is about 3.08 MTPA of cargo. Materials like fly ash will be transported majorly along with other materials like stone aggregate, fertilizers & POL. Total area of terminal site is 61.0 acres which is located in Industrial Zone of Haldia Dock Complex and whole land is Government land. Project development comprises of construction of 4 nos. of berths & approach trestles, 8 nos. of silos for fly ash storage, stockyards for stone aggregates, fertilizers & POL, internal roads, administration building, worker's amenity building, lighting tower, power supply system, fire-fighting system, sewerage system, storm water management system, waste management system and green belt development system.

Land is vacant land with scanty shrubs and herbs which is to be removed before construction and few trees are present along the existing road (to be diverted) will be retained as greenbelt. No change in land use is anticipated as terminal site already exists within Industrial area. Land is flat with ground level variation of 4-9 m. Project site is connected with NH 41 through approach road of 6 km running along Western boundary of the site, internal road of 10 m and (along the boundary) 17 m are proposed to be constructed within terminal site for internal movement. For development of terminal, existing pipeline of Tata Chemicals and existing road to Mitsubishi plant will be shifted. Pipeline will be shifted towards the River bank and a 40 m wide corridor will be reserved for pipeline. Road to Mitsubishi plant will be realigned to Eastern boundary of the terminal. New road of 15 m width will be constructed which will connect Haldia Mecheda Road to Mitsubishi Plant.

Baseline study has been carried out at the project site to study the existing condition of environmental and social parameters at site. Climate of the study area is typically moderate as it is located in coastal area. Dominant wind direction of the study area is S & SE during post-monsoon and N & NW during pre-monsoon period. As per air quality monitoring study, it is found that ambient air quality of the site is within permissible limits as per NAAQS, 2009. However levels of PM10 are observed to be higher. Noise levels at the site and in nearby areas are also found to be within the permissible limits as per CPCB standards for Industrial area. Project site is located in the Haldia Industrial Area. The area was classified as Critically Environmentally Polluted Area by CPCB and further exploitation of air & water quality was restricted in the area. However moratorium has now been lifted from Haldia. As per CPCB, it is also found that the area is classified as notified zone for extraction of ground water. No ground water extraction is proposed in the project in both construction and operation phase. Ground water in the shallow aquifers, i.e. to depth of 120-300 mbgl are brackish to saline. Ground water in deeper aquifers is fresh and potable for drinking purpose with some treatment. However Fe levels in ground water is higher in some part of district. Water quality of the River Hugli is found to be equivalent to D Class Waterbody as per CPCB classification and is fit for propagation of Wildlife & Fisheries. River bed sediments of the River Hugli were also studied along the stretch near the terminal site and they are found to

be non-toxic with very low concentration of pesticides and other chemicals like DDT, Endosulphan, Lindane & methyl Parathion. Soil of the area is Clayey sand and is slightly alkaline in nature. It is moderately fertile with low to medium NPK value. Site lies within the Industrial area thus no significant vegetation or habitat for wildlife is present in the study area. Vegetation mainly comprises of road side vegetation and some of the commonly found fauna species are Albizzia lebbeck, Casuarina equisetifolia, Phoenix sylvestris, Delonix regia, Acacia spp, Azadirachta indica, Delbergi sisso, Xanthium strumarium, Nerium indicum, Parthenium spp. Calotropis procera, Lantana camara, Casia tora, Vitex negundo, Zizyphus mauritiana, Cannabis sativa, Argemon maxicana, Sida spp etc. No significant wildlife was observed at site and in study area. Hugli River is rich in flora and fauna and variety of planktons, fishes and other aquatic life is present in the River. However no RET species was found to be present at terminal site or in study area

On the basis of the baseline data and associated project activities, impacts of the project activities on social and environmental parameters were analysed. It is predicted that project will have impact on air, water, noise, soil, drainage, hydrology and ecology and socio-economy of the area. However, mitigation measures and management plans are proposed for mitigating the anticipated negative impacts of the project.

Environment management plans are prepared to prevent / control / abatement of pollution resulting from project activities in different stages. Environment management plan defines the institutional framework responsible for implementation of EMP, environment monitoring plan and environment management budget.

As per the EIA study, it is concluded that the project “development of terminal at Haldia” is beneficial for the economic development of country by increasing the efficiency of freight transportation and beneficial for environment by shifting freight load from road/railway to waterways and cutting down carbon emission. However, project development will have many impacts on social and environmental parameters. Mitigation measures and management plans are prepared in line with impacts anticipated. If the proposed mitigation measures are taken and environment management plan is implemented, anticipated negative impacts of project can be reduced and benefits can be further enhanced. The project will overall bring development in the area.

The total budgetary cost as estimated by M/s EQMS India Pvt. Ltd. for Environment Management and Monitoring Plan is approximately Rs. 0.945 Crores. Break-up for the same is given in table below:

Table 15.1 Environmental Management Cost

Component	Item	Unit	Quantity	Rate	Amount
DESIGN AND CONSTRUCTION STAGE					
Technical Support	<ul style="list-style-type: none"> Environmental Social Impact Assessment Study, Bio-diversity Conservation Plan, Preparation of EMP 	Lump sum	-	-	15,00,000
Greenbelt development	<ul style="list-style-type: none"> Plantation in terminal site 	No. of trees	1200 trees	500 Rs/tree	6,00,000
	<ul style="list-style-type: none"> Survival loss including aftercare 	No. of trees	1200 trees	100 Rs/tree	1,20,000
Drainage Congestion and disposal of accumulated water	<ul style="list-style-type: none"> Provision of adequate surveillance 	Covered in project design and engineering cost			
Erosion & Sedimentation	<ul style="list-style-type: none"> Embankment, and River Bank Protection Measures 	Already existing river protection works. Addition, if required are covered in project design and engineering cost			
Land	<ul style="list-style-type: none"> Compensation against land 	No land acquisition involved			
Soil	<ul style="list-style-type: none"> Soil contamination protection (Septic tanks, grease traps etc.) and rehabilitation of borrow areas/debris disposal site/plant site & labour camps 	Covered in project design and engineering cost			
Noise	<ul style="list-style-type: none"> Canopy for DG sets PPEs like ear plug Timely maintenance of the machinery, equipment and vehicles Barricading the site 	Covered in project design and engineering cost			
Water	<ul style="list-style-type: none"> Provision of storm water and wastewater management system 	Estimated @ RS 5,00,000 for construction site & 5,00,000 for labour camps (2 camp sites)			15,00,000
	<ul style="list-style-type: none"> Construction of soak pits at construction sites & labour camps 	Estimated @ RS 3,00,000 per site estimated three			9,00,000
	<ul style="list-style-type: none"> Provision of clean drinking & domestic water facility at labour camps and construction site 	20,000 Per month for 30 months			6,00,000
Dust Management during construction	<ul style="list-style-type: none"> Water Sprayer / Watering for Dust suppression 	Covered in project design and engineering cost			

Component	Item	Unit	Quantity	Rate	Amount
Safety	• Appointment of Safety Officers	Covered in project design and engineering cost			
	• Safety signage, speed breakers, fire-fighting measures etc.	Covered in project design and engineering and cost			
	• Provision of trainings and PPE to workers	To be included in construction cost			To be part of contractors costs
Health	• Health checkup camps for construction workers	Camps	2 camp /year	4 lakhs/ camp	8,00,000
Environmental Monitoring in the construction phase	• Terrestrial and Aquatic Fauna	3,00,000 per season (Once in six month)			6,00,000
	• Ambient Air Quality	50,000 per monitoring for 30 months (Once in two month)			7,50,000
	• Surface Water Quality	24,000 for upstream & downstream (Once in month)			7,20,000
	• Drinking Water Quality	12,000 (Once in month)			3,60,000
	• Noise & Vibration	10,000 per monitoring for 30 months (Once in month)			3,00,000
	• Soil Quality, Erosion & Siltation and River Bed Sediment	50, 000 per Six months			2,50,000
		SUB TOTAL (DESIGN AND CONSTRUCTION STAGE)			90,00,000 0.90 Crores
TRAINING and AWARENESS					
Training	• Environmental training & awareness	-	-	Included in overall NW-1 Project Budget	-
ESTABLISHMENT AND SYSTEMS					
Establishment	• Supervision Consultant (environment and Social)	-	-	Included in overall NW-1 Project Budget	-
	• Construction Stage (Site Environmental officer)	-	-	Included in overall NW-1 Project Budget	-
	• Operation Stage	-	-	Included in overall NW-1 Project Budget	-

Component	Item	Unit	Quantity	Rate	Amount
Management Systems	• Adoption of EHS management systems	-	-	Included in overall NW-1 Project Budget	-
	• Management Information and tracking system	-	-	Included in overall NW-1 Project Budget	-
SUBTOTAL (ESTABLISHMENT & TRAINING and MANAGEMENT SYSTEM)					-
SUB TOTAL (Construction, and Operation and mobilization)					0.90 Cr
CONTINGENCIES @ 5 % on total Environmental Costs					0.045 Cr
GRAND TOTAL (in Rs)					0.945 Cr

16 COST ESTIMATE

In this chapter, an estimate of the capital cost has been prepared for the most optimal layout. The annual operation and maintenance cost of facilities that would be incurred annually is also provided.

16.1 Basis of Cost Estimates

The quantities for various project components has been arrived based on the preliminary engineering carried out by the consultant. Further, the cost estimate has been arrived on the basis mentioned below.

- The cost estimates for onshore civil works has been prepared on the basis of the rates provided in “Delhi Schedule of Rates – 2014”
- The cost estimates for the offshore civil works has been arrived based on the rates taken from current works of similar nature, updated rates of works of similar nature completed in the recent past and from Consultant’s in-house data bank
- The cost estimate for equipment is based on Consultant’s in-house data bank and budgetary quotations
- Taxes / Duties as applicable has been included

16.2 Capital Cost Estimates

The item-wise capital cost estimate for development of Haldia terminal is presented below:

Table 16.1 Capital Cost Estimate for Haldia Terminal

S. No.	Item	Quantity	Unit	Rate (Rs.)	Capital Cost (Rs. in Cr.)
1.	LAND & SITE DEVELOPMENT				15.00
1.1	Site clearance		LS		0.20
1.2	Demolition of boundary wall & other structures		LS		0.20
1.3	Earth filling	3,84,297	cum	325	12.50
1.4	Slope protection		LS		2.10
2.	JETTY INCLUDING APPROACH TRESTLES				275.00
2.1	Berths				177.00
2.2	Approach trestles				90.00
2.3	Conveyor gallery				8.00
3.	STOCKYARD DEVELOPMENT				7.50
3.1	Stockyard development with ground improvement		LS		7.50
4.	BUILDINGS & SHED				13.71
4.1	Terminal administration building	660	sqm	40,000	2.64
4.2	Worker's amenity building	121	sqm	25,000	0.30
4.3	Electrical substation building	1,089	sqm	25,000	2.72
4.4	Security office	25	sqm	18,000	0.05
4.5	Weigh bridge control room	25	sqm	18,000	0.05

S. No.	Item	Quantity	Unit	Rate (Rs.)	Capital Cost (Rs. in Cr.)
4.6	RIO / Air compressor room for ash handling	40	sqm	25,000	0.10
4.7	Gate house complex		LS		2.00
4.8	Storage Shed	3,900	sqm	15,000	5.85
5.	ROADS, BRIDGES & PAVED AREAS				20.36
5.1	Diversion road to Tata chemical with bridge		LS		5.00
5.2	Internal roads		LS		14.00
5.3	Paved areas with compaction	9,739	sqm	1,391	1.36
6.	UTILITIES AND OTHERS				18.35
6.1	Water supply and distribution		LS		1.50
6.2	Storm water drainage work		LS		2.30
6.3	Sewerage system		LS		0.50
6.4	Electrical distribution system & IT communication		LS		14.00
6.5	Firefighting system		LS		0.05
7.	WALL & FENCING				3.26
8.1	Boundary wall		LS		3.26
8.	EQUIPMENTS				99.20
8.1	Mobile harbour crane	2	No.	1500,00,000	30.00
8.2	Silo with foundation	8	No.	300,00,000	24.00
8.3	Conveyor system with fixed hopper & foundation		LS		32.40
8.4	Fixed barge loader	2	No.	300,00,000	6.00
8.5	Road Weigh Bridge	2	No.	20,00,000	0.40
8.6	Dumper truck	10	No.	50,00,000	5.00
8.7	Fork lift	2	No.	30,00,000	0.60
8.8	Front end loader	1	No.	80,00,000	0.80
9.	ENVIRONMENTAL MANAGEMENT PLAN (EMP)*		LS		0.95
A	TOTAL COST (1 to 9)				453.32
B	CONTINGENCY (3%)				13.60
C	TOTAL PROJECT COST (A + B)				467.00
D	SERVICE TAX (15% ** OF 40% OF TOTAL PROJECT COST)				28.02
E	GRAND TOTAL (C + D)				495.00
Note:					
* Cost received from M/s EQMS					
** Varies as applicable					

Note: As per estimation provided by the environment consultant (M/s EQMS India Pvt. Ltd.) the cost for Environment Management Plan (EMP) is worked out to be 0.95 Crores.

The following items have not been included in the above cost estimate.

- Land lease amount: The land proposed for the development of Haldia inland waterways terminal belongs to Haldia Dock Complex (HDC) which would be given to IWAI on lease for 30 years. One-time lease rent of Rs. 40.59 crores would be paid to HDC by IWAI which is not included in the above estimate.
- Dredging: To facilitate the navigation of the vessels, dredging needs to be carried out at approach channel, berth pocket and turning circle.
- For the augmentation of NW-1, dredging needs to be carried out for the entire stretch of NW-1. Dredging volume of Haldia terminal comparative small, it will be beneficial to exclude the dredging and supply of navigational aids for Haldia Terminal development package and to include it in the overall NW-1 dredging package. Therefore, same is not included in the above mentioned cost estimate.
- Approach road with bridge, dredging and Electricity & Water connection cost estimates are not considered.

16.3 Detail Cost Estimates

The breakup of major components of the capital cost estimates of the Haldia terminal for individual phases is furnished in the following tables

Table 16.2 Detail Cost Estimate for Berth – Haldia Terminal

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
1.	Mobilisation of all plant and equipment for the jetty construction and demobilisation of the same after completion of the works.	1	LS		14.00
2.	Construction of 1200 mm dia bored cast-in-situ piles for berth with m.s. liner, boring in all types of soil /Hard strata stabilising unlined soil using any other approved method during excavation, providing reinforcement as per design/ drawing providing and placing M40 grade concrete by means of tremie or any other approved method, providing all necessary labour, materials, plant tools etc.				
i	Shift & set up piling plant & equipment at each pile location	410	No.	50,000	2.05
ii	Supply, fabricate and driving mild steel liner (8 mm thick) including transport, alignment, pitching in position as required	4,008	T	55,000	22.05
iii	Driving the steel liners (8 mm thick) upto the required depth below bed level	13,038	m	2,500	3.26
iv	Boring through all types of soil strata	23,288	m	3,500	8.15
v	Cut & dress pile head to required lines & levels	410	No.	5,500	0.23
3.	Supply & placing in position design mix cement concrete grade M40 in pile shaft by means of tremie or any other approved method using 20 mm MSA	30,614	cum	8,000	24.49

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
	including cost of all labour and materials but excluding the cost of steel reinforcement.				
4.	Supplying corrosion resistant deformed bars grade Fe 500, cutting, bending, tying with 1.5 mm dia annealed binding wire & placing in position reinforcement cage including cleaning, straightening, tack/lap/butt welding with approved electrodes, etc. with all labour and materials complete for 1200 mm dia piles.	6,123	T	68,100	41.70
5.	Supply & place in position to lines & levels cast in-situ design & precast units mix cement concrete of grade M40 for pile cap, deck slab and beams including providing formwork shuttering, machine mixing, compacting, curing of concrete, centering, including providing pockets, openings, recesses, champhering where required and rendering if required to give a smooth and even surface in any shape etc. complete as directed with all labour and materials but excluding the cost of steel reinforcement.	18,148	cum	8,000	14.52
6.	Supplying corrosion resistant deformed bars grade Fe 500, cutting, bending, tying with 1.5 mm dia annealed binding wire & placing in position reinforcement cage including cleaning, strengthening tack/ lap/ butt welding with approved electrodes, etc. with all labour and materials complete for deck slab and beams.	3,630	T	68,100	24.72
7.	Supply & place in position to lines & levels cast in-situ design mix cement concrete for wearing coat of average thickness 75 mm including provision of formwork, machine mixing, placing in panels, compacting, curing, etc. complete with all labour and materials.	1,249	cum	6,000	0.75
8.	Providing and fixing cast steel bollards of 30 T capacity complete with base plate & H.T. anchor bolts of appropriate length, nuts washers, etc. including grouting with cement concrete M40 under base plate, filling the cavity with concrete grade M15, painting etc. complete.	75	No.	1,50,000	1.13
9.	Design, supply, assemble and fix in position in the required lines and levels arch type AN 800 E 3.0 grade rubber fenders of Trelborg or equivalent make of length 3m with steel plates manufactured as per manufacturer's specifications as directed by the Engineer.	67	No.	24,00,000	16.08
10.	Carrying out load test of pile including construction of test caps, accessories and dismantling same after test etc.	5	No.	10,00,000	0.50
11.	Supplying, fabricating, painting, welding, drilling, grouting & fixing in position etc. complete various miscellaneous items such as steel inserts, hand railing, coping fender, ladders, handhold, expansion joints, mooring rings, nut, bolts, washers, bituminous filler etc. in precast & in-situ concrete components in accordance		LS		3.00

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
	with the drawings & as directed by the Engineer.				
Total					177.00

Table 16.3 Detail Cost Estimate for Approach trestle – Haldia Terminal

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
1.	Mobilisation of all plant and equipment for the jetty construction and demobilisation of the same after completion of the works.	1	LS		7.00
2.	Construction of 1200 mm dia bored cast-in-situ piles for berth with m.s. liner, boring in all types of soil /Hard strata stabilising unlined soil using any other approved method during excavation, providing reinforcement as per design/ drawing providing and placing M40 grade concrete by means of tremie or any other approved method, providing all necessary labour, materials, plant tools etc.				
i	Shift & set up piling plant & equipment at each pile location	210	No.	50,000	1.05
ii	Supply, fabricate and driving mild steel liner (8 mm thick) including transport, alignment, pitching in position as required	2,027	T	55,000	11.15
iii	Driving the steel liners (8 mm thick) upto the required depth below bed level	6,678	m	2,500	1.67
iv	Boring through all types of soil strata	11,928	m	3,500	4.17
v	Cut & dress pile head to required lines & levels	210	No	5,500	0.12
3.	Supply & placing in position design mix cement concrete grade M40 in pile shaft by means of tremie or any other approved method using 20 mm MSA including cost of all labour and materials but excluding the cost of steel reinforcement.	15,557	cum	8,000	12.45
4.	Supplying corrosion resistant deformed bars grade Fe 500, cutting, bending, tying with 1.5 mm dia annealed binding wire & placing in position reinforcement cage including cleaning, straightening, tack/ lap/ butt welding with approved electrodes, etc. with all labour and materials complete for piles.	2,333	T	68,100	15.89
5.	Supply & place in position to lines & levels cast in-situ design & precast units mix cement concrete of grade M40 for pile cap, deck slab and beams including providing formwork shuttering, machine mixing, compacting, curing of concrete, centering, including providing pockets, openings, recesses, champhering where required and rendering if required to give a smooth and even surface in any shape etc. complete as directed with all labour and materials but excluding the cost of steel reinforcement.	9,551	cum	8,000	7.64
6.	Supplying corrosion resistant deformed bars grade Fe 500, cutting, bending, tying with 1.5 mm dia annealed binding wire & placing in position reinforcement cage including cleaning, strengthening tack/ lap/ butt welding	1,433	T	68,100	9.76

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
	with approved electrodes, etc. with all labour and materials complete for deck slab and beams.				
7.	Supply & place in position to lines & levels cast in-situ design mix cement concrete for wearing coat of average thickness 75 mm including provision of formwork, machine mixing, placing in panels, compacting, curing, etc. complete with all labour and materials.	669	cum	6,000	0.40
8.	Carrying out load test of pile including construction of test caps, accessories and dismantling same after test etc.	3	No.	10,00,000	0.30
9.	Supplying, fabricating, painting, welding, drilling, grouting & fixing in position etc. complete various miscellaneous items such as steel inserts, hand railing, coping fender, ladders, handhold, expansion joints, mooring rings, nut, bolts, washers, bituminous filler etc. in precast & in-situ concrete components in accordance with the drawings & as directed by the Engineer.		LS		3.00
10.	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	1,404	T	73,950	10.38
11.	Preparation of reinforced earth wall by providing required excavation & filling of subgrade in foundation, placement of leveling pad, facing panels and drainage bay, installing geo-grid, back filling and also providing in-situ mix concrete & reinforcements of required grade in accordance with the drawings & as directed by the Engineer.		LS		5.00
				Total	90.00

Table 16.4 Detail cost estimate for Conveyor Gallery – Haldia Terminal

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
1.	Mobilisation of all plant and equipment for the jetty construction and demobilisation of the same after completion of the works.	1	LS		1.00
2.	Construction of 600 mm dia bored cast-in-situ piles for berth with m.s. liner, boring in all types of soil /Hard strata stabilising unlined soil using any other approved method during excavation, providing reinforcement as per design/ drawing providing and placing M40 grade concrete by means of tremie or any other approved method, providing all necessary labour, materials, plant tools etc.				
i	Shift & set up piling plant & equipment at each pile location	59	No.	50,000	0.30
ii	Supply, fabricate and driving mild steel liner (8 mm thick) including transport, alignment, pitching in position as required	292	T	55,000	1.61
lii	Boring through all types of soil strata	3,056	m	3,500	1.07
iv	Cut & dress pile head to required lines & levels	59	No.	5,500	0.03
3.	Supply & placing in position design mix cement concrete grade M40 in pile shaft by means of tremie or any other approved method using 20 mm MSA including cost of all labour and materials but excluding the cost of steel reinforcement.	1,023	cum	8,000	0.82
4.	Supplying corrosion resistant deformed bars grade Fe 500, cutting, bending, tying with 1.5 mm dia annealed binding wire & placing in position reinforcement cage including cleaning, straightening, tack/ lap/ butt welding with approved electrodes, etc. with all labour and materials complete for piles.	123	T	68,100	0.84
5.	Supply & place in position to lines & levels cast in-situ design & precast units mix cement concrete of grade M40 for pile cap, deck slab and beams including providing formwork shuttering, machine mixing, compacting, curing of concrete, centering, including providing pockets, openings, recesses, champhering where required and rendering if required to give a smooth and even surface in any shape etc. complete as directed with all labour and materials but excluding the cost of steel reinforcement.	829	cum	8,000	0.66
6.	Supplying corrosion resistant deformed bars grade Fe 500, cutting, bending, tying with 1.5 mm dia annealed binding wire & placing in position reinforcement cage including cleaning, strengthening tack/ lap/ butt welding with approved electrodes, etc. with all labour and materials complete for deck slab and beams.	124	T	68,100	0.85
7.	Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as	35	cum	5,997	0.02

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
	per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, excluding the cost of centering, shuttering and finishing, including cost of curing, admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer-in charge.				
8.	Carrying out load test of pile including construction of test caps, accessories and dismantling same after test etc.	2	No.	10,00,000	0.20
9.	Supplying, fabricating, painting, welding, drilling, grouting & fixing in position etc. complete various miscellaneous items such as steel inserts, hand railing, coping fender, ladders, handhold, expansion joints, mooring rings, nut, bolts, washers, bituminous filler etc. in precast & in-situ concrete components in accordance with the drawings & as directed by the Engineer.		LS		1.00
Total					8.00

Table 16.5 Electrical distribution system & IT communication

Item No.	Description of Item	Qty.	Unit	Rate (Rs.)	Amount (Rs. in Cr.)
1.	Including supplying, installation, testing and commissioning of Power Distribution System (HT, LT switch gears, Transformer, capacitor banks, distribution boards, battery and battery charger & control room building safety equipment, etc.		LS		3.50
2.	Including supplying, installation, testing and commissioning of D.G. set		LS		0.50
3.	Including supplying, installation, testing and commissioning of illumination system (Indoor lighting / outdoor high mast)		LS		1.30
4.	Including supplying, installation, testing and commissioning of cables and cable trays with accessories		LS		5.10
5.	Including supplying, installation, testing and commissioning of Earthing and Lighting protection		LS		0.60
6.	Including supplying, installation, testing and commissioning of control equipments along with control cabling (PLC, CCTV, RIO and LED screens)		LS		2.90
7.	Communication and IT		LS		0.10
Total					14.00

16.4 Cost for Fly ash Silos

As discussed in section 10.1.8, cost for constructing 8 nos. silos with associated Conveyor System (BC-1 & BC-2) and controls for handling increased volume of flyash expected at the terminal in future, is given below.

S. No.	Item	Quantity	Unit	Rate (Rs.)	Capital Cost (Rs. in Cr.)
1.	EQUIPMENT				
1.1	Silo with foundation	8	No.	300,00,000	24.00
1.2	Conveyor system with fixed hopper & foundation		LS		11.30
	TOTAL COST				35.30

16.5 Cost for Rail Yard

The cost for rail connectivity in the terminal is given below.

S. No.	Item	Quantity	Unit	Rate (Rs.)	Capital Cost (Rs. in Cr.)
1.	RAIL CONNECTIVITY				
1.1	Earth works & Permanent way		LS		5.98
1.2	S&T and OHE		LS		2.43
1.3	Bridge over canal		LS		10.00
	TOTAL COST				18.41

16.6 Operation and maintenance (O&M) costs

Operation and maintenance costs have been calculated as described below:

The following considerations have been taken to the repair and maintenance costs.

- a) Civil works – 1 %
- b) Mechanical works – 3%
- c) Electrical works – 3 %
- d) Utilities – 3 %

The operation costs is calculated as mentioned in the Table 16.6 below.

Table 16.6 O&M Cost Estimates

S. No.	Item	Quantity	Unit	Rate	Unit	Annual Costs (Rs. in Crores)
A.	REPAIR AND MAINTENANCE COSTS					6.87
1.	Civil Works	334.82	Rs. in crores	1.00	% of Cost	3.35
2.	Mechanical and Electrical Works	113.20	Rs. in crores	3.00	% of Cost	3.39
3.	Utilities	4.35	Rs. in crores	3.00	% of Cost	0.13
B.	OPERATION COSTS					8.43
1.	Manpower Costs	4.00	Rs. in crores	1.00	LS	4.00
2.	Electricity					
	a. Electricity Consumption	186,670	units / month	6.50	Rs. / unit	1.45
	b. Fixed Charges on Demand Load	1,500	kVA / month	400.00	Rs. / unit	0.72
3.	Fuel cost	348,400	kL / annum	65	Rs. / kL	2.26
C.	TOTAL - (A) + (B)					15.30
D.	Admin, Insurance and Miscellaneous expenses					1.15
E.	TOTAL ANNUAL OPERATION AND MAINTENANCE COSTS - (C) + (D)					16.45

17 PROJECT IMPLEMENTATION SCHEDULE

17.1 General

The implementation schedule for development of Haldia MMT and its associated facilities are presented in this chapter. The probable time schedule for various activities from onset to completion of the project and commencement of operation are also discussed in this chapter.

17.2 Basic consideration for Implementation

For timely completion of the project, identification of major project components and sequential planning of various modules is very important for any project. The major components of Haldia MMT includes both the construction of offshore and onshore facilities, apart from installation of mechanical and electrical equipments.

The offshore facilities includes development of berth, approach trestles with steel girder and dredging whereas the development of onshore facilities includes site development, stockyard development, construction of buildings, storage shed, silos, development of internal roads, and providing utilities like water supply system, sewerage system, storm water drainage system and firefighting facility.

The schedule has been prepared with the presumption that IWAI will be developing the project through EPC contract.

17.3 Pre-development activities

The various activities to be carried out prior to commencement of construction, includes selection of site, preparation of Detailed Project Report, surveys and investigation, Social and Environmental Impact Assessment, preparation of tender document, Bid process management, selection of EPC contractor and award of work to the selected contractor. It is assessed that the lead time required to carry out the bid process management and selection of EPC contractor would be 3 months.

The schedule for the project also depends on the schedule of various Statutory Clearances required from different Statutory Agencies for the development of the project and therefore, all the requirement clearances need to be in place before the start of the construction activities.

17.4 Construction activities

The following are the major activities involved for effective completion, which involves engineering, procurement, construction and commencement of operational activities.

- Detailed Engineering
- Site development including site clearance, demolition of boundary wall and earth filling

- Development of stockyard
- Construction of silos with conveyor gallery for handling fly ash
- Construction of covered storage shed for handling fertilizer
- Construction of building, internal road, water supply system, storm water drainage system, electrical, firefighting system and other utilities
- Construction of Approach Trestle including earth reinforced wall, and steel girder for crossing over ammonia pipeline.
- Construction of berth of length 465m and
- Supply, installation and commission of barge loaders, mobile harbour cranes and other equipments

Implementation schedule indicating timelines is presented in figure below:

18 FINANCIAL AND ECONOMIC ANALYSIS

18.1 Introduction

Financial feasibility is a key determinant in a business oriented investment decision. For the projects of public/national interest like development of Haldia Multi-modal Terminal, the viability of the project depends on the economic feasibility which acts as the deciding factor. In this note, economic and financial viability for the development of Haldia Multimodal terminal has been carried out and presented.

18.2 General Assumptions

Following are the key assumptions considered in the financial model.

- The inputs are taken from the technical studies and traffic study carried out for the project
- The inflation rate of 5% per annum is considered in the model
- Depreciation rates and tax rates applicable to infrastructure projects have been taken as per the guidelines of Companies Act and Income Tax Act.

18.3 Construction Period and Project Life

The construction start date is July 2017 and project life is considered as 30 years. The operation may be assumed as October 2020.

Table 18.1 Project Development Schedule

Construction Start Date	July 2017
Operation Start	October 2020
Project Life considered (Years)	30

18.4 Means of Finance

The financial analysis is carried out assuming debt-equity ratio as 70:30 for the entire capital expenditure that will be invested by the Client.

18.5 Income Tax Calculations

IWAI is registered with the Income Tax Department, Ghaziabad under section 12 A (a) and has got exemption of income tax under section 10(23) (c) (iv) of Income Tax Act. Therefore, income tax is not considered in the Financial Analysis.

18.6 Project Cost

The estimated cost of the project is given below.

Table 18.2 Project Cost

S. No.	Description	Capital Cost (Rs. in Cr.)
1.	On Shore Civil Works	59.83
2.	Off Shore Civil Works	275.00
3.	Mechanical Works	99.20
4.	Electrical Works & It Communication	14.00
5.	Utilities	5.30
	Total	453.33

18.7 Revenue Estimation

Prevailing IWAI charges

The following Tariff charges published by Inland Waterways Authority of India (IWAI) have been considered for Haldia Terminal.

Table 18.3 Storage Charges

Storage Charges	Unit	Open Storage	Closed Storage
First 3 days	INR/Ton/day	0	0
From 4th - 15th day	INR/Ton/day	12	15
From 16th - 30th day	INR/Ton/day	22	27
From 31st day onwards	INR/Ton/day	44	54

Table 18.4 Cargo Handling Charges

Type of Cargo	Unit	Handling Charges
Construction Materials (Bulk)	Rs/MT	170
Construction Materials (Bagged)	Rs/MT	210
Consumer good	Rs/MT	170
Containers	Rs/TEU	4500
Food and Food Stuff	Rs/MT	170
Project Cargo	Rs/MT	170

Table 18.5 Berthing Charges

Vessel related charges		
Berthing Charges	Rs/ 24hrs	1000

18.8 Expenses

Expenses would be incurred on day to day basis which includes Operating expenses, Administration expenses, Repairs & Routine Maintenance expenses, Expenses on electricity, Insurance premium, Salaries etc. The operation & maintenance cost is considered as mentioned in Chapter 19.

18.9 Key Results - Financial Analysis

Based on the financial analysis carried out taking into consideration of the above mentioned factors, the financial IRR has worked out to be **6.40%** for development of Haldia terminal.

Table 18.6 Financial IRR for development of Haldia Terminal

Year			1	5	10	15	20	25	30
FY	2018	2019	2021	2025	2030	2035	2040	2045	2050
Cargo in Million Tonnes			1.80	2.03	2.28	2.56	2.81	3.08	3.08
Revenues (Rs in Million)									
Cargo Handling Revenue			345.16	438.16	569.02	741.46	942.09	1198.56	1389.46
Storage Revenue			21.47	24.17	28.02	32.48	37.66	43.65	50.61
Vessel Related Revenue			0.74	0.88	1.08	1.33	1.63	1.99	2.31
Total Income			367.38	463.22	598.12	775.28	981.38	1244.20	1442.37
Expenses (Rs in Million)									
Electricity Cost			26.58	32.58	41.03	51.95	64.64	80.63	93.47
Fuel Cost			25.49	28.69	33.26	38.56	44.70	51.82	69.23
Other Labour Cost			10.96	15.03	21.49	30.83	43.12	60.40	77.09
Manpower Cost			48.62	59.10	75.43	96.26	122.86	156.81	200.13
Insurance @ 0.75% of Project cost			3.82	4.30	4.98	5.78	6.70	7.76	9.00
Maintenance Cost			77.38	87.09	100.96	117.04	135.68	157.29	182.34
Total Expense			192.85	226.78	277.15	340.41	417.70	514.71	631.26
EBITDA			174.53	236.44	320.97	434.87	563.68	729.50	811.10
Depreciation			343.74	228.40	146.35	99.76	71.21	52.45	39.41
EBIT			(169.21)	8.03	174.62	335.10	492.46	677.05	771.70
Interest	348	348	322	214	80	0	0	0	0
PBT	(348.33)	(348.33)	(490.75)	(206.33)	94.24	335.10	492.46	677.05	771.70
CAPEX	(2261.90)	(2261.90)							
Salvage Value									590.05
Cash Flow before Tax	(2261.90)	(2261.90)	174.53	236.44	320.97	434.87	563.68	729.50	1401.15
IRR	6.40%								
NPV	-2043.03								

18.10 Economic Analysis

In this section, economic analysis has been carried out for development of Haldia terminal based on various socio-economic factors as mentioned below.

