

APSEZL/EnvCell/2025-26/081

Date: 22.11.2025

To,

The Inspector General of Forest / Scientist C,
Integrated Regional Office (IRO),
Ministry of Environment, Forest and Climate Change,
Karmayogi Bhawan,
Block-3, F-2 Wing, 5th Floor,
Near CH-3 Circle, Sector – 10A
Gandhinagar – 382010.
E-mail: ecompliance-guj@gov.in, iro.gandhingr-mefcc@gov.in

Sub : Half yearly Compliance report of Environment Clearance of "Single Point Mooring (SPM), Crude Oil Terminal (COT) and connecting pipes at Mundra Port, District Kachchh by M/s. Adani Ports & SEZ Limited"

Ref : Environment clearance granted to M/s Adani Ports & SEZ Ltd. vide letter dated 21st July 2004 bearing no. J-16011/30/2003-IA-III.

Dear Sir,

Please refer to the above cited reference for the said subject matter. In connection to the same, it is to state that copy of the compliance report for the Environmental and CRZ Clearance for the period of April 2025 to September 2025 is being duly uploaded on the Parivesh Portal.

Additionally, a soft copy of the same is being submitted through soft copy (e-mail communication).

Kindly consider the above submission and acknowledge.

Thank you,
Yours Faithfully,
For, **M/s Adani Ports and Special Economic Zone Limited**



Bhagwat Swaroop Sharma
Head – Environment
Mundra & Tuna Port

Encl: As above

Copy to:

- 1) The Director (IA Division), Ministry of Environment, Forests & Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi-110003.
- 2) The Zonal Officer, Regional Office, CPCB – Western Region, Parivesh Bhawan, Opp. VMC Ward Office No. 10, Subhanpura, Vadodara – 390023.
- 3) The Member Secretary, GPCB – Head Office, Paryavaran Bhavan, Sector 10 A, Gandhi Nagar – 382010.
- 4) The Director, Forests & Environment Department, Block – 14, 8th floor, Sachivalaya, Gandhi Nagar – 382010.
- 5) The Regional Officer, Regional Office GPCB (Kutch-East), Gandhidham – 370201.

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Environmental Clearance Compliance Report

of



SPM, Crude Oil Terminal and
Connecting Pipes

at

Mundra Port,
Dist. Kutch, Gujarat

of

Adani Ports and SEZ Limited

Period:

April-2025 to September-2025

Status of the conditions stipulated in Environment Clearance under CRZ notification

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	Adani Ports and Special Economic Zone Limited, Mundra.	From : Apr'25 To : Sep'25
Status of the conditions stipulated in Environment Clearance under CRZ notification		

Chronology of company name change from **M/s. Gujarat Adani Port Limited** to **M/s. Adani Ports and Special Economic Zone Ltd.** was submitted along with half yearly EC Compliance report for the period Apr'21 to Sep'21.



Adani Ports and Special Economic
Zone Limited, Mundra.

From : Apr'25
To : Sep'25

Status of the conditions stipulated in Environment Clearance under CRZ notification

Half yearly Compliance report of Environment and CRZ Clearance of "Single Point Mooring (SPM), Crude Oil Terminal (COT) and connecting pipes at Mundra Port, District Kutch issued by MoEF vide letter no. J-16011/30/2003-IA.III dated 21st July 2004.

Sr. No.	Conditions	Compliance Status as on 30/09/2025
Specific Condition		
1.	<p>Mangrove afforestation in 25 ha of area, suitably identified in consultation with State Forest Department. The GAPL shall bear the cost of the said land as well as the cost of the plantation of mangroves and its sustenance and implant within 6 months from the date of clearance of this letter. Further, it shall be ensured that mangroves in the vicinity of the salt works are not affected due to the project.</p>	<p>Complied.</p> <p>25 hectare of mangrove plantation with a cost of 10 Lakh is already completed near railway yard in consultation with Dr. Maity, Mangrove consultant of India.</p> <p>There are no salt works within the project area.</p> <p>It may be noted that to enhance the marine biodiversity, till Sep'25 APSEZ has carried out mangrove afforestation in 4140 ha. Area across the coast of Gujarat. Total expenditure for the same till date is INR 1592.8 lakh.</p> <p>Details on Mangroves afforestation & Green belt development carried out by APSEZ till date is annexed as Annexure - 1.</p> <p>Other than this Adani Foundation – CSR Arm of Adani Group at Mundra-Kutch has initiated multi-species plantation of mangroves in Luni village in association with M/s. GUIDE, Gujarat. During 2018-2019 (Phase-I) multi-species mangrove plantation was carried out in 10 ha, during Phase-II (2019-2020) it was 02 ha and during Phase III (2020-2021) it is 01 ha. During FY 2021-22, 03 ha area coastal stretches have been planted with species. During current earlier compliance period FY 2022-23, 04 Hector plantation has been planted with various species. Total 20 Ha. multi-species mangrove plantation has been carried out till March-23 association with M/s. GUIDE, Gujarat.</p> <p>Adani Foundation has done gap filling with 10000 nos. of mangrove saplings at Luni village coastal area during the compliance period Apr'25 to Sep'25.</p>



Adani Ports and Special Economic Zone Limited, Mundra.

**From : Apr'25
To : Sep'25**

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<p>These plantations are diligently maintained and continually monitored. Notably, these forests have evolved into a thriving habitat for various marine and migratory bird species, enriching the local ecosystem. Please refer attached Annexure – 2 for CSR activity report carried out by Adani Foundation.</p>
2.	<p>In addition to the mangrove plantation, GAPL should also take up massive green belt developments in 30 acres of land in and around the project in consultation with the Forest Department. Detailed plan indicating the area identified for the mangrove plantation as indicated at (i) above and for green belt development along with the financial outlay shall be provided to this ministry within 6 months from the date of receipt of this letter.</p>	<p>Complied.</p> <p>During the course of development of the project, green belt was developed in 8.58 Hectares of land. Total 8981 trees were planted with the density of 1047 trees per hectare within port premises at a cost of Rs. 25 Lakh.</p> <p>This plantation was done in consultation with Gujarat Ecological Commission (as they are one of the authorized agencies of Dept. of Forest & Env. Dept., Govt. of Gujarat).</p> <p>In addition to this, various activities on green belt development and mangrove plantation are being carried out on regular basis by horticulture department.</p> <p>Budget for Horticulture Department for the FY 2025-26 is to the tune of INR 655 lakh. Out of which, Approx. INR 175 lakh has spent during FY 2025-26 till Sep'25.</p> <p>It may be noted that APSEZ has developed 458 ha. area as greenbelt with plantation of more than 9.06 Lacs saplings within the APSEZ area. Details on mangroves afforestation & Green belt development carried out by APSEZ till date is annexed as Annexure – 1.</p>
3.	<p>No dredging activity shall be carried out.</p>	<p>Complied.</p> <p>Construction activities are completed & project is in operation stage. SPM is approximately 6.3 km inside the open sea from the shore where 30 m of draft is naturally available. Hence no dredging is required.</p>
4.	<p>No ground water should be tapped at the project site / within CRZ area.</p>	<p>Complied.</p> <p>No ground water is tapped at the project site. Entire water requirement is fulfilled through APSEZ Desal Water and GWIL.</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
5.	<p>Adequate facilities as listed in National Oil spill Disaster Contingency Plan for the Mundra Port which includes firefighting equipment of 1200 cum/hr. spray capacity with 2 monitor fitted with the dolphin 2, 3, 4 and 5 oil spill dispersant foam liquid etc. should be maintained and put into operation immediately in case of oil spills.</p>	<p>Complied.</p> <p>Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared.</p> <p>Oil spill contingency response plan is being updated on regular basis and the same was last updated on 30/07/2025 is in place and implemented. The last updated Oil spill contingency response plan is attached as Annexure - 3.</p> <p>For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. Oil spill contingency response plan (OSCRP) prepared by APSEZ is in accordance with the NOSDCP.</p> <p>Latest Regional Level Pollution Response exercise "SWACHCHH SAMUDRA-NW 2025" was carried out by Indian Coast Guard on 11th - 12th Sep'25 at Off Vadinar, Gujarat. All participants from various Oil Handling Agencies and Stakeholders (M/S Adani Port & SEZ, Mundra, BPCL, HEML- Mundra, Indian Oil Corporation LTD, Jamnagar, M/S Nayara Energy LTD VOTL, Vadinar, M/S Reliance Industries LTD, Sikka Jamnagar, etc.) were participated in this exercise.</p> <p>Area level Mock drills is conducted regularly by APSEZ. Last Oil Spill Mock drill was conducted on 21/04/2025. The updated Oil Spill Mock Drill report is enclosed as Annexure - 4.</p> <p>Based on the oil spill modeling study, it has been observed that crude oil spill of 700 tons (Tier-I) will spread over an area having radius of around 400 m within 4hr. APSEZ already has facilities for combating a Tier-1 spill. Shoreline Resources available with APSEZ, for deployment during shoreline cleanup/ emergent situation:</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025																						
		<table border="1"> <thead> <tr> <th>Item</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>Oil Spill Dispersants</td> <td>5000 ltr.</td> </tr> <tr> <td>Absorbent pads</td> <td>2000 Nos.</td> </tr> <tr> <td>Portable dispersant storage tank: 1000 ltr. Capacity</td> <td>1 no.</td> </tr> <tr> <td>Portable pumps</td> <td>2 nos.</td> </tr> <tr> <td>Oil Containment Boom-Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm</td> <td>2000 m</td> </tr> <tr> <td>Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.</td> <td>4 Nos.</td> </tr> <tr> <td>12.5T Flexible Floating Storage Tank (PUA).</td> <td>3 Nos.</td> </tr> <tr> <td>Lamor Minimax 12 m³ skimmer</td> <td>2 sets</td> </tr> <tr> <td>Lamor Side Collector system (Recovery Capacity 123 m³/ hr)</td> <td>2 Nos. 2 sets</td> </tr> <tr> <td>Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter</td> <td>1 No.</td> </tr> </tbody> </table> <p>10 Tugs are fitted with Oil Spill Lamor Side Dispersant boom and proportionate pump to mix OSD and Sea water as required.</p> <p>10 Dolphin tugs are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required. The tugs are fitted with a fire curtain and remote-controlled fire monitors.</p> <p>Dolphin 11 has firefighting system of 1200 m³/hr. along with 20 ton lifting "A" frame and diving support facility. The equipment are being kept in working condition. Routine inspection, maintenance and testing is performed as per the stipulated requirements.</p> <p>Detail of resource available at APSEZL is provided in Oil Spill Contingency Plan. The last updated Oil spill contingency response plan is attached as Annexure - 3.</p>	Item	Quantity	Oil Spill Dispersants	5000 ltr.	Absorbent pads	2000 Nos.	Portable dispersant storage tank: 1000 ltr. Capacity	1 no.	Portable pumps	2 nos.	Oil Containment Boom-Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm	2000 m	Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.	4 Nos.	12.5T Flexible Floating Storage Tank (PUA).	3 Nos.	Lamor Minimax 12 m ³ skimmer	2 sets	Lamor Side Collector system (Recovery Capacity 123 m ³ / hr)	2 Nos. 2 sets	Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter	1 No.
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6.	The duration of	Already complied. Not applicable at present.																						

