FEASIBILITY REPORT FOR DEVELOPMENT OF LIQUID JETTY AT OUTER TERMINAL-II

HALDIA DOCK COMPLEX

INDIAN PORTS ASSOCIATION

1st Floor, South Tower, NBCC Place,

Bhisham Pitamah Marg, Lodi Road, New Delhi-110003

June 2016

FEASIBILITY REPORT FOR DEVELOPMENT OF LIQUID JETTY AT OUTER TERMINAL – II, HALDIA DOCK COMPLEX

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. The proposal relates to development of Liquid Jetty at Outer Terminal, Haldia Dock-, Haldia to accommodate additional liquid cargo and ease the congestion at the existing berths at Inner Dock.

2. The traffic at HDC under the three major heads namely Liquid Cargo, Coal/ Coke Cargo and other Dry Bulk Cargo during 10 years is shown below-

Year	Liquid Bulk Cargo	Coal/ coke Cargo including transloading	Other Dry/ General/ Break Cargo & Containers	Grand Total
2006-07	**19.91**	8.70	13.84	**42.45**
2007-08	**19.66**	8.29	15.64	**43.59**
2008-09	**18.96**	9.08	13.75	**41.79**
2009-10	**11.49**	9.32	12.57	**33.38**
2010-11	**13.32**	10.00	11.69	**35.01**
2011-12	**10.66**	10.56	9.80	**31.02**
2012-13	**09.34**	8.73	10.01	**28.08**
2013-14	**09.48**	9.79	9.24	**28.51**
2014-15	**09.42**	11.63	9.96	**31.01**
2015-16	**11.51**	14.36	7.63	**33.50**

3. Based on the traffic projections, the expected future traffic of edible oils, paraxylene and chemicals will be as given hereunder:

Year	**Total Edible Oil**	**Total Paraxylene**	**Total Chemicals**	**Total**
2016-17	26.6	7.44	0	34.04
2017-18	29.6	8.26	0	37.86
2018-19	32.6	9.17	5.16	46.93
2019-20	36.0	10.00	5.68	51.68
2020-21	40.0	10.00	6.24	56.24
2021-22	40.0	10.00	6.87	56.87

Year	Total Edible Oil	Total Paraxylene	Total Chemicals	Total
2022-23	40.0	10.00	6.87	56.87
2023-24	40.0	10.00	6.87	56.87
2024-25	40.0	10.00	6.87	56.87
2025-26	40.0	10.00	6.87	56.87

4. Considering the above projections and need for increasing the productivity of lock gate and inner dock, a need is felt to create new berth for handling of edible oil, paraxylene and chemicals viz. VAM, MTBE, Methanol, Acetone, Phenol, Butadiene, Benzene etc, as indicated by customers during the meeting held on 24th May 2016) and subsequent communications. After new facility (OT-2) is commissioned, about 16 to 17 lakh tonnes of liquid cargo can be shifted to OT-2 as indicated below

Liquid Cargo Proposed to be Moved Out of Dock

						In Lakh Tonnes (2015-16)
	Berth No.2	Berth No.3	Berth No.4	Berth No.5	Berth No.7	Total
Edible Oil	Nil	0.52	1.64	9.01	4.65	15.82
Paraxylene	0.30	4.73	Nil	Nil	Nil	05.03
Total	0.30	5.25	1.64	9.01	4.65	20.85
Expected shift of cargo to OT2						
Edible Oil	Nil	0.52	1.64	9.01	4.65	15.82
Paraxylene	0.30	0.47	Nil	Nil	Nil	0.77
Total	**0.30**	**0.99**	**1.64**	**9.01**	**4.65**	**16.59**

5. The capacity as per TAMP Guidelines 2008, considering the 80% edible oil vessels and 20% paraxylene & Chemical tankers handled at new berth (OT-2) workout out to 19.68 lakh tonnes Even though, there is a potential of shifting 15.82 lakh tonnes of edible oil form the Inner dock to OT-II, the handling of edible oils is restricted to 15.63 lakh tonnes, as per the above capacity calculation. The paraxylene & chemicals traffic at the OT-II is estimate to 4.07 lakh tonnes as per the following breakup;

- Shift of Paraxylene from Inner Dock : 0.77 Lakh tonnes
- Additional cargo of Paraxylene due to Growth at estimated growth of 10% per annum 1.70 Lakh tonnes
- Additional Cargo of Chemicals due to Growth as per the user projections. 1.60 Lakh tonnes.

Total : 4.07 Lakh tonnes

6. This around 17 lakh tonnes of liquid cargo will convert into about 211 vessels being pulled out from Dock to OT-2 which resulted in saving of 227 berth days. These vessels can be replaced by about 128 vessels of dry cargo (coal, coke etc) with average parcel size of 25,000 tonnes. Thus traffic volume of 17 lakh tonnes of liquid cargo will be replaced by dry bulk cargo of 32.00 lakh tonnes

7. The proposed location of the berth is in the waterfront between the lead-in jetty and second oil jetty. There is a water frontage of 565 m between the eastern end of the lead-in jetty and outermost western mooring dolphin of the second oil jetty.

8. it is proposed that the berth can be constructed for berthing of vessels upto a maximum length of 185 m. For safely securing the vessel berthed, the outer mooring dolphins are to be provided at a distance of 270 m. The centre line of the berth, after leaving safety distances from the lead-in jetty and the tug berth/second oil jetty, would be positioned at 365 m east of the eastern end of the lead-in jetty.

9. The structural design of the berthing and mooring facilities will be done for the maximum size of the vessel which would impart the severest effect on these structures. The particulars of the design vessel considered for the structural design are furnished below.

Length	: 185.0 m
Beam	: 32.3 m
DWT	: 40000
Maximum Arrival Draft	: 9.0 m

10. The liquid bulk berth with isolated structures for berthing and mooring of tankers and a service platform where the handling facilities and utilities are provided as proposed, this would optimise the cost of construction of the berth. The major structures/ topside facilities include breasting dolphins, mooring dolphins, interconnecting walkways, approach trestle, jetty accessories, fire fighting system etc.

11. The total capital cost of the project is estimated at Rs.94.59 Crores. The above estimate includes cost of civil construction works viz berth cost and equipment cost for Electrical installations and fire fighting etc. The entire project is expected to be completed in 30 months time from the date of commencement of the pre- project activities.

12. The annual operation and maintenance cost of the proposal is estimated at Rs.9.02 crores, based on TAMP Guidelines (2008) for fixation of up-front tariff.

13. The estimated annual revenue from the project on constant tariff is given below

S.No	Particulars	2019-20
1.	**Estimated Throughput** (Lakh tonnes)	**19.68**
	(a) Edible oil	15.63
	(b) Paraxylene & Chemicals	4.05
2.	**Liquid Handling Rate** (Rs. per Ton)	
	(a) Edible oil	57.95
	(b) Paraxylene & Chemicals	98.51
3.	**Revenue on Liquid Handling** (Rs. In lakhs)	**1304.78**
	(a) Edible oil	906.10
	(b) Paraxylene & Chemicals	398.68
4.	**Estimated GRT** (Lakh GRT hours)	**827.82**
5.	**Berth hire (Rs./ GRT hour)**	**1.43**
6.	**Revenue on Berth hire** (Rs. In lakhs)	**1186.26**
	Total Estimated Income	**2491.04**

14. The pre tax project IRR from this facility is as follows

Sl. No.	Pre-Tax Project IRR at Constant prices	IRR (%)	NPV @ 12% (in Rs Lakhs)
1	Base case	20.46%	5169.06
2	Capital Cost up by 10%	18.72%	4446.80
3	Revenue down by 10%	18.28%	3760.79
4	Annual O&M Cost up by 10%	20.21%	4999.96
5	Combined effect of Sl. no. 2, 3 & 4	16.44%	2869.43

11. RECOMMENDATION

Based on the foregoing, the following conclusions are made:

- There is a need and a potential for the new liquid bulk jetty at Outer Terminal- II
- There are advantages for the users of Edible oils and chemicals in using this jetty
- The project is viable
- The Port also stands to gain by reducing the congestion and improved productivity at Inner Dock by the shifting of Edible Oils and Paraxylene.

It is finally recommended that the Port immediately take action for constructing the new liquid bulk jetty at Outer Terminal-II through Internal Resources.

* * *

SECTION 1

INTRODUCTION

1.1 PREAMBLE

Kolkata Port, the oldest Port in India, located on the east coast in the state of West Bengal, became operational in the year 1870. The Port is a reverie port located in Hooghly River. It became Major Port after promulgation of Major Port Trust Act by the Parliament in the year 1963. Subsequently Halide Dock Complex (HDC) was made a satellite extension to Kolkata Port in the year 1977 though shipping activity at Halide had started in the year 1968 with an oil jetty.

Haldia Dock presently has 17 berths out of which three oil berths (HOJ-I to HOJ-III) are located in the river and remaining 14 berths (berth No. 2 to berth No. 13) are inside impounded dock. Berth No. 4 has been marked as berth No. 4, 4A and 4B.

The Haldia Dock Complex handled 33.50 million metric tonnes of cargo during the last financial year 2015-16 against capacity of 38 million tonnes. The traffic at HDC has declined during last 10 years from 42.34 million tonnes in 2005-06 to 33.50 million tonnes in 2015-16. Though the traffic has shown upward trend during last four years from 2012-13 (28.08 million tonnes) to 2015-16 (33.50 million tonnes), it is yet to reach its capacity.

The traffic at HDC under the three major heads namely Liquid Cargo, Coal/ Coke Cargo and other Dry Bulk Cargo during 10 years is shown below-

Table 1.1: Total Cargo Traffic at HDC During Last 10 Years (In Million Tonnes)

Year (A)	Liquid Bulk Cargo outside Lock (B)	Liquid Bulk Cargo inside Lock Gate (C)	**Total Liquid Bulk Cargo D= (B+C)**	Coal/ coke Cargo (E) including transloading	Other Dry/ General/ Break Cargo & Containers (F)	**Total Dry/ General Bulk (G) = (E+F)**	**Grand Total H= (D+G)**
2006-07	17.74	2.17	**19.91**	8.70	13.84	**22.54**	**42.45**
2007-08	17.82	1.84	**19.66**	8.29	15.64	**23.93**	**43.59**
2008-09	17.03	1.93	**18.96**	9.08	13.75	**22.83**	**41.79**
2009-10	09.43	2.06	**11.49**	9.32	12.57	**21.89**	**33.38**
2010-11	10.65	2.67	**13.32**	10.00	11.69	**21.69**	**35.01**
2011-12	08.09	2.57	**10.66**	10.56	9.80	**20.36**	**31.02**
2012-13	05.92	3.42	**09.34**	8.73	10.01	**18.74**	**28.08**
2013-14	05.84	3.64	**09.48**	9.79	9.24	**19.03**	**28.51**
2014-15	05.52	3.90	**09.42**	11.63	9.96	**21.32**	**31.01**
2015-16	07.11	4.26	**11.51**	14.36	7.63	**21.99**	**33.50**

As seen from the above traffic figures of last 10 years, the decline in total traffic at HDC was due to the reduction in two types of cargo- (i) POL/ crude oil and (ii) dry bulk cargo. The crude/ POL traffic suffered due to the vessels diversion to near-by deeper draft ports like Vishakhapatnam Port Trust and Paradip Port Trust.

Further, berth-wise cargo handling statistics of liquid cargo handled outside the lock gate shows that decrease in traffic was at Berth HOJ-III and HOJ-II which handle crude oil and POL products.

Table 1.2: Liquid Cargo Traffic at Berths outside Lock Gate during Last 10 Years

(Million Tonnes)

Financial Year	**HOJ-I**	**HOJ-II**	**HOJ-III**	**Total Outside Lock Gate**
2006-07	1.84	5.79	10.11	17.74
2007-08	1.42	5.82	10.57	17.81
2008-09	1.73	5.87	9.42	17.02
2009-10	1.46	3.31	4.67	9.44
2010-11	1.96	3.5	5.19	10.65

Financial Year	HOJ-I	HOJ-II	HOJ-III	Total Outside Lock Gate
2011-12	1.84	2.95	3.21	8
2012-13	1.9	2.56	1.46	5.92
2013-14	1.99	2.71	1.14	5.84
2014-15	2.12	2.7	6.9	11.72
2015-16	1.93	2.85	2.32	7.11

The decline in dry bulk cargo traffic was due to reduction in iron ore due to environmental/ mining issues in our country. Even after environmental/ mining issues have been sorted out to some extent, iron ore traffic at Haldia Port has not increased due to new deep draft port (Dhamra Port) built by M/s Tata and M/s L&T and now being operated by M/s Adani Ports & SEZ Ltd.

The other reason for not getting back to the diverted dry bulk traffic is vessels berthing/ un-berthing issues due to Lock Gate system at Haldia Port. The vessel movement into the Dock and out from the Dock takes place only during high tides windows which occurs twice day. This has resulted in only smaller vessels/ vessels with smaller parcel size calling at Port. For example a Panamax vessel which is designed for about 75,000 tonnes capacity can berth at Haldia Port with about 25,000 to 28,000 tonnes of coal that too during high tides resulting in increased pre berthing waiting period. The regular dredging in the Hooghly River is not being taken up due to huge cost associated with capital dredging & maintenance dredging. Hence the improvement in traffic is only possible by maximising the utilisation of the existing facilities by relocating / regrouping of cargo mix to be handled at various berths inside Dock and creating new berths outside the Lock Gate to bring down waiting period of vessels.

1.2. THE NEED FOR PRESENT STUDY

The Ministry of Shipping, Govt of India, commissioned a study called UNNATI (Deep Dive-KoPT) through Consultants M/s Boston Consulting Group (BCG). M/s BCG in their Report have found that low berth productivity is the limiting factor for capacity utilisation at HDC. They have suggested moving out of low parcel size liquid vessels outside lock gate to increase lock gate productivity, resulting in addition of dry bulk traffic which have higher berth productivity if handled through mechanised system. They have further suggested that the liquid berths inside lock gate can be used as waiting berths for dry bulk cargo when ship

has completed un-loading and waiting to sail out but retained for want of tide/ lock gate capacity. As lower parcel size of liquid vessels results in wastage of lock gate productivity, these vessels can be shifted outside the lock gate on existing berths/ new liquid berths.

The Ministry of Shipping, Govt of India, commissioned another study for Sagarmala Project through consultants namely Mckinsey & M/s AECOM. The Consultants as part of scope of work deliverables submitted Draft Master Plan for Kolkata Port Trust (including Haldia Dock System) in December 2015. The Consultant vide their Draft Report of Dec 2015, while taking into the account the complexity of lock gate operation for vessels berthing/ un-berthing and need for segregation of cargo mix to be handled at various berths to have optimum utilisation of port facilities, have suggested shifting some of the selected liquid cargoes (cargoes to be identified by the Port) to a new berth to be developed outside the basin and utilise dry cargo berths inside the Dock only for handling dry bulk cargo (cargoes to be identified by the Port) to the extent possible.

The recommendation of M/s AECOM is reproduced below-

Quote:

"7.3.1. Mechanising Eastern Berths 2 and 3: To start with, the eastern berth 2 & 3 could be mechanised for up-gradation and these berths shall be developed only for handling of dry bulk cargo and all the liquid cargo shall be taken away to berths outside the basin.

It is proposed that the initial mechanisation be taken up at berth No.3 which was earlier used for handling iron ore exports. Berth No.2 could continue to handle the cargo using MHC, dumpers and front end loaders."

Unquote:

1.3. SCOPE OF WORK

Based on the recommendation of the above mentioned two Consultants, the Haldia Dock Complex engaged Indian Ports Association (IPA) in the month of May 2016 to carry out "Techno Economic Feasibility Study For Setting Up of a POL Jetty (Outer Terminal-II) and submit the Report within a month's time . The matter was further discussed between IPA personnel and Senior Officials of HDC during visit of IPA personnel and following scope of work of decided-

i) To analyse the liquid cargo mix which can be shifted out from the berths inside the Dock to proposed liquid berth (OT-2) with for 10 years traffic projection of liquid bulk cargo identified for shifting.
ii) To analyse the additional dry cargo mix which can be handled at these berths inside the Dock by shifting of liquid cargo, with 10 years traffic projection of dry cargo mix.
iii) To prepare design/ layout of berth (OT-2) for handling of liquid cargo along with associated facilities including fire fighting system and pipeline.
iv) To prepare block cost estimate for the whole project.
v) To work out financial viability of the Project along with sensitivity analysis on the basis of traffic projection.

Indian Ports Association team made two visits (1) from 24th May 2016 to 26th May 2016 and (2) from 6th June to 10th June 2016 and interacted with port officials as well as with port customers apart from carrying out site inspection. List of Participants in the Customers Meeting held on 24-05-2016 is enclosed at ***Anneuxre-1***

Annexure-I

List of Participants in Customer Meeting Held on 24.5.2016 at HDC

Sr No	Name	Organisation
1	SK Saharoy, GM (Traffic)	HDC
2	Prosenjit Dasgupta, Sr DM	HDC
3	DN Maurya, Consultant	IPA
4	J Karthikeyan, Consultant	IPA
5	Sandip Kumar Bose	Adani Wilmar Ltd
6	Sunil Laturi	Adani Wilmar Ltd
6	Rahul Lahiri	Gokul Refoil & Solvents Ltd
7	D Mahapatra	Gokul Refoils & Solvents Ltd
8	Kamal Samanta	Ruchi Industries
9	Sunil Chaturvedi	Tata Chemicals Ltd
10	MS Banerjee	Aegis Logistics Ltd
11	Arindam Mukhopadhyay	Aegies Logistics Ltd
12	Umesh Gupta	JVL Oil Refinery
13	Chayan Mondal	Haldia Petrochemicals Ltd
14	Arun Chandra	Hadia Petrochemicals Ltd
15	T Rahana	HDC
16	Rajib Banerjee	MCP I (Mitsubishi Chemicals Corpn)
17	KK Ray	HDC
18	RR Mani	HDC
19	Arup Sinha	Emami Agro Ltd (he interacted on 25.5.16)

SECTION 2

EXISTING LIQUID BULK HANDLING FACILITIES

2.1 The liquid bulk traffic at Haldia Dock Complex are handled primarily at HOJ 1, 2 & 3 with the Dock basin berths 2,3, 5, 6 & 7 also being used. During the past two years, when the crude oil traffic was at negligible level, the share of Dock basin berths was about 35% while HOJ 1, 2 & 3 handled 65% of the total liquid bulk traffic. In this section the facilities available at these berths and the users being served are discussed in detail.

2.1 HALDIA OIL JETTY (HOJ) 1

HOJ- 1 is located at Latitude 22° 01' 52.4" N and Longitude 088° 05' 3.41" E . The aerial view of the jetty is presented hereunder.

The design tanker size is 89,000 DWT dead freighted to the scheduled depth in the river Hooghly. The distance between the outermost mooring dolphins is 290 m and the maximum permissible LOA is 200m while the minimum LOA is 84 m.

Oil Jetty 1 handles the following cargo:

- POL Products: *MS; Naphtha; HSD; FO; ATF; SKO; Lube oil*
- LPG; Ammonia
- Chemicals: *PY Gas, Paraxylene; Butene, Butadiene; Benzene; Bitumen*

The average traffic handled at this jetty during the past 4 years in 1.925 million tonnes.

The user agencies that are connected to this berth are

- IOCL/HPCL/BPCL - (*POL Products)*
- Indian Oil Petronas Pvt. Ltd. - (*LPG*)
- Mitsubishi Chemical Corporation (PTA) Ltd. - (*Parxylene*)
- Haldia Petrochemicals Limited – (*Naphtha;Butene; MS; PY Gas; Butadiene; Benzene)*
- Indian Molasses Company – (*POL Products)*
- Tata Chemicals – (*Ammonia)*

The ship-shore transfer is affected through marine unloading arms and flexible hoses as detailed hereunder.

LPG	;	2 x 10” Chikson marine unloading arms
Ammonia/ PY Gas	:	1 x 8” Chikson marine unloading arms
Paraxylene	:	2 x 6” flexible hoses
Benzene	:	1 x 6” flexible hose
Butene	:	1 x 6” flexible hose
Butadiene	:	1 x 16” flexible
hose Bitumen	:	1 x 8” flexible hose
ATF	:	4 x 8” flexible hoses
Naphtha	:	3 x 8” flexible hoses
HSD	:	2 x 8” flexible hoses
SKO	:	2 x 8” flexible hoses
MS	:	2 x 8” flexible hoses
FO	:	2 x 8” flexible hoses
Lube oil	:	2 x 8” flexible hoses

JETTY HEAD WITH UNLOADING ARMS & FLEXIBLE HOSES

MANIFOLDS FOR FLEXIBLE HOSE CONNECTIONS


MARINE UNLOADING ARMS 2 X 10” AND 1 X 8”

INSULATED LPG PIPELINES

PARAXYLENE PIPELINE END MANIFOLD

FLEXIBLE HOSES

2.2 HALDIA OIL JETTY (HOJ) 2

HOJ- 2 is located at Latitude 22° 01’ 43.1” N and Longitude 088° 05’ 50.1” E . The aerial view of the jetty is presented hereunder.

The design tanker size is 150,000 DWT dead freighted to the scheduled depth in the river Hooghly. The distance between the outermost mooring dolphins is 330 m and the maximum permissible LOA is 250m while the minimum LOA is 160 m.