18.10.1 Approach and Methodology

The economic analysis of the project has been evaluated based on the following scenarios.

‘With Project’ Scenario and

‘Without Project’ Scenario

Both ‘with project’ and ‘without project’ scenarios have been quantified over the full life of the project. Also the ‘incremental situation’ or ‘Benefit from the project’ have been arrived by comparing the ‘with project’ scenario and ‘without project’ scenario wherein in the former case, the cargoes will be transported through barges and in later case, cargoes will be transported through road & rail.

18.10.2 Economic Factors considered

Following are the factors that are considered to carry out the economic analysis for this project.

- Energy Consumption
- Air Pollution
- Noise Pollution
- Soil and Water Pollution
- Accidents

18.10.3 Energy Consumption

Transport infrastructure plays a key role in the economic development of a country and an efficient transport sector, particularly for transportation of bulk goods is vital for development of any country. As per the World Bank study, Indian logistics cost is one of the highest in the world. As per this study, the logistics cost is 6% to 8% of the total value of goods in developing countries, 10% of the total values of goods in China whereas the cost of logistics in India is 14% of the total value of goods. By using the energy efficient mode of transportation, the logistics cost can be drastically reduced which in turn will boost the economy of the country.

In this section, a comparative study on the energy performance of inland shipping versus that of other land transportation modes has been carried out.

The energy consumption pattern of waterways, roadways and railways is illustrated in the below table, which is based on the ‘Eleventh Working Group Report on Shipping and IWT’ and ‘Working Group Report on Railways’.

Table 18.7 Energy Consumption - Waterways, Road and Rail

Energy Consumption	Waterways		Road		Rail	
	Mj/t km	litre/Tkm	Mj/t km	litre/Tkm	Mj/t km	litre/Tkm
11th Working Group Report on shipping and IWT (Based on EU: Progress Report on short sea shipping 1999)		0.0048		0.0313		0.0089
Report of Working Group on Railways-2012			1.3550	0.0350	0.2550	0.0066
'Energy Consumption' considered for the Study		0.0048		0.0313		0.0089

For the present study, the energy consumption pattern published by '11th Working Group Report on shipping and IWT' has been considered for further analysis.

The benefit from the project pertaining to the energy consumption of all the three modes of transportation viz. waterways, roadways and railways has been forecasted and presented in Table 18.8.

Table 18.8 Energy Consumption – Economical Benefit

Energy Consumption	FY	2021	2025	2030	2035	2050
Without Project Scenario						
Road Transportation	1.00					
Road - Energy Consumption	Rs/ Tkm	2.19	2.47	2.86	3.31	5.16
Road- Total Energy Consumption	in Rs. Mn	1,185.74	1,505.23	1,954.76	2,547.16	4,773.21
Rail Transportation						
Rail Transportation	0.00					
Rail - Energy Consumption	Rs/ Tkm	0.62	0.70	0.81	0.94	1.47
Rail- Total Energy Consumption	in Rs.	0.00	0.00	0.00	0.00	0.00
Total	in Rs. Mn	1,185.74	1,505.23	1,954.76	2,547.16	4,773.21
With Project Scenario						
Waterways Transportation						
Waterways - Energy Consumption Cost	Rs/ Tkm	0.34	0.38	0.44	0.51	0.79
Waterways- Total Energy Consumption Cost	in Rs. Mn	537.56	682.40	886.20	1,154.77	2,163.96
Incremental Benefit from the project	in Rs. Mn	648.18	822.83	1,068.56	1,392.39	2,609.25

18.10.4 External Costs

Transport contributes significantly to economic growth. Unfortunately, most forms of transport do not only affect society in a positive way but also give rise to side effects. In contrast to the benefits, the cost of these effects of transport are generally not borne by the transport users and hence not taken into account when they make a transport decision. Therefore these effects are generally labelled as external effects. The various cost associated with the external effects are described below.

18.10.4.1 Air Pollution

Transport related air pollution causes damages to humans, biosphere, soil, water, buildings and materials. The most important pollutants are the following:

- Particulate matters
- Nitrogen oxides
- Sulphur oxide
- Ozone
- Volatile organic compounds

Several studies have been carried out to estimate the level of impact caused due to the air pollution triggered by road, rail and inland shipping. Subsequently, the cost factor was arrived for the air pollution by critically evaluating various cost elements like valuation of human life, market prices for crops, valuation of building damages, and valuation of long term risks in biosphere. The external cost of air pollution arrived by various studies are listed below:

Table 18.9 External Costs of Air Pollution - Waterways, Roadways and Railways

Inland Water Transportation	Unit	Cost	Cost (in Rs/tkm)
Total Transportation System Study - Planning Commission Report	Rs / t km	0.0300	0.0300
Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0040	0.0011
le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm		
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0014	0.0004
Cost considered for the study			0.0300
Roadway	Unit	Cost	Cost (in Rs/tkm)
Total Transportation System Study - Planning Commission Report	Rs / t km	0.2020	0.2020
Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0122	0.0033

le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm	0.0329	0.0090
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0096	0.0026
Cost considered for the study			0.2020
Railway	Unit	Cost	Cost (in Rs/tkm)
Total Transportation System Study - Planning Commission Report	Rs / t km	0.0366	0.0366
Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0122	0.0033
le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm	0.0329	0.0090
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0096	0.0026
Cost considered for the Study			0.0366

Based on the traffic projection, the external cost of air pollution is estimated for the both the scenarios 'With Project' and 'Without project' which are captured in Table 18.10.

Table 18.10 Air Pollution – Economical Benefit

Air Pollution	FY	2021	2025	2030	2035	2050
Without Project' Scenario						
Road Transportation	1.00					
Unit Cost	Rs/ Tkm	0.20	0.23	0.26	0.31	0.48
Total cost	in Rs. Mn	109.32	138.78	180.22	234.84	440.07
Rail Transportation	0.00					
Unit Cost	Rs/ Tkm	0.04	0.04	0.05	0.06	0.09
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Without Project' Scenario - Total cost	in Rs. Mn	109.32	138.78	180.22	234.84	440.07
With' Project Scenario						
Waterways Transportation						
Unit Cost	Rs/ Tkm	0.03	0.03	0.04	0.05	0.07
Total cost	in Rs. Mn	49.03	62.24	80.83	105.33	197.38
Incremental Benefit from the project	in Rs. Mn	60.29	76.53	99.39	129.51	242.69

18.10.4.2 Noise Pollution

Noise costs consist of costs for annoyance and health. The external cost of noise pollution arrived by various studies are listed in the below table. The cost factors for noise pollution are available only based on European conditions and are mentioned in Euros. Same has been converted to Rupees based on the purchasing power parity as mentioned in the Key Assumptions.

Table 18.11 External Cost of Noise Pollution

Inland Water	Unit	Cost	Cost (in Rs/tkm)
Union Internationale des Chemins de fer (PIANC)	€/Tkm	Nil	Nil
le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm	Nil	Nil
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	Nil	Nil
Cost considered for the study			0.00
Roadways	Unit	Cost	Cost (in Rs/tkm)
Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0119	0.0032
le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm	-	-
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0018	0.0005
Cost considered for the Study			0.0012
Railways	Unit	Cost	Cost (in Rs/tkm)
Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0044	0.0012
le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm	0.0010	0.0003
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0035	0.0009
Cost considered for the study			0.0008

The incremental cost benefit for the project due to the external cost of noise pollution is estimated in Table 18.12.

Table 18.12 Noise Pollution – Economical Benefit

Noise Pollution	FY	2021	2025	2030	2035	2050
Without Project' Scenario						
Road Transportation	1.00					
Unit Cost	Rs/ Tkm	0.001200	0.001351	0.001566	0.001815	0.002828
Total cost	in Rs. Mn	0.65	0.82	1.07	1.40	2.61
Rail Transportation	0.00					
Unit Cost	Rs/ Tkm	0.00080	0.00090	0.00104	0.00121	0.00189
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Without Project' Scenario - Total cost	in Rs. Mn	0.65	0.82	1.07	1.40	2.61
With' Project Scenario						
Waterways Transportation						
Unit Cost	Rs/ Tkm	0	0	0	0	0
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Incremental Benefit from the project	in Rs. Mn	0.65	0.82	1.07	1.40	2.61

18.10.4.3 Soil and Water Pollution

The external cost of soil & water pollution arrived by various studies and it is observed that only roadways tends to produce soil & water pollution as mentioned.

Table 18.13 External Cost of Soil and Water Pollution

Roadways	Unit Rs/t km	Cost	Cost in Rs.
Union Internationale des Chemins de fer (PIANC)	€/Tkm	-	-
le Groupe d'Economie des Transports de l'ULB (PIANC)	€/ Tkm	-	-
Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0020	0.0005
Cost considered for the Study			0.0005

The incremental cost benefit for the project due to the external cost of soil & water pollution is estimated in Table 18.14.

Table 18.14 Soil & Water Pollution – Economical Benefit

Soil and Water Pollution	FY	2021	2025	2030	2035	2050
Without Project' Scenario						
Road Transportation	1.00					
Unit Cost	Rs/ Tkm	0.0005	0.0006	0.0007	0.0008	0.0012
Total cost	in Rs. Mn	0.27	0.34	0.45	0.58	1.09
Rail Transportation	0.00					
Unit Cost	Rs/ Tkm	0.00	0.00	0.00	0.00	0.00
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Without Project' Scenario - Total cost	in Rs. Mn	0.27	0.34	0.45	0.58	1.09
With' Project Scenario						
Waterways Transportation						
Unit Cost	Rs/ Tkm	0.00	0.00	0.00	0.00	0.00
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Incremental Benefit from the project	in Rs. Mn	0.27	0.34	0.45	0.58	1.09

18.10.4.4 Reduction in Accidents

The external cost for accident considered for three modes of transportation is mentioned below.

Table 18.15 Accident Cost - Waterways, Roadways and Railways

Accidents		Unit	Cost	Cost (in Rs/tkm)
Waterways	Total Transportation System - Planning commission	Rs./Tkm	Nil	Nil
	Union Internationale des Chemins de fer (PIANC)	€/Tkm	Nil	Nil
	le Groupe d'Economie des Transports de l'ULB (PIANC)	€/Tkm	Nil	Nil
	Bundesamt fur Umweltschutz (PIANC)	€/Tkm	Nil	Nil
	Cost considered for the Study		Nil	Nil
Roadways	Total Transportation System - Planning commission	Rs./Tkm	0.0620	0.0620
	Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0208	0.0057
	le Groupe d'Economie des Transports de l'ULB (PIANC)	€/Tkm	0.0353	0.0096
	Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0091	0.0025
	Cost considered for the Study			0.0620
Railways	Total Transportation System - Planning commission	Rs./Tkm	0.0010	0.0010
	Union Internationale des Chemins de fer (PIANC)	€/Tkm	0.0008	0.0002
	le Groupe d'Economie des Transports de l'ULB (PIANC)	€/Tkm	0.0005	0.0001
	Bundesamt fur Umweltschutz (PIANC)	€/Tkm	0.0006	0.0002
	Cost considered for the study			0.0010

The incremental cost benefit for the project due to the external cost of reduction in accidents is estimated in Table 18.16.

Table 18.16 Reduction in Accident Cost– Economical Benefit

Accidents	FY	2021	2025	2030	2035	2050
Without Project' Scenario						
Road Transportation	1.00					
Unit Cost	Rs/ Tkm	0.06	0.07	0.08	0.09	0.15
Total cost	in Rs. Mn	33.55	42.59	55.31	72.08	135.07
Rail Transportation	0.00					
Unit Cost	Rs/ Tkm	0.00	0.00	0.00	0.00	0.00
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Without Project' Scenario - Total cost	in Rs. Mn	33.55	42.59	55.31	72.08	135.07
With' Project Scenario						
Waterways Transportation						
Unit Cost	Rs/ Tkm	0.00	0.00	0.00	0.00	0.00
Total cost	in Rs. Mn	0.00	0.00	0.00	0.00	0.00
Incremental Benefit from the project	in Rs. Mn	33.55	42.59	55.31	72.08	135.07

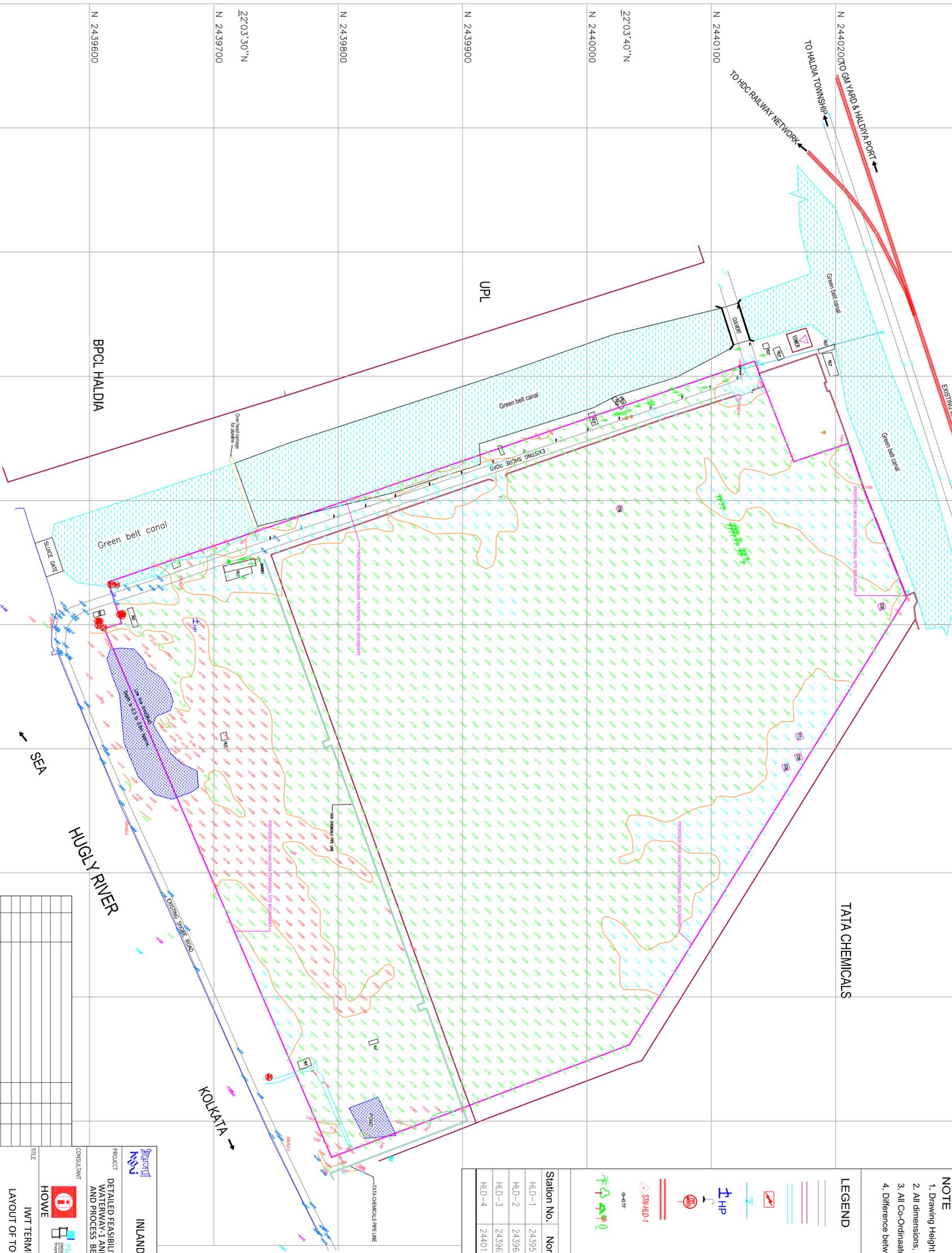
18.10.5 Economic IRR

Taking in the consideration of the economic benefits from the projects as worked out above, the economic IRR has been worked out to be 20.82% for development of Haldia terminal as given in Table 18.17, which indicates that the project is economically viable.

Table 18.17 Economical IRR for development of Haldia Terminal

S.No.	Description	FY	2018	2019	2021	2025	2030	2035	2040	2045	2050
		Unit			1	5	10	15	20	25	30
A	Cargo in Million Tonnes	Million Tonnes			1.80	2.03	2.28	2.56	2.81	3.08	3.08
B	Benefit from the project	Rs Million									
1	Revenue	Rs Million			367.38	463.22	598.12	775.28	981.38	1244.20	1442.37
2	Salvage Value	Rs Million									590.05
3	Economic Benefit from the project	Rs Million			742.94	943.12	1224.78	1595.96	2027.79	2579.82	2990.72
4	Total Benefit from the project	Rs Million			1110.31	1406.34	1822.90	2371.24	3009.17	3824.02	5023.13
C	Operation Expenses	Rs Million			192.85	226.78	277.15	340.41	417.70	514.71	631.26
D	EBIDTA	Rs Million			917.47	1179.56	1545.75	2030.83	2591.47	3309.31	4391.87
E	CAPEX	Rs Million	-2,261.90	-2,261.90							
F	Cash Flow (Before Tax)	Rs Million	-2,261.90	-2,261.90	917.47	1179.56	1545.75	2030.83	2591.47	3309.31	4391.87
G	Economic IRR	20.82%									

N 2440300	E 617300	E 617400	E 617500	E 617600	E 617700	E 617800	E 617900	E 618000	E 618100	E 618200
E 617200	22°03'50"N	E 617300	E 617400	E 617500	E 617600	E 617700	E 617800	E 618000	E 618100	E 618200



NOTE

1. Drawing Height in metres and decimetres, reduced to Chart Datum
2. All dimensions, Co-ordinates, elevations are in metres and decimetres.
3. All Co-Ordinates are in WGS 1984 grid system
4. Difference between Mean Sea Level (MSL) & Chart Datum (CD) is 3.23m.

LEGEND

	ROAD EDGE
	COMPOUND WALL
	CANAL
	ELECTRIC JUNCTION BOX
	ELECTRIC POWER LINE
	HAND PUMP
	LAMP POST
	PIPE MARKER
	RAILWAY TRACK
	REFERENCE SURVEY POINT
	TRANSFORMER
	GROUND LEVEL

HORIZONTAL CONTROL STATION

Station No.	Northing	Easting	R.L.	Remarks
HD-1	2439573.5616	617698.1898	9.198	ON SECURITY CABIN FDN
HD-2	2439634.9229	617863.8190	9.119	ON ROAD
HD-3	2439672.0100	617657.2278	8.218	ON ROAD
HD-4	2440121.5280	617517.4944	10.890	ON ROAD

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT
 DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (IAL VIKAS PROJECT)

CONSULTANT
 HOWE

NAME	SION	DATE
BENI	SKN	30-05-2016
CHD	HM/SA	30-05-2016
APD	S DARE	30-05-2016

TITLE
 IWT TERMINAL AT HALDIA
 LAYOUT OF TOPOGRAPHY SURVEY

JOB. NO. I-525
PRG. NO. HT-201

COORDINATE SYSTEM USED:
 ENTER CO-ORD SYSTEM HERE

SCALE: 1:1600

UNIT:

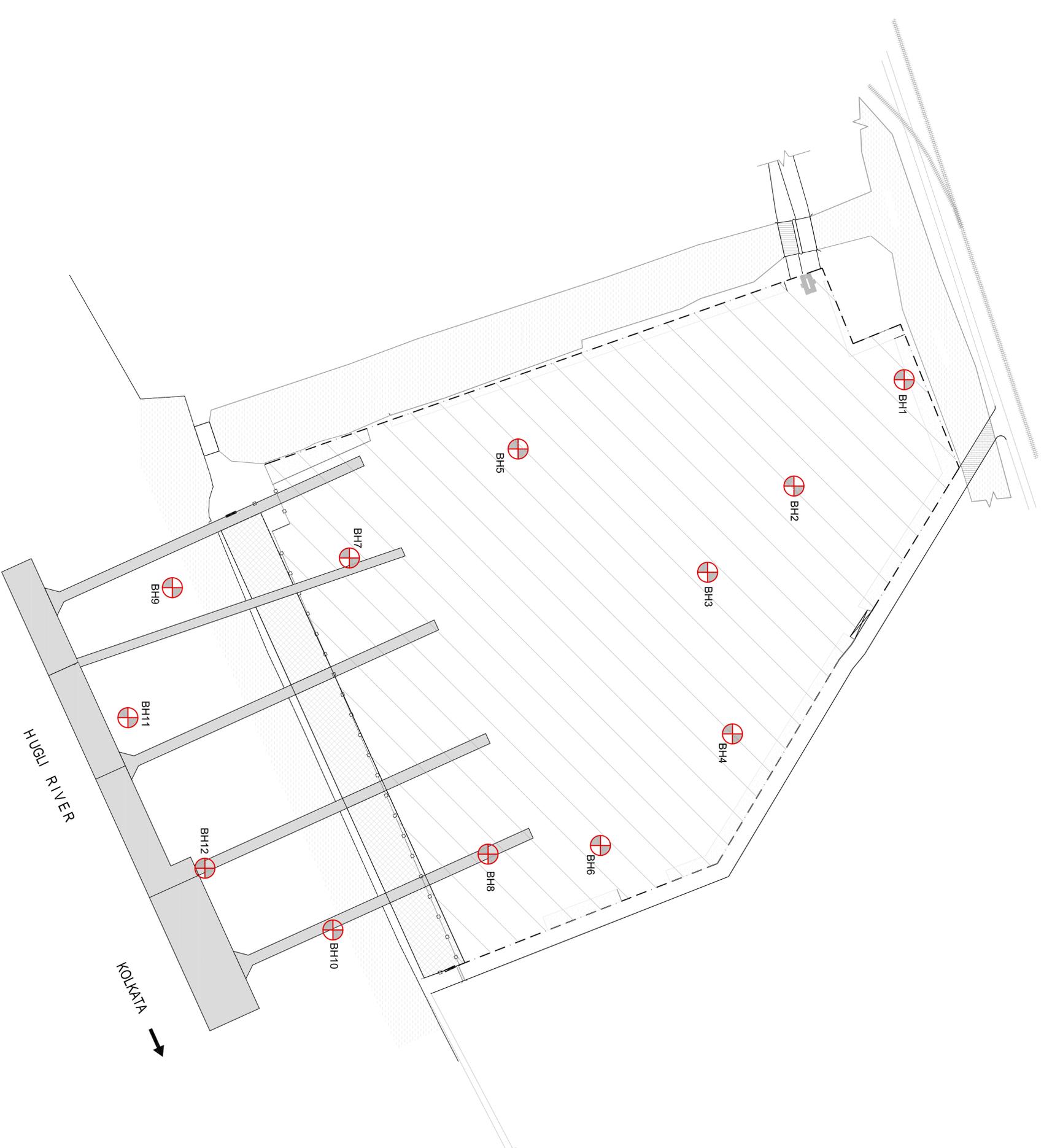
Size: A1

REV.: 0

REVISIONS:

REV.	DATE	DESCRIPTION	DRN.	CHD.	APD.

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CO-ORDINATE IN UTM			
BOREHOLE MARKED	EASTING	NORTHING	
BH1	617591.00	2440210.60	
BH2	617689.20	2440109.00	
BH3	617768.80	2440029.40	
BH4	617918.00	2440052.30	
BH5	617655.00	2439854.70	
BH6	618021.00	2439930.60	
BH7	617755.60	2439699.20	
BH8	618029.00	2439827.00	
BH9	617783.00	2439536.00	
BH10	618099.00	2439684.00	
BH11	617903.00	2439495.00	
BH12	618042.00	2439566.00	



INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (PwC PROJECTS) | **HR Wallingford**

REV	DATE	DESCRIPTION	DRN	CHD	APD

TITLE: **IWT TERMINAL AT HALDIA LOCATION PLAN OF BOREHOLES**

JOB. NO.: I-525 | DRG. NO.: HT-203

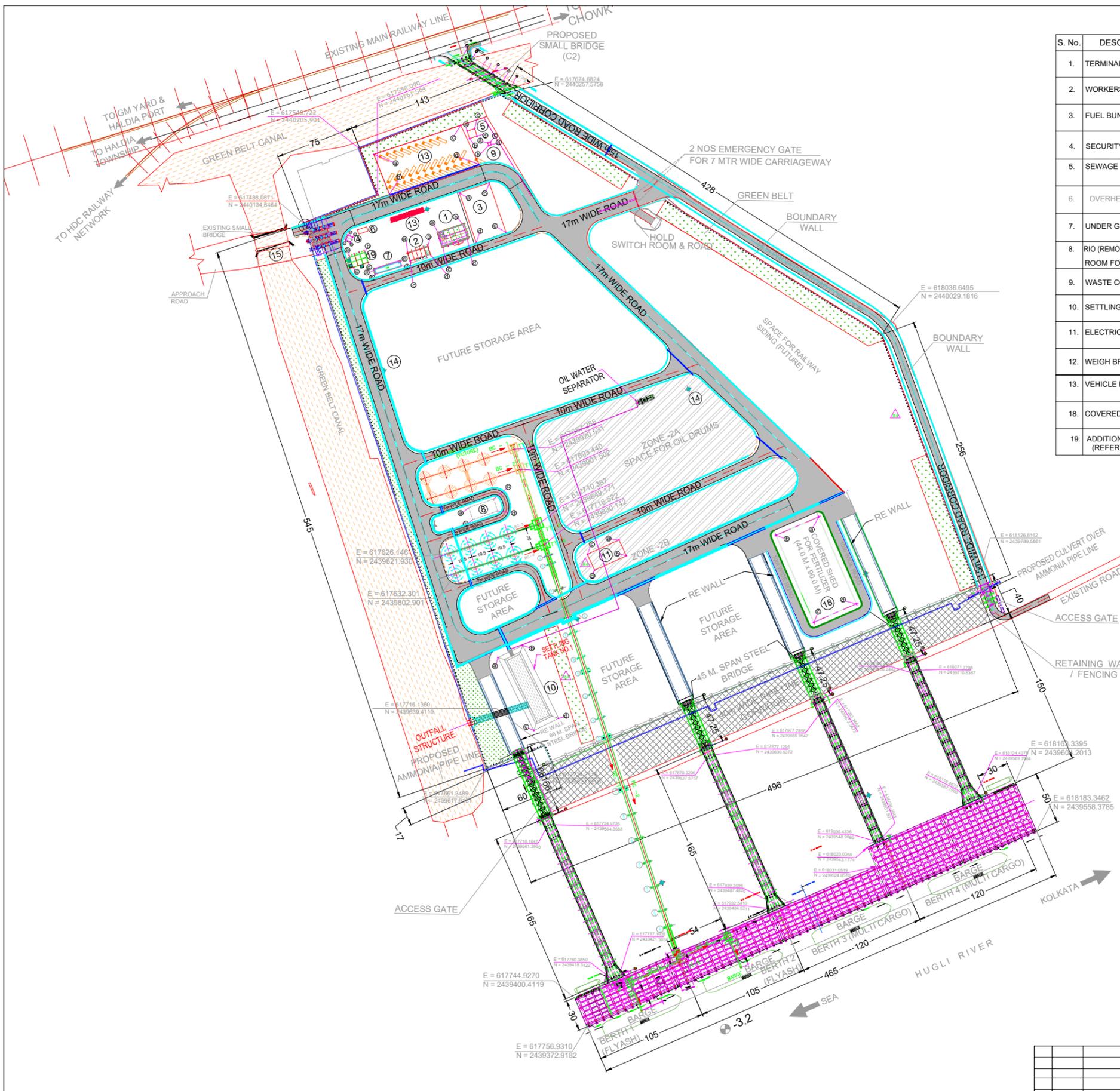
COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1:2000 | Size: A1 | REV: 0

HUGLI RIVER

SEA

KOLKATA



PLANT LAYOUT
SCALE 1:2000

CHART OF COORDINATE FOR DIFFERENT UNITS

S. No.	DESCRIPTION	a	b	c	d	AREA
1.	TERMINAL ADMINISTRATION BUILDING	X = 617615.454 Y = 2440125.667	X = 617638.834 Y = 2440133.636	X = 617619.648 Y = 2440113.362	X = 617643.027 Y = 2440121.331	537.94 m ²
2.	WORKERS AMENITY BUILDING	E = 617586.771 N = 2440106.421	E = 617605.755 N = 2440112.715	E = 617589.132 N = 2440099.302	E = 617608.115 N = 2440105.596	162.40 m ²
3.	FUEL BUNKER	E = 617635.588 N = 2440163.654	E = 617663.993 N = 2440173.307	E = 617680.081 N = 2440125.966	E = 617651.676 N = 2440116.313	1500.00 m ²
4.	SECURITY OFFICE	E = 617534.344 N = 2440121.460	E = 617532.276 N = 2440117.184	E = 617528.045 N = 2440119.231	E = 617530.113 N = 2440123.507	25.00 m ²
5.	SEWAGE TREATMENT PLANT	E = 617643.113 N = 2440222.427	E = 617645.371 N = 2440215.276	E = 617650.265 N = 2440224.686	E = 617652.523 N = 2440217.533	56.24 m ²
6.	OVERHEAD WATER TANK	E = 617538.912 N = 2440128.568	E = 617540.263 N = 2440124.591	E = 617547.623 N = 2440131.528	E = 617548.974 N = 2440127.551	38.64 m ²
7.	UNDER GROUND WATER RESERVOIR	E = 617555.509 N = 2440090.895	E = 617556.653 N = 2440087.272	E = 617579.129 N = 2440098.353	E = 617580.273 N = 2440094.730	134.51 m ²
8.	RIO (REMOTE INPUT OUTPUT / COMPRESSOR ROOM FOR ASH HANDLING)	E = 617644.481 N = 2439865.233	E = 617648.363 N = 2439853.878	E = 617668.138 N = 2439873.319	E = 617672.019 N = 2439861.964	300 m ²
9.	WASTE COLLECTION CENTRE	E = 617662.604 N = 2440211.083	E = 617663.395 N = 2440208.580	E = 617665.108 N = 2440211.873	E = 617665.898 N = 2440209.370	9.00 m ²
10.	SETTLING TANK NO.1	E = 617672.295 N = 2439723.036	E = 617695.755 N = 2439734.587	E = 617706.373 N = 2439653.820	E = 617729.833 N = 2439665.371	2017.47 m ²
11.	ELECTRICAL SUBSTATION	E = 617787.269 N = 2439834.552	E = 617794.072 N = 2439819.520	E = 617757.204 N = 2439820.947	E = 617764.007 N = 2439805.915	544.5 m ²
12.	WEIGH BRIDGE CONTROL ROOM	E = 617495.203 N = 2440134.865	E = 617499.685 N = 2440136.280	E = 617496.618 N = 2440130.383	E = 617501.100 N = 2440131.798	25.00 m ²
13.	VEHICLE PARKING AREA	E = 617554.393 N = 2440200.169	E = 617569.481 N = 2440162.086	E = 617636.979 N = 2440227.775	E = 617654.264 N = 2440190.739	3601.47 m ²
18.	COVERED SHED FOR FERTILIZER	E = 617976.554 N = 2439856.476	E = 617936.206 N = 2439838.927	E = 617972.102 N = 2439756.395	E = 618012.451 N = 2439773.945	3960.00 m ²
19.	ADDITIONAL ELECTRICAL SUBSTATION (REFER SPECIAL NOTE NO. - 01)	E = 617531.691 N = 2440102.586	E = 617545.929 N = 2440107.307	E = 617534.838 N = 2440093.094	E = 617549.076 N = 2440097.816	156.55 m ²

S. No.	DESCRIPTION	AREA
3.	ZONE -2A	19001 m ²
4.	ZONE -2B	6703 m ²

LEGENDS:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYOR
PC	PIPE CONVEYOR
FS	FLY ASH SILO
BL	FIXED BARGE LOADER

NOTES:

1. ALL DIMENSIONS ARE IN METER
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (PMCA PROJECTS PRIVATE LIMITED) & HR Wallingford

NAME	SIGN	DATE
DRN	SKN	
CHD	HM/SKA	
APD	S DHAR	

TITLE: **IWT TERMINAL AT HALDIA - LAYOUT PLAN OF TERMINAL FACILITIES AT HALDIA (ALTERNATIVE-1) RECOMMENDED LAYOUT**

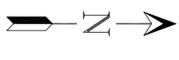
JOB. NO. I-525 DRG. NO. HT-204

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE - 1:2000 Size: A1 REV. 2

REV	DATE	DESCRIPTION	DRN	CHD	APD
2	26.02.20		VP	AM	AM
1	11.02.20		VP	AM	AM

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LEGEND:

S.NO.	DESCRIPTION
1	TERMINAL ADMINISTRATION BUILDING
2	WORKERS AMENITY BUILDING
3	FUEL BUNKER
4	SECURITY OFFICE
5	SEWAGE TREATMENT PLANT
6	OVERHEAD WATER TANK
7	UNDERGROUND RESERVOIR
8	RIO (REMOTE INPUT OUT PUT)/ COMPRESSOR ROOM FOR ASH HANDLING
9	WASTE COLLECTION CENTER
10	SETTLING POND
11	ELECTRICAL SUB STATION
12	WEIGH BRIDGE CONTROL ROOM
13	VEHICLE PARKING AREA
14	HIGHMAST LIGHTING TOWERS
15	GATE HOUSE COMPLEX

LEGEND:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYORS
PC	PIPE CONVEYORS
RE	RECLAIMER
WT	WAGON TIPLER

NOTES:
 1. ALL DIMENSIONS ARE IN METER
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