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025																																						
	construction phase of the project should be kept to a maximum of 8 months to avoid impact on marine environment and birds as suggested by NIO.	Construction activity is already completed and the project is in operation.																																						
7.	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	Not Applicable Location of SPM is unmanned (approximately 6.3 km inside the open sea from the shore) hence; there is no displacement of people, houses or fishing activity as a result of the project.																																						
8.	The project proponents must make necessary arrangements for disposal of solid wastes and for the treatment of effluents / liquid wastes. It must be ensured that the effluents / liquid wastes are not discharged into the seawater.	<p>Complied.</p> <p>No used oil / spent oil generated during compliance period.</p> <p>No other type of hazardous waste as well as no effluent or liquid waste are generated from operation of SPM or discharged into the sea water.</p> <p>The non-hazardous solid waste generated from on-shore SPM operational activity is being handled and managed as per 5R concept for environmentally sound management.</p> <p>In order to analyzed marine water quality, marine sampling (surface, bottom & sediment) is being carried out at a location nearby SPM by NABL and MoEF&CC accredited agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi. Summary of the same for duration from Apr'25 to Sep'25 is mentioned below.</p> <p>Total Sampling Locations: 09 Nos. (Frequency: Once a month)</p> <table border="1"> <thead> <tr> <th rowspan="2">Parameter</th> <th rowspan="2">Unit</th> <th colspan="3">Surface</th> <th colspan="3">Bottom</th> </tr> <tr> <th>Min</th> <th>Max</th> <th>Avg.</th> <th>Min</th> <th>Max</th> <th>Avg.</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>--</td> <td>7.96</td> <td>8.28</td> <td>8.17</td> <td>7.81</td> <td>8.4</td> <td>8.01</td> </tr> <tr> <td>BOD (3 Days @ 27 °C)</td> <td>mg/L</td> <td>2.4</td> <td>3.5</td> <td>2.96</td> <td>BDL (MDL 1.0)</td> <td>BDL (MDL 1.0)</td> <td>BDL (MDL 1.0)</td> </tr> <tr> <td>TSS</td> <td>mg/L</td> <td>112</td> <td>164</td> <td>138.15</td> <td>86</td> <td>132</td> <td>113.59</td> </tr> </tbody> </table>	Parameter	Unit	Surface			Bottom			Min	Max	Avg.	Min	Max	Avg.	pH	--	7.96	8.28	8.17	7.81	8.4	8.01	BOD (3 Days @ 27 °C)	mg/L	2.4	3.5	2.96	BDL (MDL 1.0)	BDL (MDL 1.0)	BDL (MDL 1.0)	TSS	mg/L	112	164	138.15	86	132	113.59
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Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025							
				DO	mg/L	6.37	7.04	6.69	6.27
		Salinity	ppt	35.71	36.71	36.16	36.62	37.45	37.05
		TDS	mg/L	3514	3664	3572	3599	3725	3651
				0	0	6	6	0	7
		*BDL – Below Detection Limit *MDL – Minimum Detection Limit Please refer Annexure – 5 for detailed analysis reports. Approx. INR 8.73 Lakh is spent for all environmental monitoring activities during the compliance period i.e. FY 2025-26 till Sep'25 for overall APSEZ, Mundra.							
9.	The camps of labor shall be kept outside the Coastal Regulation Zone area. Proper arrangements for cooking fuel shall be made for the labor during construction phase so as to ensure that mangroves are not cut / destroyed for this purpose.	Complied. Not applicable at present. Construction activities are completed and project is in operational phase.							

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025		
10.	<p>Regular drills should be conducted to check the effectiveness of the on-site Disaster Management Plan. The recommendations made in the Environmental Management Plan and Disaster Management Plan, as contained in the Environmental Impact Assessment and Risk analysis reports of the project, shall be effectively implemented.</p>	<p>Complied.</p> <p>Disaster Management plan is in place and implemented. Updated DMP was submitted to the MoEF & CC along with half yearly compliance report for the period from Apr - 2016 to Sep - 2016 and there is no further change.</p> <p>On Site Emergency Response Plan and Crisis Management Plan updated on August-2023 is in place and implemented. The updated Onsite emergency plan - was submitted during the EC compliance report submission for the period Apr'23 to Sep'23.</p> <p>Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. The Oil spill contingency response plan updated on 30/07/2025 is in place and implemented. Please refer Compliance of Specific Condition No. 5 for further details.</p> <p>Mock drills are conducted regularly by APSEZ. Last Oil Spill Mock drill was conducted on 21/04/2025. Updated Oil Spill Mock Drill report is enclosed as Annexure - 4.</p> <p>All the recommendations given in the report of NIO and Tata AIG Risk Management Services are implemented. Few examples are provided below.</p> <p>Few Marine EIA recommendations:</p> <table border="1" data-bbox="678 1465 1403 1881"> <tr> <td data-bbox="685 1474 1024 1873"> <p>Temporary colonies of workforce should be located sufficiently away from the HTL with proper sanitation. Adequate arrangement of fuel supply to the workers should be made to discourage them from using mangroves for firewood.</p> </td> <td data-bbox="1029 1474 1396 1873"> <p>Construction activity is already completed. Most of the construction labors were residing in the nearby villages where all basic facilities are easily available. However, for those residing near the construction site, infrastructure facilities such as water supply,</p> </td> </tr> </table>	<p>Temporary colonies of workforce should be located sufficiently away from the HTL with proper sanitation. Adequate arrangement of fuel supply to the workers should be made to discourage them from using mangroves for firewood.</p>	<p>Construction activity is already completed. Most of the construction labors were residing in the nearby villages where all basic facilities are easily available. However, for those residing near the construction site, infrastructure facilities such as water supply,</p>
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Adani Ports and Special Economic Zone Limited, Mundra.

**From : Apr'25
To : Sep'25**

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			fuel, sanitation, first aid, ambulance etc. were provided by APSEZL.
		As a step towards improvement in marine environment quality, mangrove afforestation of intertidal mudflats should be encouraged through adequate institutional support.	25 hectare of mangrove plantation with a cost of 10 Lakh is already completed near railway yard in consultation with Dr. Maity, Mangrove consultant of India. Details on mangroves afforestation & Green belt development carried out by APSEZ till date is annexed as Annexure - 1 .
		The prevailing traffic control management of deep-sea ships navigating through the gulf needs thorough review and introduction of state of the art VTS should be considered.	APSEZ is practicing well defined traffic control procedure. A VTS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India. Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel-77. Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTMS information cell through agent or by directly sending mail to vtsmanagergulfofkutch

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			<p>@yahoo.com and vtsgok@yahoo.com Mundra port has subscribed and taking VTMS feed from Kandla from link www.vts.gov.in.</p>
		<p>Few Tata AIG Risk Assessment Recommendations:</p>	
		<p>There should be facilities of boom, skimmer, dispersant, diving suits, firefighting equipment and excellent communication facilities.</p>	<p>10 Dolphin tugs fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 10 Dolphin Tugs are fitted with a fire curtain and remote-controlled fire monitors</p>
		<p>In the event of oil spillage the oil slick normally will be carried away by water current and wind. It is very difficult to identify oil slick patches by boats/vessels, hence it is suggested that GAPL may take help from coast guard/Navy for aerial surveillance in order to identify and monitor oil slick movement.</p>	<p>Oil spill contingency plan is in place to handle Tier 1 level oil spills considering different accident scenarios, and the vulnerable areas are identified and mitigation plan is prepared. Oil spill contingency plan updated & approved by coast guard, which was submitted during last half yearly compliance report.</p>
11.	The entire stretch of the pipelines shall be buried underground except at the booster pumping station, which will be properly fenced and the	<p>Complied. Entire SPM pipeline is buried underground. Total pipeline length is 15.4 km including 6.3 km inside the open sea and 9.1 km on landward side.</p>	



Adani Ports and Special Economic Zone Limited, Mundra.