Oil Jetty 2 handles the following cargo:

- Crude oil
- POL Products: *MS; Naphtha; HSD; FO; ATF; SKO; Lube oil*
- LPG

The average traffic handled at this jetty during the past 4 years in 2.929 million tonnes. The user agencies that are connected to this berth are

- IOCL – (*Crude oil*)
- IOCL/HPCL/BPCL - (*POL Products)*
- Indian Oil Petronas Pvt. Ltd. - (*LPG*)

The ship-shore transfer is affected through marine unloading arms as detailed hereunder.

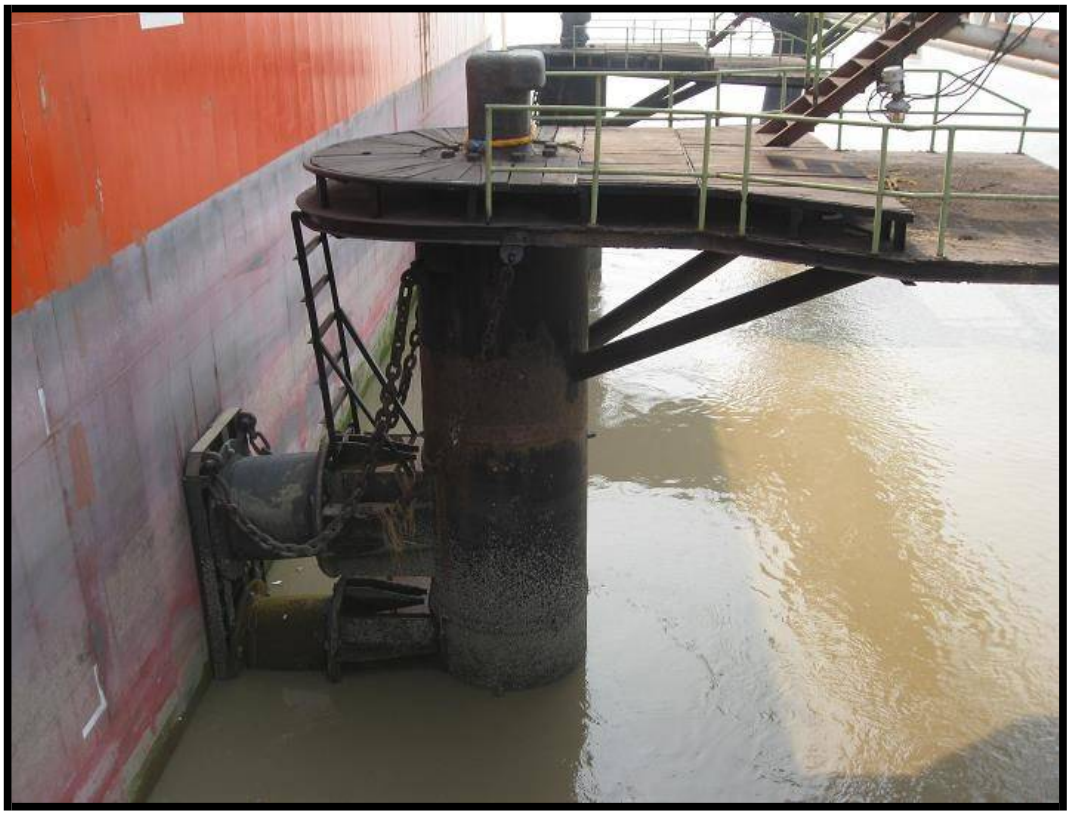
Crude oil / FO	: 2 x 16” Chickson marine unloading arms
LPG	: 2 x 12” Chickson marine unloading arms
HSD/SKO/MS/Naphtha	: 2 x 12” Chickson marine unloading arms

MARINE UNLOADING ARMS – 2 X 16” & 4 X 12”

INSULATED LPG PIPELINES

CRUDE OIL & POL PRODUCT PIPELINES

TOWER MONITOR & MOORING DOLPHINS



FLEXIBLE BERTHING DOLPHIN WITH FENDERS

2.3 HALDIA OIL JETTY (HOJ) 3

HOJ- 3 is located at Latitude 22° 00’ 57.5” N and Longitude 088° 04’ 16.5” E . The aerial view of the jetty is presented hereunder.

The design tanker size is 150,000 DWT dead freighted to the scheduled depth in the river Hooghly. The distance between the outermost mooring dolphins is 345 m and the maximum permissible LOA is 250m while the minimum LOA is 160 m.

Oil Jetty 3 handles the following cargo:

- Crude oil
- POL Products: *MS; Naphtha; HSD;*

The average traffic handled at this jetty during the past 2 years in. 1.30 million tonnes. The user agencies that are connected to this berth are

- IOCL – (*Crude oil*)
- HPL/Reliance - (*POL Products)*

The ship-shore transfer is affected through marine unloading arms as detailed hereunder.

Crude oil	:	2 x 16” Chickson marine unloading arms
HSD/MS	:	1 x 12” flexible hoses
Naphtha	:	2 x 12” flexible hoses

2 x 16” MARINE UNLOADING ARMS

MANIFOLDS FOR FLEXIBLE HOSE CONNECTION

FLEXIBLE HOSES

VIEW OF APPROACH TRESTLE

ANOTHER VIEW OF APPROACH TRESTLE

2.4 DOCK BASIN BERTHS 2 & 3

The aerial view of the dock basin berths 2 & 3 are shown hereunder.

Dock basin berths 2 is a dry bulk berth handling coal, coke, limestone, ore, fertilisers. The overall length of the berth is 260 m and it can accommodate vessels upto a maximum LOA of 236 m. For the past 4 years this berth is used to handle Paraxylene. While the average traffic through this berth over the past 4 years is 1.975 MTPA, the average volumes of Paraxylene handled at this berth during the past 4 years is 0.124 MTP.

Berth 3 is also a dry bulk berth handling iron ore and coal. However, it also handles considerable volumes of POL products and Paraxylene. The overall length of the berth is 3339 m and it can accommodate vessels upto a maximum LOA of 240 m. While the average traffic through this berth over the past 4 years is 1.51 MTPA, the average volumes of POL products & Paraxylene handled at this berth during the past 4 years is 0.0.636 MTP.

The user agencies that are connected to this berth are

- IOCL – (*POL products*)
- Mitsubishi Chemical Corporation (PTA) Ltd. - (*Parxylene*)

The ship-shore transfer is affected through marine unloading arms as detailed hereunder.

2.5 DOCK- 2 & 3

Paraxylene	:	2 x 6” flexible hoses
DOCK- 3		
HSD	:	2 x 8” flexible hoses
SKO	:	2 x 8” flexible hoses
FO	:	2 x 8” flexible hoses

MANIFOLDS FOR BERTHS 2 & 3

PARAXYLENE PIPELINES

POL PRODUCT PIPELINES

2.6 DOCK BASIN BERTHS 6 & 7 (FINGER JETTY)

The aerial view of the berth 5 as well as finger jetty accommodating berths 6 & 7 is given hereunder:

Berth 5 mainly handles edible oil and some volumes of coal, coke and ore. The finger jetty accommodating berths 6 & 7, these berths are 234 m long each. These berths handle dry bulk such as coal, coke, ore and gypsum. The liquid cargo includes phosphoric acid, liquid carbon black, bitumen, acetic acid, MEG and edible oil.

During the past 4 years, the average total traffic handled at berth 6 was 1.18 MTPA out of which 1.00 MTPA was liquid bulk while the average total traffic handled at berth 7 was 1.1 MTPA out of which 0.47 MTPA was liquid bulk.

SECTION 3

PRESENT PERFORMANCE OF LIQUID BULK HANDLING FACILITIES

3.1 In this section the performance of these berths and the users being served are discussed in detail. This analysis does not include edible oil traffic.

3.2 USER AGENCIES

3.2.1 INDIAN OIL CORPORATION LTD.

Indian Oil Corporation is having a refinery at Haldia and has the maximum liquid bulk traffic through the port. It imports some amount of crude and exports POL products. For local marketing it also imports certain products based on demands.

Storage Tanks		Refinery tankage	
Berths used:	HOJ I & III	Crude	
	HOJ I & II	POL Products:	MS; HSD; SKO; Naphtha; ATF; FO; Lube & Bitumen
	Berth No. 3	POL Products	HSD;SKO; FO
Pipelines	HOJ I	Crude	1 x 36” x 8 km
	HOJ III	Crude	1 x 48” x 11 km
	HOJ I & II	MS	1 x 14” x 0.8 km
		HSD	1 x 24” x 1.5 km
		SKO	1 x 30” x 1.5 km
		Naphtha	1 x 14” x 0.8 km
		ATF	1 x 12’ x 0.8 km
		FO	1 x 24” x 1.5 km
		Lube	1 x 12” x 0.8 km
		Bitumen	1 x 12” x 0.8 km

3.2.2 BHARAT PETROLEUM CORPORATION LTD.

Bharat Petroleum Corporation is having a marketing terminal at Haldia and it imports MS; HSD; SKO & FO.

Storage Tanks:	MS	31, 115 KL
	HSD	39, 640 KL
	SKO	5, 900 KL

		FO	19, 470 KL
Berths used:	HOJ I	FO	
	HOJ II	MS; HSD; SKO	
Pipelines	HOJ I	FO	1 x 24” x 5.9 km
	HOJ II	MS	1 x 16” x 5.9 km
		HSD	1 x 16” x 5.9 km
		SKO	1 x 16” x 5.9 km

3.2.3 HINDUSTAN PETROLEUM CORPORATION LTD.

Hindustan Petroleum Corporation is having a marketing terminal at Haldia and it imports MS; HSD; SKO & FO.

Storage Tanks:	MS	6,000 KL
	HSD	30, 000 KL
	SKO	8, 000 KL
	FO	15, 000 KL
Berths used:	HOJ I & II	
Pipelines	FO	1 x 24” x 8.1 km
	MS	1 x 16” x 8.1 km
	HSD	1 x 20” x 8.1 km
	SKO	1 x 16” x 8.1 km

3.2.4 RELIANCE INDUSTRIES LTD.

Reliance Industries is having a marketing terminal at Haldia and it imports MS& HSD. They had suspended their operations for some time and now they propose to re-start.

Storage Tanks:	MS	63,160 KL
	HSD	35, 160 KL
Berths used:	HOJ III	
Pipelines	MS	1 x 24” x 8.11 km
	HSD	1 x 24” x 8.11 km

3.2.5 INDIANOIL PETRONAS PRIVATE LTD.

Indian Oil Petronas is having a LPG terminal at Haldia. They import Propane & Butane in refrigerated condition and blend them as LPG for distribution to industries.

Storage Tanks:	Propane	16,000 Tonnes
	Butane	16,000 Tonnes

Berths used: HOJ I & II

Pipelines	2 x 16" x 8. Km	(insulated pipelines)

3.2.6 HALDIA PETROCHEMICALS LTD.

Haldia Petrochemicals at Haldia import Naphtha & Butene I and export Benzene, Butadiene and PY Gas..

Storage Tanks:	Naphtha	150,000 Tonnes
	Butene 1	4,400 Tonnes
	Butadiene	5,200 Tonnes
	Benzene	11,400 Tonnes
	PY Gas	7,400 Tonnes

Berths used: HOJ I , HOJ II & HOJ III

Pipelines	HOJ I	Naphtha	1 x 24" x 6.0 km
		Butene 1	1 x 8" x 7.0 km
		Benzene	1 x 8" x 7.0 km
		Butadiene	1 x 6" x 7.0 km
		PY Gas	1 x 16" x 6.0 km
	HOJ II	Naphtha	1 x 24" x 6.0 km
	HOJ III	Naphtha	1 x 24" x 6.0 km

(*A single naphtha line is connected to all the three jetties*)

3.2.7 MITSUBISHI CHEMICAL CORPORATION (PTA) INDIA LTD.

Mitsubishi Chemical Corporation is having a PTA plant at Haldia. They import Paraxylene and Acetic Acid.

Storage Tanks:	60,000 Tonnes	
Berths used:	HOJ I ; Berth No.2 & Berth No. 3	
Pipelines	HOJ I	2 x 18" x 13 Km
	Berth No.2	2 x 18" x 13 km
	Berth No. 3	2 x 18" x 13 km

3.2.8 TATA CHEMICALS LTD.

Tata Chemicals import Ammonia through Haldia for their plant

Storage Tanks:	10,000 Tonnes	
Berths used:	HOJ I	
Pipelines	HOJ I	1 x 16" x 8 Km (insulated pipeline)

3.2.9 IMC LTD.

IMC has a multi-user tankage terminal near the Docks and handles CBFS, Sulphuric Acid, Bitumen and edible oil. They have another tankage terminal at Patikhali where they handle POL Class A. B & C and non-hazardous chemicals.

Storage Tanks	82,838 KL (20 tanks) near Docks 33,650 KL (10 tanks) at Patikhali	
Berths used:	Finger Jetty berths 6 & 7 HOJ 1	
Pipelines:	Berths 6 & 7	1 x 8" x 946 m 1 x 10" x 540 m 1 x 14" x 868 m
	HOJ 1	1 x 12" x 4.86 km

3.3 LIQUID BULK TRAFFIC AT HALDIA

The total liquid bulk traffic at Haldia for the past four years is furnished hereunder. It could be seen that apart from crude oil and edible oil, the traffic in POL products, chemicals and LPG has been more or less consistent during 2012-13 to 2014-145 and there has been growth of around 22.30% during 2015-16 mainly due increase in POL products and edible oils..

LIQUID BULK TRAFFIC IN HDC (in million metric tons)					
		2012-13	**2013-14**	**2014-15**	**2015-16**
1	**CRUDE OIL**	**0.54**	**0.79**	**0.50**	**0.45**
2	**POL PRODUCTS**	**4.25**	**3.75**	**3.12**	**4.62**
3	**LPG**	**1.40**	**1.53**	**1.91**	**2.01**
4	**CHEMICALS**	**1.59**	**1.83**	**1.94**	**2.03**
5	**EDIBLE OIL**	**1.54**	**1.55**	**1.95**	**2.41**
	Total	**9.32**	**9.45**	**9.42**	**11.52**

3.4 PERFORMANCE OF PRODUCT VESSELS

Here an analysis will be made on the total traffic handled, number of ships, average vessel size, average parcel size and the average rate of discharge from the tankers. This will be done for each of the product handled including crude oil, POL products and Chemicals. These data will be later used as design parameters for estimating the optimum capacity of the berthing facilities at Haldia Dock Complex. The representative data four years have been considered for this analysis.

3.4.1 CRUDE OIL

Crude oil is imported by IOCL for their refinery at Haldia. Though almost all the crude oil imports, which were earlier handled at HDC for their Haldia & Barauni refineries have been shifted to the SBM terminal at Paradip, they still use HDC for marginal imports through the facilities at HOJ I & HOJ II. The data pertaining to crude oil for four years i.e. 2012-13 to 2015-16 are furnished hereunder.

SL NO	DESCRIPTION	Berth NO.	2012-13	2013-14	2014-15	2015-16
1	Volume Handled in Tonnes	HOJ II	0	140443	84587	0
		HOJ III	543951	652492	416635	447286
		TOTAL	543951	792935	501222	447286
2	Number of Tankers	HOJ II	0	6	4	0
		HOJ III	17	24	14	14
		TOTAL	17	30	18	14
3	Deadweight Tonnage	AVERAGE	100716	97034	92620	103376
		MAX	114790	115611	116960	114985
		MIN	73530	73500	73530	73606
4	Parcel Size in Tonnes	AVERAGE	34234	26431	27846	31949
		MAX	26021	40631	38120	35088
		MIN	40202	14364	15377	21005
5	Pumping Rate in TPH	HOJ II	NIL	2053	1013	0
		HOJ III	2161	2281	1429	1732

3.4.2 LIQUEFIED PETROLEUM GAS (LPG)

LPG is being imported by IPPL. This is handled at HOJ I & HOJ II. The data pertaining to LPG for four years i.e. 2012-13 to 2015-16 are furnished hereunder.

SL NO	DESCRIPTION		2012-13	2013-14	2014-15	2015-16
1	Volume Handled in Tonnes	HOJ I	0	61,051	10521	43164
		HOJ II	1399159	14,51852	1897148	1967707
		TOTAL	1399159	15,1293	1907669	2010871
2	Number of Tankers	HOJ I	0	11	1	6
		HOJ II	80	88	117	114
		TOTAL	80	99	118	120
3	Deadweight Tonnage	AVERAGE	49011	48,397	52157	51417
		MAX	59041	59,421	55800	66138
		MIN	3805	9,469	17601	6649
4	Parcel Size in Tonnes	AVERAGE	9078	15,009	16140	16754
		MAX	15486	22,421	22807	23660
		MIN	1,430	2,872	3411	5038
5	Pumping Rate in TPH	HOJ II	NIL	400	461	331
		HOJ III	600	632	457	469

3.4.3 AMMONIA

Ammonia is being imported by Tata Chemicals. This is handled at HOJ I. The data pertaining to LPG for the two years i.e. 2013-14 & 2012-13 are furnished hereunder**.**

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes		87,076	77,580
2	Number of Tankers		14	14
3	Deadweight Tonnage	Average	19,296	20,123
		Maximum	26,427	26,618
		Minimum	17,298	16,967
4	Parcel Size in Tonnes	Average	6,220	4,760
		Maximum	7,701	7,344
		Minimum	3,000	2,001
5	Pumping Rate In TPH	HOJ I	391	371

3.4.4 POL PRODUCTS

This group includes MS, HSD, SKO, FO, ATF, Lube, Naphtha ad PY Gas which is is being exported & also imported by Oil companies viz IOCL HPCL, BPCL. It is also imported Reliance for marketing purposes.. This is handled at HOJ I & HOJ II by IOCL; HPCL & BPCL and it is also handled at Berth 3 by IOC. Reliance have facilities to handle it at HOJ III. The data pertaining to POL products for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl. No.	Description		2013-14	2012-13
1	Volume Handled in Tonnes	HOJ I	4,38,249	4,62,831
		HOJ II	4,03,725	4,37,941
		Berth 3	4,11,123	3,49,339
		Total	**12,53,097**	**12,50,111**
2	Number of Tankers	HOJ I	34	46
		HOJ II	31	42
		Berth 3	25	31
		Total	**90**	**119**
3	Deadweight Tonnage	Average	49,429	47,621
		Maximum	74,859	75,570
		Minimum	29,990	29,990
4	Parcel Size In Tonnes	Average	16,722	11,072
		Maximum	29,922	23,579
		Minimum	8,265	2,027
5	Pumping Rate in TPH	HOJ I	767	339
		HOJ II	615	539
		Berth 3	858	665

3.4.5 POL PRODUCT - Naphtha

Naphtha is being exported by IOCL. It is imported by HPL for their petrochemical plant as feedstock. This is handled at HOJ I & HOJ II by IOCL; and at HOJ III by HPL. The data pertaining to Naphtha for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	HOJ I	2,58,390	2,13,447
		HOJ II	57,027	48,817
		HOJ III	4,87,374	9,17,405
		Total	**8,02,791**	**11,79,669**
2	Number of Tankers	HOJ I	22	19
		HOJ II	5	4
		HOJ III	33	45
		Total	**60**	**68**
3	Deadweight Tonnage	Average	41,743	60,033
		Maximum	99,997	76,925
		Minimum	9,010	8,956
4	Parcel Size In Tonnes	Average	14,054	21,082
		Maximum	29,556	28,308
		Minimum	3,328	3,806
5	Pumping Rate In TPH	HOJ I	408	468
		HOJ II	635	685
		HOJ III	863	1,215

3.4.6 POL PRODUCT – BITUMEN

Bitumen is being exported by IOCL. It is imported by Aegis and IMC for marketing purposes.. This is handled at HOJ I by IOCL and at Berths 6 & 7 by Aegis and IMC. The data pertaining to Bitumen for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	HOJ I	90,213	65,002
		Berth 6	40,037	53,405
		Berth 7	45,768	4,115
		Total	**1,76,018**	**1,22,522**
2	Number of Tankers	HOJ I	17	15
		Berth 6	11	14
		Berth 7	14	1
		Total	**42**	**30**
3	Deadweight Tonnage	Average	5,227	5,362
		Maximum	6,165	6,189
		Minimum	3,337	4,060
4	Parcel Size in Tonnes	Average	4,580	4,239
		Maximum	9,723	5,297
		Minimum	1,513	3,195
5	Pumping Rate In TPH	HOJ I	336	243
		Berth 6	153	155
		Berth 7	159	256

3.4.7 CHEMICALS – PARAXYLENE

Paraxylene is being imported by Mitsubishi Chemical Corporation (PTA) India for their PTA plant. This is handled at HOJ I , Berths 2 & 3. The data pertaining to Paraxylene for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	HOJ I	1,39,122	87,841
		Berth 2	44,096	2,94,832
		Berth 3	4,96,591	1,92,946
		Total	**6,79,809**	**5,75,619**
2	Number of Tankers	HOJ I	21	13
		Berth 2	6	43
		Berth 3	63	28
		Total	**90**	**84**
3	Deadweight Tonnage	Average	14,684	14,216
		Maximum	25,588	25,581
		Minimum	9,220	7,877
4	Parcel Size in Tonnes	Average	8,079	7,134
		Maximum	10,408	12,457
		Minimum	4,758	2,865
5	Pumping Rate In TPH	HOJ I	500	510
		Berth 2	506	532
		Berth 3	495	443