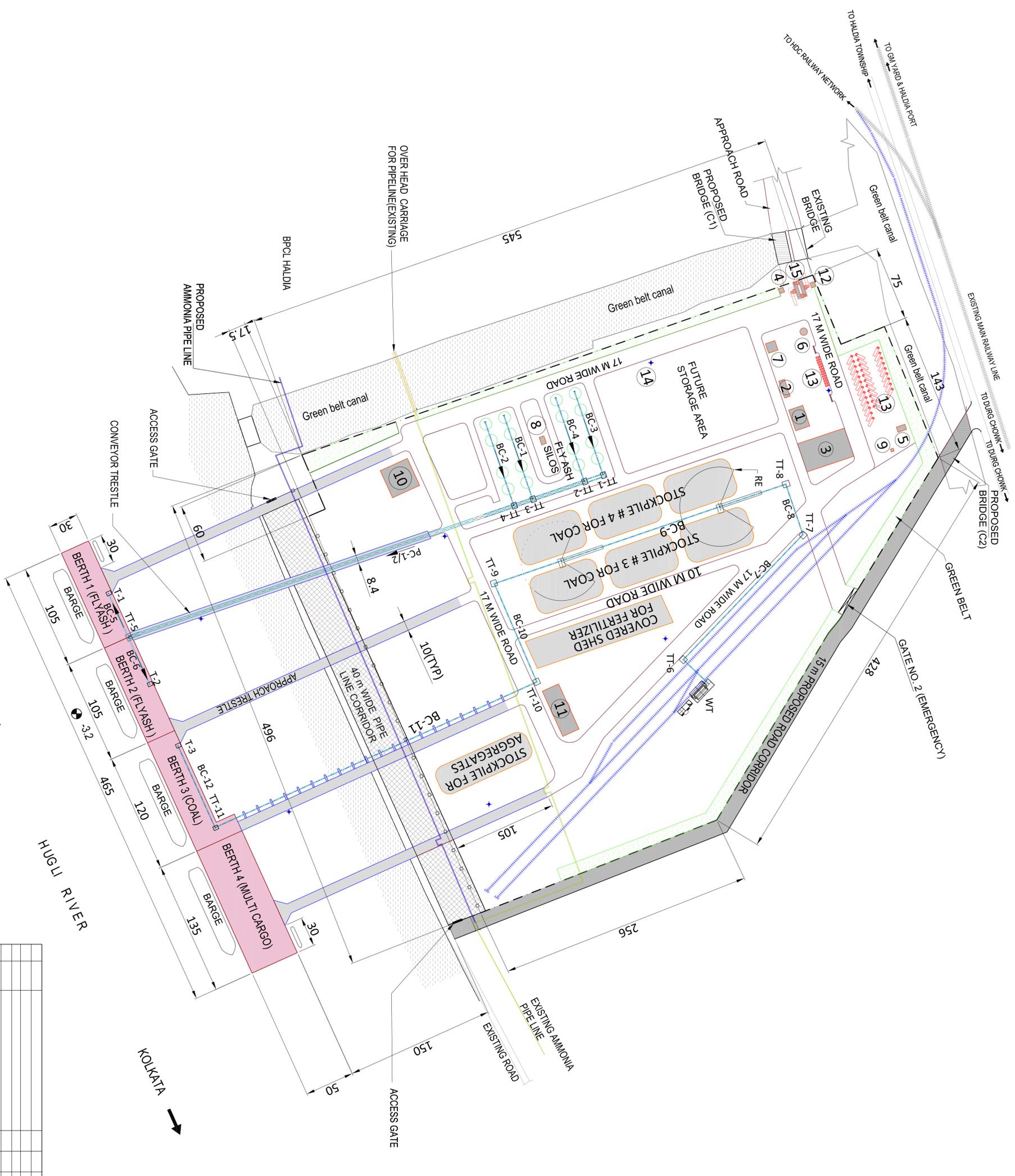
INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SRN	DATE
HOWE	BREN	SKN	30-05-2016
	CHD	HNV/SNA	30-05-2016
HOWE	APD	S DARR	30-05-2016

TITLE	JOB. NO.	PRG. NO.
IWT TERMINAL AT HALDIA- LAYOUT PLAN OF TERMINAL FACILITIES AT HALDIA (ALTERNATIVE-2)	I-525	HT-205

REV.	DATE	DESCRIPTION	DRN	CHD	APD



ALTERNATIVE-2 FLYASH, COAL & AGGREGATES

SEA ← → KOLKATA

LEGEND:

S.NO.	DESCRIPTION
1	TERMINAL ADMINISTRATION BUILDING
2	WORKER'S AMENITY BUILDING
3	FUEL BUNKER
4	SECURITY OFFICE
5	SEWAGE TREATMENT PLANT
6	OVERHEAD WATER TANK
7	UNDERGROUND RESERVOIR
8	GATE HOUSE COMPLEX
9	WASTE COLLECTION CENTER
10	SETTLING POND
11	ELECTRICAL SUB STATION
12	WEIGH BRIDGE CONTROL ROOM
13	VEHICLE PARKING AREA
14	HIGHMAST LIGHTING TOWERS

LEGEND:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYORS
S/R	STACKER/RECLAIMER
WT	WAGON TIPPLER

NOTES:
 1. ALL DIMENSIONS ARE IN METER
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

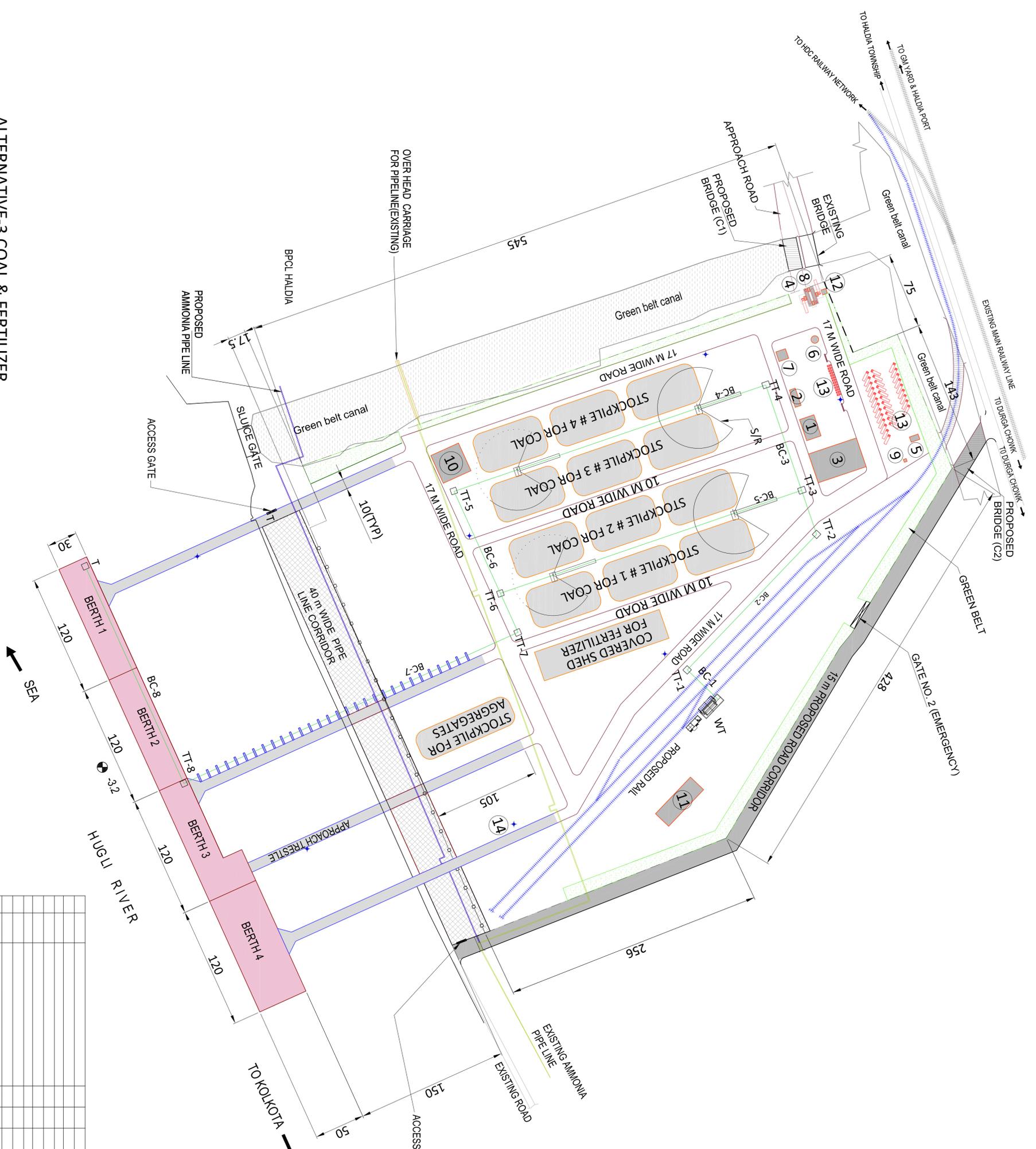
PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

NAME	SON	DATE
BREN I	SKN	30-05-2016
CHD	HM/SHA	30-05-2016
APD	S DHAR	30-05-2016

TITLE: IWT TERMINAL AT HALDIA - LAYOUT PLAN OF TERMINAL FACILITIES AT HALDIA (ALTERNATIVE-3)
 JOB. NO. I-525
 ORG. NO. HT-206

REV.	DATE	DESCRIPTION	DRN	CHD	APD

ALTERNATIVE-3 COAL & FERTILIZER



CONSULTANT: HR Wallingford

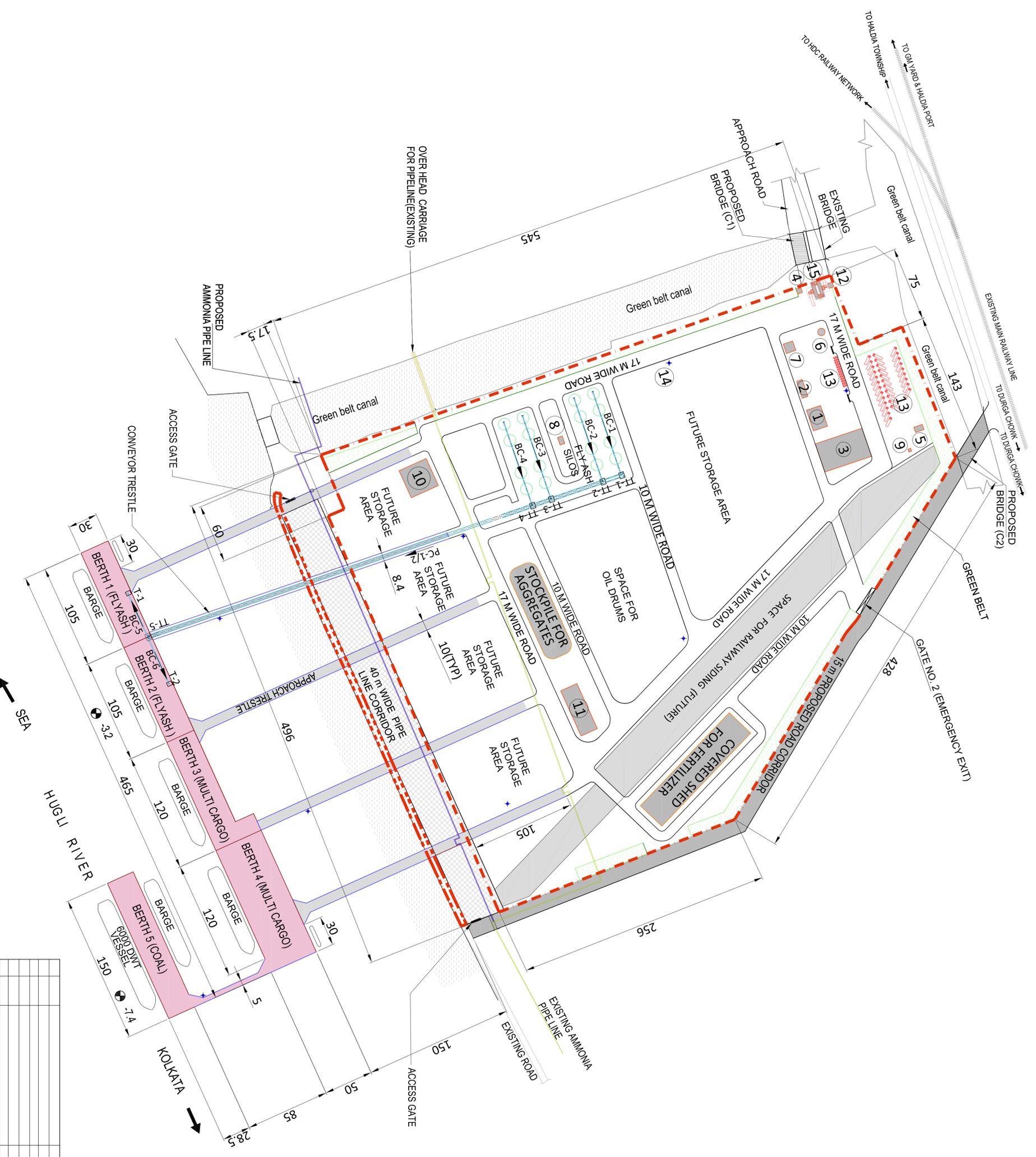
PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1:2000

Size: A1

REV. 0



LEGEND:

S.NO.	DESCRIPTION
1	TERMINAL ADMINISTRATION BUILDING
2	WORKER'S AMENITY BUILDING
3	FUEL BUNKER
4	SECURITY OFFICE
5	SEWAGE TREATMENT PLANT
6	OVERHEAD WATER TANK
7	UNDERGROUND RESERVOIR
8	RIO (REMOTE INPUT OUT PUT)/COMPRESSOR ROOM FOR ASH HANDLING
9	WASTE COLLECTION CENTER
10	SETTLING POND
11	ELECTRICAL SUB STATION
12	WEIGH BRIDGE CONTROL ROOM
13	VEHICLE PARKING AREA (5030 sqm approx.)
14	HIGHMAST LIGHTING TOWERS
15	GATE HOUSE COMPLEX

LEGEND:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYORS
PC	PIPE CONVEYORS

NOTES:
 1. ALL DIMENSIONS ARE IN METER
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

ALTERNATIVE-4 FLYASH, AGGREGATES, FERTILIZER, PETROLEUM PRODUCTS, EDIBLE OIL & COAL TRANSHIPMENT

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (P)VTY. PRIVATE LIMITED, HR Wallingford

REV.	DATE	DESCRIPTION	DRN.	CHD.	APD.

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1:2000

Size: A1

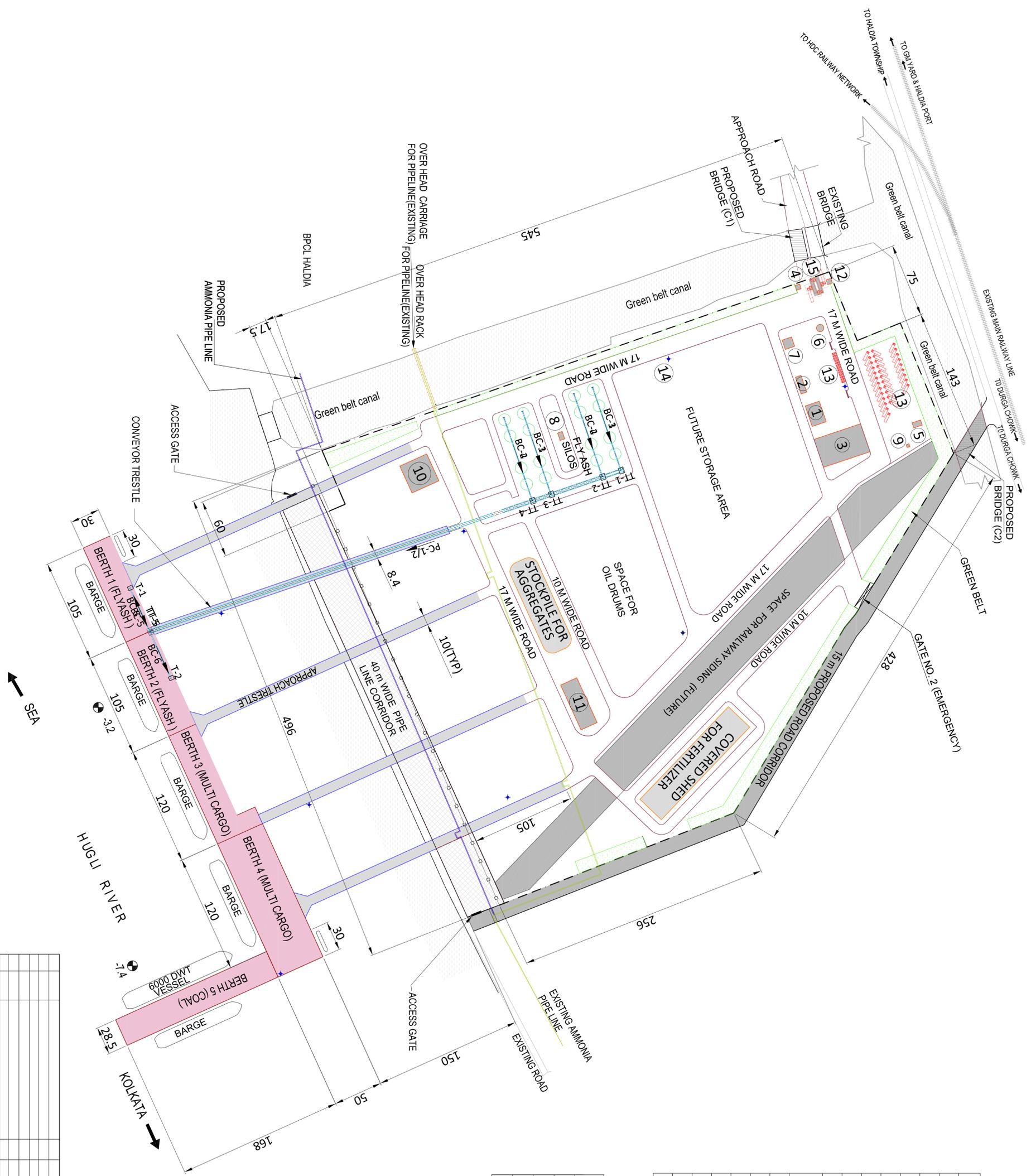
REV. 0

TITLE: INWT TERMINAL AT HALDIA - LAYOUT PLAN OF TERMINAL FACILITIES AT HALDIA (ALTERNATIVE-4)

JOB. NO. 1-525

DRG. NO. HT-207

NAME	SION	DATE
BRN	SKN	30-05-2016
CHD	HM/SHA	30-05-2016
APD	S DHR	30-05-2016



LEGEND:

S.NO.	DESCRIPTION
1	TERMINAL ADMINISTRATION BUILDING
2	WORKER'S AMENITY BUILDING
3	FUEL BUNKER
4	SECURITY OFFICE
5	SEWAGE TREATMENT PLANT
6	OVERHEAD WATER TANK
7	UNDERGROUND RESERVOIR
8	R/O (REMOTE INPUT OUT PUT)/ COMPRESSOR ROOM FOR ASH HANDLING
9	WASTE COLLECTION CENTER
10	SETTLING POND
11	ELECTRICAL SUB STATION
12	WEIGH BRIDGE CONTROL ROOM
13	VEHICLE PARKING AREA
14	HIGHMAST LIGHTING TOWERS
15	GATE HOUSE COMPLEX

LEGEND:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYORS
PC	PIPE CONVEYORS

NOTES:

1. ALL DIMENSIONS ARE IN METER
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SRN	DATE
HOWE	BEN	SKN	30-05-2016
	CHD	HM/SHA	30-05-2016
PMIC PROJECTS	APD	S DARR	30-05-2016

TITLE: IWT TERMINAL AT HALDIA - LAYOUT PLAN OF TERMINAL FACILITIES AT HALDIA (ALTERNATIVE-5)

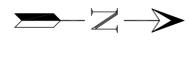
JOB. NO.	ORG. NO.
I-525	HT-208

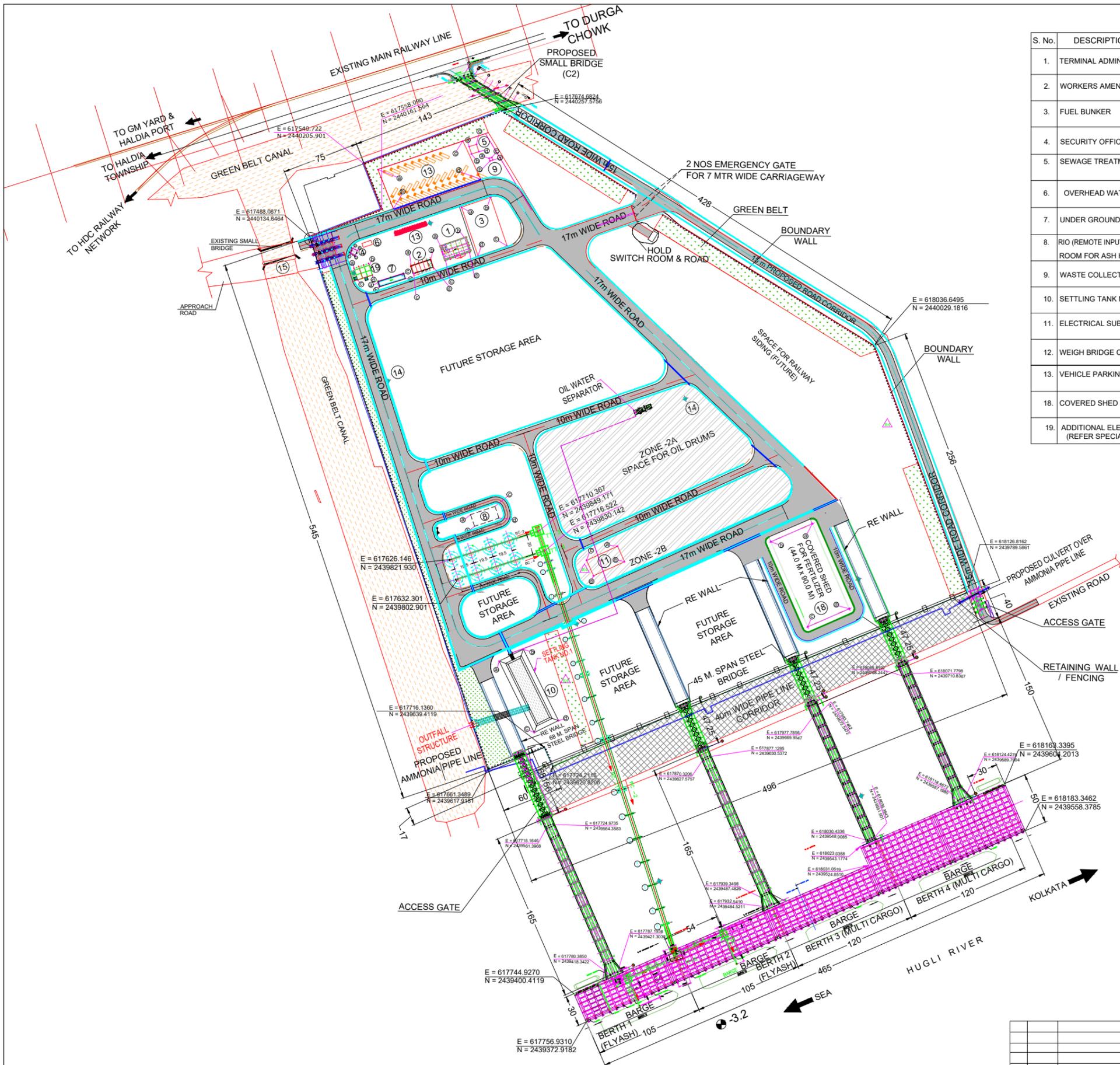
REV.	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1:2000 Size: A1 REV: 0

ALTERNATIVE-5 FLYASH, AGGREGATES, FERTILIZER, PETROLEUM PRODUCTS, EDIBLE OIL & COAL TRANSHIPMENT





PLANT LAYOUT
SCALE 1:2000
PHASE 1 DEVELOPMENT

CHART OF COORDINATE FOR DIFFERENT UNITS

S. No.	DESCRIPTION	a	b	c	d	AREA
1.	TERMINAL ADMINISTRATION BUILDING	X = 617615.454 Y = 2440125.667	X = 617638.834 Y = 2440133.636	X = 617619.648 Y = 2440113.362	X = 617643.027 Y = 2440121.331	537.94 m ²
2.	WORKERS AMENITY BUILDING	E = 617586.771 N = 2440106.421	E = 617605.755 N = 2440112.715	E = 617589.132 N = 2440099.302	E = 617608.115 N = 2440105.596	162.40 m ²
3.	FUEL BUNKER	E = 617635.588 N = 2440163.654	E = 617663.993 N = 2440173.307	E = 617680.081 N = 2440125.966	E = 617651.676 N = 2440116.313	1500.00 m ²
4.	SECURITY OFFICE	E = 617534.344 N = 2440121.460	E = 617532.276 N = 2440117.184	E = 617528.045 N = 2440119.231	E = 617530.113 N = 2440123.507	25.00 m ²
5.	SEWAGE TREATMENT PLANT	E = 617643.113 N = 2440222.427	E = 617645.371 N = 2440215.276	E = 617650.265 N = 2440224.686	E = 617652.523 N = 2440217.533	56.24 m ²
6.	OVERHEAD WATER TANK	E = 617538.912 N = 2440128.568	E = 617540.263 N = 2440124.591	E = 617547.623 N = 2440131.528	E = 617548.974 N = 2440127.551	38.64 m ²
7.	UNDER GROUND WATER RESERVOIR	E = 617555.509 N = 2440090.895	E = 617556.653 N = 2440087.272	E = 617579.129 N = 2440098.353	E = 617580.273 N = 2440094.730	134.51 m ²
8.	RIO (REMOTE INPUT OUTPUT / COMPRESSOR ROOM FOR ASH HANDLING)	E = 617644.481 N = 2439865.233	E = 617648.363 N = 2439853.878	E = 617668.138 N = 2439873.319	E = 617672.019 N = 2439861.964	300 m ²
9.	WASTE COLLECTION CENTRE	E = 617662.604 N = 2440211.083	E = 617663.395 N = 2440208.580	E = 617665.108 N = 2440211.873	E = 617665.898 N = 2440209.370	9.00 m ²
10.	SETTLING TANK NO.1	E = 617672.295 N = 2439723.036	E = 617695.755 N = 2439734.587	E = 617706.373 N = 2439653.820	E = 617729.833 N = 2439665.371	2017.47 m ²
11.	ELECTRICAL SUBSTATION	E = 617787.269 N = 2439834.552	E = 617794.072 N = 2439819.520	E = 617757.204 N = 2439820.947	E = 617764.007 N = 2439805.915	544.5 m ²
12.	WEIGH BRIDGE CONTROL ROOM	E = 617495.203 N = 2440134.865	E = 617499.685 N = 2440136.280	E = 617496.618 N = 2440130.383	E = 617501.100 N = 2440131.798	25.00 m ²
13.	VEHICLE PARKING AREA	E = 617554.393 N = 2440200.169	E = 617569.481 N = 2440162.086	E = 617636.979 N = 2440227.775	E = 617654.264 N = 2440190.739	3601.47 m ²
18.	COVERED SHED FOR FERTILIZER	E = 617976.554 N = 2439856.476	E = 617936.206 N = 2439838.927	E = 617972.102 N = 2439756.395	E = 618012.451 N = 2439773.945	3960.00 m ²
19.	ADDITIONAL ELECTRICAL SUBSTATION (REFER SPECIAL NOTE NO. - 01)	E = 617531.691 N = 2440102.586	E = 617545.929 N = 2440107.307	E = 617534.838 N = 2440093.094	E = 617549.076 N = 2440097.816	156.55 m ²

S. No.	DESCRIPTION	AREA
3.	ZONE -2A	19001 m ²
4.	ZONE -2B	6703 m ²

LEGENDS:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYOR
PC	PIPE CONVEYOR
FS	FLY ASH SILO
BL	FIXED BARGE LOADER

NOTES:

- ALL DIMENSIONS ARE IN METER
- ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM
- PROPOSED AMMONIA PIPE LINE IS TAKEN FROM DWG. NO. 85091-LAY-LD-001, REV1, PROPOSED MODIFICATION OF PIPING LAYOUT FOR 16" & 4" AMMONIA PIPE LINE

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (PMC PROJECTS), HR Wallingford

NAME	SIGN	DATE
DRN	SKN	
CHD	HM/SKA	
APD	S DHAR	

TITLE: **IWT TERMINAL AT HALDIA- LAYOUT PLAN OF TERMINAL FACILITIES AT HALDIA**

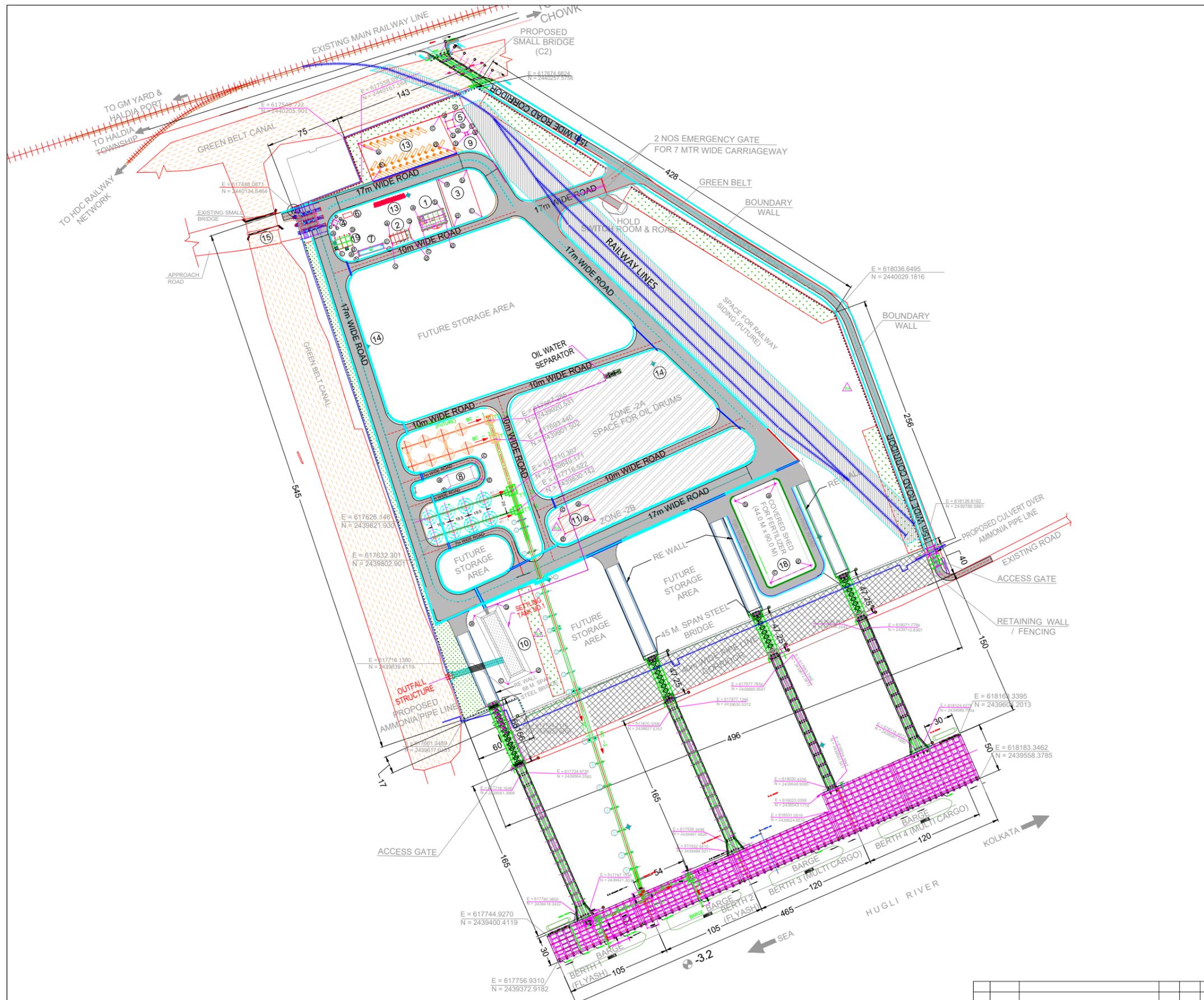
JOB. NO. I-525 DRG. NO. HT-209

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1:2000 Size: A1 REV. 2

REV	DATE	DESCRIPTION	DRN	CHD	APD
2	26.02.20		VP	AM	AM
1	11.02.20		VP	AM	AM

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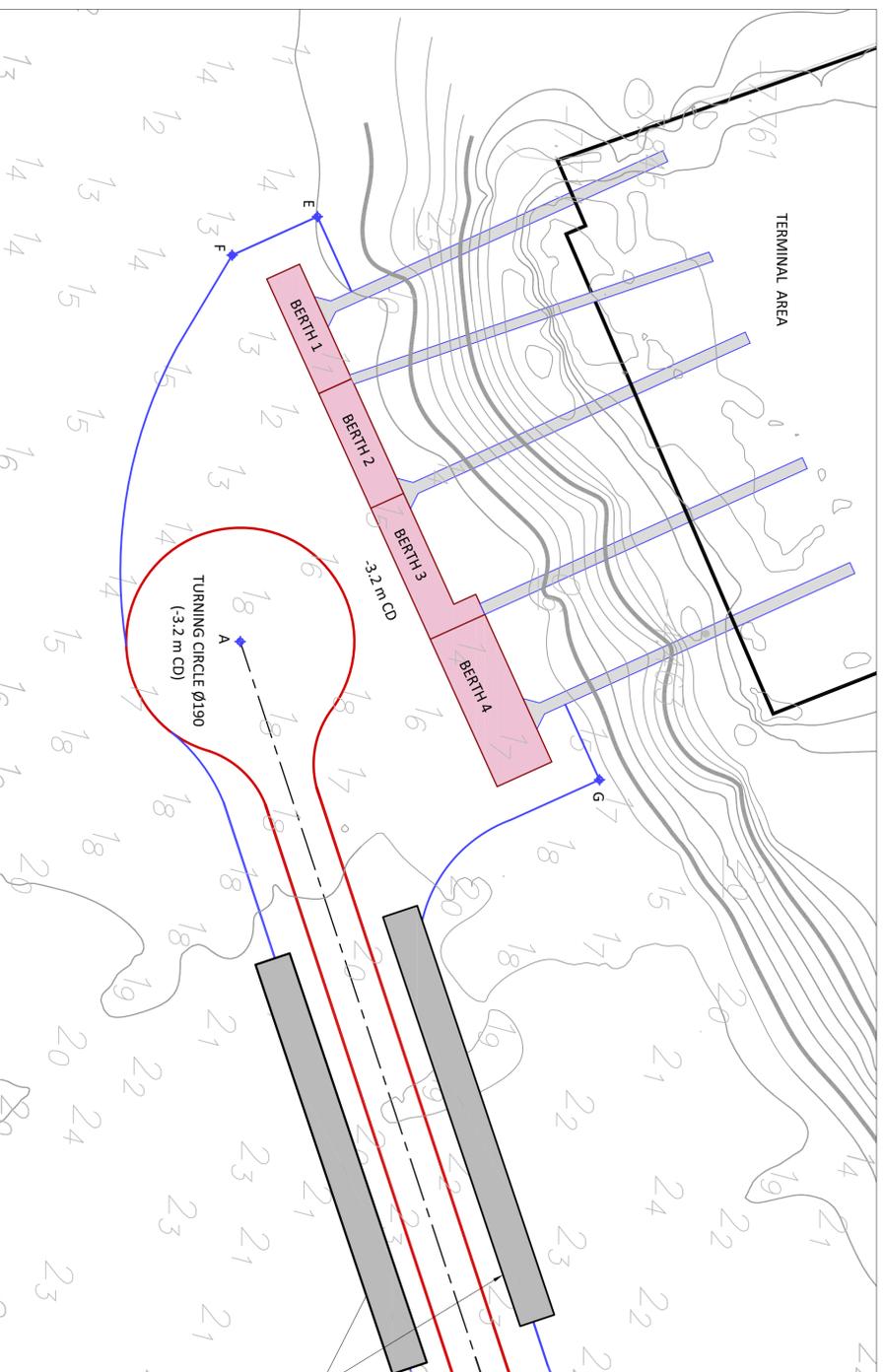
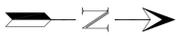
PLANT LAYOUT
SCALE 1:2000