**From : Apr'25
To : Sep'25**

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	<p>station would be manned round the clock. The buried lines will be protected with anticorrosive coal tar based coating. The coating will be tested by high voltage detector in accordance with prescribed standards.</p>	<p>Booster pump is not provided throughout the pipeline. However, the material is transferred by using pumping system of respective vessels berthed at SPM.</p> <p>Anticorrosive 3 LPE coating is provided to the portion of onshore pipeline while offshore pipeline is also protected by concrete coating.</p> <p>For offshore pipeline, Cathodic Potential (CP) survey is being done once in three years. Last CP inspection of offshore pipeline done in Mar'24. The report of offshore pipeline, Cathodic Potential (CP) survey was submitted during the compliance period Oct'24 to Mar'25.</p> <p>For onshore pipeline CP survey is being done by APSEZ on monthly basis as well as once in three year by external agency. Monthly reports of CP survey for this compliance period are enclosed as Annexure - 6.</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025								
12.	<p>Markers shall be installed at every 30 m to indicate the position of the line. Regular patrolling of the pipelines needs to be done. This will help in identifying any activity that have the potential to cause pipeline damage or to identify small leaks whose effects are too small to be detected by instrument.</p>	<p>Complied.</p> <p>Markers are installed at every 30 m to indicate position of pipeline. Details of the same were submitted during half yearly EC Compliance report for the period Oct'18 to Mar'19.</p> <p>Pressure at vessel and reception points of transfer line is being monitored during operation to ensure no leakage in pipeline.</p> <p>Regular patrolling of pipeline is being done by APSEZL Security Department. Following mitigation plan is followed in case of small leaks leading to spills.</p> <table border="1" data-bbox="683 982 1393 1325"> <thead> <tr> <th data-bbox="683 982 997 1014">Activity</th> <th data-bbox="997 982 1393 1014">Adequacy of Measures</th> </tr> </thead> <tbody> <tr> <td data-bbox="683 1014 997 1098">Hose Connection / Disconnection (liquid operation)</td> <td data-bbox="997 1014 1393 1098">It is collected in deep tray in case of leakage. Stop the supply of liquid discharge.</td> </tr> <tr> <td data-bbox="683 1098 997 1213">Hose Connection / Disconnection (liquid operation)</td> <td data-bbox="997 1098 1393 1213">Immediately stop the supply of liquid discharge. Marine break away coupling available for control of load.</td> </tr> <tr> <td data-bbox="683 1213 997 1325">Tanker discharge operation (SPM operation)</td> <td data-bbox="997 1213 1393 1325">Emergency operation shut off (stopping the discharge)</td> </tr> </tbody> </table>	Activity	Adequacy of Measures	Hose Connection / Disconnection (liquid operation)	It is collected in deep tray in case of leakage. Stop the supply of liquid discharge.	Hose Connection / Disconnection (liquid operation)	Immediately stop the supply of liquid discharge. Marine break away coupling available for control of load.	Tanker discharge operation (SPM operation)	Emergency operation shut off (stopping the discharge)
Activity	Adequacy of Measures									
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Hose Connection / Disconnection (liquid operation)	Immediately stop the supply of liquid discharge. Marine break away coupling available for control of load.									
Tanker discharge operation (SPM operation)	Emergency operation shut off (stopping the discharge)									
13.	<p>There should be display boards at critical locations along the pipeline viz. road / rail /river crossings giving emergency instructions as well as contact details of GAPL. This will ensure prompt information regarding location of accident during any emergency. Emergency Information board should contain emergency instructions in addition to contact</p>	<p>Complied.</p> <p>Display boards with emergency contact detail are provided at critical locations.</p> <p>Photographs of the same were submitted as part of the compliance report for the period from Oct'16 to March'17 and there is no farther change.</p>								

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	details.	
14.	During operation phase, proper precautions should be taken to avoid any oil spills and no oily wastes shall be discharged into the water bodies.	<p>Complied</p> <p>During operation, SPM team takes responsibility and actively supervises the operation. Inspection and maintenance activities are carried out regularly for prevention of any kind of oil spill at SPM.</p> <p>No liquid waste are generated / discharged from the project activity. In order to analyze marine water quality, marine sampling is being carried out at a location near SPM. Please refer condition no 8 for further details.</p>
15.	All conditions stipulated by the Forest and Environment Department, Government of Gujarat should be strictly implemented.	<p>Complied</p> <p>All the conditions stipulated by Forest and Environment Department are being complied. Point wise compliance report of CRZ recommendations issued vide letter No. ENV-10-2002-124-P (Part1) dated 8th October 2003 is enclosed as Annexure- A.</p>
16.	All conditions stipulated in Gujarat Pollution Control Board vide their letter No. PC/NOC/381/1039 dated 8 th January, 2002 should be implemented.	<p>Complied.</p> <p>Consent to Operate (CC&A) was granted by GPCB based on the compliance of conditions of the No Objection Certificate (CtE). This CC&A is renewed from time to time based on its validity. The last CC&A renewal has granted and issued by GPCB vide Order no. WH 117830 issued dated 29032022// & Valid Upto 26th April, 2027. Copy of the renewed CC&A were submitted along with previous EC compliance report submission for the period Oct'21 to Mar'22.</p>
General Condition		
1	Construction of the proposed structures should be undertaken meticulously conforming to the existing Central / local rules and regulations. All the construction designs / drawings relating to the proposed construction	<p>Complied. Not applicable at present.</p> <p>Construction activities are completed & project is in operation stage. Entire SPM pipeline is buried underground. Total pipeline length is 15.4 km including 6.3 km inside the open sea and 9.1 km on landward side.</p> <p>Construction activities are carried out based on the approvals of the concerned state government department and prevailing laws.</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025				
	activities must have approvals of the concerned State Government Department / Agencies.					
2	The project authorities should take appropriate community development and welfare measures for the villagers in the vicinity of the project site, including drinking water facilities. A separate fund should be allocated for this purpose.	<p>Complied</p> <p>APSEZ is actively working with local community around the project area and provides required support for their livelihood and other concerns through the CSR arm – Adani Foundation. Adani Foundation is working in main five persuasions as below.</p> <ul style="list-style-type: none"> ❖ Education ❖ Community Health ❖ Rural Infrastructure ❖ Sustainability Livelihood ❖ Skill Development <p>Brief information about activities in the main five persuasions is mentioned below. Activities carried out for the same are summarized as below.</p> <table border="1" data-bbox="673 1262 1406 1892"> <thead> <tr> <th data-bbox="678 1268 841 1310">Area</th> <th data-bbox="841 1268 1401 1310">Activity</th> </tr> </thead> <tbody> <tr> <td data-bbox="678 1310 841 1892">Community Health</td> <td data-bbox="841 1310 1401 1892"> <ul style="list-style-type: none"> ❖ Mobile Health Care Units and Rural Clinics • Rural Clinics: 7 Nos. • MHCU Stoppages: 31 Nos. • Villages Covered: 29 Nos. • Total individuals benefited from MHCU and Rural clinic services: 9867 Nos.33% average savings on healthcare-related costs. • 42% People are aware and become health Conscious • Adani Foundation's medical support program has provided critical care to 1,071 underprivileged patients, addressing serious health issues like kidney and heart conditions at Adani Hospital Mundra. </td> </tr> </tbody> </table>	Area	Activity	Community Health	<ul style="list-style-type: none"> ❖ Mobile Health Care Units and Rural Clinics • Rural Clinics: 7 Nos. • MHCU Stoppages: 31 Nos. • Villages Covered: 29 Nos. • Total individuals benefited from MHCU and Rural clinic services: 9867 Nos.33% average savings on healthcare-related costs. • 42% People are aware and become health Conscious • Adani Foundation's medical support program has provided critical care to 1,071 underprivileged patients, addressing serious health issues like kidney and heart conditions at Adani Hospital Mundra.
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Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<ul style="list-style-type: none"> • In life-threatening cases, patients are stabilized and referred to GKGH, Bhuj, with full coordination for advanced treatment—ensuring no one is left behind in their journey to recovery. • Students Health Screening Camp Beneficiary: 1093 Nos. Cataract Camp Beneficiary: 67 Nos. • MHCU - Labour Colony v: 591 Nos. • Health Awareness Session Beneficiary: 711 Nos. • Specialty Health Camp Beneficiary: 1882 Nos. • General Health Camp Beneficiary: 958 Nos. • Rural Clinic Beneficiary: 6123 Nos. • Mobile Van Beneficiary: 6719 Nos. • Medical & Dialysis Supports Beneficiary: 995 Nos. ❖ Awareness and Screening Drive in Mundra Schools: • Adani Foundation conducted health and hygiene awareness sessions across primary schools in Mundra Block, fostering lifelong wellness habits among children and educators. • Over 584 students and teachers participated in interactive sessions focused on hygiene practices and healthy living. • Comprehensive health screenings were carried out for 1,093 students, enabling early detection of health issues and timely intervention. • Core topics included handwashing, dental care, nutrition, personal cleanliness, and environmental health. • Adani Foundation organized a focused TB awareness initiative in Mundra Block, enhancing health literacy