3.4.8 CHEMICALS – PY GAS

PY Gas is being exported by HPL. This is handled at HOJ I& HOJ II . The data pertaining to PY Gas for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	HOJ I	70,681	41,946
		HOJ II	36,654	15,468
		Total	**1,07,335**	**57,414**
2	Number of Tankers	HOJ I	8	8
		HOJ II	5	3
		Total	**13**	**11**
3	Deadweight Tonnage	Average	26,148	14,180
		Maximum	45,134	15,212
		Minimum	6,184	13,149
4	Parcel Size in Tonnes	Average	10,063	2,846
		Maximum	18,045	2,858
		Minimum	4,839	2,834
5	Pumping Rate in TPH	HOJ I	547	218
		HOJ II	725	309

3.4.9 CHEMICALS – BUTADIENE

Butadiene is being exported by HPL. This is handled at HOJ I. The data pertaining to Butadiene for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes		54,237	64,086
2	Number of Tankers		34	38
3	Deadweight Tonnage	Average	4,053	3,752
		Maximum	10,282	6,954
		Minimum	2,996	2,653
4	Parcel Size in Tonnes	Average	1,683	1,641
		Maximum	5,914	2,916
		Minimum	1,444	1,024
5	Pumping Rate In TPH	HOJ I	188	183

3.4.10 CHEMICALS – BENZENE

Benzene is being exported by HPL. This is handled at HOJ I & Berth 6 . The data pertaining to Benzene for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	HOJ I	88,873	90,467
		Berth 6	6,944	0
		Total	**95,817**	**90,467**
2	Number of Tankers	HOJ I	23	29
		Berth 6	3	0
		Total	**26**	**29**
3	Deadweight Tonnage	Average	10,867	11,688
		Maximum	46,744	19,996
		Minimum	3,500	6,524
4	Parcel Size in Tonnes	Average	3,685	3,055
		Maximum	5,986	4,668
		Minimum	2,184	2,847
5	Pumping Rate in TPH	HOJ I	245	245
		Berth 6	235	x

3.4.11 CHEMICALS – BUTENE - 1

Butene - 1 is being imported by HPL. This is handled at HOJ I . The data pertaining to Butene-1 for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes		8,053	6,022
2	Number of Tankers		9	4
3	Deadweight Tonnage	Average	4,845	5,967
		Maximum	6,685	10,442
		Minimum	2,999	3,805
4	Parcel Size in Tonnes	Average	1,619	1,482
		Maximum	1,986	1,524
		Minimum	1,498	1,430
5	Pumping Rate In TPH	HOJ I	95	83

3.4.12 CHEMICALS – MONO ETHYLENE GLYCOL (MEG)

MEG is being imported by Dhunseri Petrochem & Tea Limited. This is handled at Berths 6 & 7 . The data pertaining to MEG for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	Berth 6	68,843	58,971
		Berth 7	64,447	39,479
		Total	**1,33,290**	**98,450**
2	Number of Tankers	Berth 6	11	9
		Berth 7	10	6
		Total	**21**	**15**
3	Deadweight Tonnage	Average	17,737	13,562
		Maximum	46,744	23,322
		Minimum	11,527	8,719
4	Parcel Size in Tonnes	Average	7,801	6,460
		Maximum	13,349	7,271
		Minimum	5,698	5,720
5	Pumping Rate in TPH	Berth 6	262.20	286.04
		Berth 7	285.06	271.89

3.4.13 CHEMICALS – CARBON BLACK FEEDSTOCK (CBFS)

CBFS is being imported by IMC and Aegis Logistics Ltd. This is handled at Berths 5, 6 & 7 . The data pertaining to CBFS for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	Berth 5	18,066	0
		Berth 6	87,154	1,50,429
		Berth 7	91,339	83,846
		Total	**1,96,559**	**2,34,275**
2	Number of Tankers	Berth 5	3	0
		Berth 6	5	9
		Berth 7	6	5
		Total	**14**	**14**
3	Deadweight Tonnage	Average	43,505	49,277
		Maximum	76,493	74,896
		Minimum	6,235	6,276
4	Parcel Size in Tonnes	Average	14,040	17,147
		Maximum	24,053	25,528
		Minimum	5,902	5,871
5	Pumping Rate in TPH	Berth 5	139	NIL
		Berth 6	696	664
		Berth 7	606	548

3.4.14 CHEMICALS – PHOSPHORIC ACID

Phosphoric Acid is being imported by Tata Chemicals for their fertiliser plant. This is handled at Berths 5, 6 & 7. The data pertaining to Phosphoric Acid for the two years i.e. 2013-14 & 2012-13 are furnished hereunder.

Sl No	Description		2013-14	2012-13
1	Volume Handled in Tonnes	Berth 5	0	33,883
		Berth 6	1,42,026	1,63,876
		Berth 7	1,78,941	93,079
		Total	3,20,967	2,90,838
2	Number of Tankers	Berth 5	0	3
		Berth 6	15	16
		Berth 7	17	8
		Total	32	27
3	Deadweight Tonnage	Average	27,737	26,592
		Maximum	49,487	38,450
		Minimum	19,728	19,510
4	Parcel Size in Tonnes	Average	10,030	11,371
		Maximum	15,612	14,881
		Minimum	7,201	5,692
5	Pumping Rate in TPH	Berth 5	NIL	395
		Berth 6	1,086	551
		Berth 7	594	541

3.5 PERFORMANCE OF BERTHS HANDLING LIQUID BULK

The performance of the berths handling liquid bulk are examined in the tables hereunder. This covers HOJ I; HOJ II; HOJ III; Berths 2,3,5,6 & 7.

3.5.1 HOJ I

The performance of HOJ I for the past 3 years is presented in the following table.

PERFORMANCE OF HOJ I										
Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
1	Crude	**0**	0	0	0	0	0	0	0	0
2	POL (Products) I & E	13,31,189	149	187	15,05,565	159	188	14,62,429	160	182
3	L.P.G.	81,763	8	8	0	0	0	60,953	10	13
	CHEMICALS	**431279**	**119**	**96**	**393289**	**108**	**100**	**467614**	**114**	**98**
4	Liquid Ammonia	93,445	19	17	77,580	14	13	87,076	14	13
5	Butadine - Export	60,516	39	22	64,086	38	23	54,237	34	18
6	Paraxylene	1,71,185	29	24	87,841	8	12	1,39,122	21	19
7	Benzene - Export	80,929	22	22	87,602	29	26	88,873	23	24
8	Bitumen I & E	17,081	5	6	70,158	15	21	90,213	17	19
9	Butene	8,123	5	5	6,022	4	4	8,093	5	5
10	Phosphoric Acid	0	0	0	0	0	0	0	0	0
11	Acetic Acid	0	0	0	0	0	0	0	0	0
12	MEG	0	0	0	0	0	0	0	0	0
13	CBFS	0	0	0	0	0	0	0	0	0
14	C.T.Pitch	0	0	0	0	0	0	0	0	0
15	L.C.Soda	0	0	0	0	0	0	0	0	0
	EDIBLE OILS	0	0	0	0	0	0	0	0	0
	GRAND TOTAL	**18,44,231**	**276**	**291**	**18,98,854**	**267**	**288**	**19,90,996**	**284**	**294**
	BERTH OCCUPANCY		**291days - 80%**			**288 Days - 79%**			**294 Days - 81%**	
	PREBERTHING DETENTION IN DAYS						**717**			**733**

It can be seen that the berth has been handling almost 2 million tonnes per annum with an occupancy rate of 80%. It has to be noted that this occupancy rate has been worked out taking 365 days. However international practice is to consider 350 days only leaving the balance 15 days for national holidays, cyclonic conditions and maintenance activities. In such a case the occupancy rate increases to 84% which is very high. This is reflected in the pre-berthing detention experienced by the ship due to waiting. For a multi-berth group the preferable berth occupancy to restrict the waiting time is recommended as 65% only.

3.5.2 HOJ II

The performance of HOJ II for the past 3 years is presented in the following table.

PERFORMANCE OF HOJ II

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
1	Crude	33,000	1	0.86	0	0	0	1,40,443	6	5
2	POL (Products) I & E	16,74,904	117	134	11,63,571	94	120	11,02,334	83	103
3	L.P.G.	12,42,858	81	129	13,99,159	80	139	14,65,052	89	139
4	CHEMICALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5	EDIBLE OILS	0	0	0	0	0	0	0	0	0
	GRAND TOTAL	**29,50,762**	**199**	**264**	**25,62,730**	**174**	**259**	**27,07,829**	**178**	**248**
BERTH OCCUPANCY			**264 Days - 72%**			**259 Days - 71 %**			**248 Days - 68 %**	
PREBERTHING DETENTION IN DAYS							**672**			**484**

This berth does not handle chemicals and edible oil. It can be seen that the berth has been handling on an average about 2.7 million tonnes per annum with an occupancy rate of 70%. Here again, this will increase to 73% if corrected for 350 operational days. This higher occupancy rate has again resulted in large pre-berthing detention of tankers.

3.5.3 HOJ III

The performance of HOJ III for the past 3 years is presented in the following table.'

PERFORMANCE OF HOJ III

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
1	Crude	**21,26,576**	68	68	5,43,951	17	16	6,52,492	24	23
2	POL (Products) I & E	10,84,140	49	48	9,17,405	45	48	4,87,374	33	37
3	L.P.G.	0	0	0	0	0	0	0	0	0
4	CHEMICALS	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5	EDIBLE OILS	0	0	0	0	0	0	0	0	0
	GRAND TOTAL	**32,10,716**	**117**	**116**	**14,61,356**	**62**	**64**	**11,39,866**	**57**	**60**
	BERTH OCCUPANCY		**116 Days - 32 %**			**65 Days - 18 %**			**60 Days - 16 %**	

This berth was constructed mainly for handling the crude oil for IOCL Haldia Refinery. With the shifting of crude oil handling to Paradip SBM terminal, the utilisation of this berth has come down with an occupancy rate of only 16 % during last year. This berth has surplus capacity which could be utilised.

3.5.4 BERTH 2

The performance of Berth 2 for the past 3 years is presented in the following table.'

PERFORMANCE OF BERTH 2

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
1	Crude	0	0	0	0	0	0	0	0	0
2	POL (Products) I & E	0	0	0	0	0	0	0	0	0
3	L.P.G.	0	0	0	0	0	0	0	0	0
	CHEMICALS	**97,326**	**17**	**17**	**2,94,832**	**12**	**45**	**44,096**	**6**	**5**
6	Paraxylene	97,326	17	17	2,94,832	12	45	44,096	6	5
	GRAND TOTAL	**97,326**	**17**	**17**	**2,94,832**	**12**	**45**	**44,096**	**6**	**5**
BERTH OCCUPANCY FOR LIQUID CARGO VESSELS			**17 Days - 5 %**			**47 Days - 13 %**			**5 Days - 1.4 %**	
BERTH OCCUPANCY OVERALL			**256 Days - 70 %**			**170 Days - 47 %**			**296 Days - 81 %**	
PREBERTHING DETENTION IN DAYS FOR LIQUID CARGO ONLY							**28**			**11**

The Dock basin Berth 2 is a dry bulk berth handling coal, coke, limestone, ore, fertilisers. For the past 4 years this has been handling Paraxylene also. Here again the berth occupancy rate for the last year is very high resulting in pre berthing detention.

3.5.5 BERTH 3

The performance of Berth 3 for the past 3 years is presented in the following table.

PERFORMANCE OF BERTH 3

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
1	Crude	0	0	0	0	0	0	0	0	0
2	POL (Products) I & E	1,74,011	12	16	4,29,878	32	43	4,78,369	31	43
3	L.P.G.	0	0	0	0	0	0	0	0	0
	CHEMICALS	**1,79,543**	**27**	**26**	**1,75,236**	**10**	**29**	**4,96,591**	**63**	**67**
6	Paraxylene	1,79,543	27	26	1,75,236	10	29	4,96,591	63	67
	GRAND TOTAL	**3,53,554**	39	**42**	**6,05,114**	**42**	**72**	**9,74,960**	157	**177**
BERTH OCCUPANCY FOR LIQUID CARGO VESSELS			**42 Days- 12%**			**72 Days - 20 %**			**110 Days - 30 %**	
BERTH OCCUPANCY OVERALL			**225 Days- 62 %**			**239 Days - 65 %**			**236 Days - 65 %**	
PREBERTHING DETENTION IN DAYS FOR LIQUID CARGO ONLY							**131**			**136**

The Dock basin Berth 3, like berth 3 is also a dry bulk berth handling coal, coke, limestone, ore, fertilisers. For the past 4 years this has been handling considerable volumes of Paraxylene also.

3.5.6 BERTH 5

The performance of Berth 5 for the past 3 years is presented in the following table.

PERFORMANCE OF BERTH 5

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
	CHEMICALS	**0**	**0**	0	**33,883**	3	4	18,066	3	8
1	Phosphoric Acid	0	0	0	33,883	3	4	0	0	0
2	CBFS	0	0	0	0	0	0	18,066	3	8
	EDIBLE OILS	5,41,062	69	165	5,87,017	78	178	5,95,275	87	189
	GRAND TOTAL	**5,41,062**	69	**165**	**6,20,900**	**81**	**182**	6,13,341	90	**197**
BERTH OCCUPANCY FOR LIQUID CARGO VESSELS			**165 Days - 45 %**			**182 Days - 50 %**			**197 Days - 54 %**	
BERTH OCCUPANCY OVERALL			**301 Days - 82 %**			**348 Days - 95 %**			**350 Days - 96 %**	
PREBERTHING DETENTION IN DAYS FOR LIQUID CARGO ONLY							**133**			**146**

The Dock basin Berth 5 mainly handles edible oil and some volumes of coal, coke and ore. In addition some volumes of phosphoric acid and CBFS are handled here. This berth is also having excessive occupancy rate and resulting in large pre berthing detention.

3.5.7 BERTHS 6 & 7 (FINGER JETTY)

The performance of Berths 6 & 7 for the past 3 years is presented in the following tables.

PERFORMANCE OF BERTH 6

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
	CHEMICALS	**3,73,491**	39	53	**4,70,082**	62	75	**3,78,708**	54	69
1	Benzene - Export	0	0	0	0	0	0	6,944	3	2
2	Bitumen I & E	8,080	2	4	53,405	14	20	40,037	11	16
3	Butene	0	0	0	0	0	0	0	0	0
4	Phosphoric Acid	1,53,358	14	20	1,63,876	16	18	1,42,026	15	21
5	Acetic Acid	14,532	6	6	32,879	12	8	27,704	8	4
6	MEG	36,908	6	9	58,971	9	12	68,843	11	15
7	CBFS	1,55,111	10	10	1,50,423	9	14	87,154	5	10
8	C.T.Pitch	5,502	1	4	10,528	2	3	0	0	0
9	M Alchocol	0	0	0	0	0	0	6,000	1	1
	EDIBLE OILS	6,07,347	81	185	7,67,891	75	206	7,29,192	102	133
	GRAND TOTAL	**9,80,838**	120	**238**	**12,37,973**	**137**	**281**	**11,07,900**	156	**202**
BERTH OCCUPANCY FOR LIQUID CARGO VESSELS			**238 Days - 65 %**			**281 Days - 77 %**			**202 Days - 55 %**	
BERTH OCCUPANCY OVERALL			**299 Days - 82 %**			**289 Days - 79 %**			**293 Days - 80 %**	
PREBERTHING DETENTION IN DAYS FOR LIQUID CARGO ONLY							**224**			**256**

PERFORMANCE OF BERTH 7

Sl. No.	Commodity	2011-12			2012-13			2013-14		
		Volume	No. of ships	Berth days	Volume	No. of ships	Berth days	Volume	No. of ships	Berth days
	CHEMICALS	**3,96,862**	48	65	**2,41,083**	28	36	**4,14,807**	57	74
1	Bitumen I & E	24,443	6	9	4,115	1	1	45,768	14	22
2	Butene	0	0	0	0	0	0	0	0	0
3	Phosphoric Acid	1,84,342	17	27	93,079	8	13	1,78,941	17	23
4	Acetic Acid	17,859	7	4	17,565	7	3	28,251	9	6
5	MEG	38,310	8	9	39,479	6	9	64,447	10	13
6	CBFS	1,18,322	8	13	83,846	5	9	91,339	6	9
7	C.T.Pitch	13,586	2	3	0	0	0	0	0	0
8	L.C.Soda	0	0	0	2,999	1	1	0	0	0
9	M. Alchohol	0	0	0	0	0	0	6,061	1	1
	EDIBLE OILS	42,989	6	15	1,28,078	18	35	2,24,253	32	64
	GRAND TOTAL	**4,39,851**	54	**80**	**3,69,161**	**46**	**71**	**6,39,060**	89	**138**
BERTH OCCUPANCY FOR LIQUID CARGO VESSELS			**80 Days - 22 %**			**71 Days - 19 %**			**138 Days - 38 %**	
BERTH OCCUPANCY OVERALL			**260 Days - 71 %**			**282 Days - 77 %**			**267 Days - 73 %**	
PREBERTHING DETENTION IN DAYS FOR LIQUID CARGO ONLY							**43**			**118**

The finger jetty accommodates berths 6 & 7 on either side. These berths handle dry bulk such as coal, coke, ore and gypsum. The liquid cargo includes mainly phosphoric acid, CBFS, bitumen, acetic acid, MEG and edible oil. In both these berths the berth occupancy level is high resulting in large pre berthing detention.

SECTION 4

TRAFFIC ANALYSIS AND PROJECTION OF CARGO

4.1. TRAFFIC ANALYSIS FOR CARGO MIX BEING HANDLED INSIDE DOCK

4.1.1. Berth-wise Break up of Traffic Handled inside Lock Gate at Berths Common for Liquid and Dry Bulk Cargo for 2015-16

Berth No. 2 to 7 were used for handling of dry bulk cargo as well as liquid bulk cargo. It is seen from the ***Table 4.1*** below that the berth occupancy of all berths inside Dock has been above the standard norms of 70% except Berth No. 4. If Edible Oil and Paraxylene can be shifted out, the B.O. of berth No 3, 5 and 7 will significantly come down. This will also lower the BO at berth No. 2 and all the berths (2, 3, 4, 5 and 7) will be below the standard norms of about 70%. This would make space for additional dry bulk cargo to be handled with higher productivity.

Table 4.1: Dry cargo and liquid cargo at common berth and berth occupancy in 2015-16

(In Million Tonnes)

Cargo	**Berth 2**	**Berth 3**	**Berth 4**	**Berth 5**	**Berth 6**	**Berth 7**	**Total**
Palm Oil	Nil	0.01	0.08	0.86	0.35	0.18	1.48
Soya Oil	Nil	0.04	0.08	0.03	0.46	0.30	0.91
Other Veg Oil	Nil	Nil	Nil	0.014	0.014	Nil	0.028
Total Ed Oil	**Nil**	**0.05**	**0.16**	**0.904**	**0.824**	**0.48**	**2.42**
Paraxylene	0.03	0.47	Nil	Nil	Nil	Nil	0.50
Other Liquid	Nil	0.36	Nil	0.016	0.54	0.36	1.28
Total Liquid	**0.03**	**0.88**	**0.16**	**0.92**	**1.36**	**0.84**	**4.20**
Dry Cargo	**1.81**	**0.77**	**1.44**	**0.41**	**0.014**	**0.28**	**4.724**
Grand Total	1.84	1.65	1.60	1.33	1.374	1.12	8.894
Total Berth Occupancy	86.60%	83.82%	59.76%	94.44%	85.23%	80.30%	88.21%
Berth Occupancy for Edible Oil	0	4.59%	11.94%	82.10%	54.87%	32.5%	NA
Berth occupancy for Paraxylene	1.46%	19.54%	0	0	0	0	NA
Total BO for Ed Oil & Paraxylene	1.46%	24.13%	11.94%	82.10%	54.87%	32.5%	NA

4.1.2. Berth-wise Break up of Total Liquid Traffic "Inside Lock Gate" for Last 10 Years excluding IWAI Berth and Trans-loading figures

The Berth No. 2 is dry bulk berth with MHC, dumpers and front end loaders, but about 30,000 tonnes of liquid cargo (paraxylene) in 03 vessels was handled at this berth. Berth No. 3, also dry bulk berth, earlier used for iron ore. This berth was also used for handling of handling of about 47,000 tonnes of paraxylene. The Paraxylene can be shifted outside the lock gate at a liquid berth, making room for handling of dry bulk cargo at these berths. Since discharge rate of dry bulk cargo (coal, coke, lime stone etc) is about 19,000 tonnes per day against 10,000 tonnes per day for paraxylene and 8,000 tonnes per day for other liquid cargo, shifting of liquid cargo from this berth to outside lock gate and substituting that berth occupancy with dry bulk cargo would result in enhanced productivity and more revenue to the port.

At other berths (berth No. 4 to 7) also mix liquid cargo were handled, out of which edible oil quantity was maximum (2.40 million tonnes) with max volume handled at Berth No.6 which is a liquid bulk jetty. The breakup of liquid cargo handled during last 10 years inside lock gate is shown below

Table 4.2: Liquid cargo handled inside Dock during last 10 years

(Million Tonnnes)

FY	Berth. No 2	Berth No 3	Berth No4	Berth No 5	Berth No.6	Berth No7	Berth No 8 & 9	Barge Jetty (Outside)	Total inside gate
2006-07		0.72		0.33	0.62	0.32	0	0.19	2.18
2007-08		0.32		0.43	0.48	0.43		0.18	1.84
2008-09		0.31		0.5	0.62	0.31	.0005	0.18	1.92
2009-10		0.15		0.77	0.53	0.4		0.21	2.06
2010-11	0.06	0.61		0.75	0.71	0.42		0.18	2.73
2011-12	0.1	0.35		0.54	0.99	0.44		0.16	2.58
2012-13	0.297	0.61		0.62	1.24	0.37	.055	0.23	3.422
2013-14	0.044	0.97		0.62	1.11	0.65		0.25	3.644
2014-15	0.02	0.97		0.87	1.56	0.54		0.22	4.18
2015-16	0.03	0.87	0.16	0.92	1.36	0.84		0.22	4.27

The major liquid commodity inside Dock is edible oil to the tune of 2.42 million tonnes (in 272 ships) out of 4.27 million tonnes (in 495 ships) of total liquid cargo. The average growth of liquid cargo in last 10 years inside the Dock has been 7.76% (CAGR) but Berth No. 2 has shown negative growth.