- NOTES:**
1. ALL DIMENSIONS ARE IN METER
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

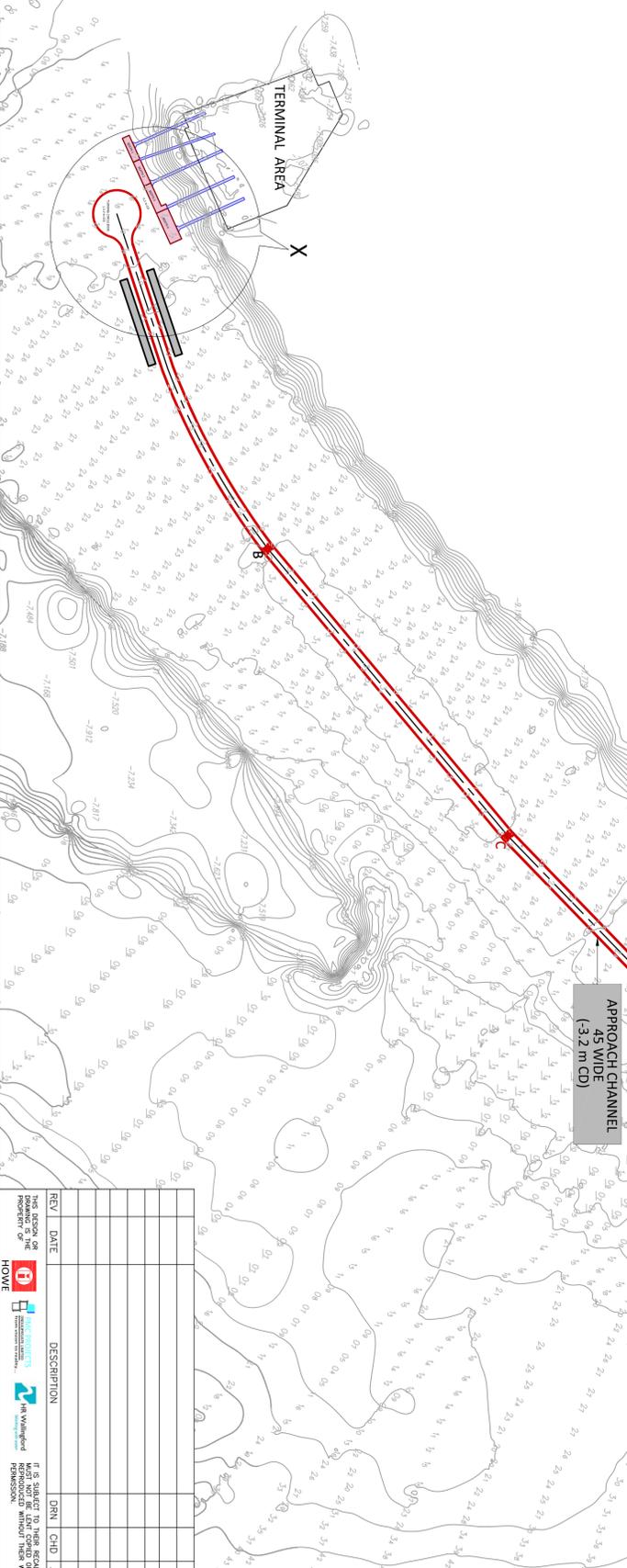
		INLAND WATERWAYS AUTHORITY OF INDIA		
		PROJECT DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)		
CONSULTANT				NAME DRN SKN CHD HM/SKA APD S DHAR
TITLE IWT TERMINAL AT HALDIA RAIL CONNECTIVITY		JOB. NO. I-525		DRG. NO. HT-210
COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE				
UNIT SCALE - 1:2000		Size : A1		REV. 2

REV	DATE	DESCRIPTION	DRN	CHD	APD
2	26.02.20		VP	AM	AM
1	11.02.20		VP	AM	AM

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CO-ORDINATE IN UTM			
MARK	EASTING (M)	NORTHING (M)	
A	618071	2439357	
B	619414	2439961	
C	620565	2440923	
D	623595	2443941	
E	617716	2439421	
F	617749	2439350	
G	618186	2439656	



REV	DATE	DESCRIPTION	DRN	CHD	APD

NOTES:

1. ALL DIMENSIONS ARE IN METER
2. ALL LEVELS ARE IN METERS WITH & ARE RESPECT TO CHART DATUM
3. DREDGE SLOPE - 1:10

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (P)vt. L. TD. No. 100/2019-20
PINC PROJECTS
PRACTICE NO. 100/2019-20
HR Wallingford
Wallingford
Wallingford

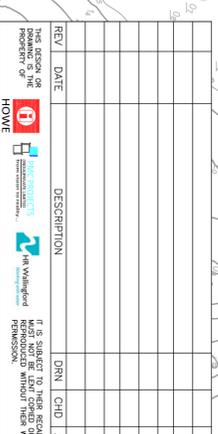
NAME	SKN	SRN	DATE
CHD	HR/SNA		
APD	S DHAR		

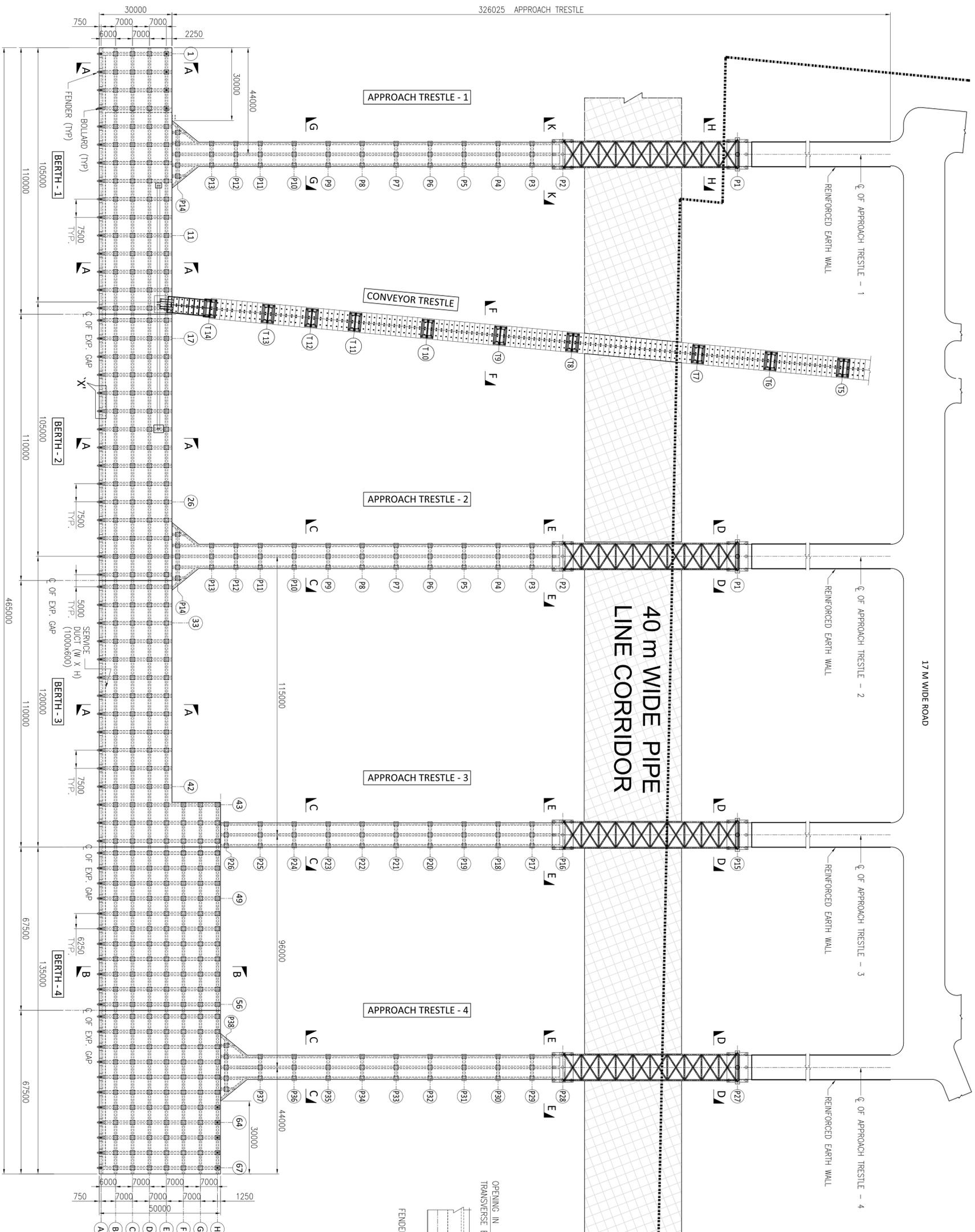
TITLE: IWT TERMINAL AT HALDIA LAYOUT OF MANOEUVRING AREA AND APPROACH CHANNEL

JOB. NO. I-525 DRG. NO. HT-211

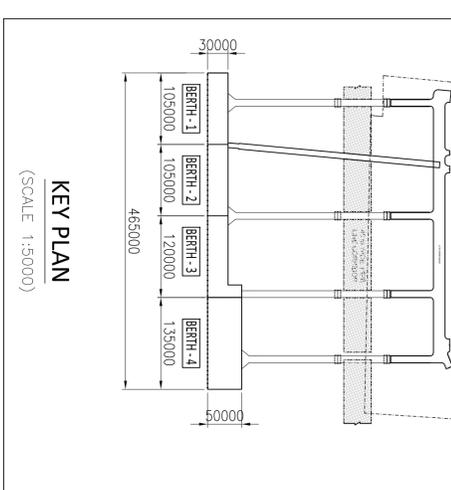
COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1:13000 Size: A1 REV. 0

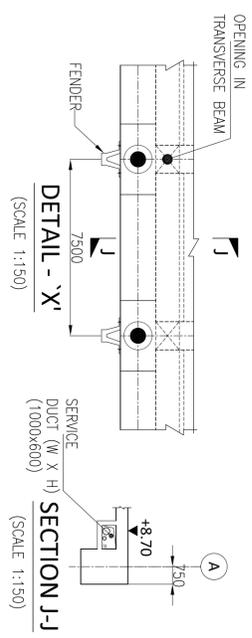




PLAN OF JETTY & APPROACH TRESTLE
(SCALE: 1:800)



KEY PLAN
(SCALE 1:5000)



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM
3. SUBSTRUCTURE SHOULD BE AVOIDED IN 40m. PRELINE CORRIDOR
4. MS. LINER NOT SHOWN IN THE DRAWING FOR CLARITY. MS. LINER FOR PILES SHOULD BE PROVIDED UP TO (-) 35m CD OR DEPTH WHERE SPT N-VALUE GREATER THAN OR EQUAL TO TEN (10) AND IN INCREASING ORDER, WHICHEVER IS MORE.
5. DURING PHASE 1A DEVELOPMENT, FENDERS & BOLLARDS SHALL BE PROVIDED IN GRIDS 65, 66 & 67

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SION	DATE
	BRI	SKM/JH	30-05-2016
	CHD	KAK/PMI	30-05-2016
HOWE	APD	S DHAR	30-05-2016

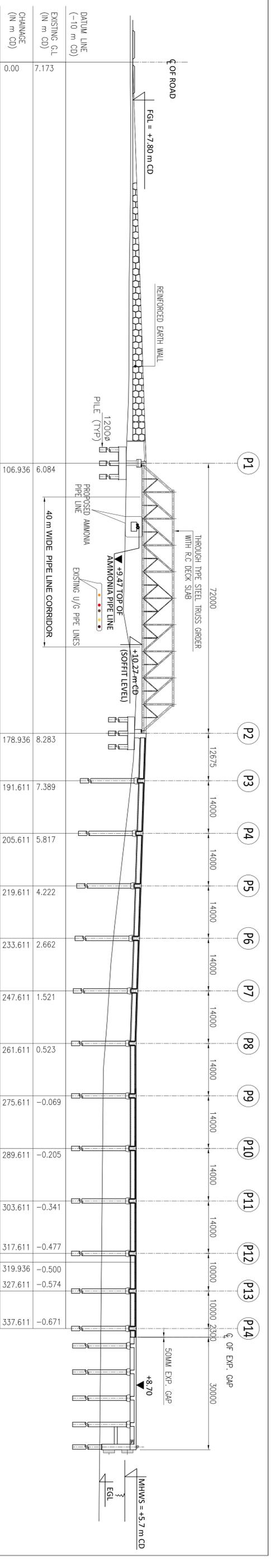
TITLE: **IWT TERMINAL AT HALDIA - GENERAL ARRANGEMENT OF JETTY AND APPROACH TRESTLE**

JOB. NO.	DRG. NO.
I-525	HT-212

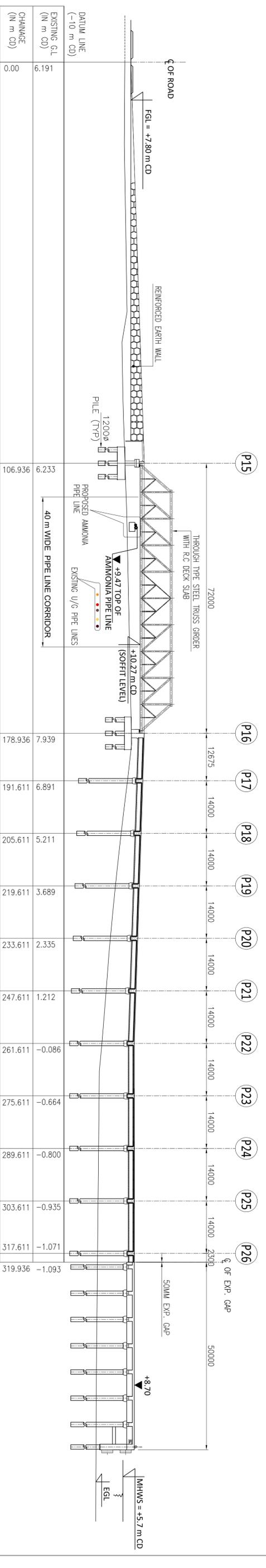
REV.	DATE	DESCRIPTION	DRN.	CHD.	APD.
R2	11.05.16	REMOVAL OF BERTH 5	SN	KR	SD
R1	07.04.16	THE SERVICE TRENCH INCLUDED	SN	AMI	SD

IT IS SUBJECT TO THE REVIEW AND APPROVAL OF THE PROJECTING AUTHORITY. THE PROJECTING AUTHORITY SHALL BE RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF THE PROJECT.

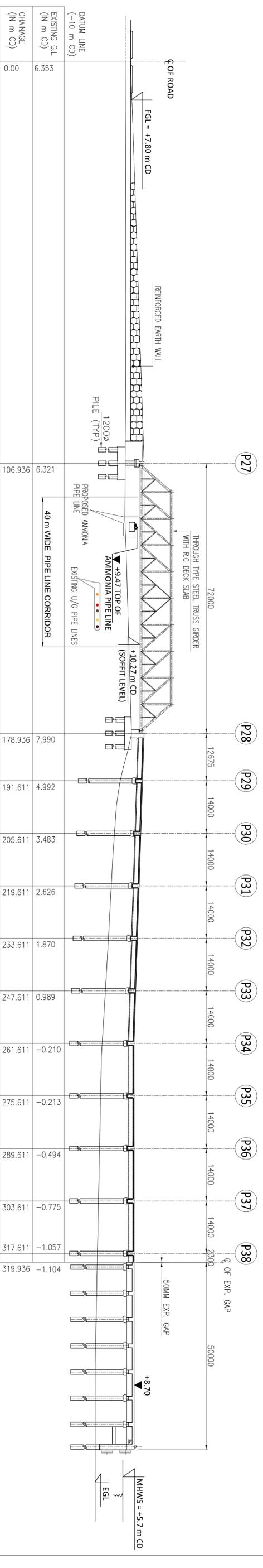
UNIT	SCALE	AS SHOWN	Size	A1	REV.	2
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LONGITUDINAL ELEVATION OF APPROACH TRESTLE - 1 & 2
(SCALE 1:500)



LONGITUDINAL ELEVATION OF APPROACH TRESTLE - 3
(SCALE 1:500)



LONGITUDINAL ELEVATION OF APPROACH TRESTLE - 4
(SCALE 1:500)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM
3. MINIMUM VERTICAL CLEARANCE ABOVE AMMONIA PIPE SHOULD BE 800mm.
4. ALL OTHER NOTES REFER TO DRAWING NO. HT-1005, SHEET-1
5. PROPOSED AMMONIA PIPE LINE IS TAKEN FROM DWG. NO. 85091-LAY-LD-001.REV1, PROPOSED MODIFICATION OF PIPING LAYOUT FOR 16" & 4" AMMONIA PIPE LINE
6. THE EXISTING UNDER GROUND PIPE LINE TAKEN FROM P&P-54-01-5008-1/2 REV 02 2ND P&P ALIGNMENT SHEET CHAINAGE 3849.65 TO 4826.00m

REV	DATE	DESCRIPTION	DRN	CHD	APD
RT	11.05.16	SHOWN IN 40M WIDE PIPE LINE CORRIDOR			

IT IS SUBJECT TO THE REVIEW AND PERMISSON OF THE PROJECT ENGINEER.

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: HR Wallingford

CLIENT: HOWE

TITLE: IWT TERMINAL AT HALDIA - CROSS SECTION OF JETTY AND APPROACH TRESTLE

JOB. NO.: I-525

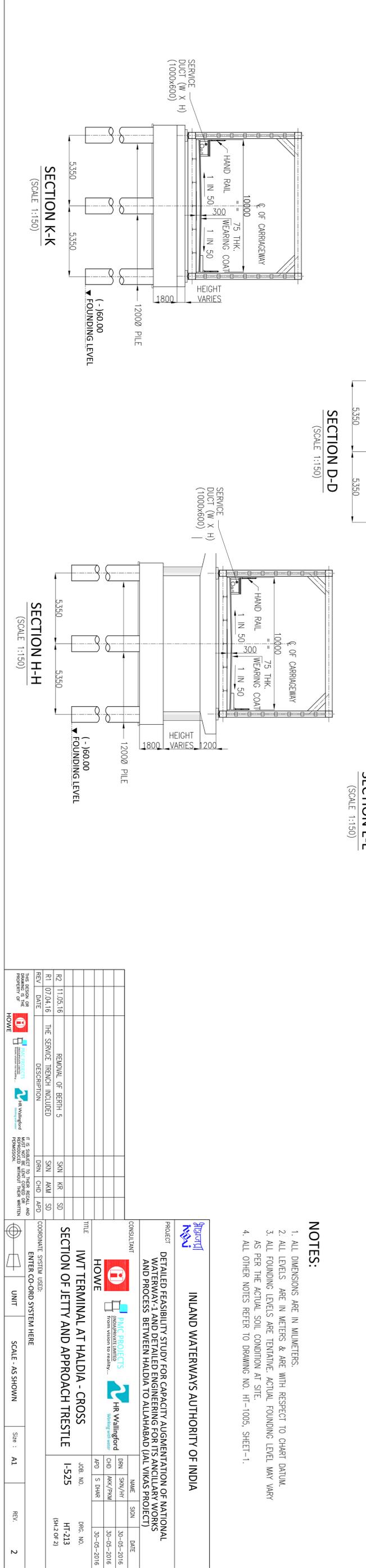
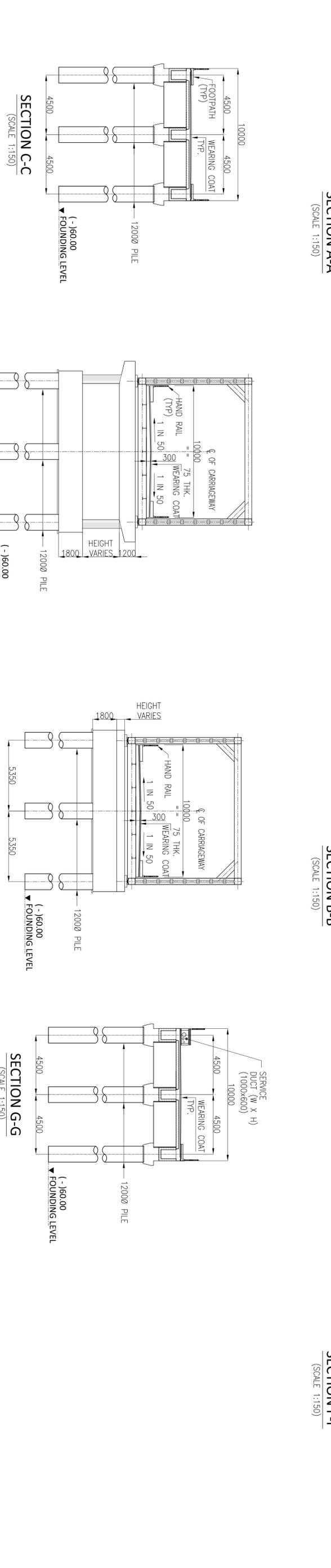
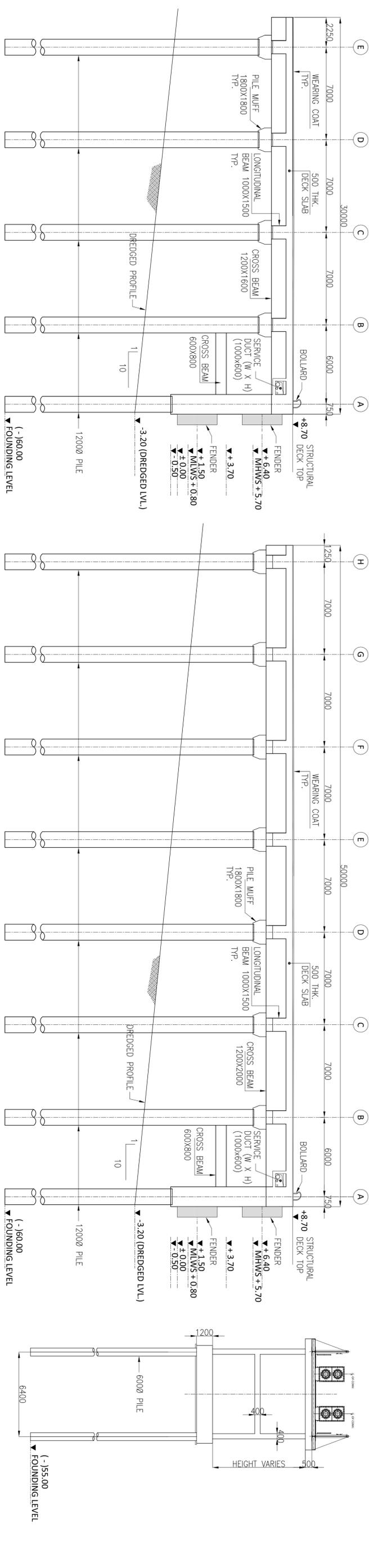
HT-213 (SH. OF 2)

DATE: 30-05-2016

SCALE: AS SHOWN

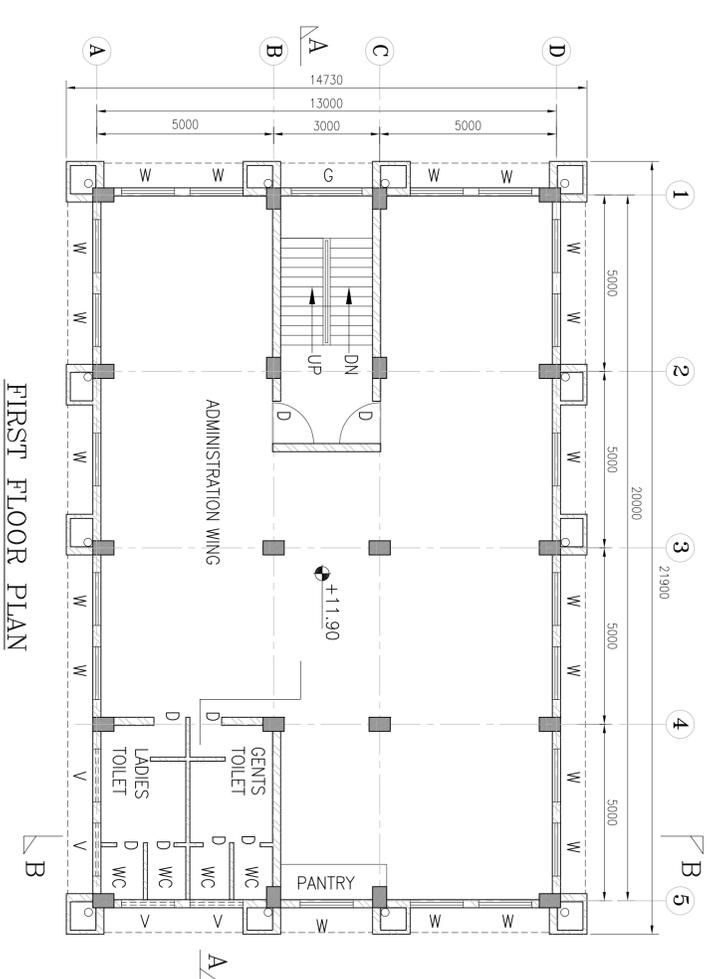
UNIT: A1

REV. 1

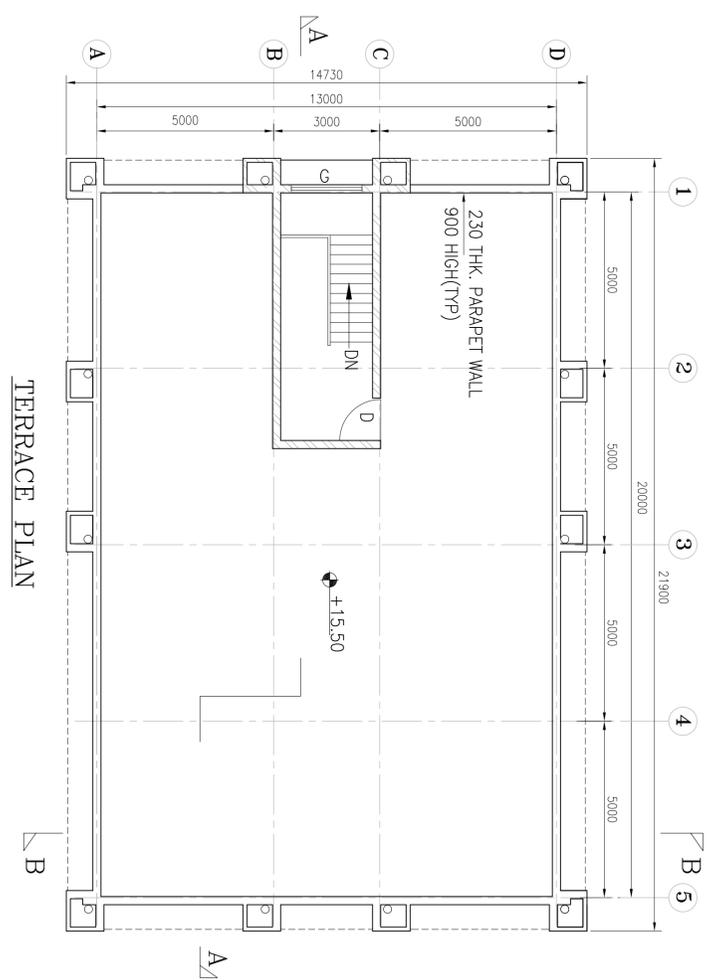


- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS.
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM.
 3. ALL FOUNDING LEVELS ARE TENTATIVE. ACTUAL FOUNDING LEVEL MAY VARY AS PER THE ACTUAL SOIL CONDITION AT SITE.
 4. ALL OTHER NOTES REFER TO DRAWING NO. HT-1005, SHEET-1.