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			<p>among affected individuals through expert-led sessions.</p> <ul style="list-style-type: none"> • Patients received vital education on symptoms, medication, hygiene, diet, and lifestyle from healthcare professionals including the District TB Health Officer. <p>❖ Animal Husbandry:</p> <ul style="list-style-type: none"> • Awareness meetings on modern dairy farming in villages, engaging local cattle owners. • Organized vaccination camps across villages, covering 1,647 animals (1,410 camels + 237 cattle). • Improved livestock health and productivity by reducing disease risk and promoting sustainable care practices.
		Sustainable Livelihood – Fisher folk, Agriculture & Women	<p>❖ <u>WOMEN EMPOWERMENT:</u></p> <p>❖ Self Help Groups: Women were mobilized into 82 SHGs through formal registration, laying the foundation for collective growth and financial inclusion.</p> <p>❖ Skill Building: Tailored workshops and hands-on training empowered members with entrepreneurial, financial, and operational skills. Conducted 12 workshops for 1000 women's.</p> <p>❖ Exposure & Learning: 60 nos. exposure visits to successful enterprises inspired SHG members, boosting confidence and sparking innovative ideas.</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<p>❖ Need-Based Support: Adani Foundation provided timely support— equipment, funding, and guidance—based on each group’s evolving needs and goals 52 times.</p> <p>❖ Community Impact: SHGs now uplift entire communities— enhancing household income, promoting leadership, and driving social change and 1450 people are benefited.</p> <p>CHETNA” - initiative with gender diversity:</p> <p>❖ Women Mobilization & Employment Facilitation: Adani Foundation, in partnership with Unnati Portal and Adani Solar, mobilized and counseled women and their families, enabling them to confidently enroll, attend interviews, and secure jobs.</p> <p>❖ Empowerment Through Opportunity: Women from Kutch began working in formal roles, gaining financial independence, self-confidence, and inspiring broader community acceptance of female workforce participation. Till Now 600+ Female Joined Adani Solar @Pan India and 459 are from Kutch.</p> <p>❖ 12th passed student benefited with 1.8 lac/annum and graduate students benefited with 2.16 Lac/Annum.</p> <p>Empowering Fisherfolk Community:</p> <ul style="list-style-type: none"> • Distributed education kits to HSC and graduation-level students, including notebooks, guides, stationery, and study bags.

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			<ul style="list-style-type: none"> • Facilitated job opportunities and skill development for youth through community engagement and support programs. • Provided daily transportation for 86 school-going children to ensure consistent access to education. • Awarded scholarships totaling ₹3,58,765 to 34 students for higher secondary and technical education. <p>❖ Job initiatives:</p> <ul style="list-style-type: none"> • Acting as a bridge between industries and fisherfolk youth, the Adani Foundation facilitated job placements for 30 fisherfolk as RTG operators, in the HR department, and as supervisors in APSEZ companies. • In the APSEZ area and colony, 45 fisherfolk youth have been offered professional painting roles. To ensure they are skilled for the role, they underwent comprehensive training in partnership with Asian Paints. <p>❖ Potable water Distribution:</p> <ul style="list-style-type: none"> • Providing access of potable Drinking water Facilities to Nine fisherfolk vasahat on Daily bases, either By Water tanker or Linkage with Nearest Gram panchayat. • More than 5000 Fisherfolk Population are getting benefit which impact on their health and well-being.
		Education	<p>Strengthening Government Primary Schools: Adopting and upgrading government 81 nos. of primary schools & High school to model schools.</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<p>Main streaming Progressive learners:</p> <ul style="list-style-type: none"> • 2776 students of classes 4 & 5 were assessed. • 1151 students emerged as progressive learners • Personalized learning through different activities and TLM • 220 students mainstreamed. <p>Library Activity:</p> <ul style="list-style-type: none"> • Library books issues & Activities planned every Saturday. • 45000+ Books issued. • 300+ Oasis workshop arranged to increase reading habits of students. <p>IT on wheels:</p> <ul style="list-style-type: none"> • 1187 primary & 1448 high school students are learning basic computer skills. • Students gain essential computer skills, enhancing their digital literacy and preparing them for future academic and career opportunities. <p>Mothers Meet:</p> <ul style="list-style-type: none"> • Mothers' meetings conducted every second Saturday in Utthan schools. • Over 95,00 mothers have joined. • Guidance on exams, scholarships, and healthy eating. • Home visits and discussions on academic performance. <p>Competitive Exam:</p> <ul style="list-style-type: none"> • 1050 passed and 21 students made it to the merit list.

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<ul style="list-style-type: none"> • 2726 students are preparing for exams like JNV, NMMS, PSE, and CET. • Meetings with 560 high school parents to encourage their support. <p>Gunotsav Primary School Performance:</p> <ul style="list-style-type: none"> • Gunotsav Results: Gunotsav grades are assessment by GoG as part of its statewide initiative to assess and enhance the quality of education in government schools. • 4 High Schools Achieved 100% Pass Rate in Results. • All Utthan-supported schools showed a marked rise in Gunotsav grades, with many moving up to A & B categories—reflecting the positive impact of targeted academic and co-curricular interventions. <p>Abacus & Vedic Maths:</p> <ul style="list-style-type: none"> • Utthan initiative has introduced Abacus and Vedic Mathematics in 54 primary and 08 high schools. Abacus is a tool used for performing arithmetic calculations, while Vedic Mathematics is an ancient system of Indian mathematics that simplifies complex calculations. Total 1800 nos. of Abacus and 1302 nos. of Vedic math's Students are benefited. <p>Project Udaan:</p> <ul style="list-style-type: none"> • Adani Foundation's Project Udaan empowers youth through immersive educational tours to key Adani Group facilities, offering real-world exposure beyond the classroom.

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			<ul style="list-style-type: none"> • Students gain firsthand insights into industries like ports, power, and refineries, sparking curiosity and ambition for future careers. • The initiative nurtures entrepreneurial thinking, leadership qualities, and a vision for innovation among school and college students. • Faculty participation strengthens academic-industry linkages, enriching the learning ecosystem. • Project Udaan has become a catalyst for inspiring young minds to dream big and pursue meaningful, future-ready paths. • Total 229 institute visit & 05 corporate visit done with 16380 student.
		Rural Infrastructure & Environmental Sustainability	<p>COMMUNITY INFRASTRUCTURE DEVELOPMENT PROJECTS & ITS BENEFICIARIES FY 2025-26 Till SEP'25:</p> <ul style="list-style-type: none"> • Pond Deepening: 03 Nos. • <u>Digital Library: 04 Nos.</u> • <u>Common Gathering Shed: 09 Nos.</u> • <u>Gaushala Development: 02 Nos.</u> • <u>RRWHS Construction: 25 Nos.</u> • <u>Community Center: 02 Nos.</u> • <u>Check dam strengthening: 02 Nos.</u> • <u>Restrengthening of Approach Road: 24 Km</u> <p>Water Conservation Work Done during Compliance Period Apr'25 to Sep'25:</p> <ul style="list-style-type: none"> • Constructed 13 rainwater harvesting ponds to store monsoon water for community and wildlife use.



Adani Ports and Special Economic Zone Limited, Mundra.

**From : Apr'25
To : Sep'25**

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			<ul style="list-style-type: none"> • Installed 6 drinking water wells in remote villages to improve daily access to clean water. • Enhanced public health and sanitation by providing reliable water infrastructure in underserved areas. • Planned expansion and deepening of 5 village ponds to increase rainwater retention and storage. • Check dam Re-strengthening- 01 Nos. • Farmer -300 famer Land irrigated-1800 Acre • Held consultative meetings with local communities to finalize pond locations and encourage grassroots involvement. • Aimed at enhancing groundwater levels and ensuring reliable water supply for farming and livestock needs. • Pond Deepening upto Sep'25- 145 Village Pond • Check dam Re-Strengthening upto Sep'25- 30 Nos. • Storage capacity Increase upto Sep'25 - 2171435 Cum. <p>Roof Top Rainwater Harvesting:</p> <ul style="list-style-type: none"> • Till Sep'25 total 355 nos. of Rooftop RRWS units built across 355 homes and positively impacting more than 1760 peoples. • TDS level below 100 meeting WHO standard for safe drinking water. • Rainwater harvesting enabled for community, ensuring drinking water quality & reducing financial burden.
		Skill Development	Student Benefitted Under Utthan Project during the FY 2025-26 till Sep'25:

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<p>Strengthening Government Primary Schools: Adopting and upgrading government 81 nos. of primary schools & High school to model schools.</p> <p>Main streaming Progressive learners:</p> <ul style="list-style-type: none"> • 2776 students of classes 4 & 5 were assessed. • 1151 students emerged as progressive learners. • Personalized learning through different activities and TLM • 220 students mainstreamed. <p>Library Activity:</p> <ul style="list-style-type: none"> • Library books issues & Activities planned every Saturday. • 45000+ Books issued. • 300+ Oasis workshop arranged to increase reading habits of students. <p>IT on wheels:</p> <ul style="list-style-type: none"> • 1187 primary & 1448 high school students are learning basic computer skills. • Students gain essential computer skills, enhancing their digital literacy and preparing them for future academic and career opportunities. <p>Mothers Meet:</p> <ul style="list-style-type: none"> • Mothers' meetings conducted every second Saturday in Utthan schools. • Over 95,00 mothers have joined.