4.1.3. Break up of Liquid Traffic inside Lock Gate Under Category of Edible Oil, Paraxylene and Other Liquids for Last 10 Years:

Table 4 .3: Break-up of Liquid Cargo Traffic

(In Million Tonnes)

Year	Palm Oil	Soya Oil	Other Veg Oil	Total Edible Oil	Paraxylene Inside Lock Gate	Other Liquids	**Total Liquid (In Lock Gate)**
2006-07	0.17	0.22	0	0.39	0.063	1.727	2.18
2007-08	0.25	0.26	0	0.51	0.048	1.282	1.84
2008-09	0.52	0.15	0	0.67	0.027	1.223	1.92
2009-10	0.66	0.22	0	0.88	0.022	1.158	2.06
2010-11	0.62	0.39	0	1.01	0.14	1.580	2.73
2011-12	0.78	0.38	0.03	1.84	0.27	0.470	2.58
2012-13	0.58	0.42	0.06	1.06	0.47	1.89	3.42
2013-14	0.99	0.52	0.04	1.55	0.54	1.55	3.64
2014-15	1.19	0.66	0.09	1.94	0.46	1.78	4.18
2015-16	1.47	0.90	0.03	2.40	0.50	1.37	4.27

The liquid cargo mix traffic inside lock gate has grown from 21.8 lakh MT in 2006-07 to 42.70 lakh MT in 2015-16 @ 8.2% (CAGR) during last 10 years. The edible oils (Palm Oil, Soya bean Oil and other vegetable Oil) has grown considerably from 3.88 lakh MT in 2006-07 to 24.06 lakh MT in 2015-16 @ CAGR of 22.48%. The growth in other liquid cargo has been negative.

The growth in edible oil traffic is as detailed below-

Growth in Palm Oil Traffic (CAGR): 27.47%
Growth in Soya Oil Traffic (CAGR): 16.89%
Growth in other Veg Oil Traffic (CAGR): (-) 2.56%

Major liquid cargoes are edible oil and paraxylene to the volume of 2.41 million tonnes against 1.28 million tonnes of large numbers of acids/ POL/ chemicals. Therefore, edible oil and paraxylene have been identified to be moved out of lock gate (basin) making space for dry bulk cargo vessels inside basin. Apart from current volume of traffic of edible oil and paraxylene, the traffic growth of these two commodities are also analysed to assess the total cargo volume which would be available at the time of commissioning of new berth (2019-20)

and whether there will be enough cargo from these two commodities to occupy the design capacity of the proposed new berth.

4.1.4: Traffic Projection & Methodology

The likely growth in liquid cargo is analysed two ways – (1) based on past trend and (2) based on customers interaction. Estimated traffic under both methods is then averaged to arrive at smoothed estimation.

4.1.5. Edible Oil Traffic Forecast Based on Past Trend

The growth in edible oil traffic is likely to continue based as demand for edible oil is on rise in India due to lower production at home. It is unlikely to maintain the growth rate in future as achieved in the past 10 years (CAGR of 27.4% for Palm Oil and CAGR of 16.89% for Soya Oil). Therefore, the trend for only last three years has considered. Accordingly traffic projection is made considering 10% growth in Palm oil and 12% in Soya Oil, and both commodities have been stagnated in the 6th year as continuous growth cannot be sustained unless new industries in the hinterland are set up or capacity of the existing industries are enhanced. The other Vegetable oils, whose volume is low and fluctuating year to year, has been stagnated (at 50,000 MT in third year) to forecast the total edible oil traffic for next 10 years.

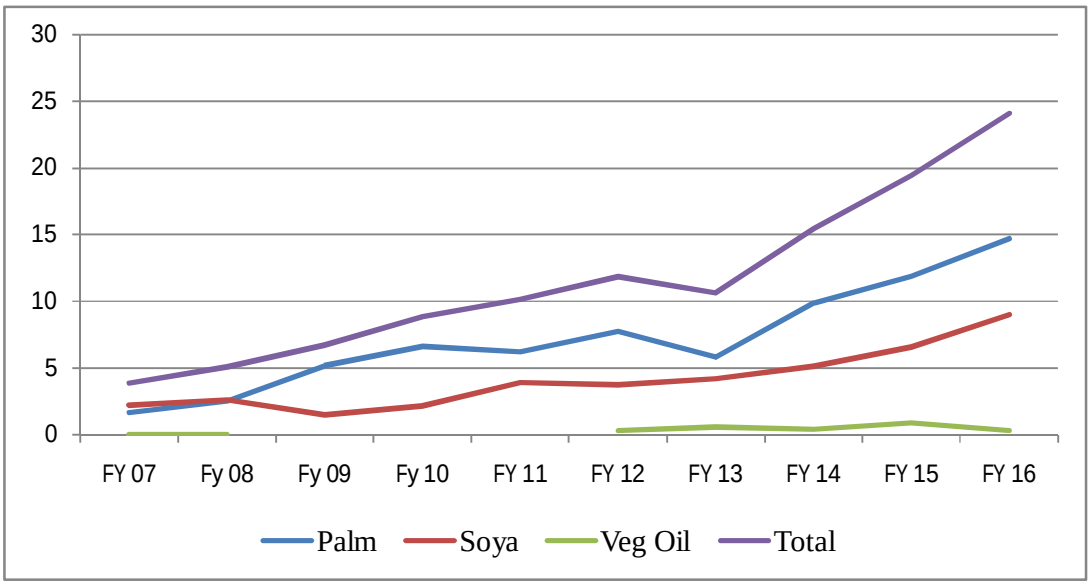


Fig. 1: Edible Oil Trend during Past 10 Years

Table 4.4 : Edible oil Projection based on Trend CAGR (10% for Palm and 12% for Soya)

(In Million Tonnes)

Financial Year	Palm Oil	Soya Oil	Other Veg Oil	Total
2015-16	1.47	0.91	0.03	2.41
2016-17	1.62	1.01	0.03	2.66
2017-18	1.78	1.13	0.04	2.96
2018-19	1.96	1.27	0.05	3.28
2019-20	2.16	1.42	0.05	3.63
2020-21	2.37	1.59	0.05	4.02
2021-22	2.37	1.59	0.05	4.02
2022-23	2.37	1.59	0.05	4.02
2023-24	2.37	1.59	0.05	4.02
2024-25	2.37	1.59	0.05	4.02
2025-26	2.37	1.59	0.05	4.02

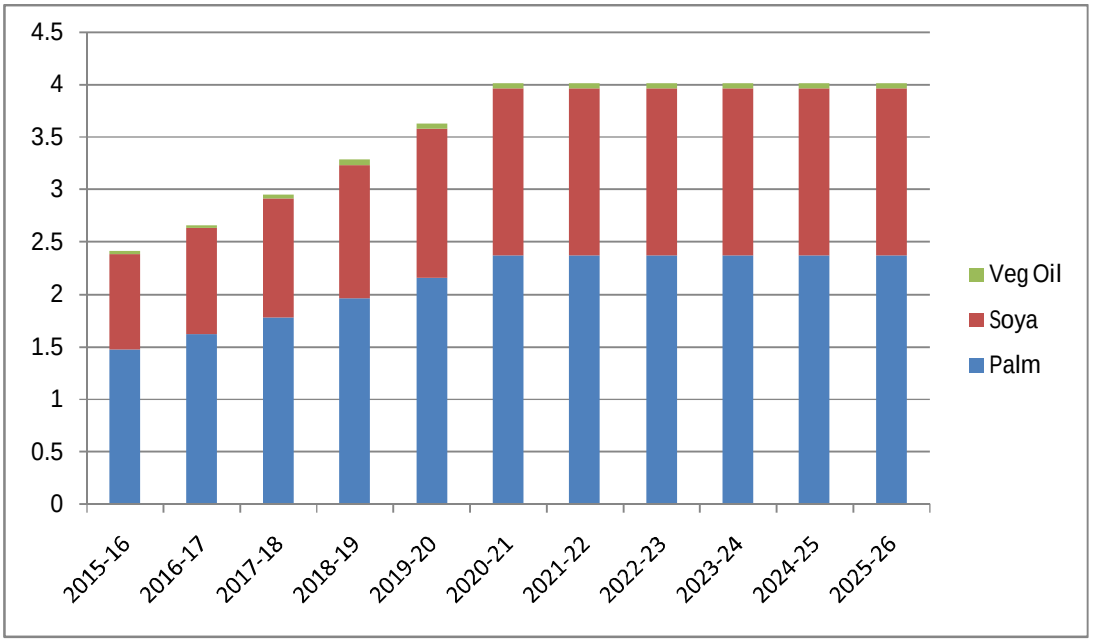


Figure 2: Edible Oil Traffic Projection Based on Trend (Million Tonnes)

4.1.6. Edible Oil Traffic Projection Based on Customer Interaction

During the common meeting with customers organized by GM (Traffic) at HDC on 24th May 2016, customers said that the growth in edible oil traffic at Haldia Port is expected to continue in the range of 10 to 15% per annum. The Minutes of Meeting along with the list of

participants is placed at Annexure **– 2** to this report. The list of participants in the Meeting is placed at **Annexure-1.**

Apart from discussion in the common meeting on 24th May 2016, major edible oil Customers were also contacted telephonically by the IPA Consultant during the period from 30th May 2016 to 3rd June 2016 and traffic indicated by them were noted as below-

Table 4.5: Traffic indication by Customers based on Telephonic Interaction

Customer	**Edible Oil Traffic Indicated for FY 2016-17**	**Traffic Indicated for FY 2017-18**	**Remarks**
Emami Agrotech Ltd	7.50 lakh MT	12% increase	Traffic will continue to grow in future as demand for edible oil is on increase
Adani Wilmar Ltd	5.50 lakh MT	10-15% increase	--do--
Gokul Refoil & Solvents Ltd	3.00 lakh MT	3.60 lakh MT	They are enhancing capacity of their plant by putting new unit. As a result, their requirement of oil will be 30,000 MT per month against 25,000 MT per month now.
Ruchi Infrastructure Ltd	6.00lakh MT	6.20	About 10% growth thereafter. The 10% growth will continue for 5 to 6 years
JVL Oil Refinery	4.00 lakh MT	--	Provisional fig, to be rechecked with concerned person. They handled 3.86 lakh tonnes in 2015-16
Misc Customers with very small volumes	0.50	--	Large number of importers for Nepal Govt.
MCCPTI (Mitsubishi)	Nil	--	They would import 8 lakh tonnes of paraxylene and 60,000 tonnes of acetic acids
Haldia Petrochemicals Ltd	Nil	--	They would import 90,000 tonnes of Butene and 30,000 tonnes of Butadiene in 2016-17. New cargo C4, VAM and MTB after new jetty is commissioned in 2019-20.
Total	26.50 lakh MT		

Based on above, a growth of 10% is considered on indicated traffic from 2016-17/ 2017-18 based on customer's indication and traffic stagnated in 6th year.

Table-4.6: Traffic Projection for Edible Oil Based on Customer Interaction

FY	Emami Agro	Adani Wilmar	Gokul Refoils	Ruchi Infrastructures	JVL Oil Refinery	Misc- Nepal Cargo	Total
2015-16	0.72	0.48	0.26	0.58	0.386	0.05	2.48
2016-17	0.75	0.55	0.3	0.6	0.4	0.06	2.66
2017-18	0.83	0.61	0.36	0.66	0.44	0.07	2.96
2018-19	0.91	0.67	0.40	0.73	0.48	0.07	3.25
2019-20	1.00	0.73	0.44	0.80	0.53	0.08	3.58
2020-21	1.10	0.81	0.48	0.88	0.59	0.09	3.93
2021-22	1.10	0.81	0.48	0.88	0.59	0.10	3.96
2022-23	1.10	0.81	0.48	0.88	0.59	0.10	3.96
2023-24	1.10	0.81	0.48	0.88	0.59	0.10	4.05
2024-25	1.10	0.81	0.48	0.88	0.59	0.10	4.14
2025-26	1.10	0.81	0.48	0.88	0.59	0.10	4.25

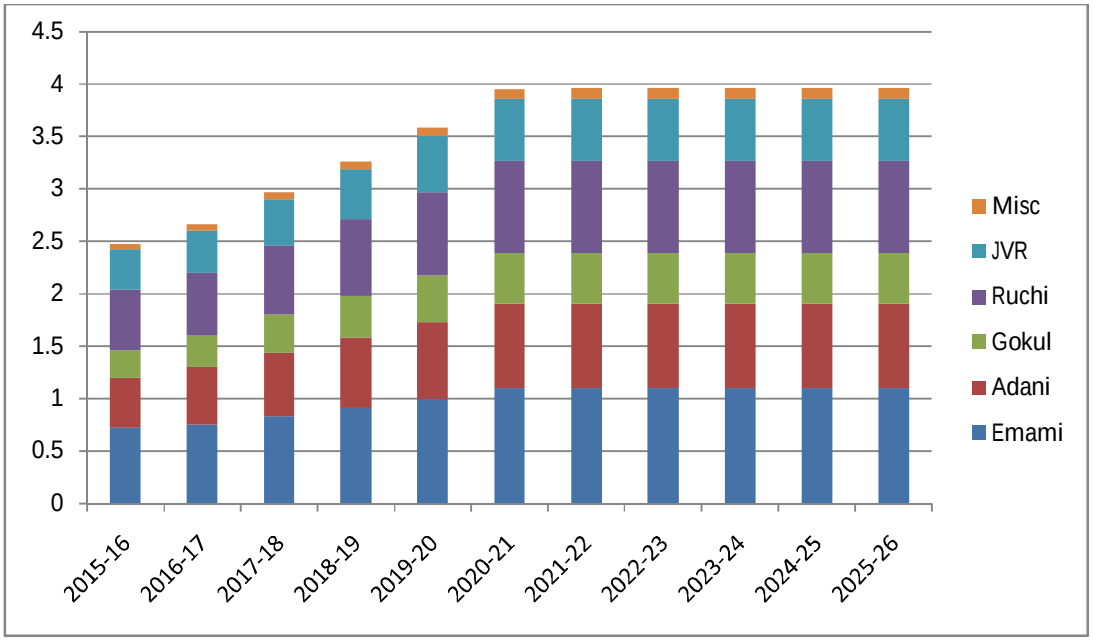


Figure 3 Edible Oil Traffic Projection Based on Customer Interaction (In Million tonnes)

4.1.7: Edible Oil Traffic Projection as Average of Trend and Customers Interaction:

Table 4.7: Traffic projection as Average of Trend and Customers Interaction

(In Million Tonnes)

Financial Year	Traffic Projection Based on Trend last 3 years trend	Traffic Projection Based on Customer Interaction	Average Estimated Traffic
2015-16 (Actual)	2.40	NA	2.40
2016-17	2.66	2.66	2.66
2017-18	2.96	2.96	2.96
2018-19	3.28	3.25	3.26
2019-20	3.63	3.58	3.60
2020-21	4.02	3.94	4.00
2021-22	4.02	3.94	4.00
2022-23	4.02	3.94	4.00
2023-24	4.02	3.94	4.00
2024-25	4.02	3.94	4.00
2015-26	4.02	3.94	4.00

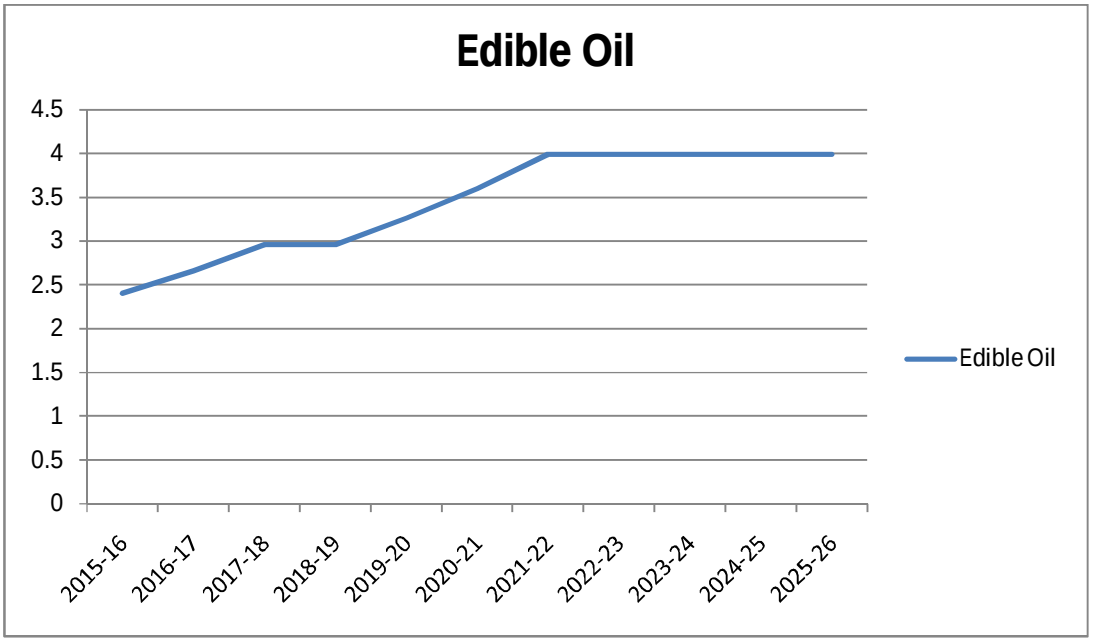


Figure 4 : Edible Oil Traffic Projection As Average of Trend and Customers Interaction (in million tonnes)

The traffic projection for edible oil has been made based on the average of past growth in traffic of edible oil (traffic trend) and traffic indicated by the customer for their cargo at HDC. The traffic in first year (2016-17) is 2.66 million tonnes and rises to 4 million tonnes in 6th year (2020-21). Thereafter has been stagnated in at 4 million tonnes as it is difficult to assess beyond 6 years in view of the absence of information on likely new industries/ capacity up-gradation of existing industries and Govt policy on import of edible oil based on monsoon condition in India.

4.1.8. Cargo Volume which can be moved from inside Lock Gate to the Proposed Berth *(OT-2)*

The total edible oil handled in the FY 2015-16, was 24.06 lakh tonnes, out of which 8.24 lakh tonnes was handled at berth no.6 and balance 15.82 lakh tonnes was handled at berth no 2 to 7 as shown below. Since the berth no. 6 is having full-fledged facilities for handling liquid cargo and the importers has laid down transfer pipelines to this respective places and also the proposed OT-2 liquid jetty, the extension of pipeline is likely to terminate at the adjacent area of Berth No. 6 to facilitate the connectivity to the existing pipeline, hence, the shifting of liquid cargo to OT-2 is not envisaged. The Paraxylene volume of 5.03 lakh tonnes was handled at berth 2 and 3 together. Thus about 16.59 lakh tonnes of these two category of liquid cargo (edible oil and paraxylene) can be shifted outside lock gate to the proposed berth (OT-2/ HDC-II) creating space for handling of dry bulk/ general bulk like coal, coke and lime stone with higher productivity than these two liquid cargo.

Table 4.8 : Liquid Cargo Proposed to be Moved Out of Dock

In Lakh Tonnes (2015-16)

	Berth No.2	**Berth No.3**	**Berth No.4**	**Berth No.5**	**Berth No.7**	**Total**
Edible Oil	Nil	0.52	1.64	9.01	4.65	15.82
Paraxylene	0.30	4.73	Nil	Nil	Nil	05.03
Total	0.30	5.25	1.64	9.01	4.65	20.85
Expected shift of cargo to OT2						
Edible Oil	Nil	0.52	1.64	9.01	4.65	15.82
Paraxylene	0.30	0.47	Nil	Nil	Nil	0.77
Total	**0.30**	**0.99**	**1.64**	**9.01**	**4.65**	**16.59**

The total volume of edible oil and Paraxylene which can be accommodated at OT-2 can be derived from following calculation (TAMP Guidelines)-

HDC Plans to handle 80% edible oil vessels and 20% paraxylene & Chemical tankers at new berth (OT-2).

Handling capacity for edible oil= 365 days x 70% (BO) x 0.85 x 300 tonnes per hour x 24 hours = 15.63 lakh tonnes

Handling capacity for Paraxylene = 365 days x 70% (BO) x 0.15 x 440 tonnes per hour x 24 hours = 4.05 lakh tonnes

Total = 15.63 + 4.05 = 19.68 lakh tonnes

Even though, there is a potential of shifting 15.82 lakh tonnes of edible oil form the Inner dock to OT-II, the handling of edible oils is restricted to 15.63 lakh tonnes, as per the above capacity calculation. The paraxylene & chemicals traffic at the OT-II is estimate to 4.07 lakh tonnes as per the following breakup;

- Shift of Paraxylene from Inner Dock : 0.77 Lakh tonnes
- Additional cargo of Paraxylene due to Growth at estimated growth of 10% per annum 1.70 Lakh tonnes
- Additional Cargo of Chemicals due to Growth as per the user projections. 1.60 Lakh tonnes.