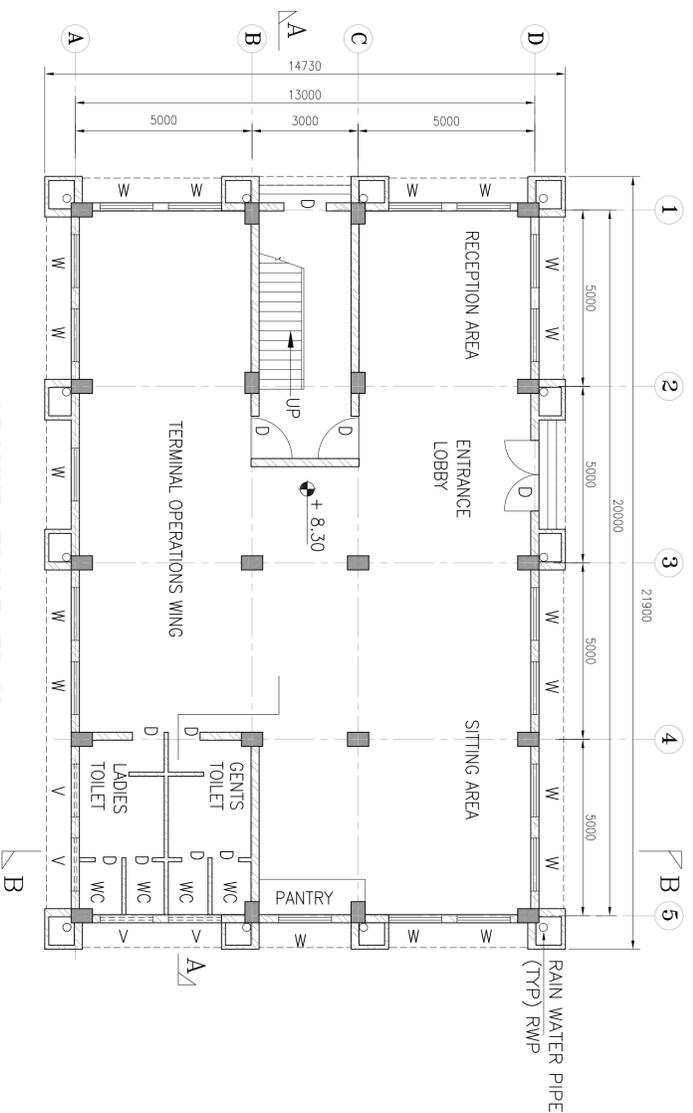
		INLAND WATERWAYS AUTHORITY OF INDIA	
PROJECT DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)			
CONSULTANT 		PROJECTS 	
TITLE IWT TERMINAL AT HALDIA - CROSS SECTION OF JETTY AND APPROACH TRESTLE		JOB. NO. I-525	
REVISIONS		DATE	
R2 11.05.16 R1 07.04.16	REMOVAL OF BERTH 5 THE SERVICE TRENCH INCLUDED	SNR KR SD SNR AMI SD DRN CHD AND	30-05-2016 30-05-2016
COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE			
UNIT: SCALE: AS SHOWN		Size: A1	
REV: 2			



FIRST FLOOR PLAN



TERRACE PLAN



GROUND FLOOR PLAN

S.NO.	TYPE	DESCRIPTION
1.	D	DOOR
2.	W	WINDOW
3.	V	VENTILATOR
4.	G	GLASS WINDOW
5.	WC	WATER CLOSET

E.G.L. - EXISTING GROUND LEVEL
F.F.L. - FINISH FLOOR LEVEL

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JALVIKAS PROJECT)

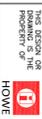
CONSULTANT	NAME	SKN	DATE
HOWE	BEN	SKN	30-05-2016
	CHD	HM/SA	30-05-2016
PMC PROJECTS	APD	S DMR	30-05-2016

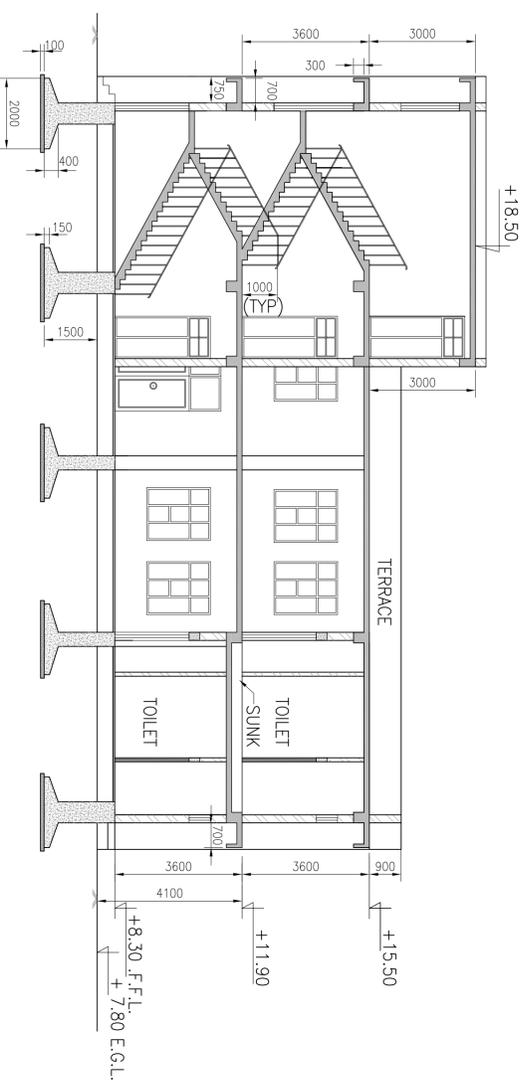
TITLE	JOB. NO.	ORG. NO.
TYPICAL LAYOUT OF TERMINAL ADMINISTRATION BUILDING	I-525	HT-214

REV	DATE	DESCRIPTION	DRN	CHD	APD

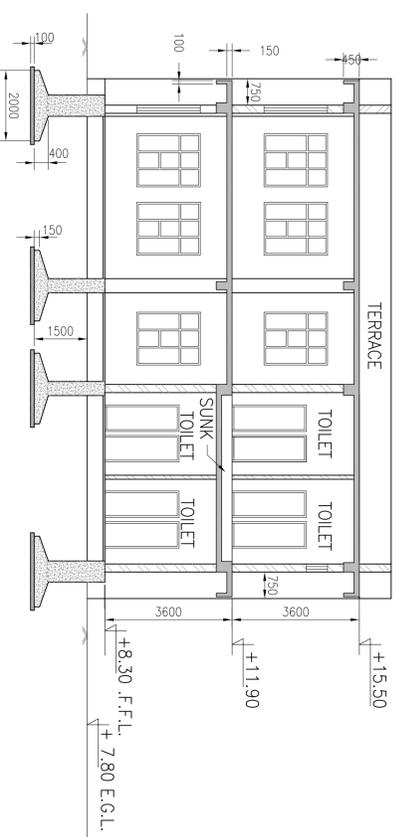
COORDINATE SYSTEM USED:	SCALE	SIZE	REV.
ENTER CO-ORD SYSTEM HERE	1:100	A1	0

IT IS SUBJECT TO THE RULES AND REGULATIONS OF THE INLAND WATERWAYS AUTHORITY OF INDIA. THE USER MUST NOT BE ABLE TO OBTAIN PERMISSION FROM THE INLAND WATERWAYS AUTHORITY OF INDIA.

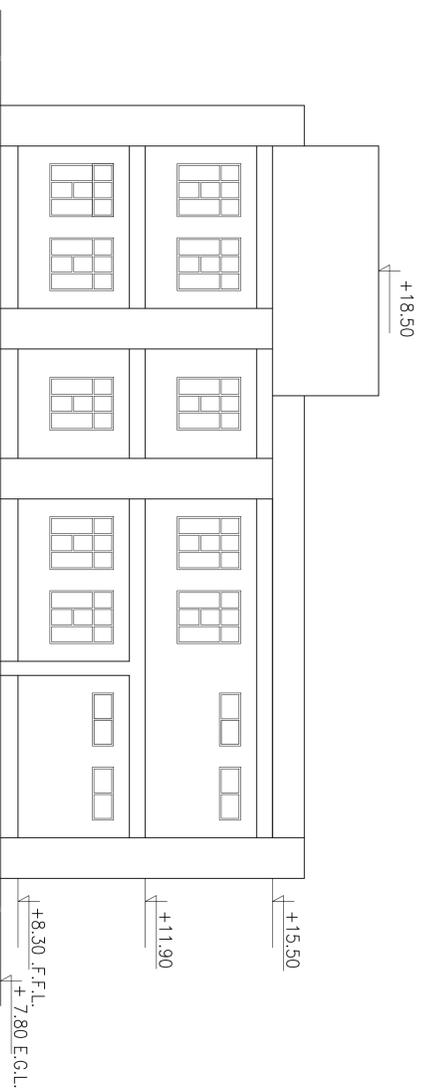




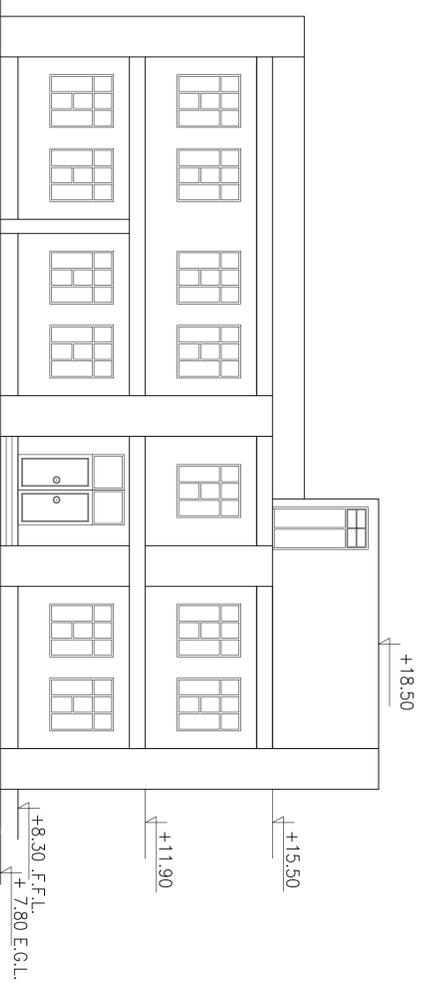
SECTION A-A



SECTION B-B



FRONT ELEVATION



REAR ELEVATION

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA



PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SKN	DATE
HOWE	DRN		30-05-2016
	CHD		30-05-2016
PMC PROJECTS	APD	S DARR	30-05-2016
	APD		
HR Wallingford	APD		
	APD		

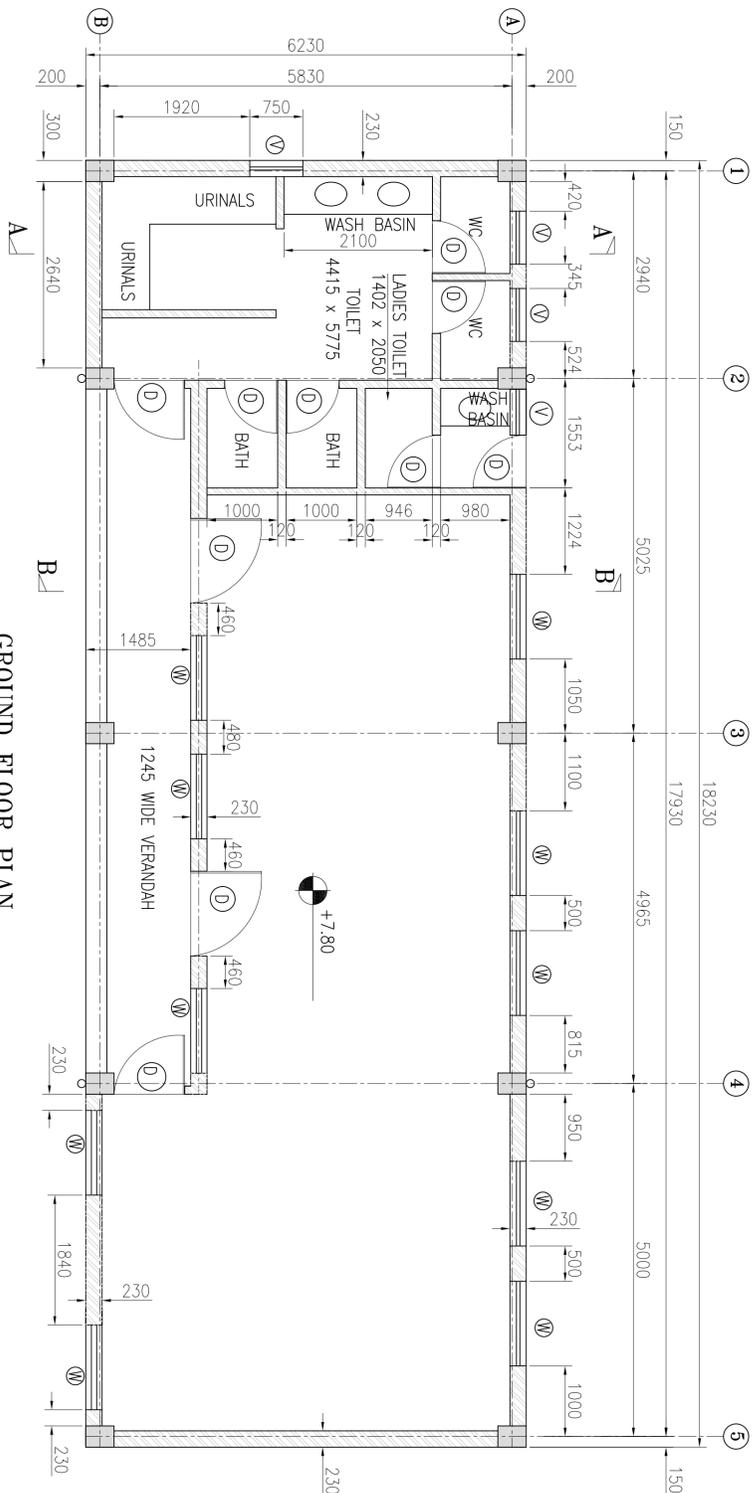
TITLE: INW TERMINAL AT HALDIA
ELEVATION OF TERMINAL ADMINISTRATION BUILDING

JOB. NO. I-525
PRG. NO. HT-215

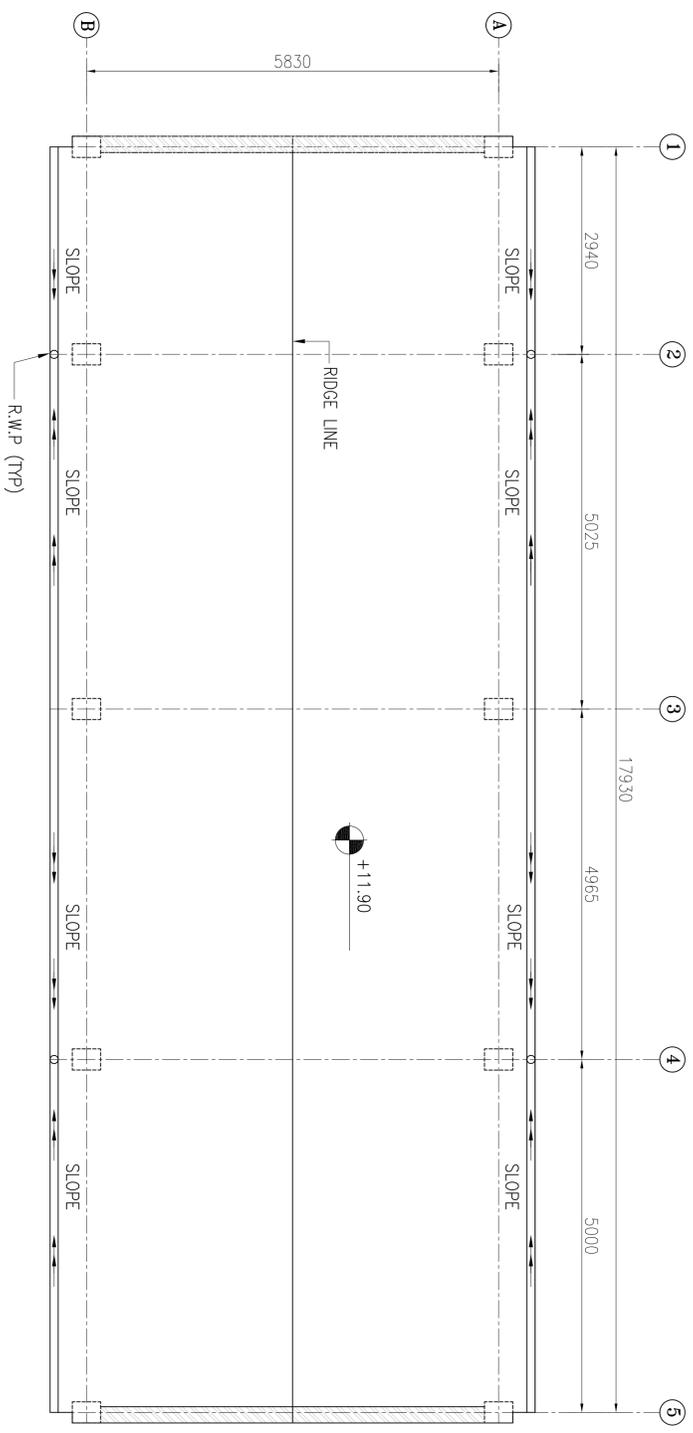
REV	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE		SCALE: 1:100	Size: A1	REV. 0
UNIT				

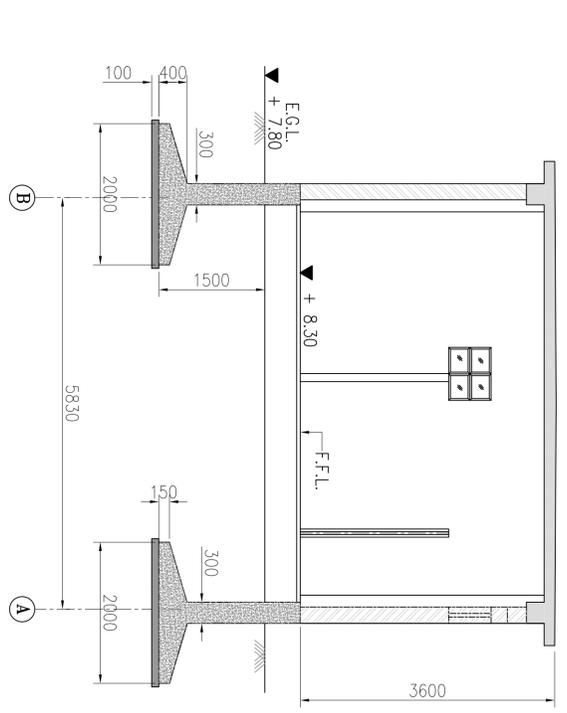
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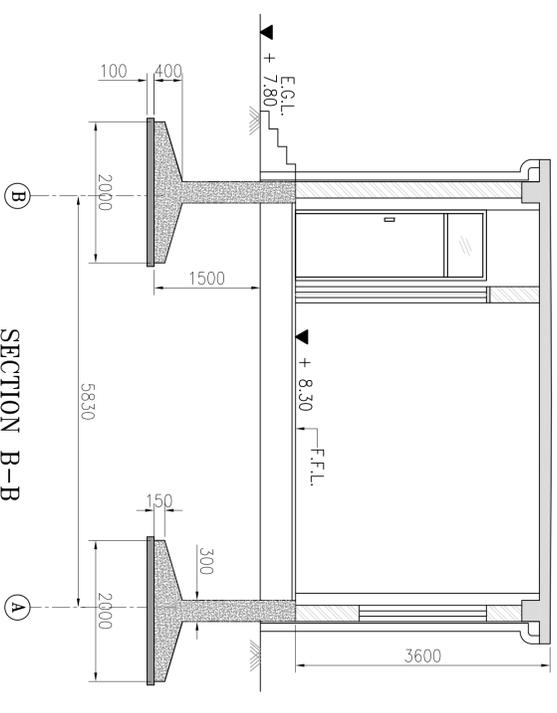
GROUND FLOOR PLAN



ROOF PLAN



SECTION A-A



SECTION B-B

S.NO:	TYPE	DESCRIPTION
1.	D	DOOR
2.	W	WINDOW
3.	V	VENTILATOR
4.	WC	WATER CLOSET

E.G.L. - EXISTING GROUND LEVEL
F.F.L. - FINISH FLOOR LEVEL

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

REV	DATE	DESCRIPTION	DRN	CHD	APD

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (P)VTY. PRIVATE LIMITED, HR Wallingford

TITLE: INT TERMINAL AT HALDIA

JOB. NO.: I-525

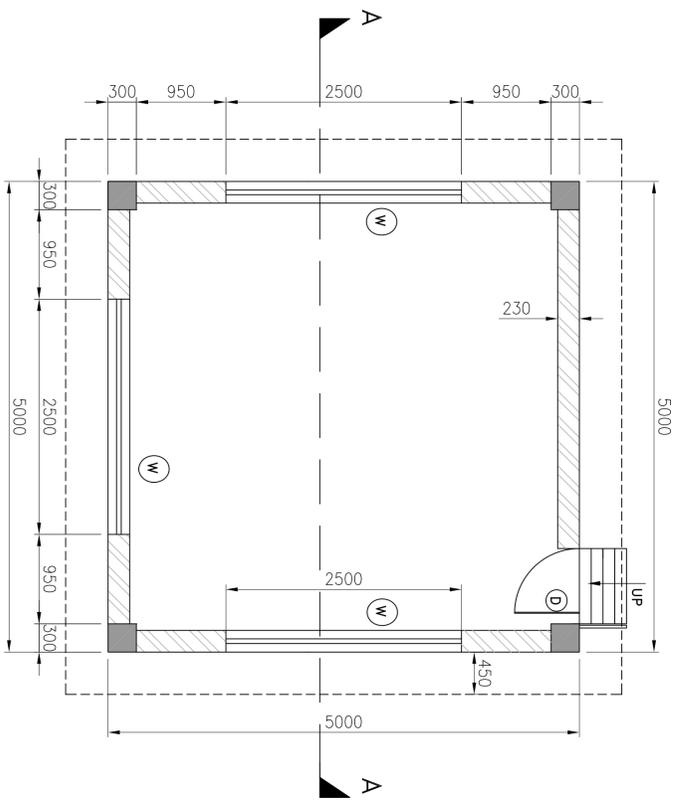
PRG. NO.: HT-216

DATE: 30-05-2016

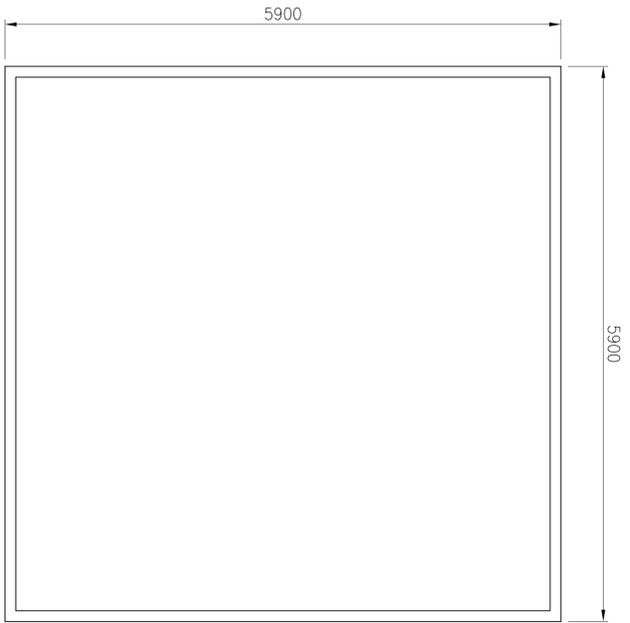
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UNIT: A1

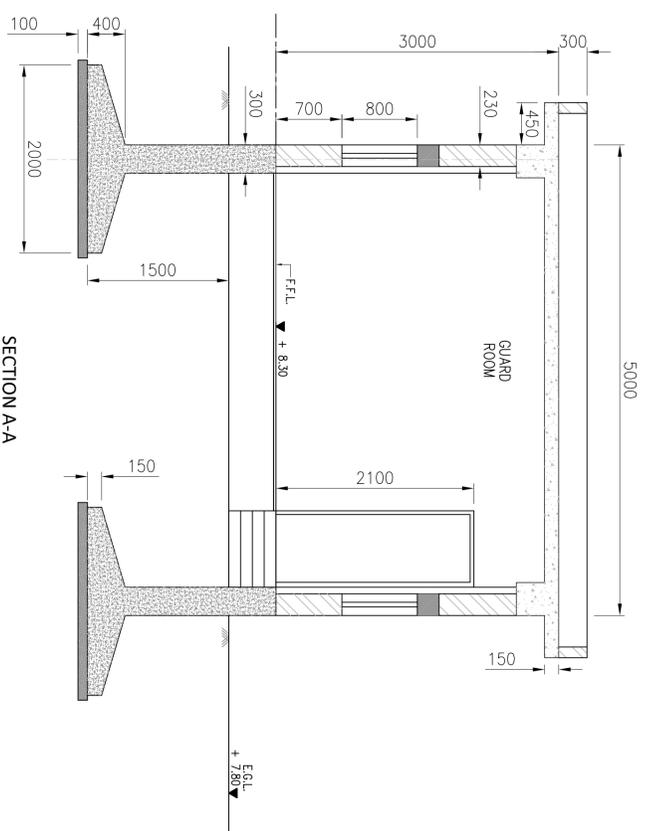
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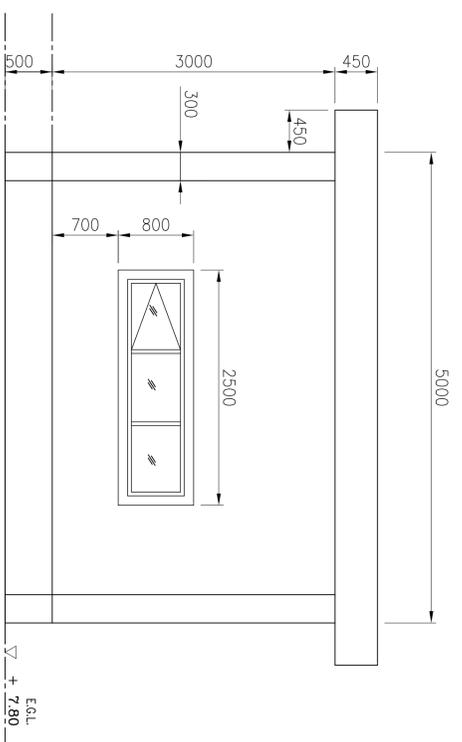
GROUND FLOOR PLAN



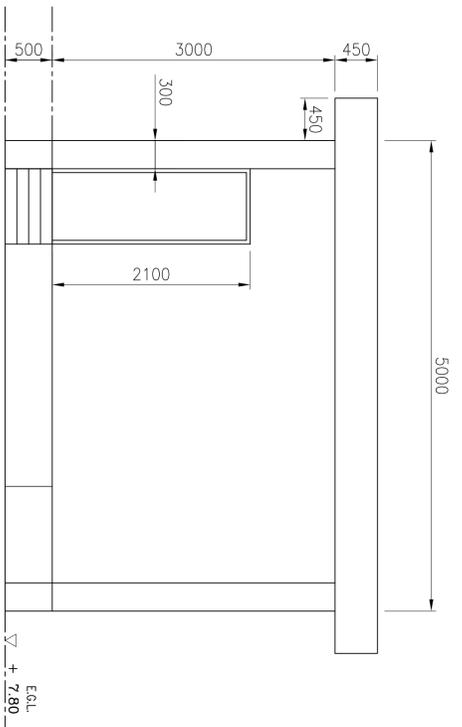
TERRACE PLAN



SECTION A-A



FRONT ELEVATION



REAR ELEVATION

S.NO.	TYPE	DESCRIPTION
1.	D	DOOR
2.	W	WINDOW

E.G.L.-EXISTING GROUND LEVEL
F.F.L.-FINISH FLOOR LEVEL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SKN	DATE
HOWE	CHD	HM/SA	30-05-2016
	APD	S DVAR	30-05-2016

TITLE: IWT TERMINAL AT HALDIA-TYPICAL LAYOUT AND ELEVATION OF SECURITY OFFICE & WEIGH BRIDGE CONTROL ROOM

REV.	DATE	DESCRIPTION	DRN	CHD	APD

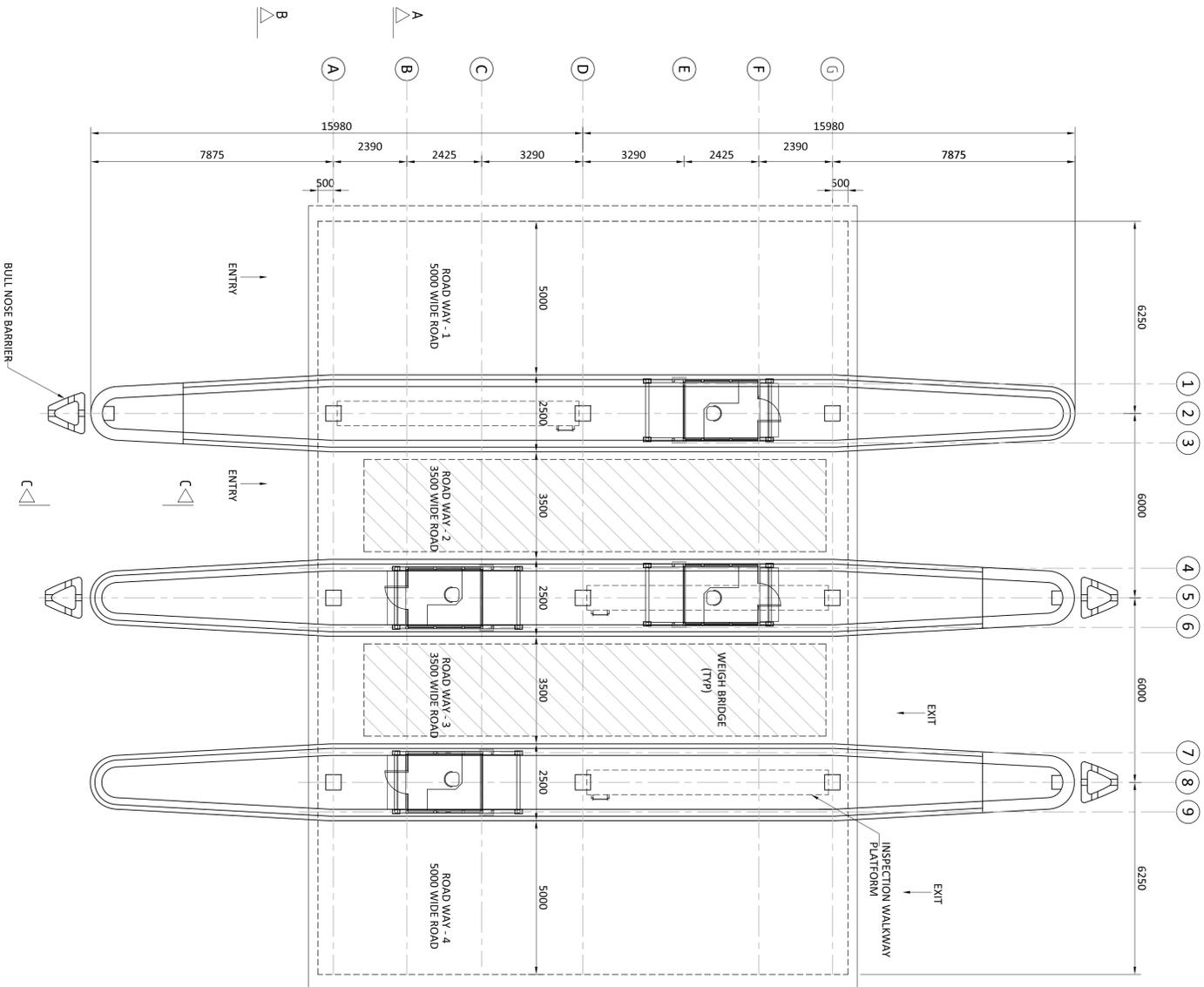
REV.	DATE	DESCRIPTION	DRN	CHD	APD

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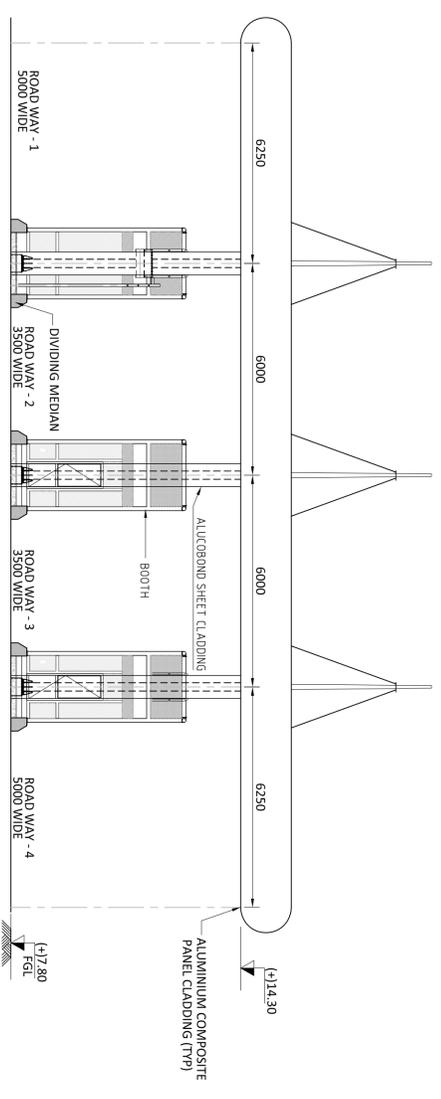
THIS DRAWING IS THE PROPERTY OF HOWE

IT IS SUBJECT TO THE RIGHTS AND CONDITIONS OF THE LICENSE AGREEMENT FOR THE SOFTWARE USED IN THIS PROJECT.