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025		
		<table border="1" data-bbox="673 464 1404 976"> <tr> <td data-bbox="673 464 841 976"></td> <td data-bbox="841 464 1404 976"> <ul style="list-style-type: none"> Guidance on exams, scholarships, and healthy eating. Home visits and discussions on academic performance. <p>Competitive Exam:</p> <ul style="list-style-type: none"> 1050 passed and 21 students made it to the merit list. 2726 students are preparing for exams like JNV, NMMS, PSE, and CET. </td> </tr> </table> <p>Please refer Annexure - 2 for full details of CSR activities carried out by Adani Foundation in the Mundra region. The budget allocated for CSR activities for the financial year 2025-26 was INR 1131.67 lakh and 448.96 lakh spent during FY 2025-26 till Sep'25.</p> <p>Till Sep'25, Adani Foundation has done total expenditure of INR 192.08 Cr. for CSR activities in Kutch region since its inception.</p>		<ul style="list-style-type: none"> Guidance on exams, scholarships, and healthy eating. Home visits and discussions on academic performance. <p>Competitive Exam:</p> <ul style="list-style-type: none"> 1050 passed and 21 students made it to the merit list. 2726 students are preparing for exams like JNV, NMMS, PSE, and CET.
	<ul style="list-style-type: none"> Guidance on exams, scholarships, and healthy eating. Home visits and discussions on academic performance. <p>Competitive Exam:</p> <ul style="list-style-type: none"> 1050 passed and 21 students made it to the merit list. 2726 students are preparing for exams like JNV, NMMS, PSE, and CET. 			
3	To meet any emergency situation, appropriate fire – fighting system should be installed. Appropriate arrangements for uninterrupted power supply to the environment protection equipment and continuous water supply for the firefighting system should be made.	<p>Complied.</p> <p>Tug (Dolphin-11) has firefighting system of 1200 m³/hr. along with 20 ton lifting "A" frame and diving support facility for support at offshore.</p> <p>With respect to onshore facilities valve station, pumping station and transportation pipeline, foam base fire tender is available.</p> <p>With respect to onshore facilities valve station, pumping station and transportation pipeline, foam base fire tender, fire water network is available Fire-fighting system has been installed and maintained to meet emergency situations. Additionally for emergency, DG Set is provided for fire water pumps to ensure continuous water supply</p>		



Adani Ports and Special Economic Zone Limited, Mundra.

**From : Apr'25
To : Sep'25**

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		for firefighting purpose. Detail information on firefighting facility available at APSEZL was submitted as part of the compliance report for the period from Oct'16 to March'17 and there is no farther change.
4	A separate Environment Management Cell with suitably qualified staff to carry out various environment related functions should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.	Complied. APSEZL has a well-structured Environment Management Cell, staffed with qualified manpower for implementation of the Environment Management Plan at site. Site team report to Site environment head direct report to site Chief Executive Officer (CEO) and the CEO directly reports to the top management. Updated Environment Management Cell Organogram was submitted during Apr'24 to Sep'24 compliance period. And there is no further change.
5	The funds earmarked for environment protection measures should be maintained in a separate account and there should be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards should be reported to this Ministry's Regional Office at Bhopal.	Complied. Separate budget for the Environment Protection measures is earmarked every year. All environmental and horticulture activities are considered at group level and budget allocation is also done accordingly. No separate bank account is maintained for the same however, all the expenses are recorded in advanced accounting system of the organization. Budget for environmental management measures (including horticulture) for the FY 2025-26 is to the tune of INR 1173.79 lakh. Out of which, Approx. INR 463.43 lakh are spent during the year FY 2025-26 till Sep'25. Detailed breakup of the expenditures for the past 3 years is attached as Annexure - 7 .
6	Full support should be extended to the officers of this Ministry's Regional Office at Bhopal and the officers of the Central and State Pollution Control Board by the project proponents during their inspection for	Complied APSEZL is always extending full support to the regulatory authorities during their visit to the project site. Last visit of Regional Office, GPCB was done on 14022022// with respect to SPM project and compliance of the same has been submitted vide our letter dated 16022022//. Details of the same Details were submitted during half yearly EC Compliance report for the period

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	<p>monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.</p>	<p>Oct'21 to Mar'22.</p> <p>Inline to the compliance certification process of Environment Clearance condition of Waterfront Development Plan, RO, MoEF&CC Bhopal had visited the site on 27th & 28th January, 2020 for compliance verification. APSEZ provided all requisite information and documents required by the Regional Officer MoEF&CC). During the said compliance verification visit and as per the compliance certification received, there was no major non-compliance observed.</p> <p>Inline to the compliance certification process of Consent to Operates of existing facilities developed under Waterfront Development Plan, RO, GPCB, Gandhidham had visited the site on 17th March, 2021 for compliance verification. APSEZ provided all requisite information and documents required by the Regional Officer GPCB). During the said compliance verification visit and as per the compliance certification received, there was no non-compliance observed.</p> <p>Inline to the compliance of MoEF&CC Order dated 18th September, 2015, Joint Review Committee (JRC) comprising officials from various competent authorities visited the APSEZ, Mundra from 1st to 3rd September, 2021 to monitor the progress of implementation of the conditions stipulated in the order. APSEZ provided all requisite information and documents required by the JRC. As per the report received by MoEF&CC vide dated 01122021//, there was no non-compliance observed.</p> <p>Inline to the compliance certification process of Environment Clearance of Waterfront Development Plan, IRO- MoEF&CC Gandhinagar has lastly visited the site on 18th to 20th December, 2023 for compliance verification. APSEZ provided all requisite information and documents required by the Regional Officer MoEF&CC). During the said compliance verification visit and as per the compliance certification received, there was no non-compliance observed. Copy of submitted action taken</p>



**Adani Ports and Special Economic
Zone Limited, Mundra.**

**From : Apr'25
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Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		report w.r.t. certified compliance were submitted during half yearly EC Compliance report for the period Oct'23 to Mar'24.
7	In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new one for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.	Point noted. There is no change in the approved project proposal.
8	This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	Point noted.
9	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which should be complied with.	Point noted.
10	A copy of the clearance letter should be marked to the concerned Panchayat / local NGO, if	Not applicable at present



Adani Ports and Special Economic Zone Limited, Mundra.

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Sr. No.	Conditions	Compliance Status as on 30/09/2025
	any, from whom any suggestion / representation has been received while processing the proposal.	
11	State Pollution Control Board / Committee should display a copy of the clearance letter at the District Industries Center and Collector's Office/ Tehsildar's Office for 30 days from the date of receipt of this letter.	Not Applicable This condition does not belong to project proponent.
12	The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letter are available with the Gujarat Pollution Control Board and may also be seen at the website of the Ministry of Environment & Forests at http://www.envfor.nic.in /	Already Complied.
13	The project proponents should inform regional Office Bhopal as well as the Ministry, the date of	Already Complied

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	financial closure and final approval of the project by the concerned authority and the date of start of work.	
14	The project proponent will obtain Forest clearance for any stretch of land if it passes through the forest land.	Not Applicable No forest land was involved in the project.
15	So as to maintain ecological features and avoid damage to the ecosystem, movement of vehicles in the Inter Tidal Zone shall be restricted to minimum.	Complied. All activities are carried out as per the permissions obtained from competent authorities. No unauthorized movement of vehicles is allowed in the intertidal zone.
16	Since the pipeline passes along mangrove areas and the mud flats of Mundra area, the project proponents will ensure adequate protection to mangroves.	Complied. Not applicable at present. Construction activities are completed & project is in operation stage. Please refer to specific condition no 1 for detailed reply regarding mangrove plantation activity.
17	Budgetary break up for Environmental Management Plan for the project to be mentioned.	Complied. Please refer to general condition no 5 for detailed reply regarding budgetary break up.



Adani Ports and Special Economic
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Status of the conditions stipulated in Environment Clearance under CRZ notification

ANNEXURE - A

Half yearly Compliance report of CRZ Recommendation Compliance Report of SPM, COT and connecting pipeline at Mundra Port

Status of the conditions stipulated in Environment Clearance under CRZ notification

Half yearly Compliance report of CRZ recommendation for "SPM, COT and connecting pipeline at Mundra Port, Dist. Kutch in Gujarat" issued by DoEF, GOG vide letter no. ENV-10-2002-124-P (Part1) dated 8th October 2003.

Sr. No.	Conditions	Compliance Status as on 30/09/2025
1	The provision of the CRZ notification of 1991 and its amendments issued from time to time shall be strictly complied with by the GAPL.	Complied. Construction activities are completed and the project is in operation phase. All stipulations with respect to the CRZ notification and its subsequent amendments are complied with.
2	This recommendation is only for those activities proposed to be commissioned before the end of the year 2008 as mentioned in the bar chart submitted by GAPL.	Point noted. Construction activities are completed and the project is in operation phase.
3	A separate clearance shall be obtained by the GAPL for construction of the SPM No. 3 and 4, corresponding pipelines and COTs after demonstrating the compliance of the conditions, ecological upliftment activities undertaken successfully and mitigative measures implemented while developing the SPM no.1 and corresponding COT. A regional EIA shall also be commissioned	Point Noted. APSEZL has only developed SPM no. 1 so far. SPM no. 3 and 4 are not developed yet and required permissions for the same will be obtained by following procedures mentioned in respective notifications.

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	immediately by the GAPL and all future development should be based on the outcome of the said regional EIA only.	
4	Before commissioning of the construction activities, the construction design and pipeline alignment shall be validated/ approved by National Institute Oceanography to ensure that there is no negative impact on the coastal morphology, hydrodynamics and ecological systems including the corals, if any. The mitigative measures as may be suggested by the NIO for this purpose shall be implemented by the GAPL.	<p>Complied.</p> <p>Construction activities are completed and the project is in operation phase.</p> <p>The EIA report was prepared by NIO and specific design considerations were taken into account for carrying out various studies for preparation of the same. Findings of the studies were considered before commissioning of the construction activities.</p> <p>There are no corals present at the project site.</p>
5	A comprehensive EIA shall be prepared and submitted to this Department by the GAPL, before commissioning of the SPM. All the suggestions for environmental protection /management	<p>Complied.</p> <p>EIA study has been completed and report is already submitted to MoEF&CC and other concerned authorities. Based on the same, Environment and CRZ clearance was granted by MoEF&CC.</p> <ul style="list-style-type: none"> A Regional Impact Assessment study to identify impacts of all the existing as well as proposed project activities in Mundra region inline to ToR issued by