Total : 4.07 Lakh tonnes

This around 17 lakh tonnes of liquid cargo will convert into about 211 vessels being pulled out from Dock to OT-2 which resulted in saving of 227 berth days. These vessels can be replaced by about 128 vessels of dry cargo (coal, coke etc) with average parcel size of 25,000 tonnes. Thus traffic volume of 17 lakh tonnes of liquid cargo will be replaced by dry bulk cargo of 32.00 lakh tonnes as tabulated below-.

Table 4.9: Volume of Dry Bulk cargo Replacing Liquid Bulk cargo

Cargo Type	Volume (Lakh Tonnes)	Average parcel size (tonnes)	Number of ships
Edible Oil	15.63	8,850	177
Paraxylene	0.77	12,000	34
Total Liquid Cargo to be shifted from Dock	16.59	NA	223
Berth Days saved due to shifting of cargo	160 days (155 + 5)	NA	NA
Dry Cargo (Coal) replacing liquid cargo at estimated handling rate of 20000 TPD	32.00	25,000	128

4.1.9. Capacity to be created for Handling of Total Liquid Cargo at OT-2

There is need to create new berth for handling of edible oil and paraxylene (along with new cargo C4, VAM and MTB as indicated by M/s Haldia Petrochemicals in the Customer meeting held on 24th May 2016). After new facility (OT-2) is created, these liquid traffic of 20 lakh tonnes can be shifted to OT-2. But the balance cargo of the projected traffic will have to be handled at existing berths as summarised below.

However as the capacity of OT-2 is limited to 21 lakh tonnes per annum, it would not be improving present utilisation of dry bulk cargo handling facilities at berth no. 2, 3, 4 and 5 because by the time OT-2 is created, the traffic of these liquid commodities would grow significantly to off-set the effect of OT-2 as tabulated above (additional 18.88 lakh tonnes in 2019-20 to 25.68 lakh tonnes in 2025-26 due to cargo growth at HDC).

Therefore, the only way forward to achieve the shifting of 20 lakh tonnes and by using other liquid berths along with OT-2 (HOJ-I to HOJ-III) for paraxylene and other chemicals viz. VAM and MTBE etc. and using Berth No. 6/ HOJ-III for additional edible oil than it handled in 2015-16 (8.25 lakh tonnes in 2015-16). This would This would enable OT-2 to handle about 20 lakh tonnes of liquid cargo (edible oil and paraxylene and other chemicals in the ratio of 80% and 20%) and cargo overflow to be handled at other berths as mentioned above.

2.1.10: Distribution of liquid cargo for OT-2 in ratio of 80% and 20% to Achieve Capacity of 20 lakh tonnes Per Annum

Financial Year	Total Edi Oil traffic Projectin (A)	Ed Oil at OT-2 @ 80% capacity (20 Lakh tonne) (B)	Total Paraxyl Traffic Projection (C)	Parax & POL at OT-2 @ 20% capacity 20 lakh T (D)	Share of Paraxy and POL in 4 lakh tonne (E)	Edible Oil for Berth-6 (F)	Balance Ed oil for Berth5 &Other berths G=A-B-F	Balance Parax for HOJ-1 & Berth 3 H=(C-E)	Total VAM, MTBE, Traffic Projec (J)	Balance VAM, MTBE, etc for Shaluk Khali/ HOJ-1 K=J-E
2015-16	24.0	NA	6.71	NA	NA	8.24	15.76	6.71	0	0
2016-17	26.6	NA	7.44	NA	NA	9.50	17.10	7.44	0	0
2017-18	29.6	NA	8.26	NA	NA	9.50	20.10	8.26	0	0
2018-19	32.6	NA	9.17	NA	NA	9.50	23.10	9.17	5.16	5.16
2019-20	36.0	16.0	10	4.0	2.4+1.6	9.50	10.50	7.60	5.68	4.08
2020-21	40.0	16.0	10	4.0	2.4+1.6	9.50	14.50	7.60	6.24	4.64
2021-22	40.0	16.0	10	4.0	2.4+1.6	9.50	14.50	7.60	6.87	5.27
2022-23	40.0	16.0	10	4.0	2.4+1.6	9.50	14.50	7.60	6.87	5.27
2023-24	40.0	16.0	10	4.0	2.4+1.6	9.50	14.50	7.60	6.87	5.27
2024-25	40.0	16.0	10	4.0	2.4+1.6	9.50	14.50	7.60	6.87	5.27
2025-26	40.0	16.0	10	4.0	2.4+1.6	9.50	14.50	7.60	6.87	5.27

2.1.11: Projection of Dry Bulk Traffic Available for Shifting Inside Dock In Lieu of Liquid Cargo

Haldia Dock commissioned a traffic study through IPA in FY 2014-2015 for development of a mechanised coal berth (OT-1) outside the Dock. According to this study, which holds good in 2015-16 on traffic projected and traffic realised, the Consultants have indicated additional volume of coal/ coke to the tune of 5.5 million tonnes by 2020-21 and another additional volume of 4.5 million tonnes by 2015-26. The dry bulk traffic available and its handling inside Dock in lieu of liquid cargo being shifted to OT-2, is tabulated below-

(In Million Tonnes)

Table 4.11: Dry Bulk Cargo Availability for Handling in Dock in Lieu of Liquid Cargo

FY (A)	Coal Traffic Projection (B)	Capacity of Docks Coal/ coke Berths (C)	Capacity of Proposed OT-1 (D)	Availability of cargo for shifting after OT-1 E=(B-(C+D))	Availability of cargo for shifting Before OT-1 Facility F=(B-C)
2016-17	14.78	11	5.6	-1.82	3.78
2017-18	16.72	11	5.6	0.12	5.72
2018-19	20.04	11	5.6	3.44	9.04
2019-20	20.95	11	5.6	4.35	9.95

2020-21	**22.02**	11	5.6	5.42	11.02
2021-22	23.3	11	5.6	6.7	12.3
2022-23	24.81	11	5.6	8.21	13.81
2023-24	24.81	11	5.6	8.21	13.81
2024-25	26.62	11	5.6	10.02	15.62
2025-26	**26.62**	11	5.6	10.02	15.62

4.1.12: Vessel Profile for Projected Dry Bulk Cargo:

The vessel profile of coal/ coke vessels will remain same as presently being handled inside Dock. The ratio of coking coal/ coke, non coking coal and thermal coal will be in proportion to 51%, 37% and 13%.

DETAILS OF VESSELS CARRYING COAL

2014 - 15

	Type of Coal		**Thermal Coal**	**Coking Coal**	**Non coking coal**
	Total volume handled in million Te		1.33	5.89	3.62
	Number of ship calls		54	234	162
	Deadweight Tonnage - DWT	Average	48,955	73,978	62,479
		Minimum	39,985	9,839	9,839
		Maximum	74,293	84,094	83,690
	Parcel Size in Tonnes	Average	24,633	26,052	22,505
		Minimum	17,261	9,320	5,500
		Maximum	48,203	42,924	46,304
	Length Overall in metres	Average	200	220	203
		Minimum	185	135	135
		Maximum	224	235	229

4.1.13 Conclusion/ Recommendation

Based on the above study, the following conclusions are made-

1. There is a need to create a berth (OT-2) outside the Lock Gate for handling of liquid cargo.
2. The liquid cargo consisting of edible oil and paraxylene can be handled at the new berth.
3. The liquid cargo volume equal to about 17 lakh tonnes in 211 vessels (ref 2015-16 traffic of these two cargo) can be moved out from Dock to OT-2, making berth No 2, 4, 5 & 7 free of edible oil & paraxylene and creating spare capacity for equivalent dry bulk cargo with volume of 32 lakh tonnes in about 120 to 140 vessels per annum.
4. The new berth (OT-2) can handle edible oil and paraxylene & chemicals in ratio of 80% and 20% to ensure capacity realisation of 20 lakh tonnes in line with TAMP Guideline on discharge rate of edible oil @ 300 tonnes per hour and paraxylene and other chemicals @ 440 tonnes per hour with working of 255 days in a year (70% berth occupancy) 24 hours a day.
5. The remaining volume of edible oil (available due to traffic growth wef 2016-17) can be handled at Berth No 6, HOJ-III or at proposed new berth at Shalukkali.
6. The remaining volume of paraxylene (available due to traffic growth wef 2016-17) can be handled at berth No. HOJ-III/ HOJ-I or at proposed liquid berth at Shalukkali
7. The space created inside Dock by shifting liquid cargo, can be used for handling of coal/ coke to the volume of 32 tonnes per annum. There is enough traffic available for this cargo.

SECTION 5

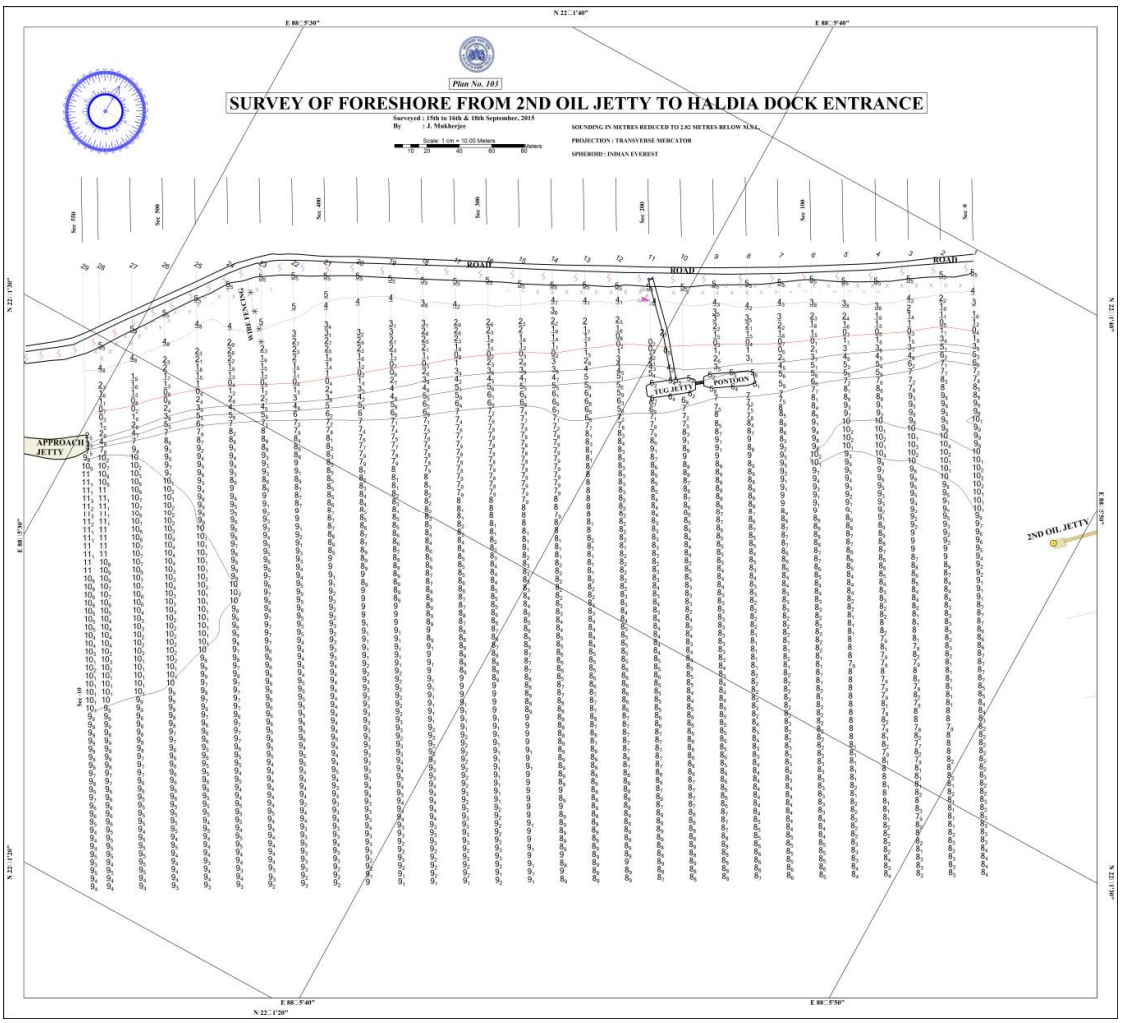
PLANNING PARAMETERS

5.1 BERTH LOCATION AND ALIGNMENT

The proposed location of the berth is in the waterfront between the lead-in jetty and second oil jetty. There is a water frontage of 565 m between the eastern end of the lead-in jetty and outermost western mooring dolphin of the second oil jetty. At present there is a tug berth at a distance of 365 m east of the eastern end of the lead-in jetty. The tug berth is being shifted to a new tug berth which is under construction west of the second oil jetty. A satellite picture of the area is presented below for better appreciation of the location.

The maximum berth length and its location have to be finalised without imposing any restrictions on the operations of the existing facilities like lead-in jetty and second oil jetty and also the tug berth under construction. After detailed study and deliberations with the Port Marine Department it is concluded that the proposed berth can be constructed for berthing of vessels upto a maximum length of 185 m. For safely securing the vessel berthed, the outer mooring dolphins are to be provided at a distance of 270 m. The centre line of the berth, after leaving safety distances from the lead-in jetty and the tug berth/second oil jetty, would be positioned at 365 m east of the eastern end of the lead-in jetty. Incidentally, the land fall point of the centre line of the approach of the proposed berth is the same as that of the existing tug berth.

For taking advantage of the depth available in the approaches the berth has to be located at a place having natural depth not less than 8.0 m below Chart Datum. Bathymetry of the area as per survey taken during September 2015 is as reproduced below



On a detailed study of the bathymetry of the area it is observed that 8.0 m depth is available at a distance of about 100 m from the shore line. Based on data provided, it is concluded that the present depth is in existence over the last five years and can be reasonably expected to prevail the depth in future. Accordingly, the centre point of the berth frontage is selected at 100 m from the shore line.

The orientation of the berth has to be parallel to the predominant current direction at the location for minimising the adverse effect of the current on the berthing/de-berthing operations and also on the moored vessels. In the mathematical model studies for the

determination of location and alignment of proposed jetties at Haldia, conducted by the Central Water and Power Research Station (CW&PRS), Pune, vide their Technical Report No. 4606 of Feb. 2009 it has been recommended to align the proposed barge berth with 7 m draft with a bearing of 58^0N. Since the location of the proposed berth is adjacent to this location off shore, no significant deviation in the predominant current direction is expected. Accordingly the same orientation will be considered for the feasibility study of the proposed berth. However, this may be confirmed before the construction is taken up at site.

Based on the above details, site plan of the proposed berth is prepared and attached at ***Annexure-3***

5.2 CARGO PROFILE

As indicated earlier, it is recommended that edible oil and other liquid cargo of about 2.00 million tonnes be handled at the new oil jetty. The main cargo items are as given below

Edible oils like vegetable oil, soya oil, Pamoleon Oil etc.

Paraxylene (MCC) and Other Chemical viz, VAM. MTBE, Butadiene, Benezene, Acetone, Phenol, Methanol etc.,

5.3 DESIGN SHIP SIZE

As detailed in Para 6.1 above the berth would be designed for receiving vessels upto 185 m long. For planning and design of the berth facilities the smallest and largest vessels likely to call at the berth are to be detailed. As per the details of edible and chemical tankers calling at the port, smaller size vessels with minimum 90 m length are deployed. Accordingly, it is proposed to plan the berth facilities for handling vessels with length in the range of 90 m to 185 m. The structural design of the berthing and mooring facilities will be done for the maximum size of the vessel which would impart the severest effect on these structures. The particulars of the design vessel considered for the structural design are furnished below.

Length	: 185.0 m
Beam	: 32.3 m
DWT	: 40000
Maximum Arrival Draft	: 9.0 m

SECTION 6

SITE INFORMATION

ENVIRONMENTAL DATA

Rainfall

6.1 This region is mainly exposed to southwest monsoon from June to September and an average monthly rainfall of over 250mm is experienced (July and August are the wettest months having monthly rainfall as high as 400mm). During northwest monsoon from November to February, monthly average rainfall of less than 50mm is experienced. The average annual rainfall is around 1500mm and the average number of rainy days in a year with rainfall of 25mm or more is about 20.

Temperature

6.2 At Haldia, there is a seasonal variation in the temperature. April and May are hotter month, whereas December and January are colder months. The highest temperature so far recorded is 44.9^0 C during the month of May in 1975 and the lowest temperature is 6.9^0 C recorded during the month of December 1975. Design range of effective temperature is $\pm 25^0$ C

Visibility

6.3 It is learnt that visibility at Haldia is better compared to that at Kolkata, as the area is free from industrial smoke. At times due to heavy rainfall poor visibility is reported during the southwest monsoon. On an average, fog is reported on 5-7 days in each month from November to February during mornings.

Wind

6.4 For the purpose of design of the berth, wind loads have been considered with the following wind velocities.

Basic wind speed = 50m/sec

Wind speed in operating condition = 24m/sec

Earthquake

6.5 Seismic loads are estimated according to modified clause for the interim measures for seismic provisions clause 222 of IRC:6-2000. Horizontal seismic forces to be resisted shall be computed as follows:

Feq = A n x (Dead Load ± Appropriate Live Load)

A n = {(Z / 2) x (Sa / g)} / (R / I)

Horizontal Seismic Co-efficient = 0.18

Z = Zone Factor = 0.24 (Table 5)

Sa / g = Average response acceleration coefficient = 2.50

R = Response Reduction Factor = 2.50

I = Importance Factor = 1.50

Tidal Data

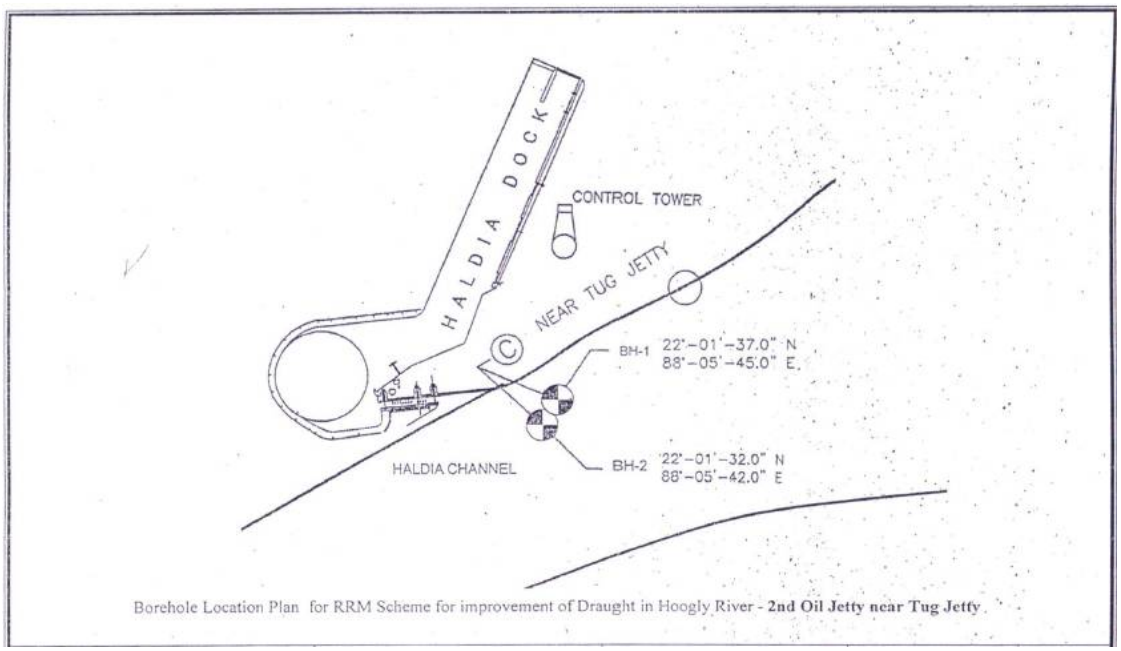
6.6 The tide levels of river Hugli at Haldia are as follows:

Highest High Water (HHW)	**:** (+) 7.26 m CD
Mean High Water Spring (MHWS)	**:** (+) 5.70 m CD
Mean High Water (MHW)	**:** (+) 5.01 m CD
Mean High Water Neaps (MHWN)	**:** (+) 4.26 m CD
Local Mean Water Level (LMWL)	**:** (+) 3.23 m CD
Mean Low Water Neaps (MLWN)	**:** (+) 2.10 m CD
Mean Low Water (MLW)	**:** (+) 1.34 m CD
Mean Low Water Springs (MLWS)	**:** (+) 0.80 m CD
Lowest Low Water (LLW)	**:** (-) 0.07 m CD

GEO-TECHNICAL INFORMATION

Marine

6.7 The sub-soil formation in the river adjacent to the Project site has been investigated by sinking two bore holes upto a depth of 40m below the existing bed level. The location of the boreholes is shown in the following figure.



Borehole Location Plan for RRM Scheme for improvement of Draught in Hoogly River - **2nd Oil Jetty near Tug Jetty**

6.8 The field investigation data and the results of laboratory test conducted on samples collected from the bore holes indicate the presence of different layers. The details of layers viz. layer no., description of layer and the thickness of each layer as encountered in the bore holes are furnished below.

Layer No.	Description	Layer thickness (m)	
		BH-1	BH-2
I	Very loose / medium dense grey sandy silt / silty fine sand with traces of clay and mica	7.00	7.00
II	Stiff grey / bluish grey / brownish yellow silty clay with rusty brown / yellow spots and traces of sand	4.00	5.50
III	Loose to medium dense yellowish brown / brownish yellow silty fine sand with traces of mica	15.50	20.00
IV	Stiff / very stiff bluish to brownish grey / dark grey silty clay	3.00	4.50
V	Medium dense brownish yellow / yellowish brown / yellowish grey sandy silt / silty fine sand with traces of mica	10.50	3.00

Note: The description of layers are very much generalized. For detail description refer respective bore hole logs.