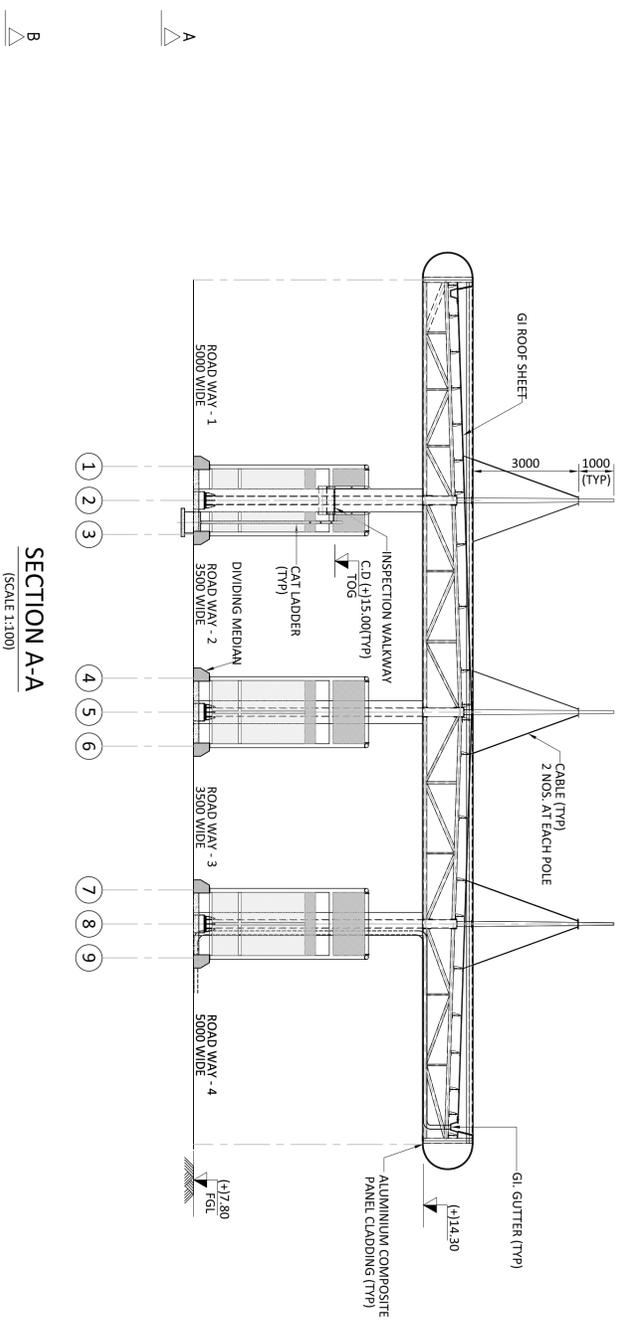
PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)



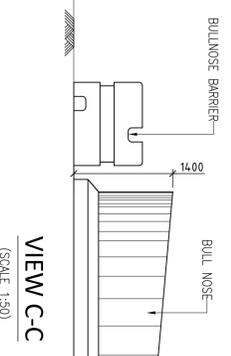
GATE COMPLEX ENTRY & EXIT PLAN
(SCALE 1:100)



VIEW B-B
(SCALE 1:100)



SECTION A-A
(SCALE 1:100)



VIEW C-C
(SCALE 1:50)

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT
DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT
HOWE | **PMC PROJECTS** | **HR Wallingford**

TITLE
GENERAL ARRANGEMENT OF GATE COMPLEX

REV	DATE	DESCRIPTION	DRN	CHD	APD

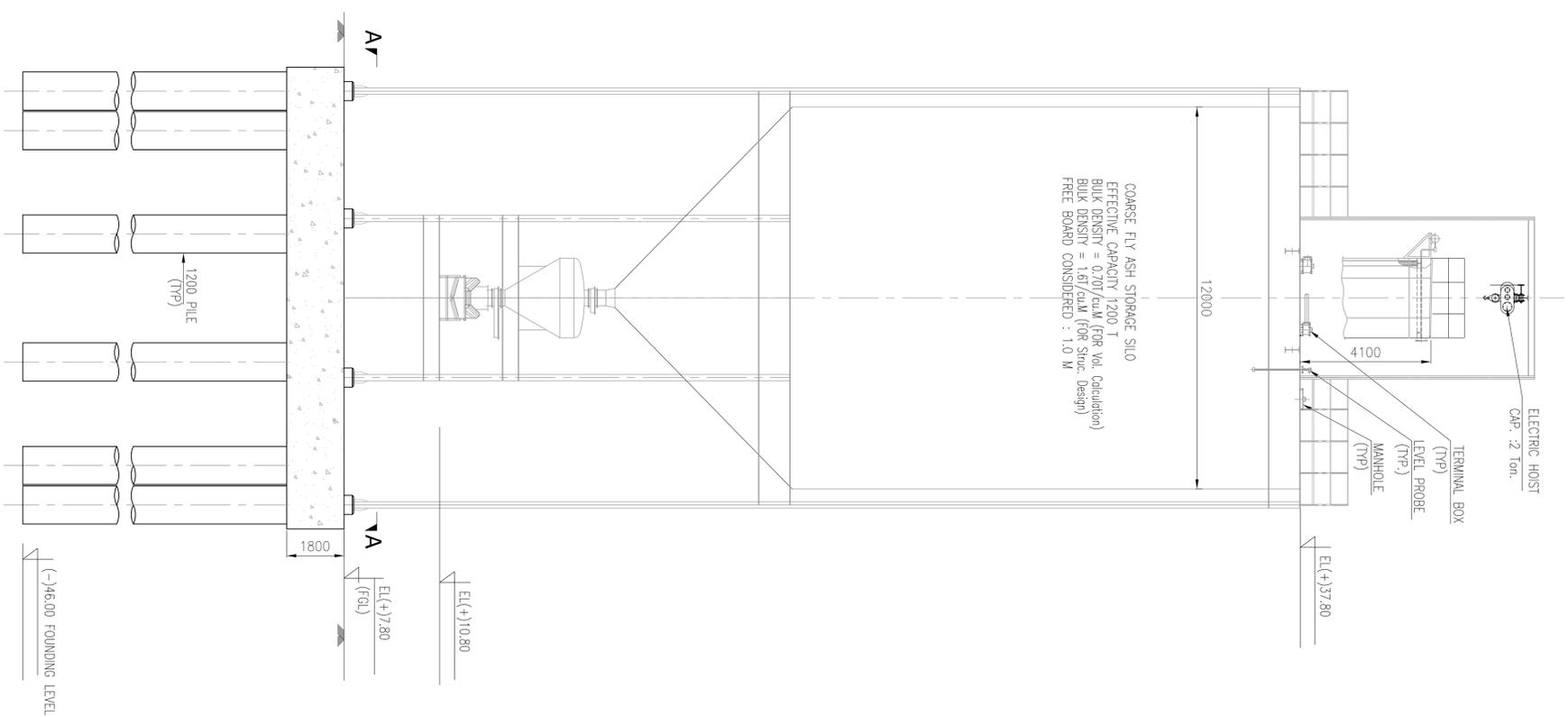
NAME	SION	DATE
BRN	SKN	30-05-2016
CHD	HM/SKA	30-05-2016
APD	S DHAR	30-05-2016

JOB. NO. I-525
PRG. NO. HT-219

COORDINATE SYSTEM USED:
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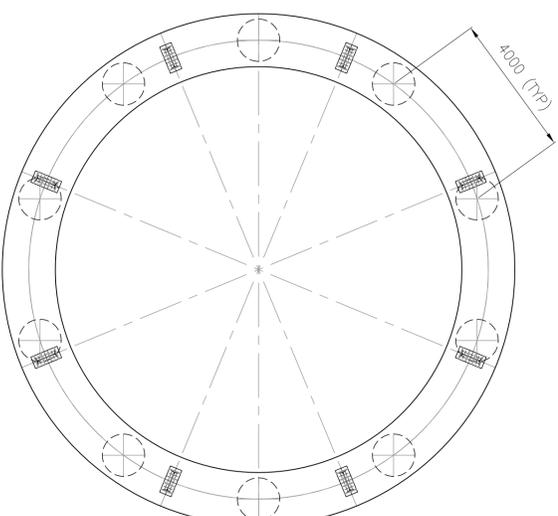
REVISIONS:
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UNIT SCALE - AS SHOWN
Size : A1
REV. 0



ELEVATION

SCALE - 1:100



PLAN A-A

SCALE - 1:100

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

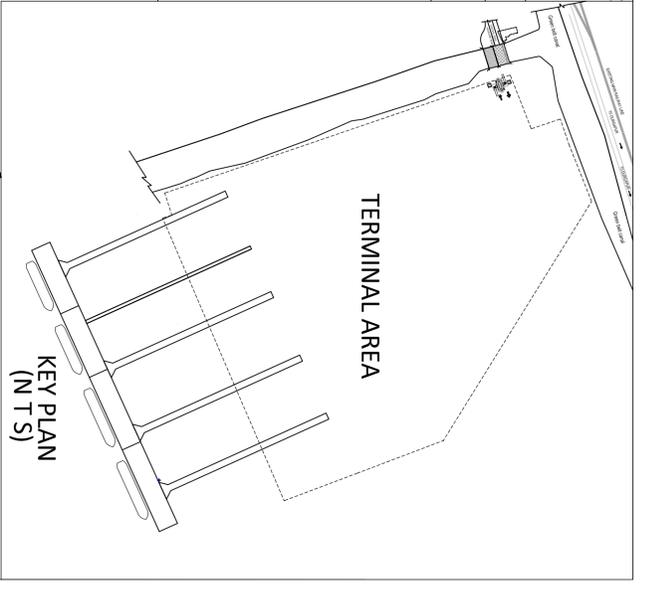
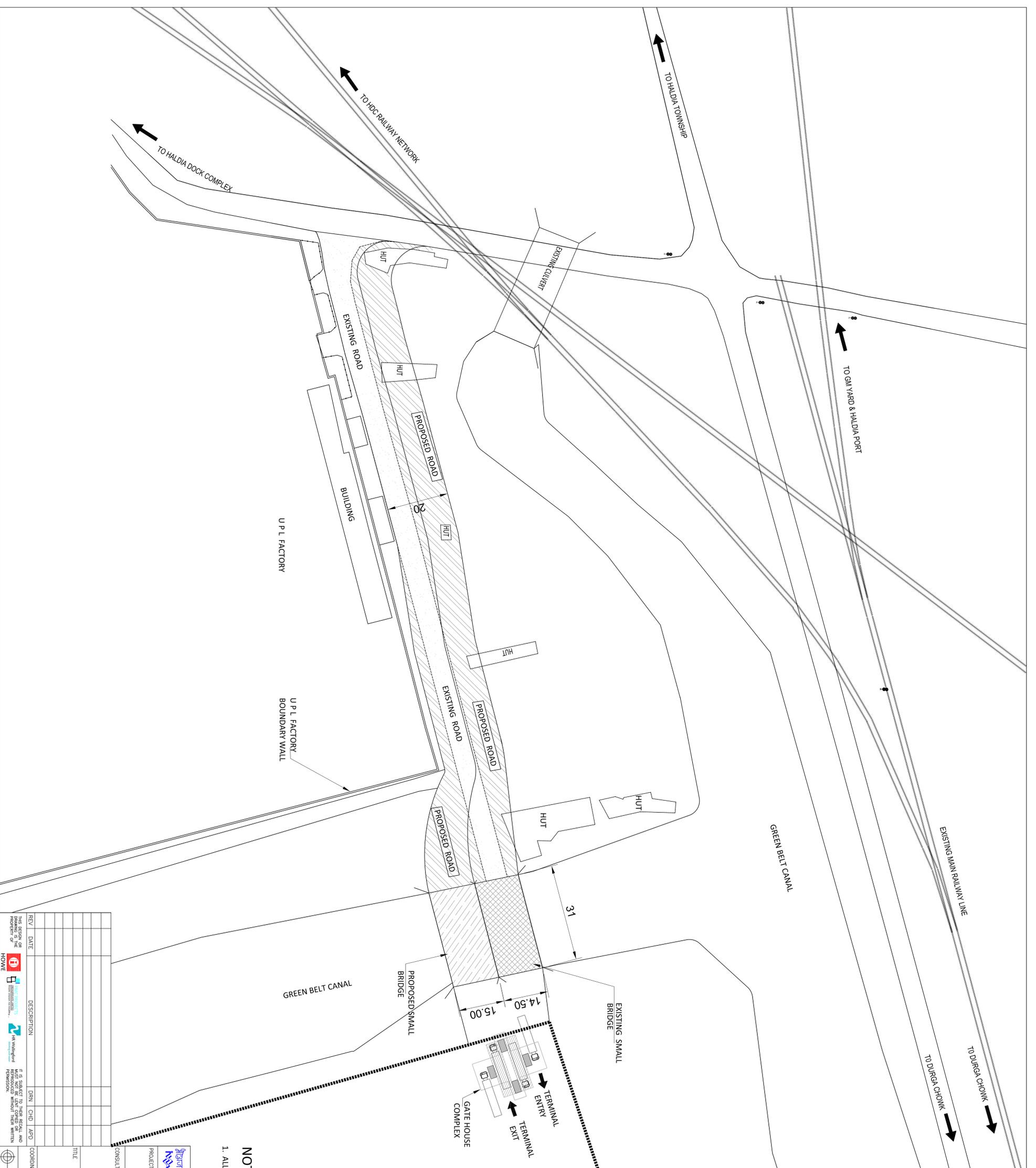
CONSULTANT	NAME	SKN	DATE
HOWE	BEN	SKN	30-05-2016
	CHD	AK	30-05-2016
PMC PROJECTS	APD	S DASH	30-05-2016

TITLE: IWT TERMINAL AT HALDIA
TYPICAL PLAN & ELEVATION DETAIL OF SILO

JOB. NO. I-525
ORG. NO. HT-220

REV	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED:	UNIT	SCALE	AS SHOWN	Size	A1	REV.	0
ENTER CO-ORD SYSTEM HERE							



- LEGEND :**
- EXISTING ROAD
 - PROPOSED ROAD
 - EXISTING BRIDGE
 - PROPOSED BRIDGE

NOTES:
1. ALL DIMENSIONS ARE IN METERS

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT		DATE	
HOWE	HR Wallingford	SRN	30-05-2016
		CHD	30-05-2016
		APD	30-05-2016

TITLE: IWT TERMINAL AT HALDIA APPROACH ROAD LAYOUT

JOB. NO. I-525
ORG. NO. HT-221

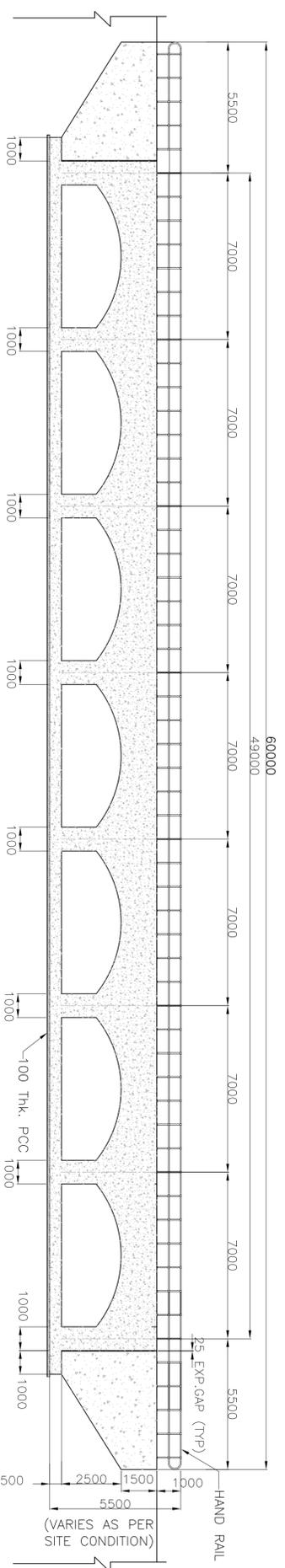
REV	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE: 1: 600 Size: A1 REV: 0

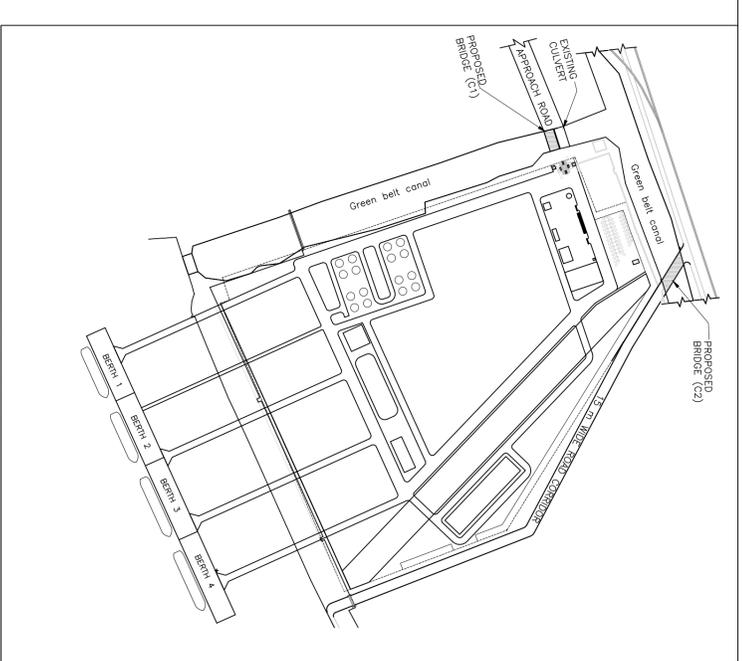
IT IS SUBJECT TO THE SCALE AND MOST NOT BE ALTERED OR PERMITTED TO BE USED WITHOUT THE PERMISSION OF THE PROJECT OWNER.

HOWE



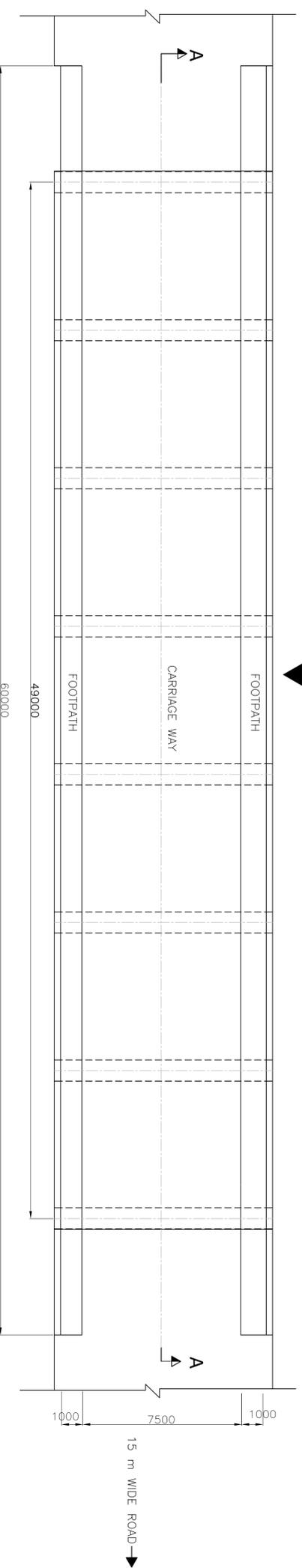
SECTION A-A

KEY PLAN



NTS

FLOW DIRECTION OF
'GREEN BELT CANAL'



PLAN FOR

PROPOSED BRIDGE 'C2'

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS WITH & ARE RESPECT TO CHART DATUM
 3. THE DIMENSIONS OF THE PROPOSED BRIDGE (C2) HAS TO BE CONSIDERED BASED ON THE ACTUAL DIMENSIONS OF 'GREEN BELT CANAL'.

INLAND WATERWAYS AUTHORITY OF INDIA



PROJECT
DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SION	DATE
 HR Wallingford Engineering Services	BRN	SKN	30-05-2016
	CHD	HML/SNA	30-05-2016
 PMC PROJECTS Project Management Services	APD	S DHAR	30-05-2016

TITLE
IWT TERMINAL AT HALDIA - PLAN AND CROSS
SECTION OF PROPOSED BRIDGE OVER GREEN BELT CANAL'

JOB. NO. HT-222
PRG. NO. HT-222

COORDINATE SYSTEM USED:
ENTER CO-ORD SYSTEM HERE

REV.	DATE	DESCRIPTION	DRN	CHD	APD

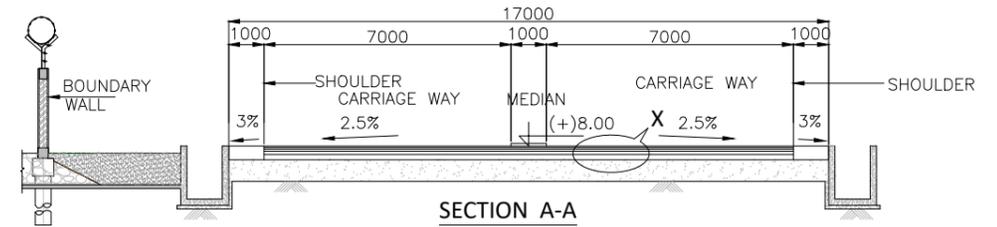
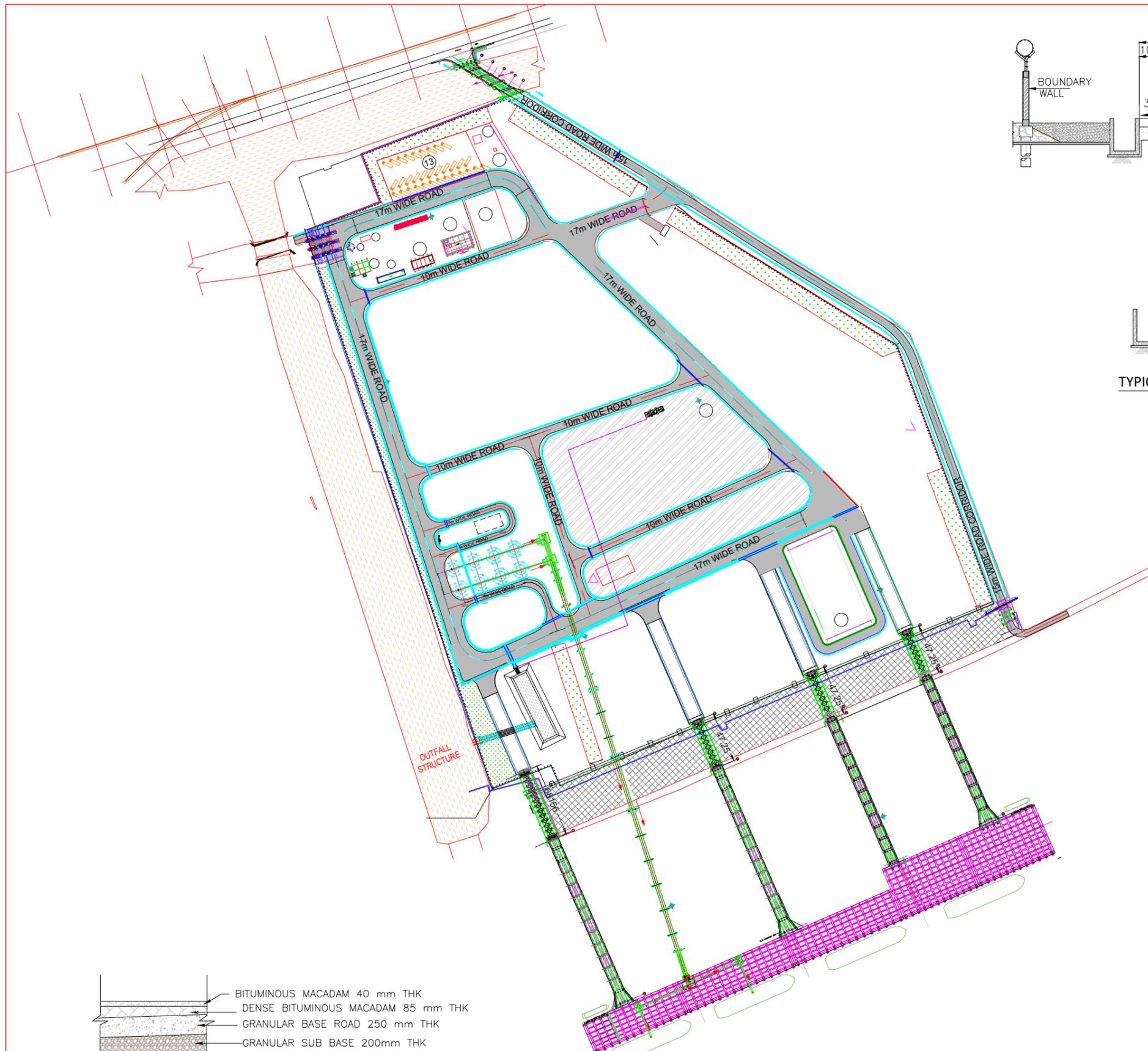
REV.	DATE	DESCRIPTION	DRN	CHD	APD

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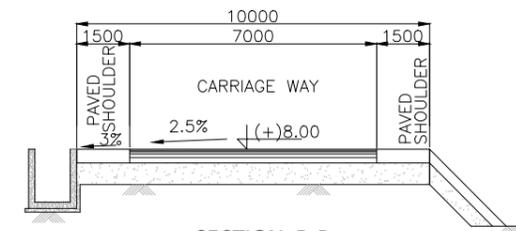


HOWE CONSULTANTS

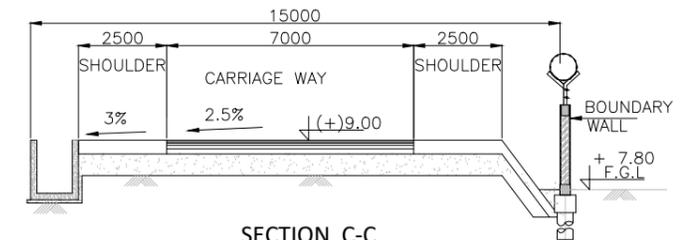
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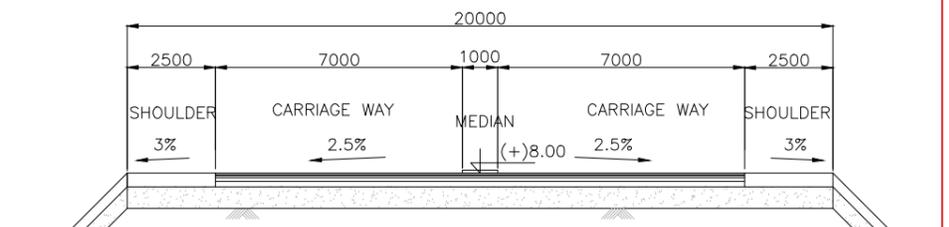
SECTION A-A
TYPICAL CROSS SECTION OF 17 m WIDE ROAD
SCALE-1:100



SECTION B-B
TYPICAL CROSS SECTION OF 10 m WIDE ROAD
SCALE-1:100



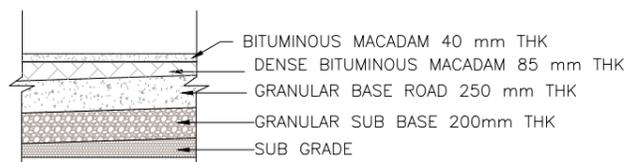
SECTION C-C
TYPICAL CROSS SECTION OF 15 m WIDE ROAD CORRIDOR
SCALE-1:100



SECTION D-D
TYPICAL CROSS SECTION OF 20 m WIDE ROAD
SCALE-1:100

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM
3. THE LEVELS OF APPROACH ROAD & 'PROPOSED 15 m WIDE ROAD CORRIDOR' TO TATA CHEMICAL ARE INDICATIVE. THE LEVELS SHOULD BE PROVIDED INLINE WITH THE LEVELS OF THE EXISTING ROADS



TYPICAL PAVEMENT DETAIL -X
NTS

REV	DATE	DESCRIPTION	DRN	CHD	APD
2	26.02.20		VP	AM	AM
1	11.02.20		VP	AM	AM

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INLAND WATERWAYS AUTHORITY OF INDIA			
PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)			
CONSULTANT: HOWE		NAME: DRN SKN SIGN: CHD HM/SKA DATE: APD S DHAR	
TITLE: IWT TERMINAL AT HALDIA		JOB. NO. DRG. NO.	
		I-525 HT-223	
COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE			
UNIT	SCALE - AS SHOWN	Size : A1	REV. 2



CHART OF COORDINATE FOR DIFFERENT UNITES

S. No.	DESCRIPTION	AREA
1.	TERMINAL ADMINISTRATION BUILDING	537.94 m ²
2.	WORKERS AMENITY BUILDING	162.40 m ²
3.	FUEL BUNKER	1500.00 m ²
4.	SECURITY OFFICE	25.00 m ²
5.	SEWAGE TREATMENT PLANT	56.24 m ²
6.	OVERHEAD WATER TANK	38.64 m ²
7.	UNDER GROUND WATER RESERVOIR	134.51 m ²
8.	RIO (REMOTE INPUT OUTPUT / COMPRESSOR ROOM FOR ASH HANDLING	300 m ²
9.	WASTE COLLECTION CENTRE	9.00 m ²
10.	SETTLING TANK NO.1	2017.47 m ²
11.	ELECTRICAL SUBSTATION	544.5 m ²
12.	WEIGH BRIDGE CONTROL ROOM	25.00 m ²
13.	VEHICLE PARKING AREA	3601.47 m ²
18.	COVERED SHED FOR FERTILIZER	3960.00 m ²
19.	ADDITIONAL ELECTRICAL SUBSTATION (REFER SPECIAL NOTE NO.- 01)	156.55 m ²

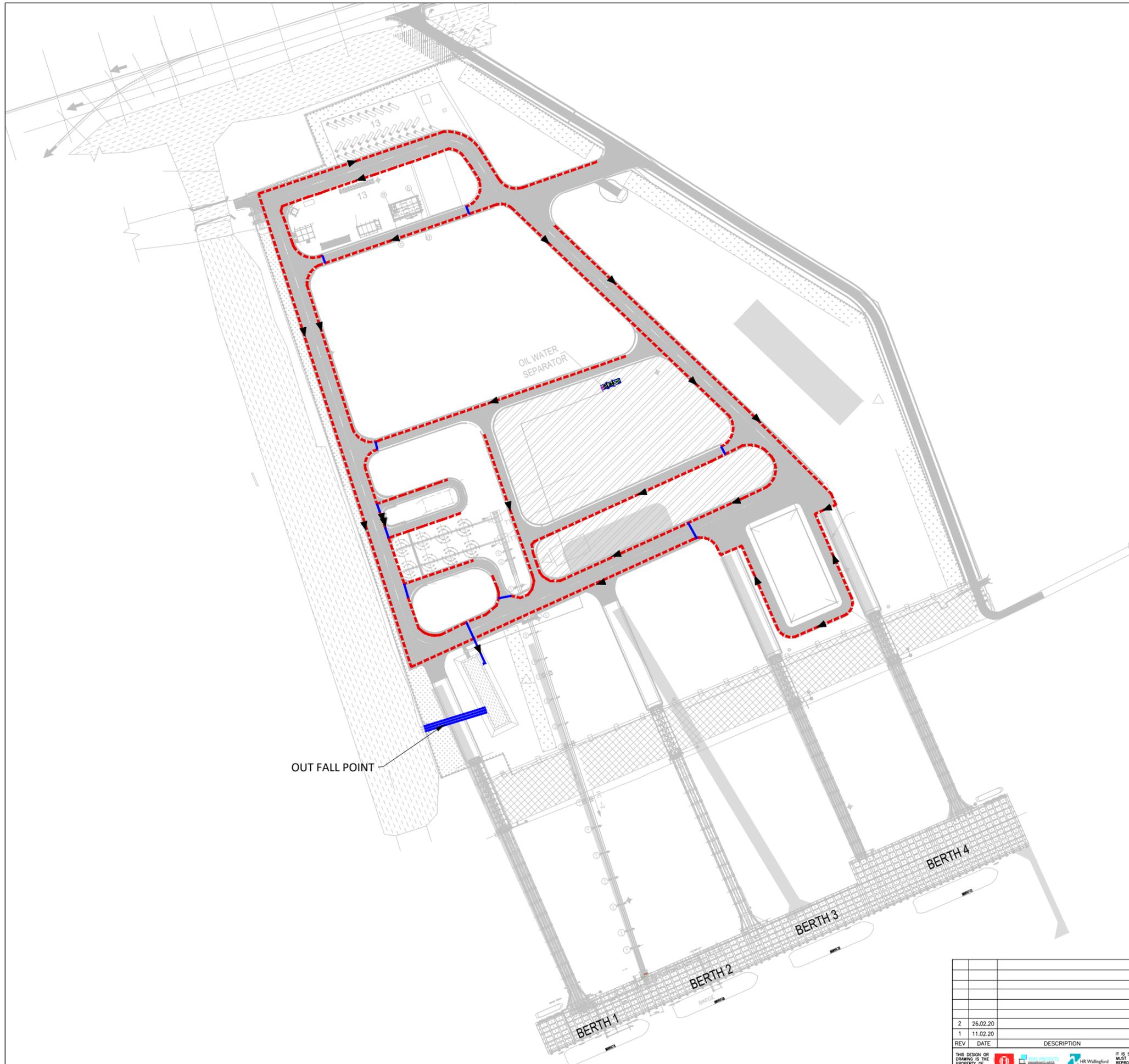
LEGEND:

----- POTABLE WATER PIPE LINE

REV	DATE	DESCRIPTION	DRN	CHD	APD
2	26.02.20		VP	AM	AM
1	11.02.20		VP	AM	AM

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<p>INLAND WATERWAYS AUTHORITY OF INDIA</p>			
<p>PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)</p>			
<p>CONSULTANT:</p>		<p>NAME</p> <p>DRN SKN</p> <p>CHD HM/SKA</p> <p>APD S DHAR</p>	<p>SIGN</p> <p>DATE</p>
<p>TITLE:</p> <p>IWT TERMINAL AT HALDIA</p> <p>SCHEMATIC LAYOUT OF WATER SUPPLY SYSTEM</p>		<p>JOB. NO.</p> <p>I-525</p>	<p>DRG. NO.</p> <p>HT-224</p>
<p>COORDINATE SYSTEM USED:</p> <p>ENTER CO-ORD SYSTEM HERE</p>			
	<p>UNIT</p>	<p>SCALE - 1:2000</p>	<p>Size : A1</p>
			<p>REV. 2</p>



OUT FALL POINT

OIL WATER SEPARATOR

BERTH 1

BERTH 2

BERTH 3

BERTH 4

LEGEND:

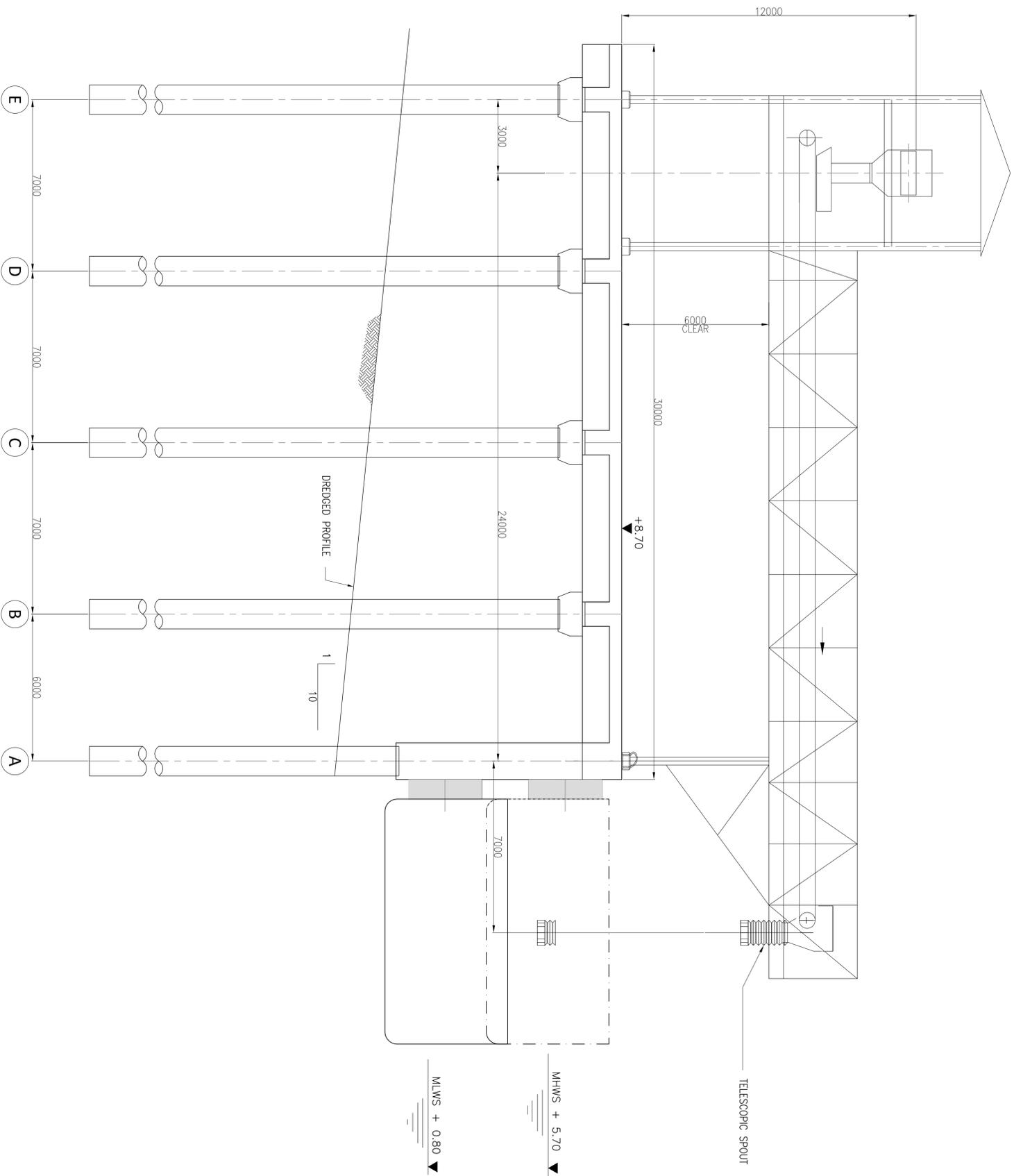
	COVERED RCC DRAIN
	PIPE / CULVERT

NOTES:
 1. PIPE DRAINS / CULVERT TO BE CONSIDERED AT ROAD CROSSING

INLAND WATERWAYS AUTHORITY OF INDIA														
PROJECT DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)														
CONSULTANT		<table border="1"> <tr> <td>NAME</td> <td>SIGN</td> <td>DATE</td> </tr> <tr> <td>DRN SKN</td> <td></td> <td></td> </tr> <tr> <td>CHD HM/SKA</td> <td></td> <td></td> </tr> <tr> <td>APD S DHAR</td> <td></td> <td></td> </tr> </table>	NAME	SIGN	DATE	DRN SKN			CHD HM/SKA			APD S DHAR		
NAME	SIGN	DATE												
DRN SKN														
CHD HM/SKA														
APD S DHAR														
		<table border="1"> <tr> <td>JOB. NO.</td> <td>DRG. NO.</td> </tr> <tr> <td>I-525</td> <td>HT-225</td> </tr> </table>	JOB. NO.	DRG. NO.	I-525	HT-225								
JOB. NO.	DRG. NO.													
I-525	HT-225													
TITLE IWT TERMINAL AT HALDIA LAYOUT OF STORM WATER DRAINAGE														
COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE														
	UNIT	SCALE - 1:2000												
Size : A1	REV.	2												

REV	DATE	DESCRIPTION	DRN	CHD	APD
2	26.02.20		VP	AM	AM
1	11.02.20		VP	AM	AM

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- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SRN	DATE
HOWE	DRN	SKN	30-05-2016
	CHD	HM/SA	30-05-2016
	APD	S DARR	30-05-2016

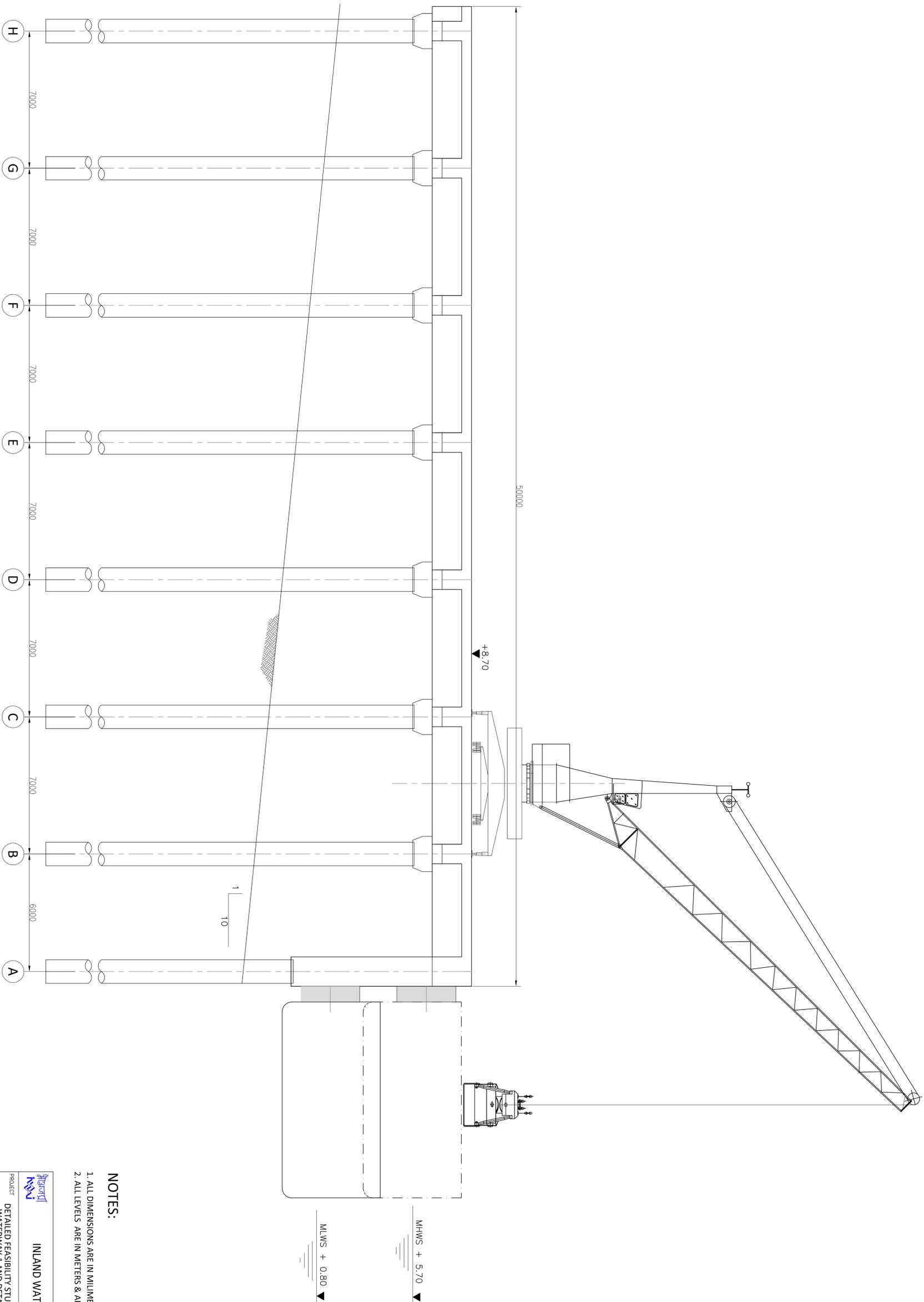
TITLE: INT TERMINAL AT HALDIA
CROSS SECTION OF FIXED TYPE BARGE LOADER

JOB. NO. I-525 ORG. NO. HT-226

REV	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED:	ENTER CO-ORD SYSTEM HERE
UNIT	SCALE : 1:100
Size :	A1
REV.	0

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- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETERS
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT	NAME	SION	DATE
	BRN	SKN	30-05-2016
	CHD	HM/SA	30-05-2016
	APD	S DMR	30-05-2016

TITLE: INTR TERMINAL AT HALDIA
 CROSS SECTION OF MOBILE HARBOUR CRANE

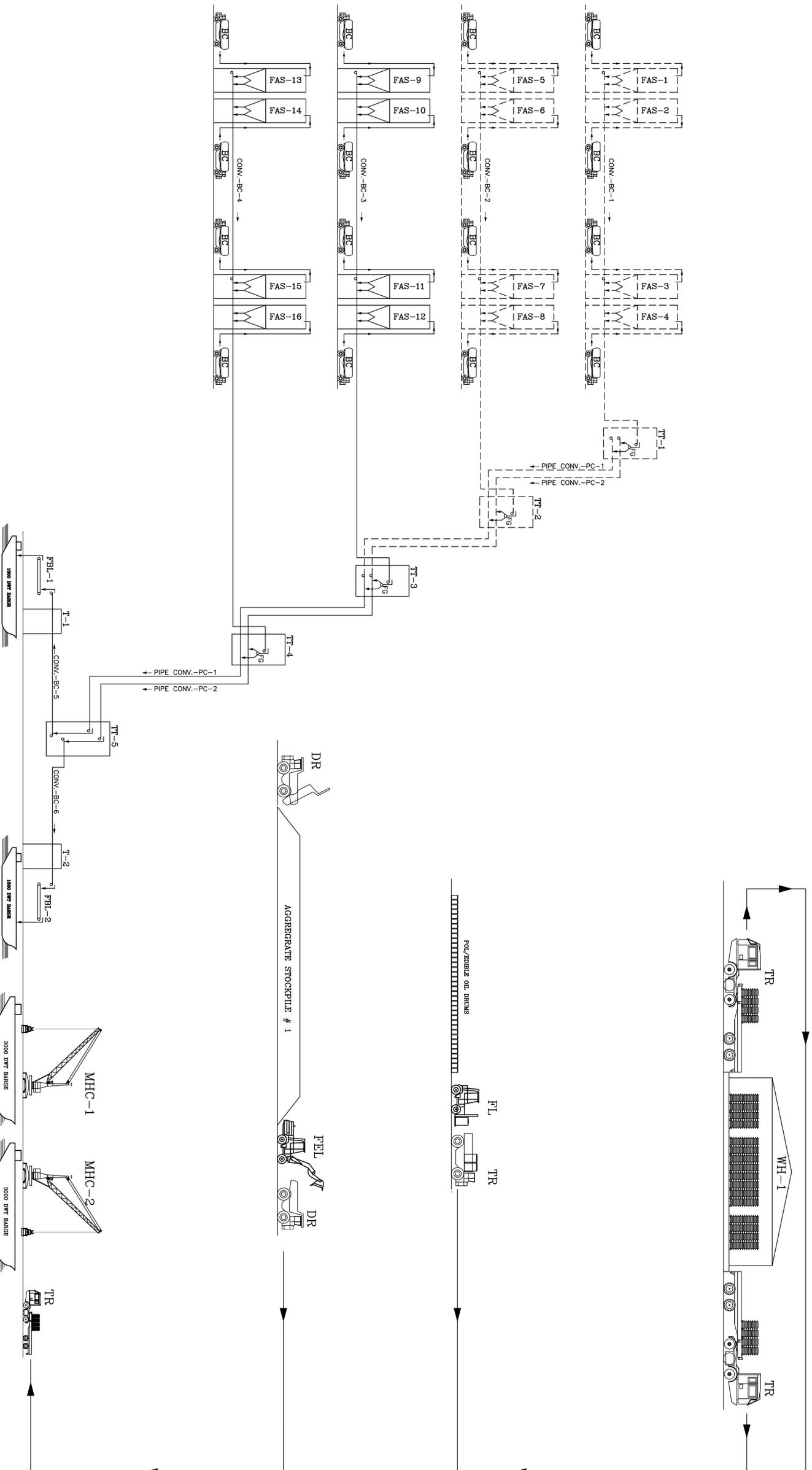
REV	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED:
 ENTER CO-ORD SYSTEM HERE

SCALE : 1:100 Size : A1 REV. : 0

THIS SECTION OF DRAWING IS THE PROPERTY OF HOWE

IT IS SUBJECT TO THE SCALE AND MOST NOT BE ANY OTHER PERMISSION



LEGENDS:-
 ————— FACILITY IN PHASE - 1
 - - - - - FACILITY IN PHASE - 2

SYM-BOL	DESCRIPTION	RATED CAP. TPH.	QTY.	REMARKS
FAS	FLY ASH SILO	1200 T	8 NOS	8 NOS (FUT.)
FBL	FIXED BARGE LOADER	-	2 NOS	
MHC	MOBILE HARBOUR CRANE	-	2 NOS	
BUL	BARGE UNLOADER	-	2 NOS	
BC	BELT CONVEYOR	400	LOT	
PC	PIPE CONVEYOR	400	LOT	
FG	FLAP GATES	-	LOT	
TT	TRANSFER TOWER	-	LOT	
T	TOWER	-	LOT	
WH-1	WARE HOUSE FOR FERTILIZER FOR BAGGED CARGO	-	1 NO.	
BC	BULK CARRIER	-	LOT	BY OTHERS
DR	DUMPER TRUCKS	-	LOT	
FL	FORK LIFT TRUCK	-	LOT	
FEL	FRONT END LOADER	-	LOT	
TR	TRUCK	-	LOT	

REV	DATE	DESCRIPTION	DRN	CHD	APD

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** (PwC PROJECTS) & **HR Wallingford** (Independent Member from system of review)

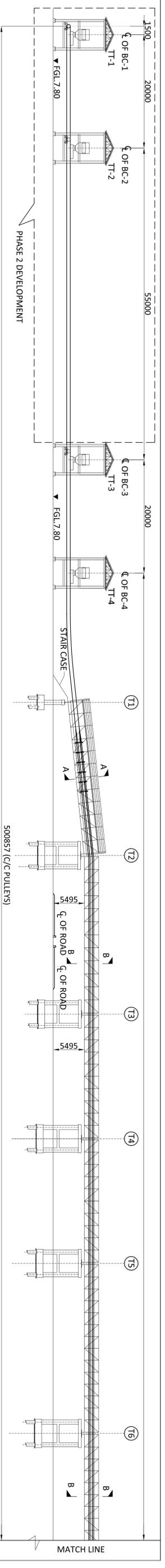
TITLE: **INWT TERMINAL AT HALDIA**

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

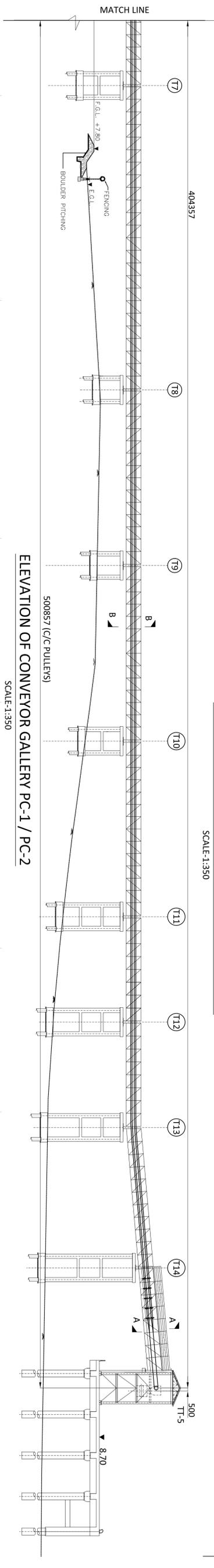
NAME	SION	DATE
BRN	SKN	30-05-2016
CHD	HM/SKA	30-05-2016
APD	S DADR	30-05-2016

JOB. NO. **I-525** ORG. NO. **HT-228** (SH. 1 OF 2)

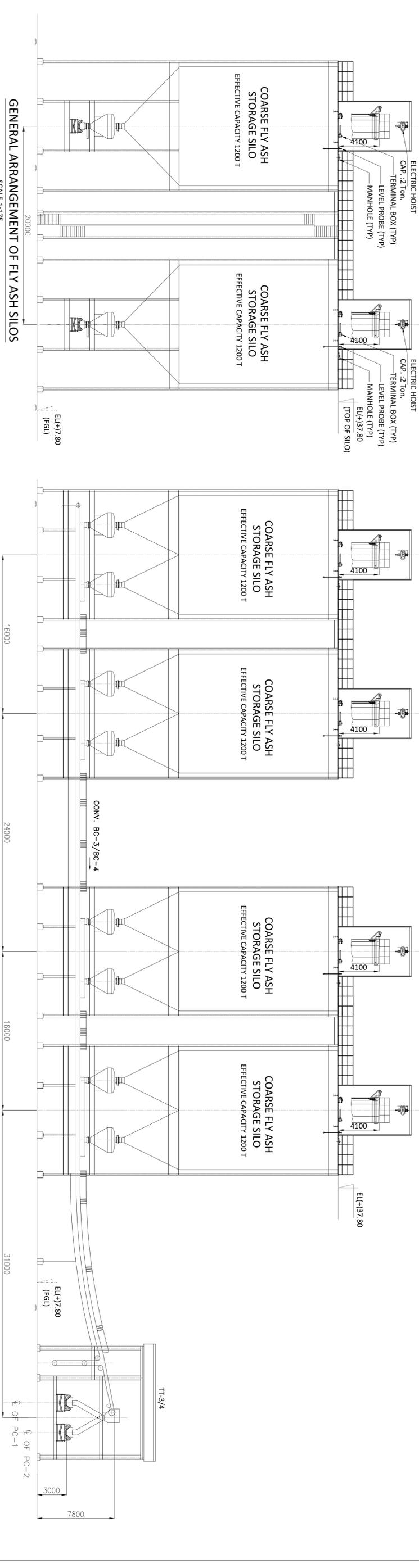
SCALE: NTS Size: A1 REV. 0



ELEVATION OF CONVEYOR GALLERY PC-1 / PC-2
SCALE:1:350



ELEVATION OF CONVEYOR GALLERY PC-1 / PC-2
SCALE:1:350



GENERAL ARRANGEMENT OF FLY ASH SILOS
SCALE:1:175

ELEVATION OF CONVEYOR BC-3/BC-4
SCALE:1:175

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM
3. REFER DWG. NO. HT 213 FOR STRUCTURAL DETAILS

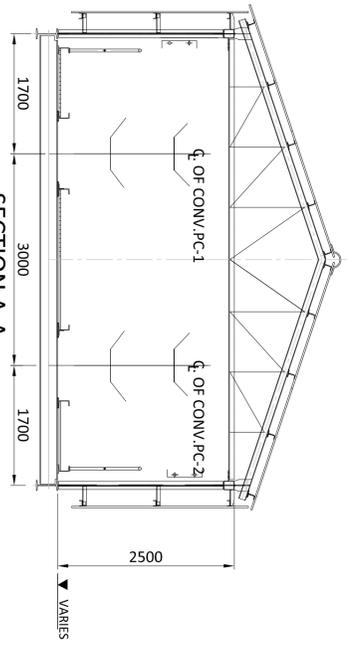
INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT
DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (IAL VIKAS PROJECT)

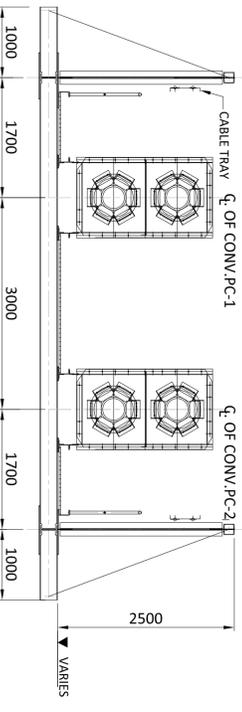
CONSULTANT	HR Wallingford
CLIENT	INLAND WATERWAYS AUTHORITY OF INDIA
PROJECT NO.	HT-228
JOB NO.	1-525
DATE	30-05-2016
REVISED DATE	30-05-2016
APPROVED BY	30-05-2016

REV.	DATE	DESCRIPTION	DRN	CHD	APD

COORDINATE SYSTEM USED:	ENTER CO-ORD SYSTEM HERE
UNIT	SCALE - AS SHOWN
Size :	A1
REV.	0



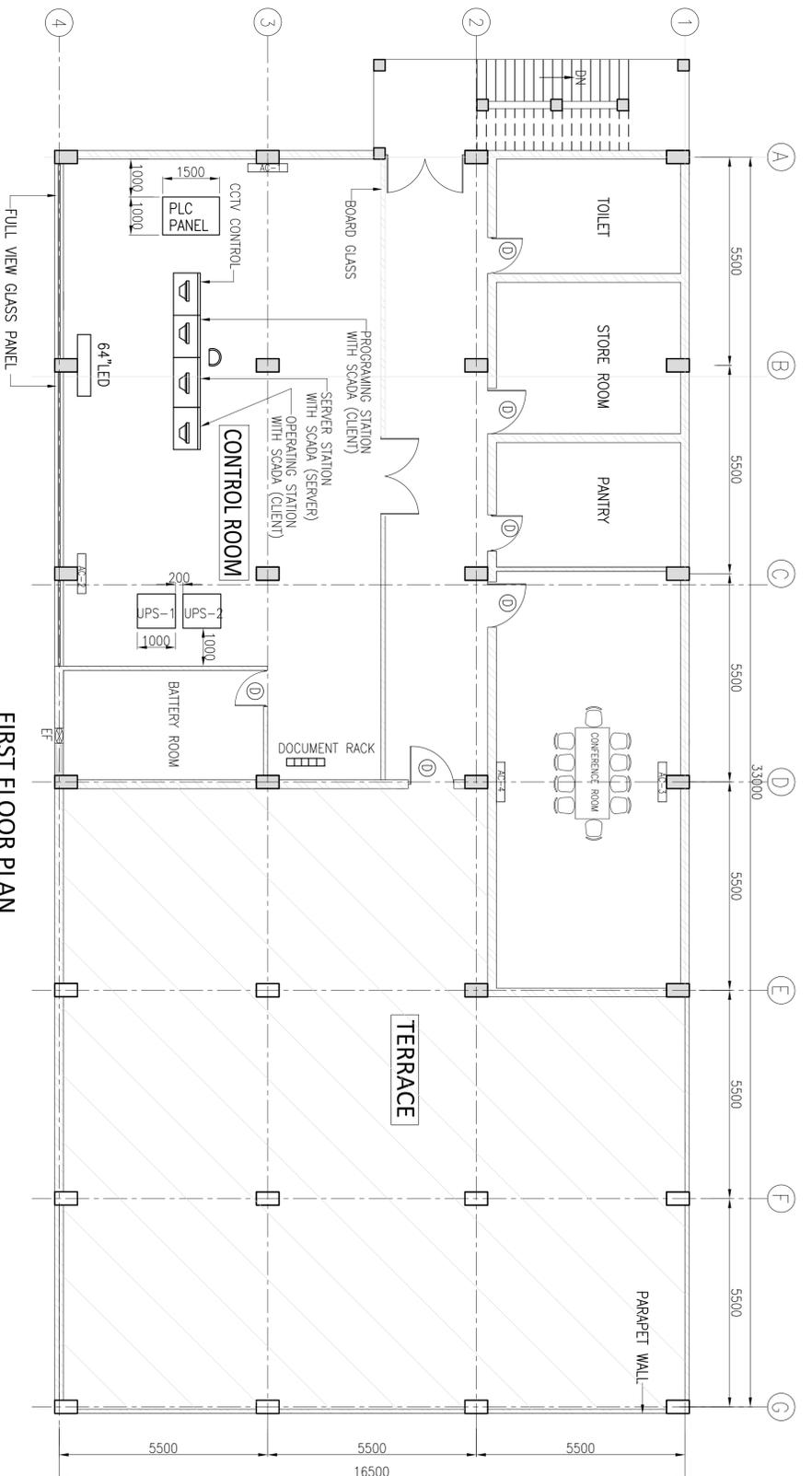
SECTION A-A
SCALE:1:50



SECTION B-B
SCALE:1:50

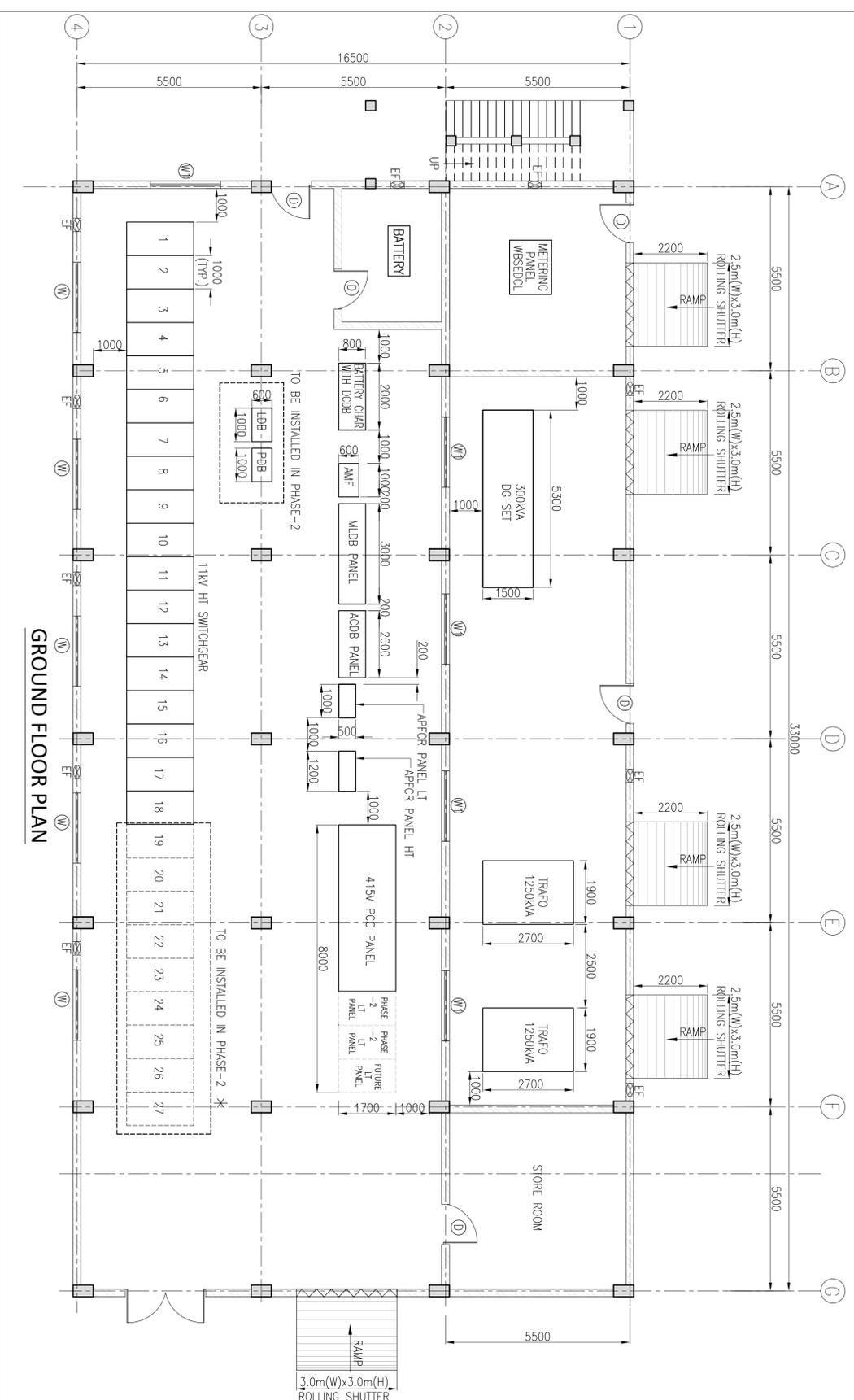
REV.	DATE	DESCRIPTION	DRN	CHD	APD

REV.	DATE	DESCRIPTION	DRN	CHD	APD



FIRST FLOOR PLAN

- LEGEND :-**
- ⊕ WINDOW (OPENABLE)
 - ⊕ FIXED GLASS WINDOW
 - ⊕ EXHAUST FAN
 - ⊕ DOOR



GROUND FLOOR PLAN

NOTE :-
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.

REV	DATE	DESCRIPTION	DRN	CHD	APD
RT	11.05.16	BASED ON REMOVAL OF BERTH 5	SKN	SS	SD

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE**

TITLE: **IWT TERMINAL AT HALDIA SUBSTATION EQUIPMENT LAYOUT**

JOB. NO. **I-525** PRG. NO. **HT-230**

NAME	SION	DATE
BEN	VS	30-05-2016
CHD	SS	30-05-2016
APD	SD	30-05-2016

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

SCALE: 1:100 Size: A1 REV. 1

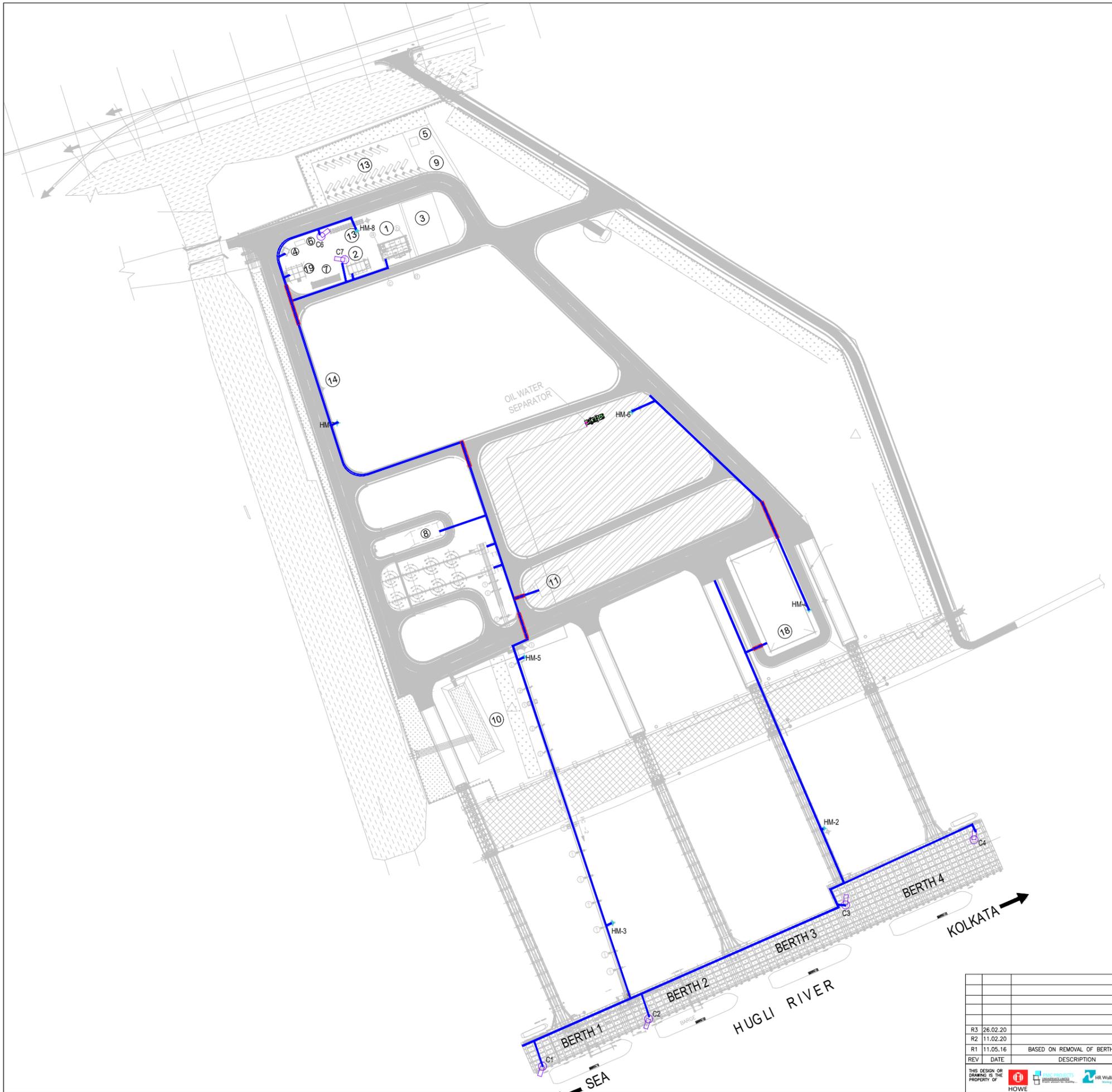


CHART OF COORDINATE FOR DIFFERENT UNITS

S. No.	DESCRIPTION	AREA
1.	TERMINAL ADMINISTRATION BUILDING	537.94 m ²
2.	WORKERS AMENITY BUILDING	162.40 m ²
3.	FUEL BUNKER	1500.00 m ²
4.	SECURITY OFFICE	25.00 m ²
5.	SEWAGE TREATMENT PLANT	56.24 m ²
6.	OVERHEAD WATER TANK	38.64 m ²
7.	UNDER GROUND WATER RESERVOIR	134.51 m ²
8.	RIO (REMOTE INPUT OUTPUT / COMPRESSOR ROOM FOR ASH HANDLING	300 m ²
9.	WASTE COLLECTION CENTRE	9.00 m ²
10.	SETTLING TANK NO.1	2017.47 m ²
11.	ELECTRICAL SUBSTATION	544.5 m ²
12.	WEIGH BRIDGE CONTROL ROOM	25.00 m ²
13.	VEHICLE PARKING AREA	3601.47 m ²
18.	COVERED SHED FOR FERTILIZER	3960.00 m ²
19.	ADDITIONAL ELECTRICAL SUBSTATION (REFER SPECIAL NOTE NO.- 01)	156.55 m ²

LEGEND:

SYMBOL	DESCRIPTION
TT	TRANSFER TOWER
T	TOWER
BC	BELT CONVEYORS
PC	PIPE CONVEYORS
	HUME PIPE FOR CABLE ROAD CROSSING
	RCC CABLE TRENCH 1.0x1.0 m
	CCTV CAMERA
	HIGHMAST(HM)

NOTES:

1. ALL DIMENSIONS ARE IN METER

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE**, **PMC PROJECTS**, **HR Wallingford**