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	that may be given in the comprehensive EIA shall be implemented by the GAPL.	<p>GCZMA. CIA Report was prepared inline to the ToR by Chola MS and the same was submitted to the GCZMA on 30042018//. Details of the same were submitted along with half yearly EC Compliance report for the period Apr'19 to Sep'19.</p> <ul style="list-style-type: none"> • Presentation on the findings of the report was made to GCZMA committee on 4th October 2019 and after detailed discussion, authority has decided to constitute committee to discuss the details of the report further. • Reminder Letter vide dated 07092020// & 10032021// submitted to the GCZMA, Gandhinagar for further directives to present the findings of the CIA report in detail. Details of the same were submitted along with previous half yearly EC Compliance report for the period Oct'20 to Mar'21. • Presentation done before GCZMA on 31102021// and 16022021// to discuss proposed EMP of CIA study in detail and way forward. • GCZMA, Gandhinagar issued a letter to co-ordinate with various departments in the matter of CIA with Gujarat Pollution Control Board as Nodal Agency vide dated 12th July, 2022. • APSEZ submitted the letter to GPCB for detailed deliberation and suitable action / way forward vide letter dated 20th July, 2022. Details of the same were submitted during the last compliance period Apr'22 to Sep'22. <p>However, APSEZ is already complying with the Environment Management Plan (applicable to APSEZ) suggested in the Cumulative Impact Assessment report. The detailed compliance, applicable to APSEZ is attached as Annexure – 8.</p>
6	The ground water shall not be tapped in any case to meet with the water requirements	<p>Complied.</p> <p>APSEZ does not withdraw any ground water for the water requirement. Present source of water for entire port and</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
	during construction and/or operation phases.	SEZ is desalination plant and/or Gujarat Water Infrastructure Limited (GWIL).
7	The GAPL shall ensure that the free flow of water in the intertidal area is not hampered due to proposed construction activities for pipeline corridor as well as other activities including the COT. Further, it shall be ensured by the GAPL that the nearby mangroves are not at all affected due to proposed development activities specifically the COT.	<p>Complied.</p> <p>Construction activity is already completed and the project is in operation phase.</p> <p>Free flow of water in the intertidal area is not hampered due to any operational activities. There are no filling or reclamation activities done at any of the creeks or mangrove areas in the vicinity of the project. As per the bathymetry study carried out by NCSCM in 2017-18, it can be concluded that there are sufficient depths at the creek mouths and all creek mouths are open allowing flushing of water.</p> <p>To comply with the GCZMA recommendations regarding mangrove monitoring at every 2 years, presently APSEZ has awarded the work order to NCSCM, Chennai vide order no. 4802055905, dated 24/09/2024 with cost 45.87 Lacs for mangrove mapping in and around APSEZ from year 2021 to 2023.</p> <p>Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below.</p> <ul style="list-style-type: none"> • The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February 2021 and September 2023. • Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025						
		<p>approximately 2 hectares, accounting for about a 0.08% increase.</p> <ul style="list-style-type: none"> Hence, overall increase in mangrove cover area in creek system in and around APSEZ from 2011 (2094 Ha) to September 2023 (2501 Ha) is 407 Ha (19.43%). The NCSCM Mangrove mapping report is attached as Annexure - 9. <p>As a part of GCZMA recommendations and NCSCM mangrove conservation action plan, APSEZ has undertaken following activities.</p> <table border="1" data-bbox="678 919 1409 1864"> <thead> <tr> <th align="center">Sr. No</th> <th align="center">Recommendations</th> <th align="center">Compliance</th> </tr> </thead> <tbody> <tr> <td align="center">1.</td> <td>Mangrove mapping and monitoring in and around APSEZ</td> <td> <ul style="list-style-type: none"> APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island. Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February </td> </tr> </tbody> </table>	Sr. No	Recommendations	Compliance	1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"> APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island. Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February
Sr. No	Recommendations	Compliance						
1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"> APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island. Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February 						

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025			
					<p>2021 and September 2023.</p> <ul style="list-style-type: none"> ○ Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover approximately 2 hectares, accounting for about a 0.08% increase. ○ Hence, overall increase in mangrove cover area in creek system in and around APSEZ from 2011 (2094 Ha) to September 2023 (2501 Ha) is 407 Ha (19.43%). The NCSCM Mangrove mapping report is attached as Annexure - 9. The cost of the said study was INR 45.87 Lacs incurred by APSEZ.
		2.	Tidal observation in creeks in and around APSEZ		<ul style="list-style-type: none"> ● APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM. ● The observed tidal ranges indicate that the creeks experience normal tidal ranges, adequate for the growth of mangroves. ● The cost of the said activity was INR 1.0 Lacs.
		3.	Removal of Algal and Prosopis growth from mangrove areas		<ul style="list-style-type: none"> ● Algal and Prosopis growth monitoring was done in and around mangrove area and algal encrustation was found in some of the mangrove areas, which has been removed manually. ● The cost of the said activity was Rs. 1,50,000 during FY 2024-25. The algal removal report was submitted during



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From : Apr'25
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Sr. No.	Conditions	Compliance Status as on 30/09/2025	
			<p>the compliance period Oct'24 to Mar'25.</p> <p>4. Awareness of mangroves importance surrounding communities in</p> <ul style="list-style-type: none"> • Adani Foundation – CSR Arm of Adani group has done awareness camps/activities created in the community regarding importance of mangroves. Adani Foundation provides Good Quality dry and green fodder to 36 Villages. Dry Fodder 8,65,965 Kg Green – 30,75,945 Kg. • Awareness of mangroves importance in surrounding communities & Fodder support - The expenditure for fodder supporting activities was approx. 236.66 Lacs during FY 2025-26 till Sep'25, which was incurred by APSEZ. • Grass Land development: 213 acres of gauchar land has been cleaned and allocated for Grass land development with strong Community Contribution and Mobilization. • Other than this dedicated security guard with gate system deployed by APSEZ across the coastal area and no any unauthorized persons allowed within coastal as well as mangrove areas. • APSEZ has celebrated the International Day for the Conservation of the Mangrove Ecosystem with coordination of Adani Foundation from 24th to 26th July 2024 to raise awareness of the importance of mangrove ecosystems as “a unique, special and vulnerable ecosystem”. The report for the same was submitted during the compliance period Apr'24 to Sep'24. • Refer CSR report attached as Annexure – 2.



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Sr. No.	Conditions	Compliance Status as on 30/09/2025
8	The GAPL shall take up massive mangroves plantation activities in addition 25 Ha. of area suitably identified in consultation with the office of the Principal Chief Conservator of Forests, GoG, as well as this Department. The GAPL shall bear the cost of the said land as well as the cost of the plantation of mangroves & its sustenance for a reasonable period of time.	Complied. Construction activities are completed & project is in operation stage. Please refer to specific condition no 1 of the compliance of EC and CRZ clearance for detailed reply regarding mangrove plantation activity.
9	In addition to the mangroves plantation, the GAPL shall also take up massive greenbelt development in and around the project site in consultation with the Forest Department.	Complied. Construction activities are completed & project is in operation stage. Please refer to specific condition no 2 of the compliance of EC and CRZ clearance for detailed reply regarding greenbelt development activity.
10	The GAPL shall provide financial contribution as many as decided by this department for any common study like carrying capacity for the Gulf of Kachchh as well as for any common facilities including Vessels Traffic	Complied. APSEZ is practicing well defined traffic control procedure. A VTMS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India. Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77.

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Sr. No.	Conditions	Compliance Status as on 30/09/2025
	Management System in the Gulf of Kachchh, for the purpose of the environment protection/management .	<p>Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTMS information cell through agent or by directly sending mail to vtsmanagergulfofkutch@yahoo.com and vtsgok@yahoo.com</p> <p>Mundra port has subscribed and taking VTMS feed from Kandla from link www.vts.gov.in.</p> <p>Necessary financial contribution if require will be provided on hearing from MOEF&CC.</p>
11	The GAPL shall provide financial support in implementation of National Green Corps scheme (being implemented in Gujarat by the GEER Foundation) in Kachchh district in consultation with Forests & Environment Department.	<p>Complied</p> <p>Necessary contribution if require will be provided on hearing from GEER foundation to support NGC scheme.</p>
12	The GAPL shall bear the cost of the external agency that may be appointed by the Forests and Environment Department, GoG for supervision/ monitoring of their activities during construction and/or operational phases.	<p>Point noted.</p> <p>APSEZ will provide full support for supervision and monitoring of the project operations after due discussion with the concerned agency and Forests & Environment Department, GoG. No such agency was appointed during the compliance period.</p> <p>As part of the directions given by MoEF&CC vides order dated 18th Sep, 2015, following studies were conducted.</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<p>3. NCSCM (MoEF&CC promoted Government Agency) study on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around APSEZ in year.</p> <p>As a part of mangrove conservation plan, APSEZ has done following activities.</p> <p>a. To comply with the GCZMA recommendations regarding mangrove monitoring at every 2 years, presently APSEZ has entrusted NCSCM, Chennai to carry out the Monitoring of mangrove distribution in creeks in and around APSEZ with cost 45.87 Lacs from year 2021 to 2023.</p> <p>b. Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below.</p> <ul style="list-style-type: none"> • The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February 2021 and September 2023. • Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover approximately 2 hectares, accounting for about a 0.08% increase. • Hence, overall increase in mangrove cover area in creek system in and around APSEZ from 2011 (2094 Ha) to September 2023 (2501 Ha) is 407 Ha (19.43%). The NCSCM Mangrove mapping report is attached as Annexure - 9. <p>c. Tidal observation in creeks in and around APSEZ – The cost of the said activity was INR 1.0 Lacs incurred by APSEZ.</p> <p>d. Algal & Prosopis removal from Mangrove area - The</p>