6.9 The respective borehole logs are presented below for detailed appreciation of the soil conditions.

A. Borehole: BH-1

LAYER DETAILS									
No.	Description	B.C.D. (m)		Thick-ness (m)	Av. Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter	Remarks
		From	To					
I	Very loose grey sandy silt with traces of clay and mica	(-) 7.0 (B.C.D)	(-) 14.0	7.0	*1	§1.600	§ϕ=24°	—
II	Stiff grey to brownish yellow silty clay with rusty brown / yellow spots and traces of sand	(-) 14.0	(-) 18.0	4.0	12	1.957	c=7.0t/m²	—
III	Medium dense yellowish brown / brownish yellow silty fine sand with traces of mica	(-) 18.0	(-) 33.5	15.5	*24	1.930	ϕ=34°	—
IV	Very stiff bluish to brownish grey silty clay with red / brown spots	(-) 33.5	(-) 36.5	3.0	29	§2.000	§c=13.0t/m²	—
V	Medium dense brownish yellow / yellowish brown sandy silt / silty fine sand with traces of mica	(-) 36.5	(-) 47.0 (T.L.)	10.5	*19	§1.900	§ϕ=32.5°	—
T.L=Termination Level, *= Corrected 'N' value, §= Suggested Value								

B. Borehole: BH-2

LAYER DETAILS								
No.	Description	B.C.D. (m)		Thick-ness (m)	Av. Field N-Value	Bulk Density (t/m^3)	Shear Strength parameter	Remarks
		From	To					
I	Very loose to medium dense grey sandy silt / silty fine sand with traces of clay and mica	(-) 6.2 (B.C.D)	(-) 10.2	4.0	*2	§1.600	§ϕ=24°	—
		(-) 10.2	(-) 13.2	3.0	*25	§1.995	§ϕ=34°	—
II	Stiff grey / bluish grey silty clay with rusty brown / yellow spots and traces of sand	(-) 13.2	(-) 18.7	5.5	13	1.974	c=7.6t/m²	—
III	Loose to medium dense yellowish brown / brownish yellow silty fine sand with traces of mica	(-) 18.7	(-) 28.2	9.5	*10	1.878	ϕ=29°	—
		(-) 28.2	(-) 38.7	10.5	*25	§1.995	§ϕ=34°	—
IV	Stiff / very stiff grey / dark grey silty clay with occasional traces of decomposed wood	(-) 38.7	(-) 43.2	4.5	18	§1.900	§c=8.0t/m²	—
V	Medium dense yellowish grey sandy silt / silty fine sand with mica and kankars	(-) 43.2	(-) 46.2 (T.L.)	3.0	*21	§1.935	§ϕ=33°	—
T.L=Termination Level, *= Corrected 'N' value, §= Suggested Value								

SECTION 7

PROJECT DESCRIPTION

7.1 GENERAL

The project involves the pre-project activities such as field investigations and surveys, planning and detailed design of terminal facilities, construction of jetty with accessories, installation of top side facilities such as, flexible hoses, jetty-head pipe manifold with headers, jetty infrastructure such as fire fighting system, and pollution control. The construction of the common user edible oil pipelines from the jetty-head to the proposed exchange pit near the Berth No.6 for giving linkage to the existing pipelines of the users, leading to their respective terminals is expected to be part of this project.

7.2 BERTHING JETTY

Unlike dry bulk and break-bulk cargo which need a continuous wharf for transfer between ship and shore, liquid bulk cargo need only a limited space where connections are made from the tanker manifold to the manifold on the jetty through flexible hoses or marine loading arms. Hence, a liquid bulk berth could be with isolated structures for berthing and mooring of tankers and a service platform where the handling facilities and utilities are provided. This would optimise the cost of construction of the berth.

The berth comprising isolated dolphins with pile foundation and suspended concrete deck structure will involve the least cost. In this case the bearing capacity of the soil does not pose any problem, since the piles are taken below the designed dredge level to be founded at a suitable bearing stratum. As regards the type of piles, it is proposed that bored cast-in-situ concrete piles will be used.

Considering the size range of tankers to be handled, it is proposed to provide four breasting dolphins and four mooring dolphins for berthing and mooring of the tankers. A service platform to accommodate marine unloading arms and other utilities will be provided centrally between the two inner breasting dolphins,. The breasting dolphins and the service platform as also the mooring dolphins will all be interconnected by walkways. An approach trestle,

accommodating the pipelines, power and control cables and a carriageway with footpath, will connect the service platform to the shore.

7.2.1 *Service Platform*

The service platform shall have sufficient space to support pipeline manifolds with headers, two fire monitor towers and an operations control cabin all of which are located on concrete plinths on the platform deck and to keep the flexible hoses. The platform shall also have space for installing up to three unloading arms and additional pipelines in future. The platform is connected to the approach trestle at the rear of the deck. An earthing strap is provided at front of the platform to which tankers are connected prior to the commencement of unloading.

The service platform is 24 m long and 20 m wide. The front edge of the platform has set back of 4 m from the berthing line to ensure that, during normal berthing operations, it is protected by the inner breasting dolphins from possible ship impacts. The deck elevation is kept at + 8.70 m (CD) in line with the existing berths of HDC.

The structure of the service platform is proposed to be in the form of open piled jetty. 1200 mm diabored cast-in-situ concrete piles are proposed. Considering the nature of sub-soil at this location, the founding level of the piles is proposed at (-) 45.0 m. However, the diameter of the piles, their spacing and founding depth, will all be firmed up during detailed engineering.

7.2.2 Breasting Dolphins

There will be four breasting dolphins, two on either side of the service platform, to absorb the berthing energy of the vessel. These are positioned so as to allow handling of all ranges of vessels. The spacing between the breasting dolphins is generally kept as 0.25 to 0.4 times the length of the design vessel(s).

In the present case, keeping in view the LOA of vessels to be handled at the jetty varying from 90 m to 185 m, the centre to centre of the inner breasting dolphins is kept as 38 m and that of the outer breasting dolphins as 66 m. Size of the breasting dolphins will be mainly

governed by the structural arrangement required to withstand the berthing force. The proposed deck size is 12 m x 20 m. The deck elevation is kept at + 8.70 m (CD).

In this case also, the structure is proposed to be in the form of open piled jetty. The bored cast-in-situ concrete piles would be of 1400 mm dia. Considering the nature of sub-soil at this location, the founding level of the piles is proposed at (-) 45.0 m. However, the diameter of the piles, their spacing and founding depth, will all be firmed up during detailed engineering.

For absorbing the berthing energy from the vessels and keeping the berthing forces within the design capacity of the structure, each of the breasting dolphins will be provided with dual type cone fendering system suitable for berthing of vessels at all stages of the tide.

Each of the breasting dolphins is equipped with a double quick release mooring hooks with a total capacity of 80 tonnes. The mooring hooks system would be mounted on 500mm high concrete plinths. The dolphins are connected to mooring dolphins and service platform by walkways. They are provided with handrails along the rear side and also with access ladders.

7.2.3 *Mooring Dolphins*

Mooring dolphins are required for securing the berthed vessel in position. The distance between the outer mooring dolphins is usually taken as the maximum ship's length plus the distance taken by the head and stern line under a maximum angle of 45° relative to a line perpendicular to the berthing line. The inner mooring dolphins are located to optimise breast lines perpendicular to the longitudinal vessel axis and/or to accommodate the range of vessel sizes to be handled.

Four mooring dolphins are proposed for mooring of the vessels. The inner dolphins will be spaced at 80 m from centre line on either side while the outer mooring dolphins will be spaced at 135 m from centre line on either side. The inter distance between the inner and outer mooring dolphins will be 55 m.

The proposed deck size is 12 m x 16 m. The deck elevation is kept at + 8.70 m (CD).The structure is proposed to be in the form of open piled jetty. The bored cast-in-situ concrete piles would be of 1400 mm dia. Considering the nature of sub-soil at this location, the

founding level of the piles is proposed at (-)35.0 m. However, the diameter of the piles, their spacing and founding depth, will all be firmed up during detailed engineering.

Each of the mooring dolphins is equipped with a quick release mooring hooks system with triple hooks having a total capacity of 160 tonnes. The mooring hooks system would be mounted on 500mm high concrete plinths. The mooring dolphins are connected to breasting dolphins and service platform by walkways. They are provided with handrails along the rear side and also with access ladders.

7.2.4 *Interconnecting Walkways*

To provide access to the different berth structures for handling, fixing and releasing mooring ropes, it is proposed to provide 1.5 m wide walkways. It would be with reinforced concrete beam and slab deck supported on 1000 mm dia piles founded at depth of (-)30.0 m/(-)35.0 m depending on the location. However, the diameter of the piles, their spacing and founding depth, will all be firmed up during detailed engineering.

7.2.5 *Approach Trestle*

An approach trestle, accommodating the pipelines, power and control cables and a carriageway, will connect the service platform to the shore. Keeping in view the present and future requirements of the pipelines, it is proposed to provide two pipe rack, each of 4.0 m width on either side of carriageway. One rack would be used exclusively for POL and other hazardous pipelines whereas the other would be used for edible oil and services pipelines.

The length of the trestle is 76.0 m. allowing for 7 m wide access road, 1.2 m footpath and kerbs, the total width of the approach trestle works out to 17 m. The deck elevation is kept at + 8.70 m (CD).The structure is proposed to be with reinforced cement concrete beam and slab decking supported on bored cast-in-situ concrete piles. The piles would be of 1000 mm dia. for the areas near the shore whereas 1200 mm dia piles have been proposed for the deeper portion. Considering the nature of sub-soil at this location, the founding level of the piles is proposed at (-) 35.0 m in the area near the shore and at (-) 45.0 m for the piles in the deeper portion. . However, the diameter of the piles, their spacing and founding depth, will all be firmed up during detailed engineering.

7.2.6 Berth Accessories

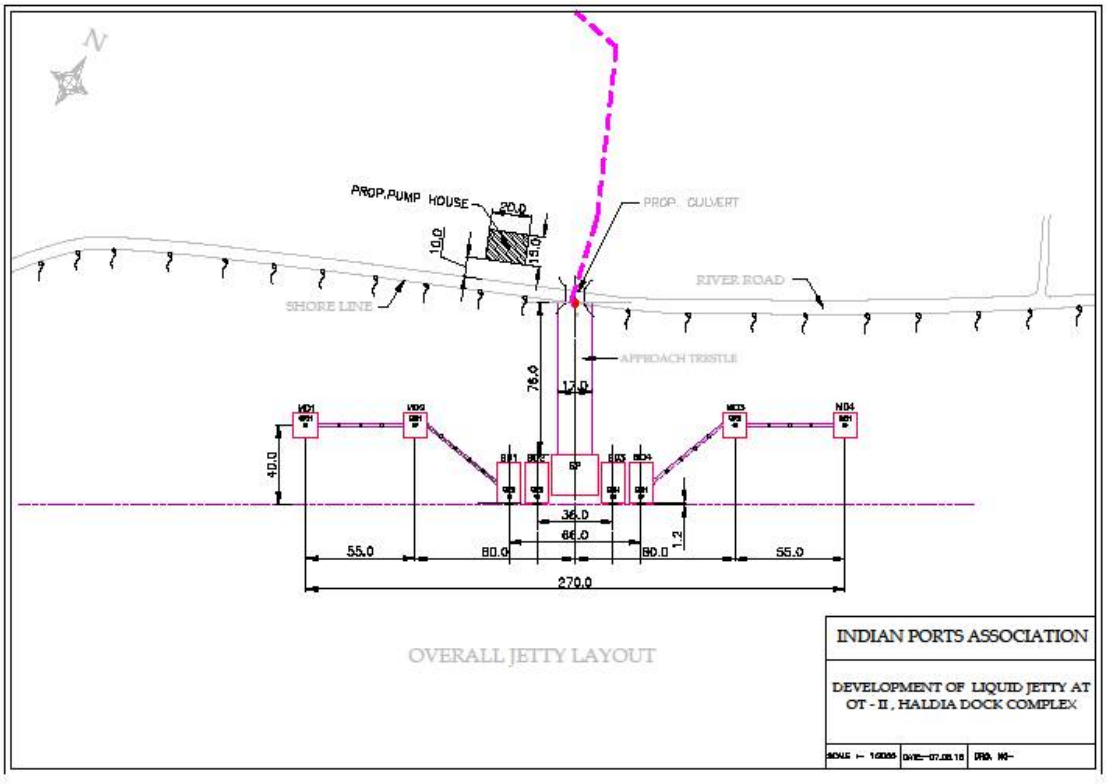
For access from the water, each of the dolphins and the service platform will be provided with ladders, safety chains and mooring rings.

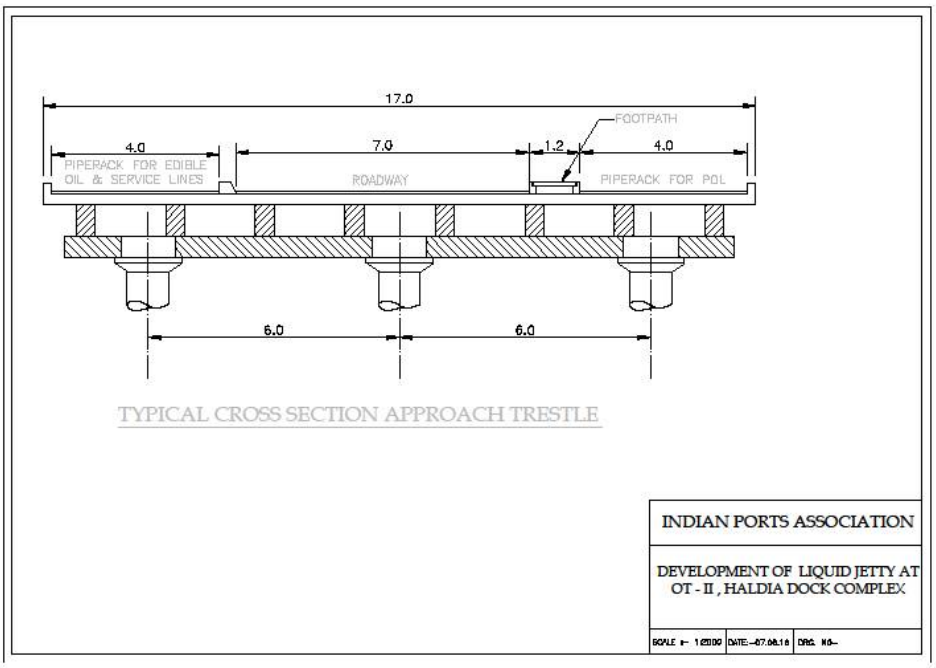
Timber rubbing strips will be provided at the face of the jetty and the mooring dolphins to protect the mooring ropes from rubbing with the concrete.

Handrails will be provided along the approach, walkways and mooring dolphins (at places where it does not foul with the mooring ropes)

7.2.7 Berth layout

The berth layout and a typical cross section of approach trestle are presented hereunder. A bigger drawing of the berth layout and approach trestle is attached as ***Annexure 7.1(A)&(B)***





7.3 SHIP-SHORE TRANSFER AND EVACUATION OF PRODUCTS

7.3.1 Unloading Facility

The berth is intended mainly for handling edible oil. For unloading edible oil which a non-hazardous cargo hoses are generally employed. In the proposed berth, hoses would be deployed for the handling of the edible oils. For the flexibility of port operations and also for the conveniences of the trade it is a general practice to provide flexibility in vessel operations at any berth. This would call for enabling the proposed berth for handling chemicals and paraxylene on special occasions. Marine unloading arm is essentially required for handling these types of hazardous cargo. As the handling of these type of cargo is not a regular operation in the proposed berth and flexibility of operations are mainly in the interest of the trade, it is considered prudent to provide the unloading arms required for handling of chemicals and paraxylene through the user agency(ies). However the service platform would be suitably planned and constructed for the installation and operation of upto three numbers marine unloading arms.

7.3.2 Edible Oil Pipelines from the Proposed Berth to Berth No.6

Major portion of edible oil traffic is at present handled at the berths inside the dock. The edible oil importers have laid edible oil pipelines from Berth No.6 to the storage terminals of respective consignees. The importers would have to use the berths inside the dock also, even after the construction of the proposed berth since it can meet only the part requirements of the import. In this scenario, the importers have to continue the use of existing lines and they prefer to have appropriate facility for linking the proposed berth to the existing pipeline at Berth No.6. The existing pipelines are of 12" dia. The requirements have been discussed with various importers and their preference is to have common user pipelines from the proposed berth to Berth No.6 for giving connection to the existing lines. After considering various options it has been concluded that the common user lines have to be laid and maintained by the Port as part of the project.

Based on a detailed study it is seen that the unloading rate achieved through the existing 12" dia line is to the order of 250-300 tonnes per hour which is not a satisfactory performance. It is necessary to improve the unloading rate through appropriate measures in due course. While selecting the size of the common user lines to be laid from Berth No.6 to the proposed berth the adaptability of the lines for the improved productivity has to be kept in view. It is gathered that there are potential for pumping from multiple tanks in the vessel simultaneously. This calls for the availability of atleast two pipelines. Further, it is feasible to improve the productivity by laying one more line from Berth No.6 to the terminals of the importers and simultaneously using two 12"dia lines. In order to facilitate the simultaneous use of two lines, the proposed common user line should have matching capacity of two 12" dia lines. It is assessed that a 16" dia line has the matching capacity of two 12" dia lines. It is also a fact that increased size of pipeline even for part length would improve the productivity to some extent. On the above considerations it has been proposed to provide two numbers 16" dia common user lines from the proposed berth to Berth No.6 with facilities for pigging and connecting to the existing pipelines of various importers with hoses. The distance from Berth No.6 to the proposed jetty head is about 2.20 km. A drawing showing the pipeline route from the proposed jetty to Berth No.6 is attached as ***Annexure- 7.2***

7.4 FIRE FIGHTING FACILITIES

7.4.1 General

As the berth requires the flexibility for handling POL and also other hazardous cargo similar in characteristics to LPG it is proposed to provide fire fighting facilities as required for port terminals handling liquefied hydrocarbon gases. The proposed facilities are for handling ships of 10,000 to 20,000 tonnes deadweight, carrying liquefied hydrocarbons, keeping in view the future potentials and flexibility in operations. This fire fighting system would also have adequate capacity for handling ships of 20,000 tonnes and above but not more than 50,000 tonnes carrying POL.

The system design will be based on the guidelines given in the following documents:

- OCIMF Document "Guide on Marine Terminal Fire Protection & Emergency Evacuation"
- OISD standard 156- Fire Protection Facilities for Port Oil Terminals.

The layout of fire fighting facilities is done in accordance with standard engineering practices. It will have adequate access for fire fighting, escape routes in case of fire and also provisions for segregation of facilities in the event of emergency.

The following fire fighting facilities are proposed to take care of the size of tankers as also the nature of products to be handled viz., chemicals and other liquid cargoes

- Fire Water System
- Foam System
- Gas Detection and Alarm System
- Fire Alarm/ Communication System
- DCP Protection System for electrical room
- First Aid Fire Fighting Equipment

The fire station will be equipped with a control room for auto remote and manual mode operation of fire fighting system and the forestation will have Portable & Mobile Fire Fighting Equipment for combating any hazards in the pipe lines.

In addition, the port forestation manned round the clock is in the vicinity of the proposed berth.

7.4.2 Design Criteria for fire fighting

i) It is assumed that in case of fire on ship tanker, ship will be towed to open sea and that fire fighting for tanker will be treated as first aid till towing is done.

ii) Tower mounted water cum foam monitors shall be provided for protection to loading /unloading arms/first aid to tankers.

iii) All facilities shall be covered with Hydrant System.

iv) Water curtains will be provided for segregation of loading / unloading arms/piping manifold and ship tanker in the event of fire on either of these facilities.

v) Manual/ automatic below deck fixed water spray system or pile fire-proofing to protect berth structure and installations will be provided.

7.4.3 Fire Water System

For the purpose of fire fighting, water turrets, spray and mist/ fog may be used effectively against oil fires and for making a screen between the fire fighter and the fire. Water is used for fire extinguishing, fire control, cooling of equipment etc.

Provision will be made to prevent inadvertent operation of a water suppression system. When water is used, an adequate drainage system will be provided.
The main components of the system are:

- Design Flow Rate
- Fire water pumps.
- Distribution piping network.

The Fire water flow rate for the jetty will be

- Aggregate of Water flow for Tower mounted water/ foam monitors for protection of loading / unloading arms./ piping manifold and ship tanker.
- Water flow for area segregation by providing water curtains between ship tanker and loading / unloading arms and Hydrant service.

For the size of tankers expected to call at the proposed terminal, the fire water system is proposed to be designed to have2 x 720 M3/hr(2 Tower monitors x 6000 lpm + 2 Jumbo Nozzles x 6000 lpm)

The fire water pressure system shall be designed for a minimum residual pressure of 7 Kg/cm^2 at the hydraulically remotest point of application in the terminal. Fresh water from borewell is proposed to be used for fire fighting in order to minimise the corrosion of pipelines and fire fighting equipment. As large quantity of water is required an exclusive reservoir with an effective capacity of 6300 m^3 with attached borewell is included in the fire fighting system.

Vertical turbine type fire water pumps are proposed to meet the design fire water flow rate and head. These will have flooded suction and capable of discharging 150% of its rated discharge at a minimum of 65% of the rated head.