DRN	VS	NAME	SIGN	DATE
CHD	SS			
APD	SD			

TITLE: **IWT TERMINAL AT HALDIA HIGH MAST & CABLE LAYOUT**

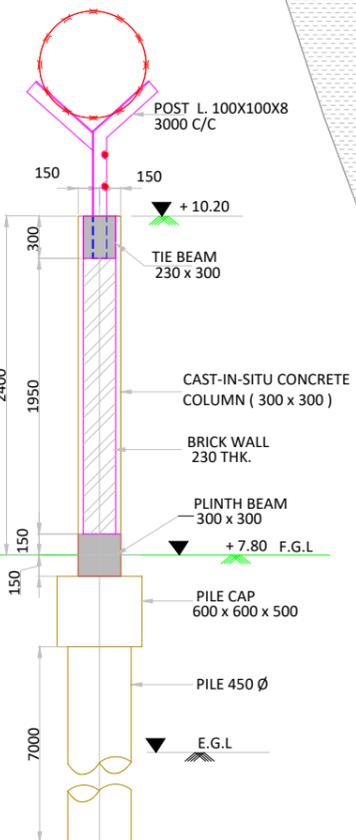
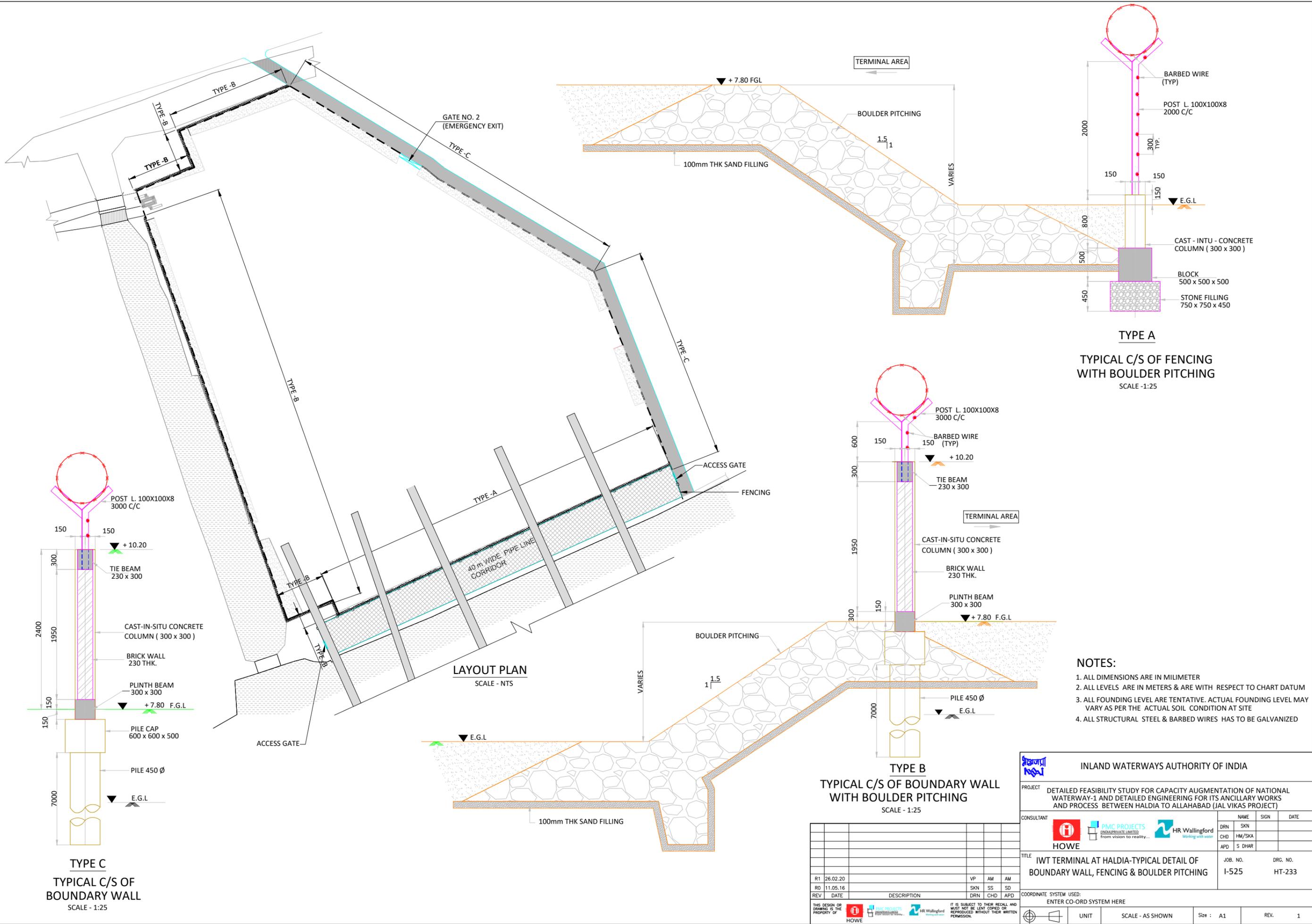
JOB. NO. I-525 DRG. NO. HT-231

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

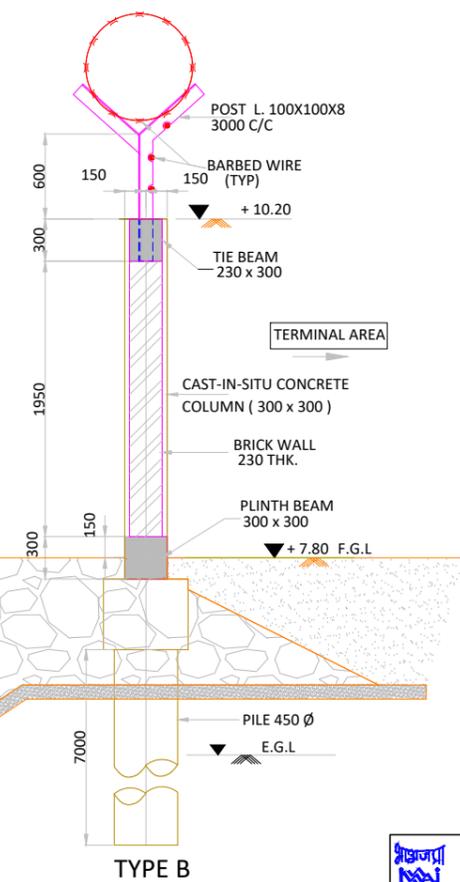
UNIT: SCALE:-NTS Size : A1 REV. 3

REV	DATE	DESCRIPTION	DRN	CHD	APD
R3	26.02.20		VP	AM	AM
R2	11.02.20		VP	AM	AM
R1	11.05.16	BASED ON REMOVAL OF BERTH 5	SKN	SS	SD

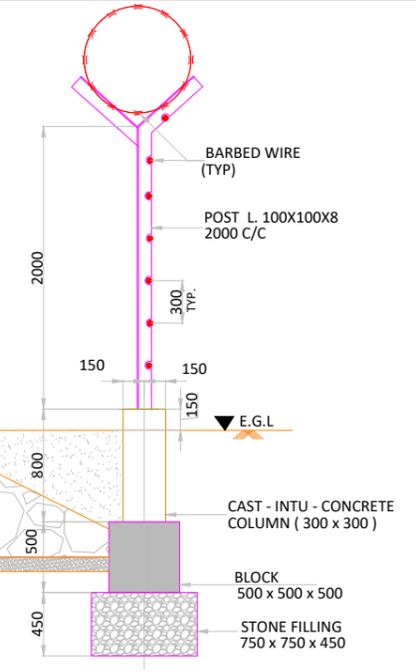
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TYPE C
TYPICAL C/S OF
BOUNDARY WALL
SCALE - 1:25



TYPE B
TYPICAL C/S OF BOUNDARY WALL
WITH BOULDER PITCHING
SCALE - 1:25



TYPE A
TYPICAL C/S OF FENCING
WITH BOULDER PITCHING
SCALE - 1:25

LAYOUT PLAN
SCALE - NTS

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETER
 2. ALL LEVELS ARE IN METERS & ARE WITH RESPECT TO CHART DATUM
 3. ALL FOUNDING LEVEL ARE TENTATIVE. ACTUAL FOUNDING LEVEL MAY VARY AS PER THE ACTUAL SOIL CONDITION AT SITE
 4. ALL STRUCTURAL STEEL & BARBED WIRES HAS TO BE GALVANIZED

REV	DATE	DESCRIPTION	DRN	CHD	APD
R1	26.02.20		VP	AM	AM
R0	11.05.16		SKN	SS	SD

INLAND WATERWAYS AUTHORITY OF INDIA

PROJECT: DETAILED FEASIBILITY STUDY FOR CAPACITY AUGMENTATION OF NATIONAL WATERWAY-1 AND DETAILED ENGINEERING FOR ITS ANCILLARY WORKS AND PROCESS BETWEEN HALDIA TO ALLAHABAD (JAL VIKAS PROJECT)

CONSULTANT: **HOWE** | **PMC PROJECTS** (INDIA) PRIVATE LIMITED | **HR Wallingford**

NAME	SIGN	DATE
DRN	SKN	
CHD	HM/SKA	
APD	S DHAR	

TITLE: **IWT TERMINAL AT HALDIA-TYPICAL DETAIL OF BOUNDARY WALL, FENCING & BOULDER PITCHING**

JOB. NO. I-525 | DRG. NO. HT-233

COORDINATE SYSTEM USED: ENTER CO-ORD SYSTEM HERE

UNIT: SCALE - AS SHOWN | Size: A1 | REV. 1

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39. Annexure XVII: Base Case Financial Model

[Note: The model BCFM would be developed with the appropriate inputs from the financial and technical consultants. However such Financing Plan would need to be customized based on each project and its requirements. Such model Financing Plan would essentially include;

- (i) Total Project Cost,
- (ii) License Fee and Royalty payable to the Concessioneing Authority,
- (iii) Annual estimated Project revenue,
- (iv) Equity contribution,
- (v) Cargo handling projections estimated by Concessionaire,
- (vi) Discounted net present value of the cash flows,
- (vii) Equity IRR,
- (viii) Debt equity ratio, and
- (ix) Debt service ratio.

Such Financing Plan would be submitted by the concessionaire and got approved by the Concessioneing Authority at the time of Financial Close.]

Note: Such format of the Financing Plan shall also identify the respective threshold limit of the above parameters and the basis of further projections and the detailed requirements that would need to be stratified with respect to each line item.

40. Annexure XVIII: Draft Tripartite Agreement

MODEL TRIPARTITE AGREEMENT

BETWEEN INLAND WATERWAYS AUTHORITY OF INDIA, CONCESSIONAIRE AND INFRASTRUCTURE DEBT FUND

This Tripartite Agreement is made at ***** on the ***** day of *****, 20** by
and between

(i) **MEMBERS OF INLAND WATERWAYS AUTHORITY OF INDIA**, a body corporate constituted under the provisions of the Inland Waterways Authority of India Act 1985, and having its principal administrative office at A-13, Sector-1, Noida – 201301, Uttar Pradesh, hereinafter referred to as the “**Concessioneing Authority**” which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns;

(ii) The [***** Infrastructure Debt Fund], a company registered under the Companies Act, 1956, acting through *****, and having its registered office at ***** (hereinafter referred to as the “**Debt Fund**” which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns);

And

[***** Limited], a company registered under the Companies Act, 2013, acting through *****, duly authorised by the resolution passed at the meeting of its Board of Directors held on *****, and having its registered office at ***** (hereinafter referred to as the “**Concessionaire**” which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns)

WHEREAS:

(A) The Concessioneing Authority and the Concessionaire had entered into a Concession Agreement (as defined hereinafter), a true copy of which is annexed hereto and marked as Annex-I, for development of ***** (the “**Project**”);

(B) The Project entered into commercial operation or any substitute thereof on ***** (the “**Date of Commercial Operation**”) in accordance with the provisions of the Concession Agreement;

(C) Following the occurrence of the Date of Commercial Operation, the Concessionaire has been operating the Project in accordance with the terms and conditions of the Concession Agreement;

(D) The Concessionaire had raised debt from the Senior Lenders for financing the Project and had utilised the same for the purposes of the Project under the Concession Agreement;

(E) The Concessionaire has been discharging its debt service obligations, including the repayment of principal and interest, in accordance with the provisions of the Financing Documents;

(F) The debt service obligations have not been rescheduled, waived or postponed in any manner during the past one year from the date hereof, and the Concessionaire is not in default of its debt service obligations under the Financing Documents; and

(G) The Concessionaire has decided to refinance all or part of its outstanding debt and has requested the Debt Fund to invest in its bonds, the proceeds of which shall be paid to the Senior Lenders as specified in Schedule-I.

Now, therefore, the Parties hereby agree and this agreement witnessed - as follows:

1. DEFINITIONS AND INTERPRETATIONS

1.1 For the purposes of this Agreement, the following terms shall have the meaning hereinafter respectively assigned to them:

“**Agreement**” means this Tripartite Agreement, and amendments if any thereto;

“**Bonds**” means the securities issued by the Concessionaire in consideration of the amounts paid for the investment thereof;

“Concession Agreement” means the executed Concession Agreement dated [date on which the Concession Agreement has been signed] for the Project, entered into between the Concessions Authority and the Concessionaire,

and shall include all Schedules thereof and any amendments thereto made in accordance with the provisions contained in this behalf therein;

“Financing Documents” means financing documents under the Concession Agreement and documents executed on the date [...date of signing of the financing documents] for the Project and shall include all Schedules thereof and any amendments thereto made in accordance with the provisions contained in this behalf therein.

“Senior Lenders” means any Persons based in India or abroad providing Financial Assistance under the Financing Documents and includes a trustee for the holders of debentures/ or other debt instruments issued by the Concessionaire to finance the Project.

“Senior Lenders’ Representative” shall have the same meaning as ascribed to it in the Financing Document, provided that, this would include the Trustees for any bonds issued by the Concessionaire. In absence of one such person/ entity having the authority to sign, Senior Lenders Representative shall mean all the Senior Lenders, and/or the Trustees for any bonds issued by the Concessionaire.

“Parties” means the parties to this Agreement collectively and **“Party”** shall mean any of the parties to this Agreement individually;

1.2 The words and expressions beginning with or in capital letters used in this Agreement and not defined herein but defined in the Concession Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Concession Agreement.

1.3 Interpretation

1.3.1 In this Agreement, unless the context otherwise requires,

- (a) references to any legislation or any provision thereof, or any rules, regulations, bylaws or notifications thereunder, shall include amendment or re-enactment or consolidation of such legislation or any provision thereof so far as such amendment or re-enactment or consolidation applies or is capable of applying to any transaction entered into hereunder;
- (b) references to “**development**” include, unless the context otherwise requires, construction, renovation, refurbishing, augmentation, upgradation and other activities incidental thereto, and “**develop**” shall be construed accordingly;
- (c) “**lakh**” means a hundred thousand (100,000) and “**crore**” means ten million (10,000,000);
- (d) save and except as otherwise provided in this Agreement, any reference, at any time, to any agreement, deed, instrument, licence or document of any description shall be construed as reference to that agreement, deed, instrument, licence or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Sub-clause shall not operate so as to increase liabilities or obligations of the Debt Fund hereunder or pursuant hereto in any manner whatsoever;
- (e) any agreement, consent, approval, authorisation, notice, communication, information or report required under or pursuant to this Agreement from or by any Party shall be valid and effective only if it is in writing under the hand of a duly authorised representative of such Party in this behalf and not otherwise;
- (f) the Recitals and Annexes to this Agreement form an integral part of this Agreement and will be in full force and effect as though they were expressly set out in the body of this Agreement; and
- (g) time shall be of the essence in the performance of the Parties’ respective obligations. If any time period specified herein is extended, such extended time shall also be of the essence.

1.3.2 Any word or expression used in this Agreement shall, be construed as per the definition given in the General Clauses Act, 1897 failing which it shall bear the ordinary English meaning.

2. ISSUE OF BONDS

2.1 The Parties agree that the Concessionaire may, in accordance with the provisions of this Agreement, issue Bonds for the amounts subscribed by the Debt Fund; provided that the total value of such Bonds shall not exceed 94% (ninety four percent) of compensation payment from the Concessioneing Authority on day of signing this Tripartite Agreement(**as specified in Schedule II**); [provided further that the Concessionaire may, with prior written approval of the Concessioneing Authority, which approval the Concessioneing Authority may in its sole discretion deny, issue additional Bonds for a total value not exceeding the balance of the said compensation payable]⁵.

2.2 Upon investment in Bonds pursuant to Paragraph 2.1, the Debt Fund shall be deemed to be a Senior Lender and shall thereupon be entitled to all the rights and privileges of a Senior Lender under the Concession Agreement.

2.3 The tenor of the Bonds, in accordance with the provisions of this Agreement shall be such that at least 50% (fifty per cent) and 75% (seventy five per cent) of the total nominal value thereof shall be fully redeemed by the Concessionaire no later than the expiry of 75% (seventy five per cent) and 85% (eighty five per cent) of the Concession Period respectively and the balance, if any, shall be redeemed no later than 2 (two) years prior to the expiry of the Concession Period.

2.4 Subject to the clause 2.3 of this Agreement, the tenure, rate of interest and other commercial terms of the Bonds shall be determined by mutual agreement between the Debt Fund and the Concessionaire.

2.5 The Bonds shall be in such denomination as the Debt Fund and the Concessionaire may determine, but not less than Rs [10,000 (Rupees ten thousand)] in any case.

2.6 Subject to the provisions of Paragraph 4.1, the Debt Fund and the Concessionaire may, with prior written approval of the Concessions Authority, which approval the Concessions Authority may in its sole discretion deny, allocate and bear the foreign exchange risks for and in respect of any foreign-exchange denominated Bonds, in such manner as they may mutually agree. For the avoidance of doubt, the Parties expressly agree that if the foreign exchange risk for any or all Bonds is borne by the Concessionaire. The compensation to be made by the Concessions Authority for and in respect of such Bonds shall be adjusted to cover the variation between the nominal value of Bonds and the actual amount payable to the Debt Fund, such that the liability of the Concessionaire for redemption of the Bonds hereunder is fully discharged by the Concessions Authority.

2.7 The Parties expressly agree and confirm that repayment of the principal and interest in respect of the Bonds shall have a prior charge over the Senior Lenders on appropriation of compensation under Articles 9, 16 and 17 of the Concession Agreement, and only the balance remaining shall be paid to the other Senior Lenders.

2.8 Any delay in the repayment of the principal or interest for and in respect of the Bonds shall attract interest at a rate of 3% (three per cent) above the rate of interest applicable for the Bonds.

2.9 The Parties agree and confirm that upon execution of this Agreement, the Debt Fund shall, acting through the Senior Lenders' Representatives, be deemed to be a party to the Escrow Agreement and the Substitution Agreement for the Project, and all rights, privileges and obligations of the Senior Lenders shall also vest in the Debt Fund. The Parties further agree and confirm that the provisions of the Concession Agreement and all other agreements, including the Escrow Agreement, Substitution Agreement and Financing Documents, shall be read and construed so as to give effect to the provisions of this Agreement, but without increasing any financial obligations and/ or liabilities of the Concessions Authority under the Concession Agreement.

2.10 By counter-signing the Tripartite Agreement, the Senior Lenders' Representative, acting on behalf of the Senior Lenders agrees, confirms and undertakes that the *paripassu* rights, title or interest of the Lenders in compensation, to the extent such rights, title or interest are provided in the Concession Agreement, Substitution Agreement, Escrow Agreement, Financing Documents or any other agreement, shall be subordinate to the rights, title or interest created by the Bonds in favour of the Debt Fund, and accordingly, the

compensation shall be applied first for the redemption of Bonds and only the balance remaining, if any, shall be paid into the Escrow Account for meeting other obligations including the balance Debt Due. For the avoidance of doubt, the Parties expressly agree that the Debt Fund may, in its discretion, exercise all the rights and privileges of the Senior Lenders' Representative under the Concession Agreement, Substitution Agreement, Escrow Agreement and this Agreement. The Parties further agree that save and except the application of compensation for redemption of Bonds in pursuance of this Agreement and subject to the provisions of Paragraph 2.7, the Senior Lenders shall have *paripassu* charge on the revenues of the Concessionaire in accordance with the provisions of the Concession Agreement.

2.11 The Debt Fund may, by notice to the Parties, transfer all or any Bonds to any other person, and upon such transfer, the rights and obligations of the Debt Fund shall vest in such person. Provided that no such notice shall be required for transfer of Bonds if they have been listed in any recognized Stock Exchange and such transfer is in accordance with the regulations of the Stock Exchange.

2.12 Notwithstanding anything to the contrary contained in this Agreement, the Debt Fund may have the option to extend a term loan to the Concessionaire for an amount not exceeding 50% (fifty per cent) of its total exposure to the Concessionaire and the provisions of this Agreement shall apply *mutatis mutandis* to such term loan as if it were a Bond.

3. REDEMPTION OF BONDS

3.1 The Concessionaire agrees and undertakes that upon completion of the tenor of the Bonds, it shall redeem the same by making full and complete payment of the outstanding principle and the interest thereon.

3.2 Notwithstanding anything to the contrary in this Agreement, the Debt Fund may by notice require the Concessionaire to redeem upto 10% (ten per cent) of the value of the Bonds in any financial year and upon notice in this behalf, the Concessionaire shall redeem such Bonds no later than 120 (one hundred and twenty) days from the date of receipt of such notice.

3.3 The Parties expressly agree that the Debt Fund and the Concessionaire may at any time by mutual agreement undertake early redemption of the Bonds and upon full redemption thereof, this Agreement shall cease to be in force.

3.4 The Parties expressly agree and confirm that in terms of Articles 15, 16 and 17 of the Concession Agreement, the Concessions Authority has covenanted that in the event of termination of the Concession Agreement, the Concessions Authority shall pay compensation in accordance with the provisions of the Concession Agreement, which shall be applied for redemption of the Bonds in accordance with the provisions of this Agreement. The Parties further agree and confirm that upon termination on account of a Concessionaire Event of Default or Concessions Authority Event of Default, the Concessions Authority shall pay compensation in accordance with the provisions of the Concession Agreement.

3.5 The Parties agree and confirm that in the event of default in Debt Service by the Concessionaire, the Senior Lenders shall have the right to enforce termination of the Concession Agreement in terms of Article 15.1.1 and 17.1.2 of the Concession Agreement, which *inter alia* requires the Concessions Authority to pay compensation in accordance with the provisions of the Concession Agreement. The Parties further agree that in the event the Concessions Authority approves the issuance of additional Bonds under the provisions of Paragraph 2.1 of this Agreement, the liability of the Concessions Authority shall, notwithstanding the provisions of the Concession Agreement, extend to an amount equal to 100% of the compensation in Concessionaire Event of Default.

3.6 The Concessions Authority agrees and undertakes that upon receipt of a notice under and in accordance with the provisions of Article 3.2 of the Substitution Agreement, it shall, no later than 15 (fifteen) days from the date of receipt of such notice, issue a notice to the Concessionaire requiring it to cure the Financial Default and in the event the default is not cured before the expiry of the Remedial Period specified in Article 15.4 of the Concession Agreement, a Concessionaire Default shall have occurred and the Concessions Authority shall issue the Termination Notice forthwith, but no later than 15 (fifteen) days from the date of occurrence of Concessionaire Default, and shall make compensation no later than 15(fifteen) days from the date of Termination Notice. The Parties expressly agree that the timelines specified in the Paragraph 3.6 of this Agreement are not in modification of the Concession Agreement but only in elaboration thereof.

3.7 The Parties expressly agree and confirm that the rights of the Debt Fund and the Senior Lenders' Representative to enforce termination of the Concession Agreement in accordance with Paragraph 3.6 may be exercised individually or jointly, as the case may be, by the Debt Fund and/or the Senior Lenders' Representative.

3.8 The Parties expressly agree that the Concessioneing Authority shall, instead of depositing the compensation in the Escrow Account of the Project, redeem the Bonds by making payments due and payable to the Debt Fund, and the balance, if any, shall be paid into the Escrow Account. The Parties further agree that the provisions hereof shall in no way be construed to increase the financial liability of the Concessioneing Authority for and in respect of the compensation [save and except as provided in Paragraph 3.5 for and in respect of the additional bonds specified therein].

3.9 The Parties agree and confirm that the amounts, if any, paid by the Concessioneing Authority for redemption of Bonds and the balance compensation, if any, paid as per the Concession Agreement into the Escrow Account shall be deemed to be a valid discharge of its obligations to make compensation under and in accordance with the Concession Agreement.

4. FEES

4.1 The Debt Fund shall pay to the Concessioneing Authority, 0.05% (zero point zero five per cent) per annum of the outstanding debt financed by the IDF, by way of a guarantee fee in consideration of the obligations of the Concessioneing Authority hereunder; [provided that the guarantee fee shall be 1% (one per cent) in respect of Bonds for which the foreign exchange risk is to be borne by the Concessionaire] [provided further that the guarantee fee for and in respect of the additional Bonds specified in Paragraph 2.1 shall be 3% (three per cent) per annum of the nominal value thereof].

4.2 The guarantee fee specified in Paragraph 4.1 shall be due and payable annually before commencement of the financial year to which it relates. In the event of delay in payment of the guarantee fee, the Debt Fund shall pay interest at the rate of 14% (fourteen per cent) per annum, to be computed on a daily basis and compounded every month for the period of delay; provided, however, that if such delay exceeds the period of 180 (one hundred and eighty) days this Agreement shall cease to be in force, and upon termination of the Concession Agreement at any time thereafter, the Concessioneing Authority's obligation to pay the compensation to the Debt Fund shall be deemed to be reduced by 20% (twenty per cent) thereof.

5. REPRESENTATIONS AND WARRANTIES

5.1 Each of the Parties represent, warrant and confirm the following:

- (a) This Agreement constitutes its legal, valid and binding obligation, enforceable against it in accordance with the terms hereof, and its obligations under this Agreement will be legally valid, binding and obligations enforceable against it in accordance with its terms;
- (b) the execution, delivery and performance of this Agreement will not conflict with or result in a breach or constitute default under or accelerate performance required by any of the terms of Memorandum and Articles of Association of any Party or any applicable law or any covenant, contract, arrangement or understanding, or any decree or order of any court to which it is a party or by which it or any of its properties or assets is bound or affected;
- (c) all information provided by the Party is true and accurate in all material respect;
- (d) there are no actions, suits, proceedings or investigations pending or to its knowledge threatened against it at law or in equity before any court or any other judicial, quasi judicial or other authority or body, the outcome of which may result in a material breach of this Agreement;
- (e) the Party has complied with all Applicable Laws and Applicable Permits in all material respects;
- (f) the Concessionaire is not in a material breach of the Concession Agreement or of any Project Contracts or Financing Documents; and
- (g) no representation or warranty contained herein or in the Concession Agreement or any other document furnished by the Party contains or will contain any untrue or misleading statement of material facts or omits or will omit to state a material fact necessary to make such representation or warranty not misleading.

5.2 In the event of any occurrence or circumstance coming to the knowledge of the Party making any representation hereunder which renders any of its aforesaid representations or warranties untrue or incorrect at any time during the subsistence of this Agreement, such Party shall immediately notify the other Parties hereto about the same. Such notification shall not have the effect of remedying any such representation or warranty that has been found to be incorrect or untrue.

6. ARBITRATION

6.1 Any Dispute which is not resolved amicably by conciliation shall be finally decided by reference to arbitration by a Board of Arbitrators appointed in accordance with Paragraph 6.2 of this Agreement. Such arbitration shall be held in accordance with the Rules of Arbitration of the International Centre for Alternative Dispute Resolution, New Delhi (the “**Rules**”), or such other rules as may be mutually agreed by the Parties, and shall be subject to the provisions of the Arbitration Act. The venue of such arbitration shall be Delhi, and the language of arbitration proceedings shall be English.

6.2 In the event of a dispute between two Parties, there shall be a Board of three arbitrators, of whom each Party shall select one, and the third arbitrator shall be appointed by the two arbitrators so selected, and in the event of disagreement between the two arbitrators, the appointment shall be made in accordance with the Rules. In the event of a dispute involving all the Parties, a single arbitrator shall be appointed in accordance with the Rules.

6.3 The arbitrators shall make a reasoned award (the “**Award**”). Any Award made in any arbitration held pursuant to this Paragraph 6 shall be final and binding on the Parties as from the date it is made, and the Parties agree and undertake to carry out such Award without delay.

- 6.4 The Parties agree that an Award may be enforced against the Concessionaire, the Concessioneing Authority and/or the Debt Fund, as the case may be, and their respective assets wherever situated.
- 6.5 This Agreement and the rights and obligations of the Parties shall remain in full force and effect, pending the Award in any arbitration proceedings hereunder.

7. COMING INTO FORCE AND DURATION OF THE AGREEMENT

This Agreement shall come into force and effect on the date hereof and shall remain in force until the redemption of all Bonds.

IN WITNESS WHEREOF, this Agreement has been executed on the day and year first above written.

For and on behalf of the **Concessioneing Authority**

Signature :

Name :

Designation :

For and on behalf of the **Debt Fund**

Signature :

Name :

Designation :

For and on behalf of the **Concessioneaire**

Signature :

Name :

Designation :

Agreed, Accepted, Countersigned and Witnessed by the Senior Lenders'

Representatives for and on behalf of **Senior Lenders** by

Signature :

Name :

Designation :

SCHEDULE-I

(Refer Recital G)

No.	Name of Senior Lenders/Bond holders' Trustee with Address	Amount to be refinanced IDF by way of Bonds/Loan (Rs. in crore)	Remarks, if any
1.			
2.			
3.			
4.			

5.			
6.			
7.			
8.			
9.			
10.			

SCHEDULE-II

(Quantum of compensation)

As per the definition in the Concession Agreement, the quantum of (i) Book Value, (ii) 90% of Debt Due and (iii) Total Project Cost as on the date of execution of this Agreement, and at the end of each financial year until the end of the concession period is mentioned in the table below:

(Rs. In Crores)

Date	Book Value	% of Debt Due	Total Project Cost	Amount of Compensation

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41. Annexure XIX: Auditors

1.1 Appointment of Auditors

- 1.1.1 The Concessionaire shall appoint, and have during the subsistence of this Agreement as its Statutory Auditors, a firm chosen by it from the mutually agreed list of 5 (five) reputable firms of chartered accountants (“Panel of Chartered Accountants”), such list to be prepared substantially in accordance with the criteria set forth in Schedule P. All fees and expenses of the Statutory Auditors shall be borne by the Concessionaire.
- 1.1.2 The Concessionaire may terminate the appointment of its Statutory Auditors in accordance with the provisions of the Companies Act, 2013, subject to the replacement Statutory Auditors being appointed from the Panel of Chartered Accountants.
- 1.1.3 Notwithstanding anything to the contrary contained in this Agreement, the Authority has the right, but not the obligation, to appoint at its cost from time to time and at any time, another firm (“**Additional Auditors**”) from the Panel of Chartered Accountants to audit and verify all those matters, expenses, costs, realisations and things which the Statutory Auditors are required to do, undertake or certify pursuant to this Agreement.
- 1.1.4 Further, the Concessionaire shall change the Statutory Auditor from time to time to comply with the provisions of the Companies Act, 2013 and any rules and regulations framed thereunder.

1.2 Panel of Chartered Accountants

Pursuant to the provisions of the Agreement, the Authority and the Concessionaire shall prepare a mutually agreed panel of 5 (five) reputable firms of Chartered Accountants having their registered offices in India (“**Panel of Chartered Accountants**”). The criteria for preparing such Panel and the procedure to be adopted in this behalf shall be as set forth in this Annexure XIX.

1.2.1 Invitation for Empanelment

The Authority shall invite offers from all reputed firms of Chartered Accountants who fulfil the following eligibility criteria, namely:

- (a) the firm should have conducted statutory audit of the annual accounts of at least one hundred companies registered under the Companies Act, 2013, including any re-enactment or amendment thereof, of which at least ten should have been public sector undertakings;

- (b) the firm should have at least 5 (five) practising Chartered Accountants on its rolls, each with a minimum experience of 10 (ten) years in the profession;
- (c) the firm or any of its partners should not have been disqualified or black-listed by the Comptroller and Auditor General of India or the Authority; and
- (d) the firm should have an office in the State or in an adjacent State with at least 2 (two) practising Chartered Accountants on its rolls in such State.

Interested firms meeting the eligibility criteria shall be required to submit a statement of their capability, including the bio-data of all the practising Chartered Accountants, on its rolls. In particular, each firm shall be required to furnish year-wise information relating to the names of all the companies with an annual turnover exceeding Rs. 25,00,00,000 (Rupees Twenty Five Crore) whose annual accounts were audited by such firm in any of the preceding 5 (five) Accounting Years.

1.2.2 Evaluation and Selection

The information furnished by each firm shall be scrutinised and evaluated by the Authority and 1 (one) point shall be awarded for each annual audit of the companies specified in Paragraph 0 above. (By way of illustration, a firm which has conducted audit of the annual accounts of any such company for 5 (five) years shall be awarded 5 (five) points).

The Authority shall prepare a list of all the eligible firms along with the points scored by each such firm and 5 (five) firms scoring the highest points shall be identified and included in the draft Panel of Chartered Accountants.

1.2.3 Consultation with the Concessionaire

The Authority shall convey the aforesaid panel of firms to the Concessionaire for scrutiny and comments, if any. The Concessionaire shall be entitled to scrutinise the relevant records of the Authority to ascertain whether the selection of firms has been undertaken in accordance with the prescribed procedure and it shall send its comments, if any, to the Authority within 15 (fifteen) days of receiving the aforesaid panel.

1.2.4 Mutually Agreed Panel

The Authority shall, after considering all relevant factors including the comments, if any, of the Concessionaire, finalise and constitute a panel of 5 (five) firms which shall be deemed to be the mutually agreed Panel of Chartered Accountants.

After completion of every 5 (five) years from the date of preparing the mutually agreed Panel of Chartered Accountants, or such earlier period as may be agreed between the Authority and the Concessionaire, a new panel shall be prepared in accordance with the provisions of this Annexure XIX.

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