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		<p>cost of the said activity was Rs. 1,50,000 during FY 2024-25. The algal removal report was submitted during the compliance period Oct'24 to Mar'25.</p> <p>e. Awareness of mangroves importance in surrounding communities & Fodder support - The expenditure for fodder supporting activities was approx. 236.66 Lacs during FY 2025-26 till Sep'25, which was incurred by APSEZ. This activity is being done on continuous basis as a part of CSR activity.</p> <p>2. A Regional Impact Assessment study through Chola MS, Chennai (NABET accredited consultant) to identify impacts of all the existing as well as proposed project activities in Mundra region inline to ToR issued by GCZMA. The cost of said study was 1.3 Cr, which was incurred by APSEZ.</p>
13	<p>The dredged material that may be generated, if any, shall be disposed of at location suitably identified in consultation with the institute of repute like NEERI/NIO after due consideration of various environmental aspects and ensuring no significant negative impacts due to the same.</p>	<p>Complied.</p> <p>Construction activities are completed & project is in operation stage. SPM is approximately 6.3 km inside the open sea from the shore where 30 m of draft is naturally available. Hence no dredging is required.</p>
14	<p>No waste including the construction debris, oily waste from construction equipment's, untreated sewage, etc. would be disposed of in to sea/ river/ creek or in the CRZ areas. The treated</p>	<p>Complied.</p> <p>Construction activities are completed and the project is in operation phase.</p> <p>There is no disposal of any waste including civil debris in CRZ area.</p> <p>No Sewage or RO Reject water is being generated by SPM activity.</p>

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Sr. No.	Conditions	Compliance Status as on 30/09/2025
	sewage meeting with the norms fixed by the Gujarat Pollution Control Board and the reject water from RO plant if any, shall be disposed of at a point in the deep sea as may be suggested by the institute of repute like the NEERI/NIO.	
15	The Gujarat Maritime Board shall ensure that the Vessel Traffic Management System for safe navigation in the Gulf of Kachchh shall be established and commissioned before commissioning of the SPM No. 1 by the GAPL. The GAPL shall follow up for this with various stakeholders and provide financial and technical inputs for the same.	Complied . Kandla, GMB & DGLL are the agencies who financially support to VTMS. For SPM, APSEZ is mutual partner to support in case of Oil spill & vice versa. For further details regarding traffic management, please refer condition no. 10 of CRZ recommendations above.
16	A mutual aid system for the Mundra Port region shall be developed to meet with any unforeseen circumstances or to meet with any accidental condition. The GAPL shall take a lead for this by involving other	Complied. APSEZ has signed a MoU with HPCL, Mittal Pipeline Ltd., Mundra in the region of Gulf of Kutch to assist each other within stipulated time frame with best combination of resources. Interface with ROSDCP and NOSDCP For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. The NOSDCP brings together the combined resources of the

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Sr. No.	Conditions	Compliance Status as on 30/09/2025
	stakeholders including HPCL.	<p>various organizations and departments, Coast Guard, Ports and Oil handling Agencies, and related industries, to provide a level of preparedness to the threat posed to the marine environment by oil spills.</p> <p>Latest Regional Level Pollution Response exercise "SWACHCHH SAMUDRA-NW 2025" was carried out by Indian Coast Guard on 11th - 12th Sep'25 at Off Vadinar, Gujarat. All participants from various Oil Handling Agencies and Stakeholders (M/S Adani Port & SEZ, Mundra, BPCL, HEML- Mundra, Indian Oil Corporation LTD, Jamnagar, M/S Nayara Energy LTD VOTL, Vadinar, M/S Reliance Industries LTD, Sikka Jamnagar, etc.) were participated in this exercise.</p> <p>Area level Mock drills is conducted regularly by APSEZ. Last Oil Spill Mock drill was conducted on 21/04/2025. The updated Oil Spill Mock Drill report is enclosed as.</p>
17	A detailed Risk Assessment and Disaster Management Plan shall be worked out before commissioning of the SPM by the GAPL and the mitigative measures shall be identified and implemented. The local Oil Spill Contingency Plan in lines with the National Oil Spill Disaster Contingency Plan for the Mundra Port shall be put into operation immediately.	<p>Complied.</p> <p>Detailed Risk Assessment and Disaster Management Plan were prepaid By Tata AIG risk assessment services and few mitigation measures are addressed in compliance of specific condition no 10 of EC & CRZ clearance above. These studies were carried out before the start of the development activity and were considered by MoEF&CC before grant of the EC and CRZ clearance.</p> <p>For responding to oil spill, the Indian Coast Guard has developed the National Oil Spill Disaster Contingency Plan NOSDCP which has the approval of the Committee of Secretaries and has been in operation since 1996. Oil spill contingency response plan (plan (OSCRP) is prepared in accordance with the NOSDCP.</p> <p>Please refer specific condition no 5 of EC & CRZ clearance for further details.</p>



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Sr. No.	Conditions	Compliance Status as on 30/09/2025
18	Proper rehabilitation scheme shall be worked out for local fisherman communities in consultation with the District Collector/the Commissioner of Fisheries, Government of Gujarat, before commissioning of the SPM and report shall be furnished to the Forests and Environment Department.	<p>Not applicable</p> <p>Location of SPM is unmanned (approximately 6.3 km inside the open sea from the shore) hence, there is no displacement of people, houses or fishing activity because of the project. However, APSEZ performs large scale socio-economic upliftment program and shares the details with FOKIA (Federation of Kutch Industries Association) chaired by District Collector quarterly.</p> <p>For further information related to CSR activities carried out by Adani Foundation in the Mundra region, please refer to compliance of General condition no. 2 of the EC and CRZ clearance above.</p>
19	The construction labour shall be provided with adequate amenities/facilities including the water supply, sanitation and fuel to ensure that the existing environmental condition is not deteriorated by them. The camps for the construction labour shall be kept outside the CRZ area. The GAPL shall ensure that there is no confrontation amongst the local villagers and construction labour.	<p>Complied.</p> <p>Construction activity is already completed, project is in operation phase.</p> <p>No construction camps were located in CRZ area. Most workers came from nearby villages however, for others; construction camps were located outside CRZ area.</p> <p>All necessary infrastructure and facilities like mobile toilets, safe drinking water, medical health care etc. were provided.</p>
20	All possible social and health impacts due to the proposed development at Mundra	Complied.

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Sr. No.	Conditions	Compliance Status as on 30/09/2025
	Port shall be assessed in detail in the comprehensive EIA and a detailed management plan shall be developed to mitigate the same.	Aspects of social and health impact were studied as part of EIA report prepared by NIO and mitigation measures have been implemented. APSEZ performs large scale socio-economic upliftment program and shares the details with FOKIA (Federation of Kutch Industries Association) chaired by District Collector quarterly.
21	The GAPL shall work out a detailed socio-economic upliftment programme in consultation with the District Collector and District Development Officer and shall implement the same. Separate budgetary provisions shall be kept for this purpose.	For further information related to CSR activities carried out by Adani Foundation in the Mundra region, please refer to compliance of General condition no. 2 of the EC and CRZ clearance above.
22	An Environmental Management Cell with person having proper background shall be constituted. A separate budgetary provision shall have to be made for implementation of the Environmental Management Plan.	Complied. APSEZL has a well-structured Environment Cell, staffed with qualified manpower for implementation of the Environmental Management Plan. For further details on the same, please refer to compliance of general condition no. 4 of the EC and CRZ clearance above. Separate budget for the Environment Protection measures is earmarked every year. For further details on the same, please refer to compliance of general condition no. 5 of the EC and CRZ clearance above.
23	Post project environmental monitoring shall be carried out regularly through a reputed institute like NEERI/NIO	Being complied. Monitoring of various environmental parameters for Ambient Air, Noise, marine water and sediments is being carried out by NABL accredited and MoEF&CC approved agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi.

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Sr. No.	Conditions	Compliance Status as on 30/09/2025																																																												
	and report shall be submitted to the Forests and Environment Department, GoG every year.	<p>Ambient Air Quality (twice in a week) and Noise (once in a month) monitoring are being carried out by NABL and MoEF&CC accredited agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi. Summary of the same for duration from Apr'25 to Sep'25 is mentioned below.</p> <p>Total Ambient Air & Noise Sampling Locations: 5 Nos.</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Unit</th> <th>Min</th> <th>Max</th> <th>Average</th> <th>Perm. Limit[§]</th> </tr> </thead> <tbody> <tr> <td colspan="6">AAQM</td> </tr> <tr> <td>PM₁₀</td> <td>µg/m³</td> <td>51.21</td> <td>86.15</td> <td>69.40</td> <td>100</td> </tr> <tr> <td>PM_{2.5}</td> <td>µg/m³</td> <td>13.82</td> <td>39.74</td> <td>25.64</td> <td>60</td> </tr> <tr> <td>SO₂</td> <td>µg/m³</td> <td>10.85</td> <td>35.89</td> <td>23.20</td> <td>80</td> </tr> <tr> <td>NO₂</td> <td>µg/m³</td> <td>14.18</td> <td>39.84</td> <td>27.42</td> <td>80</td> </tr> <tr> <td colspan="6">Noise</td> </tr> <tr> <th>Noise</th> <th>Unit</th> <th>Leq Min</th> <th>Leq Max</th> <th>Leq Ave.</th> <th>Leq Perm. Limit*</th> </tr> <tr> <td>Day Time</td> <td>dB(A)</td> <td>57</td> <td>69.6</td> <td>65.31</td> <td>75</td> </tr> <tr> <td>Night Time</td> <td>dB(A)</td> <td>55.4</td> <td>64.7</td> <td>61.44</td> <td>70</td> </tr> </tbody> </table> <p>[§] as per NAAQ standards, 2009 [*] as per CC&A granted by GPCB Values recorded confirms to the stipulated standards.</p> <p>Marine water monitoring is carried out on monthly frequency. In order to analyzed marine water quality, marine sampling is being carried out at a location nearby SPM. Please refer specific condition No. 8 of EC & CRZ clearance above.</p> <p>Environmental monitoring reports for the period from Apr'25 to Sep'25 are enclosed as Annexure - 5.</p>	Parameter	Unit	Min	Max	Average	Perm. Limit [§]	AAQM						PM ₁₀	µg/m ³	51.21	86.15	69.40	100	PM _{2.5}	µg/m ³	13.82	39.74	25.64	60	SO ₂	µg/m ³	10.85	35.89	23.20	80	NO ₂	µg/m ³	14.18	39.84	27.42	80	Noise						Noise	Unit	Leq Min	Leq Max	Leq Ave.	Leq Perm. Limit*	Day Time	dB(A)	57	69.6	65.31	75	Night Time	dB(A)	55.4	64.7	61.44	70
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24	No construction activities shall be carried out by the GAPL in any of the Forest areas.	<p>Already Complied. Not applicable at present.</p> <p>The construction work is completed and project is in operation phase. No construction activity at any of the forest area is carried out for project of SPM, COT and connecting pipeline.</p>																																																												
25	All necessary clearances from different	Complied.																																																												