It is proposed to have two diesel engine driven pump sets with a standby of one electrically driven pump of similar capacity for tower monitors and hydrant system, ground monitors, water curtain system separately.
The Fire water pump house will be located in a covered building at least 100 M away from the jetty. Also Jockey Pumps of adequate capacity to maintain minimum pressure of12 kg / cm2 in fire water distribution network will be provided to achieve required input pressure of water cum foam monitors to the tune of 10 kg/ cm2.

The Fire water pump house will be located in a covered building at least 100 M away from the jetty. Also Jockey Pumps of adequate capacity to maintain minimum pressure 7 kg / cm2 in fire water distribution network will be provided.

There will be two fire fighting water lines one leading to the two tower monitors and the line will have a capacity of 12000 LPM to supply each monitor to have a discharge rate of 6000 lpm. Similarly there will be a second line to supply water the jumbo nozzles for providing a water curtain on the jetty head platform covering the marine loading arms and tower monitors

so that there will be a curtain of water to isolate the shore installation from the ship. This second line with a similar capacity also will have fire hydrants mounted on it.

7.4.4 Fire Hydrant System

Hydrants will be located bearing in mind the fire hazards at different sections of the premises to be protected and to give most effective service. At least one hydrant post will be provided for every 30 metre length on the Jetty for high hazard area.

Hydrants protecting utilities and miscellaneous buildings in high hazard areas may be spaced at 45 metre intervals. Hydrants will be located at a minimum distance of 15 metre from the periphery of tanker or equipment under protection. Double headed hydrants with two separate landing valves on 4" stand post will be used. All hydrant outlets shall be situated 1.4 metre above ground level. . Provision of one international shore coupling shall be kept at the service platform.

7.4.5 Water-cum-Foam Monitors

For protection of ship tank and unloading arms long range/high head foam/water monitor will be used. This can be effectively achieved by mounting monitor on a steel tower of suitable height. It is proposed to have two Tower Monitors for the proposed jetty and shall be auto operated from control room which should be located minimum 100 metre from the manifold. The horizontal and vertical range of tower monitors with water shall be to the tune of 100 m and 50 m respectively. The horizontal and vertical range of tower monitors with foam shall be to the tune of 90 m and 40 m respectively

The height of the monitor shall be such that it will cover the deck of the largest tanker in the lightest condition at spring tides at the jetty. Tower monitors will be located minimum 15 m away from the hazardous area it is to protect.

7.4.6 Ground Monitors

It is also proposed to have two Ground Monitors located to direct water on the object as well as to provide water shield to firemen approaching a fire. These monitors also will be installed

at a height of 3 m and not less than 15 m away from hazardous equipment. . The horizontal range of ground monitors with water and foam shall be to the tune of 60 m and 50 m respectively...

7.4.7 Foam System

It is also proposed to have a foam system as the jetty will be handling hydrocarbons and chemicals. The foam system should be designed to create foam blanket on the burning surface in a reasonably short period. Foam shall be applied to the burning hazard continuously at a rate high enough to overcome the destructive effects of radiant heat. The fixed foam installation system shall consist of two numbers foam feeding pumps, foam proportionate and foam injector with adequate capacity of fixed foam tanks for at least 60 minutes fire fighting .

7.4.8 Fire Detection, Alarm & Communication System

As timely detection of fire at an early stage, is most important it is proposed to have an alarm system consisting of manual call points (break glass), automatic gas/ smoke/ heat detectors, release & inhibit switches for fire suppressment clean agent. Conventional or micro-processor based data gathering fire alarm and central fire alarm panel, mimic panels & associated equipment will be provided. Flammable gas detectors will be provided to give warning of the presence of flammable gases or vapours in air, well before they reach explosive concentrations.

7.4.9 Control room for remote operation:

The entire fighting system will be operated from a control room located at an adequate height and in the close vicinity but not less than 100 m away from the jetty. Apart from commanding a complete and unhindered view of the ship and jetty area, all fire fighting operations through the tower monitors and operation of jumbo curtain will be controlled from the control room.

7.4.10. Water Curtain System:-

In front of service platform along the quay face, water curtain with required number of fish-tail nozzles and vertical nozzles to achieve minimum height of 15 m water spray would be provided.

7.4.11. Fire Alarm System:

Electrical/ hand operated fire siren shall be installed at suitable location in the installation. The operating switch buttons shall be located near the Risk Area at a safe, identifiable and accessible location. The fire alarm shall be different from shift sirens.

7.4.12. Accessories:

Apart from regularly used fire fighting as well as personal protective equipment (PPE) the following accessories shall be maintained in the fire station-

Esplosimeter-1 nos.

Resuscitator-2 nos.

7.4.13. Portable Fire Extinguishers:

The jetty shall be provided with following portable fire extinguishers-

75 kg DCP fire extinguishers- 8 nos.

10 kg DCP fire extinguishers- 6 nos.

CO2 type extinguishers – 4.5 kg-6 nos.

7.4.14. Fire Water Pump House:

The 30 m x20 m size fire water pump house shall also consist of diesel lifting pumps, foam loading pumps etc.

7.4.15. Fire Floats:

The jetty shall be facilitated with existing fire floats of HDC with a provision of reaching the fire floats at the jetty within 10 minutes.

7.5 ELECTRICAL POWER SUPPLY & DISTRIBUTION SYSTEM

7.5.1 Power Requirement

The estimated maximum demand when the drives of one electrically motor driven tower monitor pump, one electric motor driven hydrant pump and jockey pump and the entire illumination is operational use will be about 700 KVA.

7.5.2 Electrical System

It is therefore proposed to have a 1 MVA incomer with circuit breakers and distributor with bus bar for 3.3 KV HV power and a 100 KVA 3.3 KV/440 V HV/LV Transformer a distribution panel for all LT power requirements of the installations on the jetty.

The receiving and distribution system will comprise the following:

a. A receiving substation where power from nearest 2nd Oil Jetty Sub-Station will be received at 3.3 KV through an incomer with circuit breaker..
b. The power received at 3.3 KV will be distributed at the same voltage to all the HT drives which will be basically meant for fire protection facilities.
c. A 3.3 KV/ 440 V/220 V- HV LV transformer to step down and supply LT power to various utilities in the jetty for illumination, electrically operated valves, quick release mooring hooks with capstans, tower and ground monitor drives, foam pumps and for drive of main hydraulic pumps of Marine unloading arms..

The fire fighting pump room where electrically driven pumps are provided (with diesel engine driven as standby) will be located at shore near to a point where the jetty approach trestle is touching the shore.

All the drives, fitting, cables etc., will be flame proof and fire retardant as required. A capacitor bank will be provided to main the power factor.

A stand-by diesel gen set of about 100 KVA is proposed for emergency lighting and for operation of Motor driven fire fighting standby pump, form feeding pump. MOV, MUA etc.

All electrical fittings/ equipment shall be provided in line with Hazardous Area Classification as laid down for electrical area classification and selection of electrical equipment IS-5571, IS-5572 (Part- 1) and OISD-Standard 113 – “Classification of areas for electrical Installations at Hydrocarbon Processing and handling facilities.

SECTION 8

CAPITAL COST ESTIMATE & IMPLEMENTATION SCHEDULE

8.1 The total capital cost of the project is estimated at Rs. 94.59 Crores. The detailed estimate is attached as ***Annexure 8.1.*** The summary breakup of the estimate is given as under:

Sl. No.	Item of Work	Estimated Capital Cost (Rs. Crores)
1	Civil Works	58.93
2	Mechanical Works	25.25
3	Electrical Works	3.50
	Total (1+2+3)	87.68
4	Add: a. Detailed Engineering & Project Supervision @ 2% b. Contingencies @ 3%	1.75 2.63
5	Works Contract Tax @ 4% on 100% of Civil costs + 4% on 15% of Mech. & Electrical costs	2.53
	Grand Total	**94.59**

IMPLEMENTATION SCHEDULE

8.2 The project implementation period including detailed engineering from the date of award of work is estimated at 20 months.

PHASING OF EXPENDITURE

8.3 The phasing of expenditure proposed is as under:

1st Year (Preliminary works in 2016-17))	= Rs.	4.73 crores
2nd Year	= Rs.	47.30 crores
3rd Year	= Rs.	42.57 crores
Total	**= Rs.**	**94.59 crores**

Implementation Schedule is at ***Annexure - 8.2***

ANNEXURE 8.1

CAPITAL COST ESTIMATE

CIVIL WORKS

1.	Pre project activities, surveys and soil investigation	Rs. 1.50 crores
2.	Jetty structure with fenders, quick release hooks, walkways, ladder and other accessories	Rs. 48.96 crores
3.	Approach trestle 76 m long and 17 m wide with roadway and pipeline rack and control room platform	Rs. 7.67 crores
4.	Shore based building for providing accommodation to the operation and management personnel	Rs 0.60 crores
5.	Pipe crossing culvert near Approach Trestle	Rs. 0.20 crores
	Sub Total	***Rs. 58.93 crores***

MECHANICAL WORKS

6.	Shore based firefighting pump house including Water tank and bore well	Rs. 4.65 crores
7.	Two numbers 16" dia edible oil pipelines from Berth No. 6 to the new berth with exchange pit and pigging arrangements for transfer of edible oil from the ship at the new berth to the pipelines of the various importers, existing at the landside of Berth No.6.	Rs. 5.80 crores
8.	Flexible hoses and pipe manifolds	Rs. 0.30 crores
9.	Firefighting system with pumps, towers, monitors, Hydrants, pipelines etc.	Rs 13.00 crores
10.	Oil containment system	Rs 1.50 crores
	Sub Total	***Rs. 25.25 crores***

ELECTRICAL WORKS

11.	Electrical facilities including sub-station, lighting etc. with flame-proof equipment in the jetty and approach Area near by jetty and Stand-by Gen Set	Rs. 3.00 crores
12.	Communications	Rs. 0.50 crores
	Sub Total	***Rs. 3.50 crores***
	Grand Total	***R. 87.68 crores***

SECTION 9

ANNUAL OPERATION AND MAINTENANCE COST

9.1 The annual operation and maintenance cost of the proposal is estimated at Rs. 9.02 Crores based on TAMP Guidelines for fixation of up-front tariff. The broad break-up of estimate is given in the table below.

Sl. No.	Particulars	Amount (Rs. In lakhs)
1.	**Repairs & Maintenance Cost**	**131.21**
	• Civil Works (1% of capital cost – Rs. 6744.54 lakhs)	67.45
	• Mech./Elec Works (2% of capital cost – Rs.3187.80 lakhs)	63.76
2.	**Power for illumination**	**25.31**
	• Illumination (Op. Land area 1 hectares + 20% of Waterfront of 2.905 hectares) x 2.4 lakh units per hectare x Rs.6.67 per unit	25.31
3.	**Depreciation**	**532.58**
	• Deprecation on civil structures (3.17% of capital cost – Rs.6744.54 lakhs)	213.80
	• Mechanical items & fire- fighting System etc (10% of equip. cost –Rs.2799.72 lakhs)	279.97
	• Electrical & Communication 10.00% of equip. cost – Rs. 388.08 lakhs)	38.81
4.	**Other Expenses** (towards salaries and overheads @ 1% of Gross value of assets of Cargo handling Activity – Rs.4328.87 lakhs)	**43.29**
5.	**Insurance** (@ 1% of Gross value of assets – Rs.9932.34 lakhs)	**99.32**
6.	**Lease rentals** • (1 hectare x Rs.1304.22/100 sqm/month x 100 x 12 + 2.905 hectares of waterfront x Rs.652.11 per 100 sqm/month x 100 x12	**70.16**
	Total Operating Cost	**901.87**

The capital cost for assessing R&M Cost, Deprecation, Other expenses and Insurance has been with 5% Misc. Cost as per TAMP guidelines (2008)

9.2 The key assumption for estimation of annual Operation and Maintenance expenditure are as follows.

9.2.1 Optimal Capacity Terminal:

The Optimal Capacity of the proposed OT-2 Terminal is determined at 19.68 lakh tonnes considering Edible oil, Paraxylene and other chemicals handling rate based on the norms prescribed in Upfront Tariff Guidelines 2008/ Tariff Orders.

9.2.2 Repairs & Maintenance Cost:

As per norms specified in guidelines, the Repairs & Maintenance cost is estimated at Rs.131.20 lakhs per annum at the rates of 1% of civil assets and 2% of all mechanical and electrical equipment.

9.2.3 Power cost for Illumination:

As per norms specified in TAMP guidelines, the power consumption for illumination is taken at 2.4 lakh units per annum per hectare. It is considered that 1 hectare of land for operational area and approaches etc and 20% of waterfront area of 2.905 hectares will be allotted to the project and accordingly the power cost is estimated at Rs.25.31 lakhs per annum.(Unit Rate at Rs.6.67 is taken as per WBSEDCL applicable for HT consumers for industrial purpose)

9.2.4 Depreciation:

As per guidelines, Depreciation is estimated at 3.33% on Civil Assets, 10% of the capital cost of the Mechanical equipments viz. flexible hoses & Fire Fighting system and 10.00% of Electrical and Communication systems on Straight line method. However the same is not considered in the cash flows being non cash expenditure.

9.2.5 Other expenses:

As per norms specified in guidelines, other expenses are estimated at Rs. 43.75 lakhs per annum at the rates of 1% of original capital cost of the assets of Cargo Handling activity which include the following:

(a) Salaries and wages of operating and maintenance staff including welfare and other expenses towards them.

(b) Management and general overheads and other miscellaneous cost.

9.2.6. Insurance:

As per guidelines, Insurance cost is estimated at Rs.99.32 lakhs @ 1% of the total capital cost.

9.2.7 License Fee:

License Fee payable for the land area and waterfront area of the project is estimated at Rs.70.16 lakhs as per applicable lease rental rates of HDC @ Rs.1304.22 per 100 sqm per month and Rs. 652.11 per 100 sqm per month respectively. However it has not been considered in the cash flows in view of the project being implemented through internal resources.

SECTION 10

ANNUAL FINANCIAL REVENUE EARNINGS

10.1 The revenue earnings from the project to the Port is basically the Berth hire charges, Handling charges from cargoes. The Project is planned to be taken up through Internal Resources. The tariff shall be determined under Revised Reference Tariff guidelines 2013 or under Upfront Tariff guidelines 2008 in case no reference tariff is available for the given cargo profile in the port concerned or in any other Major Port. The said guidelines will also apply to Port's own Project. As such, the financial analysis has been carried out considering the entire project is taken up through Internal Resources and accordingly, the revenue from handling charges and berth hire charges during a period of 30 years is calculated at constant prices.

10.2 The estimated annual revenue based on provisional tariff assessed as per the upfront tariff guidelines 2008 / Tariff orders is given below :

(Rs. In Lakhs)

S.No	Particulars	2019-20
1.	**Estimated Throughput** (Lakh tonnes)	**19.68**
	(a) Edible oil	15.63
	(b) Paraxylene & Chemicals	4.05
2.	**Liquid Handling Rate** (Rs. per Ton)	
	(a) Edible oil	57.95
	(b) Paraxylene & Chemicals	98.51
3.	**Revenue on Liquid Handling** (Rs. In lakhs)	**1304.78**
	(a) Edible oil	906.10
	(b) Paraxylene & Chemicals	398.68
4.	**Estimated GRT** (Lakh GRT hours)	**827.82**
5.	**Berth hire (Rs./ GRT hour)**	**1.43**
6.	**Revenue on Berth hire** (Rs. In lakhs)	**1186.26**
	Total Estimated Income	**2491.04**

10.3 The broad assumptions for the estimating the revenue are as follows.

11.3.1. The anticipated Handling charges and berth hire charges are worked out based on the preliminary calculations of annual revenue requirement and capacity as per the TAMP Guidelines for determination of upfront tariff (2008.) / Tariff orders.

Although the guidelines of TAMP are followed for arriving at the Revenue requirement, the rates for specific cargoes are not worked out in accordance with the 2008 or 2013 guidelines in view of the project being developed with the Internal Resources The Tariff for the said cargoes is already available in the ports' General SOR which can also be made applicable to the cargoes proposed to be handled at OT-2. However, keeping in mind the wide difference between the tariff for Edible oil and the Paraxylene/chemicals in the current SOR of the port, the new tariff is considered with the same proportional difference and adopted in the Annual revenue earnings. The IRR does not make any difference with any rates adopted by the port keeping the revenue requirement as per guidelines.

TAMP vide their Guidelines of 2015 have stated that "Based on the Annual Revenue Requirements assessed, taking into account the traffic will have the flexibility to determine the rates to respond to the market forces based on its commercial judgement and draw the SOR within the ceiling of indexed ARR". Hence, the port may have to take a call on the rates to be charged at OT-2, based on the situation at the time of commissioning the Jetty and may approach TAMP accordingly for adopting the Port Scale of Rates.

10.3.1. The anticipated Handling charges and berth hire charges are worked out based on the preliminary calculations of annual revenue requirement and capacity as per the TAMP Guidelines for determination of upfront tariff (2008.) / Tariff orders.

10.3.2. The port will also earn revenue from Port Dues and Pilotage as per the General scale of rates, which has not been considered for the cash flows.

10.4 As already brought out elsewhere in this report, the Edible oil hither to being handled at Berth Nos. 2 and 3 and Paraxylene hither to being handled at Berth Nos. 2, 3, 4, 5 and 7 and other chemicals are proposed to be handled at this Liquid jetty and thus envisages

shifting of cargo. However, the growth in traffic for the above commodities not only necessitates the development of OT-2 but also gives an opportunity to handle Dry bulk cargo about 30 to 32 lakh tonnes as brought out in Chapter-2. It is also mentioned that the berth days released at the above berths could be productively used for handling of Coal, the volume of which is on increasing trend. Thus there is no decline in the revenue due to shifting of cargo handling. On the other hand there is every scope for increase in the revenue not only due to the growth of edible oil, paraxylene & chemicals but also in the demand for handling additional dry bulk cargo such as coal etc.

SECTION 11

FINANCIAL VIABILITY AND SENSITIVITY ANALYSIS

11.1 The Financial viability of the project, considering the 30 years life period from the date of award of the construction of the project works out to 20.46%.

11.2 Sensitivity analysis has also been carried out to gauge the impact of increase in cost and reduction of revenue earnings on the viability of the proposal. The results of the analysis are presented below. The detailed Cash flow statement is given at ***Appendix-11.01.***

Sl. No.	Pre-Tax Project IRR at Constant prices	IRR (%)	NPV @ 12% (in Rs Lakhs)
1	Base case	20.46%	5169.06
2	Capital Cost up by 10%	18.72%	4446.80
3	Revenue down by 10%	18.28%	3760.79
4	Annual O&M Cost up by 10%	20.21%	4999.96
5	Combined effect of Sl. no. 2, 3 & 4	16.44%	2869.43

From the above, it is evident that the FIRR of the Project at Base case is 20.46% and even in the least case of sensitivity gives 16.44% and hence the Project is Financially viable for taking up through Internal Resources. The Payback in absolute net revenues works out to be between 7 to 8 years and at NPV of 12% is between 10 to 11 years.

11.3. The viability of the project will be further prospective, in the event port achieves the productivity norms and eligible for 15% productivity increase in tariff over the notified tariff.

Annexure- 11.01

SETTING UP OF LIQUID JETTY AT OUTER TERMINAL, HALDIA DOCK COMPLEX

CASH FLOW STATEMENT FOR CALCULATION OF FIRR

Rs Lakhs

							20.46%	18.72%	18.28%	20.21%	16.44%
Year of Opn	F Y			Cap-ex	Total Revenue	O&M Exps	Net Operation Cashflows	Sensitivity Analysis			
								Cap-ex +10%	Revenue -10%	O&M +10%	Combined Effect
1	2			3	4	5	6	7	8	9	10
1	2016	-	17	472.97			-472.97	-520.27	-472.97	-472.97	-520.27
2	2017	-	18	4,729.69			-4,729.69	-5,202.65	-4,729.69	-4,729.69	-5,202.65
3	2018	-	19	4,256.72			-4,256.72	-4,682.39	-4,256.72	-4,256.72	-4,682.39
4	2019	-	20		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
5	2020	-	21		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
6	2021	-	22		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
7	2022	-	23		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
8	2023	-	24		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
9	2024	-	25		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
10	2025	-	26		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
11	2026	-	27		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
12	2027	-	28		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
13	2028	-	29		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
14	2029	-	30		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
15	2030	-	31		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
16	2031	-	32		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
17	2032	-	33		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
18	2033	-	34		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
19	2034	-	35		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
20	2035	-	36		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
21	2036	-	37		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
22	2037	-	38		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
23	2038	-	39		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
24	2039	-	40		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
25	2040	-	41		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
26	2041	-	42		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
27	2042	-	43		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
28	2043	-	44		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
29	2044	-	45		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
30	2045	-	46		2,491.04	299.12	2,191.92	2,191.92	1,942.81	2,162.00	1,912.90
	Total			**9,459.37**	**67,258.06**	**8,076.30**	**49,722.39**	**48,776.46**	**42,996.59**	**48,914.76**	**41,243.02**
						FIRR	20.46%	18.72%	18.28%	20.21%	16.44%
						NPV@12%	▪ 5,169.06	▪ 4,446.80	▪ 3,760.79	▪ 4,999.96	▪ 2,869.43

Note : 1. Annual O&M Excluding Depreciation and Licence fee.

2. Project revenue has been considered as Revenue earnings

ANNEXURE -2

Minutes of the Meeting held
with the Representative Of Liquid cargo Importers / Exporters
on 24.05.16 in the Conference Room at Jawahar Tower Annexe.

List of Participants is enclosed.

At the outset General Manager (Traffic) I/C welcome the participants from the Trade as well as the Consultants from IPA and explained that the instant meeting had been called to apprise the trade regarding KoPT's proposed plan to create a new facility viz. Outer Terminal – II for handling liquid cargo outside the Lock Gate between Haldia Oil Jetty –II and the Lock Gate near the Tug Parking Jetty and also to obtain feed back from the Trade regarding the facilities required by them at the said jetty.

It was further explained to the trade by him that the said jetty would be primarily utilized for handling edible oil cargo through pipeline, thereby creating more rooms for handling dry bulk cargo inside the impounded dock system where advantage of mechanized loading / unloading facilities as well as Mobile Harbour Cranes are available for faster loading / unloading of dry bulk cargo. However, if the trade desires then the facilities may be created for handling other liquid cargo at the said jetty also. He informed the trade that during the financial year 2015-2016 altogether 495 liquid cargo vessels were handled inside the lock gate, out of which 277 vessels were edible oil with 2.4 million tones of cargo. The balance vessels were primarily A/c Paraxylene, POL products, CBFS, Phosphoric Acid, Bitumen, etc.

He informed the trade that although the facilities would be created at HOJ-III for accommodating edible oil vessels yet due to increasing demand for LPG handling, HOJ-III might not be available for handling liquid cargo from 2019-2020 as this jetty would be mostly occupied by the LPG vessels, apart from

Crude and Naptha vessels. In that event handling of edible oil vessels would be required to be shifted from HOJ- III to the proposed Outer Terminal-II.

General Manager (Traffic) I/C thereafter requested the representatives of the trade to put forward their suggestion / proposal for handling any other cargo at the proposed OT-II.

The representative of MCC PTA informed that they would be importing around 8.0 lakh tones of paraxylene per annum and their average parcel load per vessel would be 10,000 MT which means a total of 80 no. of vessels would be required to be handled on their account. He informed that to avoid detention of their paraxylene vessels, facilities would be required to be created for handling paraxylene vessels at OT-II also where such vessels would be handled through flexible hose. He further indicated that 20 vessels might be required to be handled at this jetty per annum.

The representative of HPL indicated that they would to import and export various new products like Methanol (import), Vinyl Acetate Monomer (VAM) (import), Fuel Grade Naptha (import), MTBE (Methyl Tetra Butyl Ether) (export), C4 Affinate (Export) from 2018 onwards. In addition the facility would also be required at this jetty for handling Butene and Butadiene which are currently being handled at HOJ-I. He stated that at present due to high occupation of HOJ-I, Butene and Butadiene vessels are required to wait for a substantial period prior to berthing. He indicated that altogether 100-120 vessels would be required to be handled at this jetty and for handling such vessels an exclusive loading / unloading arm would be required to be provided at the said jetty. He further indicated that the length of such vessels would be ranging from 90-130 M and the parcel load will vary from 3,000-15,000 MT. He also indicated that 4 pipelines would be required for handling the above cargo.

The representative of Ageis Logistics indicated that if the loading / unloading arm is provided at the said jetty then they would be importing C4 substrate to the tune of 35000 MT per month.

General Manager (Traffic) I/C informed that at present the average parcel load of edible oil vessel is 8000 MT and the average discharge rate is to the tune of 225-250 hours. Thus, the average working period for each edible oil vessel worked out to be 1½ day. He informed the edible oil trade that for maximum utilization of the proposed jetty, the turn round time of the vessel must be reduced which could be achieved only by increasing the discharge rate from the current level of 250 hrs. to 450-500 MT per hour so that the vessel could complete the discharge within 24 hrs. The trade was also requested to increase the average parcel load of the vessel from the current level of 8000 MT to 10,000 tonnes to increase the cargo throughput.

The edible oil trade confirmed that they would be in a position to increase the parcel load as well as to increase the discharge rate to the tune of 500 MT per hour provided the 2 pipelines with piggable facility are allowed to be laid.

The trade was informed that their request would be examined appropriately. The trade was further requested that the diameter of the pipelines should be 16 inches to increase the flow rate and thereby in turn to increase the discharge rate.

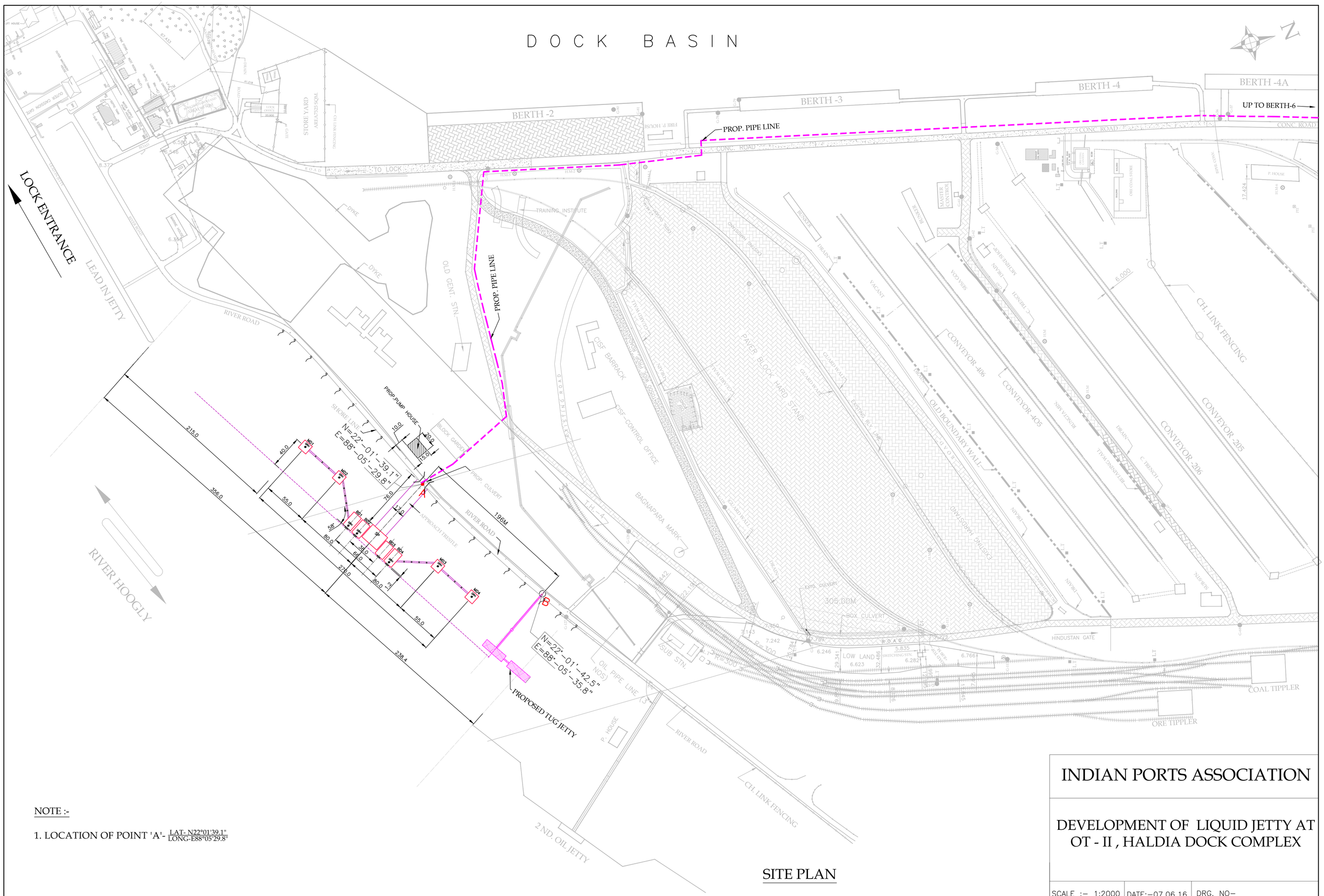
General Manager (Traffic) I/C informed the trade that considering the average TRT of the vessels as 1½ day, maximum 230 to 240 vessels can be handled per annum at OT-II. He further confirmed that considering the above number of vessels to be handled at Outer Terminal-II, 170 to 175 edible oil vessels, 15 to 20 paraxylene vessels and 45 to 50 vessels a/c HPL could be handled at the proposed jetty. He also informed the trade that while the jetty with fire fighting facilities would be constructed by port, pipeline will be required to be laid by

the importers / users of the jetty after observing necessary formalities. In addition the unloading / loading arm will also be required to be installed by the prospective user at their own cost and responsibility. He requested the trade to

inform their further requirement / suggestion, if any, immediately so that the Techno-Economic feasibility report for the proposed jetty can be prepared by the Consultants without any delay.

General Manager (Traffic) I/C expressed his sincere thanks to the representative of Trade as well as the Consultants of IPA for attending attend the meeting and sharing their views.

NOTE: HPL, subsequently through E-mail revised the cargo profile from which it is apparent that the cargo " C4 reffinet" is not proposed.



SITE PLAN

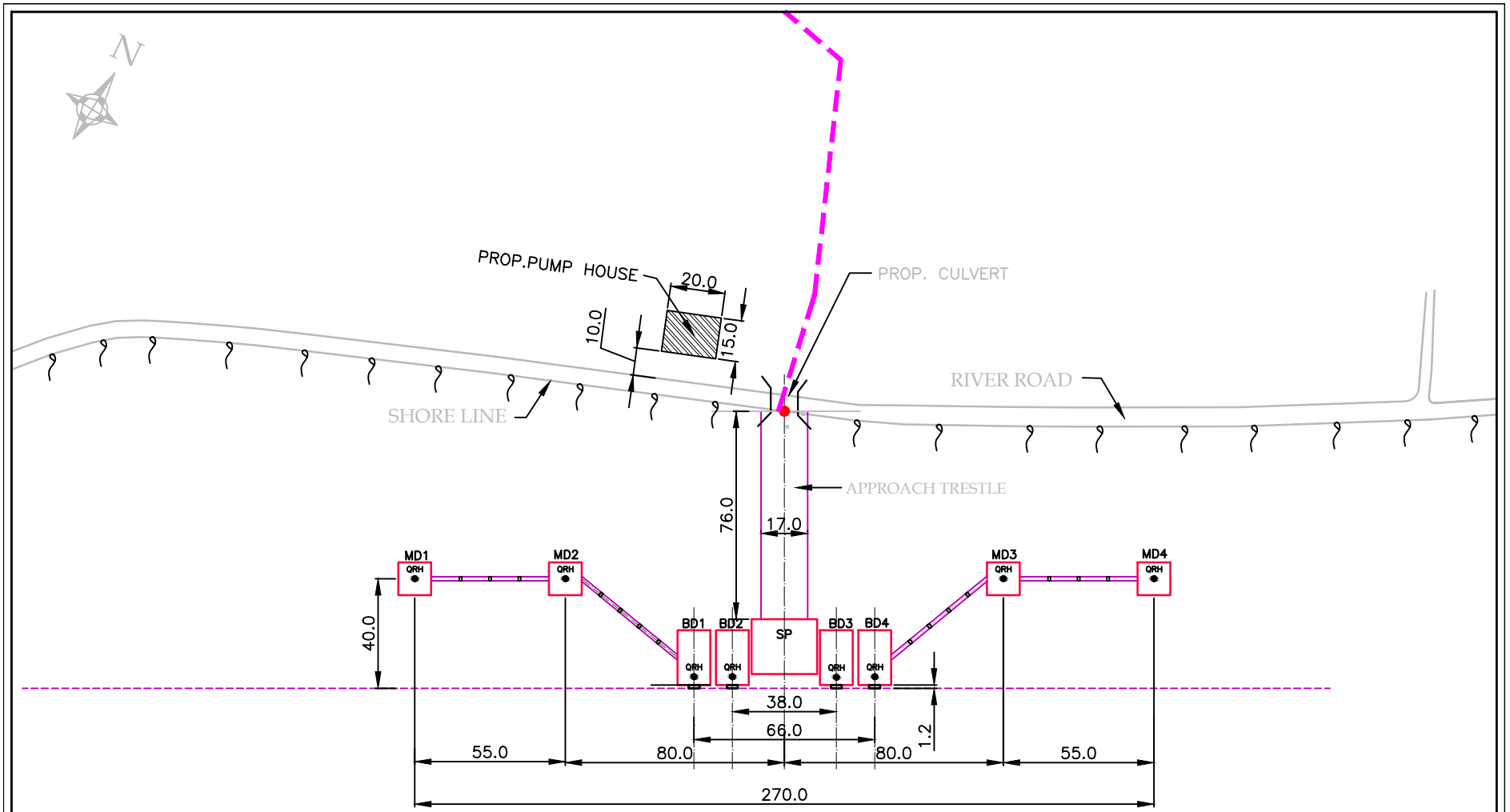
NOTE :-

1. LOCATION OF POINT 'A'- LAT- N22°01'39.1" / LONG-E88°05'29.8"

INDIAN PORTS ASSOCIATION

DEVELOPMENT OF LIQUID JETTY AT OT - II , HALDIA DOCK COMPLEX

SCALE :- 1:2000	DATE:-07.06.16	DRG. NO-



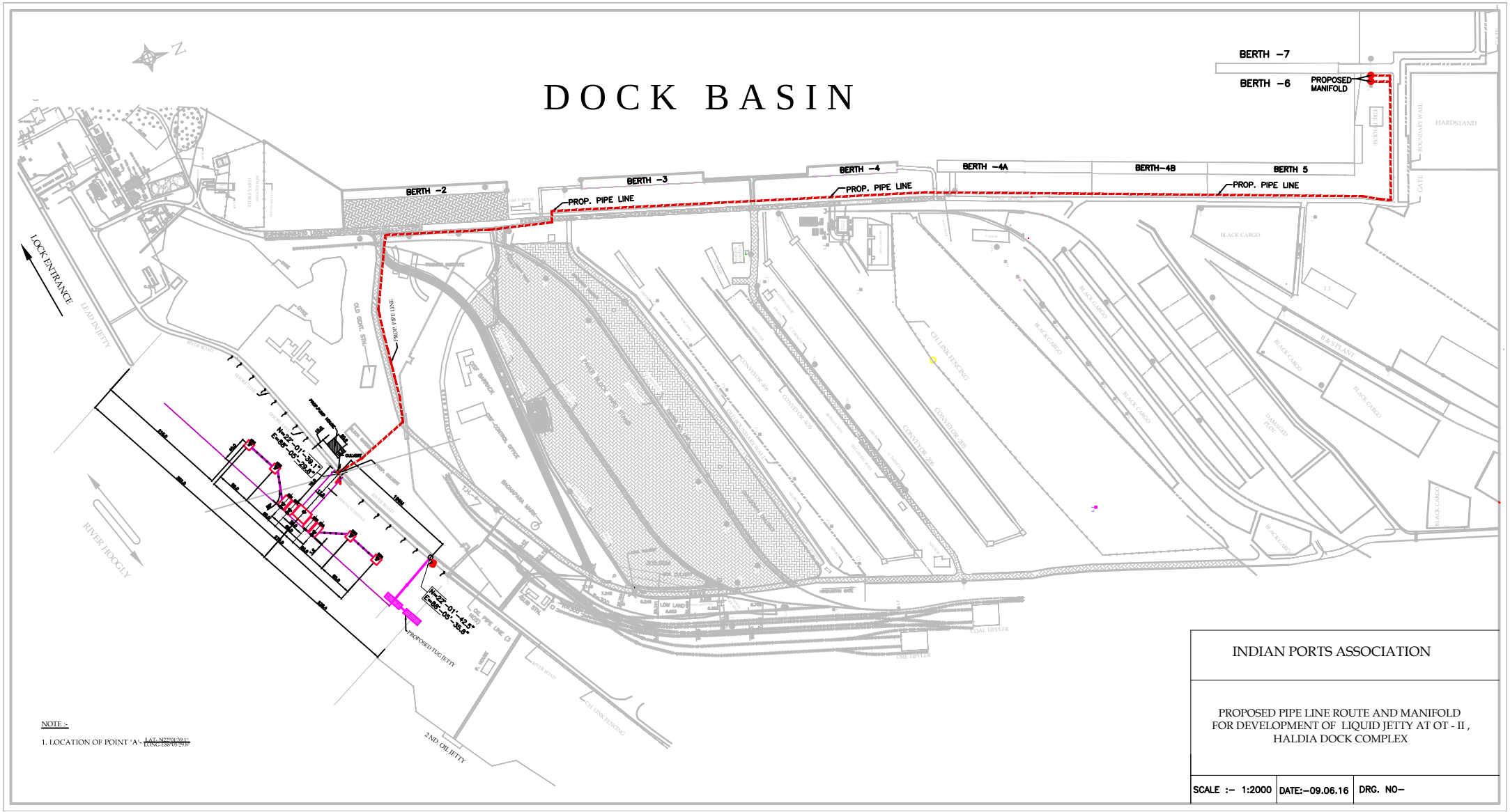
OVERALL JETTY LAYOUT

INDIAN PORTS ASSOCIATION

DEVELOPMENT OF LIQUID JETTY AT OT - II , HALDIA DOCK COMPLEX

SCALE :- 1:2000	DATE:-07.06.16	DRG. NO-

DOCK BASIN



NOTE :-

1. LOCATION OF POINT 'A' :- ~~LAT. N22°01'39.1"~~ ~~LONG. 088°05'29.8"~~

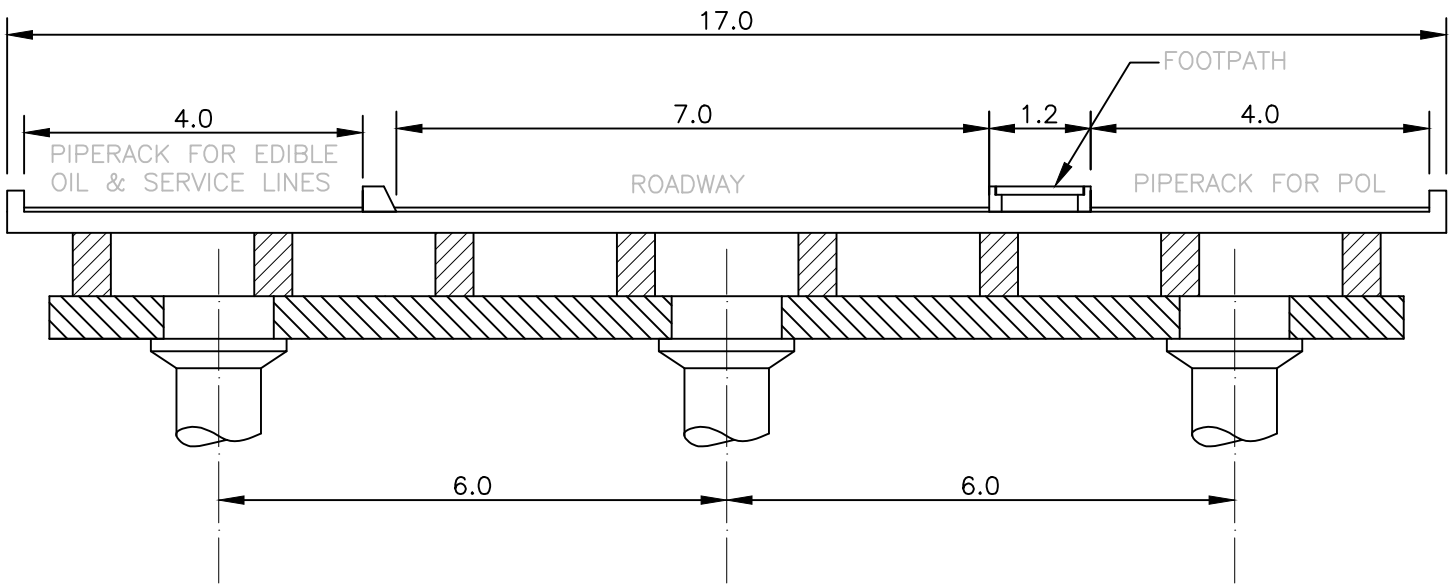
INDIAN PORTS ASSOCIATION

PROPOSED PIPE LINE ROUTE AND MANIFOLD FOR DEVELOPMENT OF LIQUID JETTY AT OT - II , HALDIA DOCK COMPLEX

SCALE :- 1:2000	DATE:-09.06.16	DRG. NO-

IMPLEMENTATION SCHEDULE FOR DEVELOPMENT OF LIQUID JETTY AT OUTER TERMINAL 2(OT-II)

S.No.	Item of work	EXECUTION IN MONTHS
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
1	**PRE PROJECT ACTIVITIES**	
	a) Environmental Clearance	
	b) Detailed Engineering	
2	**Civil Works**	
	a) Preparation of Tender Documents	
	b) Tendering and Award of Contract	
	c). Mobilisation	
	c. Piling	
	d. Deck Superstructure	
	e. Fixtures: fenders & Quick Release Mooring Hooks	
3	**Mechanical Works**	
	i) Fire Fighting System	
	a) Preparation of Tender Documents, Tendering & Award	
	b) Supply, Installation, Testing and commissioning	
	ii) Edibile Oil Pipe line	
	a) Preparation of Tender Documents, Tendering & Award	
	b. Supply, Laying, Testing and Commissioning	
4	**Electrical Works**	
	a) Preparation of Tender Documents, Tendering & Award	
	b. Execution/supply and erection	



TYPICAL CROSS SECTION APPROACH TRESTLE

INDIAN PORTS ASSOCIATION

DEVELOPMENT OF LIQUID JETTY AT OT - II , HALDIA DOCK COMPLEX

SCALE :- 1:2000	DATE:-07.06.16	DRG. NO-