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Sr. No.	Conditions	Compliance Status as on 30/09/2025																					
	Government Department/Agencies shall be obtained before commissioning any construction activities.	All necessary clearances as per prevailing laws have been already obtained. Construction activity is already completed, project is in operation phase.																					
26	A half yearly compliance report with respect to above mentioned conditions as well as the implementation of the suggestions/ recommendations of the EIA and Risk Assessment reports shall be furnished to the Forest and Environment Department, GoG, without fail at regular interval.	<p>Complied.</p> <p>Compliance report of EC conditions is uploaded regularly. A soft copy of last compliance report including results of monitoring data for the period of Oct'24 to Mar'25 was submitted through e-mail to Integrated Regional Office (IRO), MoEF&CC @ Gandhinagar, Zonal Office of CPCB @ Baroda, GPCB @ Gandhinagar & Gandhidham and Dept. of Forests & Env., Gandhinagar vide our letter dated 24/05/2025. The copy of the same is also available on our web site https://www.adaniports.com/ports-downloads as well as also uploaded on MoEF&CC Parivesh Portal on dated 30/05/2025.</p> <p>Please refer below for the details regarding past six compliance submissions.</p> <table border="1" data-bbox="657 1344 1421 1701"> <thead> <tr> <th data-bbox="657 1344 787 1428">Sr. No.</th> <th data-bbox="787 1344 1096 1428">Compliance period</th> <th data-bbox="1096 1344 1421 1428">Date of submission</th> </tr> </thead> <tbody> <tr> <td data-bbox="657 1428 787 1480">1</td> <td data-bbox="787 1428 1096 1480">Apr'22 to Sep'22</td> <td data-bbox="1096 1428 1421 1480">30/11/2022</td> </tr> <tr> <td data-bbox="657 1480 787 1522">2</td> <td data-bbox="787 1480 1096 1522">Oct'22 to Mar'23</td> <td data-bbox="1096 1480 1421 1522">30/05/2023</td> </tr> <tr> <td data-bbox="657 1522 787 1564">3</td> <td data-bbox="787 1522 1096 1564">Apr'23 to Sep'23</td> <td data-bbox="1096 1522 1421 1564">29/11/2023</td> </tr> <tr> <td data-bbox="657 1564 787 1606">4</td> <td data-bbox="787 1564 1096 1606">Oct'23 to Mar'24</td> <td data-bbox="1096 1564 1421 1606">29/05/2024</td> </tr> <tr> <td data-bbox="657 1606 787 1648">5</td> <td data-bbox="787 1606 1096 1648">Apr'24 to Sep'24</td> <td data-bbox="1096 1606 1421 1648">29/11/2024</td> </tr> <tr> <td data-bbox="657 1648 787 1701">6</td> <td data-bbox="787 1648 1096 1701">Oct'24 to Mar'25</td> <td data-bbox="1096 1648 1421 1701">30/05/2025</td> </tr> </tbody> </table> <p>All the recommendations given in the report of Tata AIG Risk Management Services are implemented. For further information related to the same, please refer to</p>	Sr. No.	Compliance period	Date of submission	1	Apr'22 to Sep'22	30/11/2022	2	Oct'22 to Mar'23	30/05/2023	3	Apr'23 to Sep'23	29/11/2023	4	Oct'23 to Mar'24	29/05/2024	5	Apr'24 to Sep'24	29/11/2024	6	Oct'24 to Mar'25	30/05/2025
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**Adani Ports and Special Economic
Zone Limited, Mundra.**

**From : Apr'25
To : Sep'25**

Status of the conditions stipulated in Environment Clearance under CRZ notification

Sr. No.	Conditions	Compliance Status as on 30/09/2025
		compliance of specific condition no. 10 of the EC and CRZ clearance above.
27	The GAPL shall also have to comply with any other condition as may be stipulated by the Forests and Environment Department, GoG, from time to time.	Point noted.

Annexure – 1

Details of Greenbelt Development at APSEZ, Mundra

	Total Green Zone Detail till Up to September 2025				
LOCATION	Area (In Ha.)	Trees (Nos.)	Palm (Nos.)	Shrubs (SQM)	Lawn (SQM)
SV COLONY	72.29	34920.00	7962.00	69696.00	100646.00
PORT & NON SEZ	81.61	149359.00	19220.00	75061.78	62966.38
SEZ	115.70	226120.00	20489.00	220583.60	28162.03
MITAP	2.47	8113.00	33.00	3340.00	4036.00
WEST PORT	104.29	248074.00	66816.00	24112.00	16369.00
AGRI PARK	8.94	17244.00	1332.00	5400.00	2121.44
SOUTH PORT	14.45	27530.00	3470.00	3882.00	3327.26
Samundra Township	58.26	63722.00	11834.00	23908.89	47520.07
Productive Farming (Vadala Farm)	0.00	0.00	0.00	0.00	0.00
TOTAL (APSEZL)	457.99	775082	131156	425984.27	265148.18
		906238.00			

Details of Mangrove Afforestation done by APSEZ

Sl. no.	Location	District	Area (Ha)	Duration	Species	Implementation agency
1	Mundra Port	Kutch	24	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
2	Mundra Port	Kutch	25	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
3	Luni/Hamirmora (Mundra)	Kutch	160.8	2007 - 2015	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GUIDE, Bhuj
4	Kukadsar (Mundra)	Kutch	66.5	2012 - 2014	Avicennia marina	GUIDE, Bhuj
5	Forest Area (Mundra)	Kutch	298	2011 - 2013	Avicennia marina	Forest Dept, Bhuj
6	Jangi Village (Bhachau)	Kutch	50	2012 - 2014	Avicennia marina	GUIDE, Bhuj
7	Jakhau Village (Abdasa)	Kutch	310.6	2007-08 & 2011-13	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GUIDE, Bhuj
8	Sat Saida Bet	Kutch	255	2014-15 & 2016-17	Avicennia marina & Biodiversity	GUIDE, Bhuj
9	Dandi Village	Navsari	800	2006 - 2011	Avicennia marina, Rhizophora mucronata, Ceriops tagal	GEC, Gandhinagar
10	Talaja Village	Bhavnagar	50	2011-12	Avicennia marina	Forest Dept, Talaja
11	Narmada Village	Bhavnagar	250	2014 - 2015	Avicennia marina	GEC, Gandhinagar
12	Malpur Village	Bharuch	200	2012-14	Avicennia marina	SAVE, Ahmedabad
13	Kantiyajal Village	Bharuch	50	2014-15	Avicennia marina	SAVE, Ahmedabad
14	Devla Village	Bharuch	150	210-16	Avicennia marina	SAVE, Ahmedabad
15	Village Tala Talav (Khambhat)	Anand	100	2015 - 2016	Avicennia marina	SAVE, Ahmedabad
16	Village Tala Talav (Khambhat)	Anand	38	2015 - 2016	Avicennia marina	GEC, Gandhinagar
17	Aliya Bet, Village Katpor (Hansot)	Bharuch	62	2017-18	Avicennia marina & Rhizophora spp.	GEC, Gandhinagar
18	Kukadsar- (Bhadeswar- Mundra)	Kutch	250	2021-22	Avicennia marina	Shreeji Enterprise, Amreli
19	Kukadsar- (Bhadeswar- Mundra)	Kutch	750	2022-23	Avicennia marina	Shreeji Enterprise, Amreli
20	Kukadsar- (Bhadeswar- Mundra)	Kutch	250	2023-24	Avicennia marina	Shreeji Enterprise, Amreli
Total			4140			

Annexure – 2



Adani Foundation

CSR Gujarat

Kutch – Dahej - Hazira

Six Monthly Report 2025-26



INDEX

3	CSR Kutch	42	AKBPTL – TUNA
4	Environment Sustainability	44	Adani Skill & Education
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35	khavda AGEL	101	Media Coverage
39	Dayapar AGES		

CSR Kutch



Environment Sustainability



Environment Sustainability

Adani Foundation Environmental Initiatives.

The Adani Foundation is committed to environmental conservation and biodiversity preservation, essential for maintaining ecological balance. Significant progress has been made through the development of 162 hectares of mangrove forest, which contributes to enhancing coastal biodiversity and ecosystem resilience.

Action to Environment Sustainability



FOCUS AREAS



Water Sustainability



Terrestrial Biodiversity



Coastal Biodiversity



Soil Conservation

Till date
Water
conservati
on Work

 **145**
Pond
Deepening

 **209**

Bore & Wells

 **355**
Rainwater
Harvesting

 **30**

Check Dams

 **25**

Percolation
Wells

Water Conservation Project

In recent years, the villages near our operational area have experienced significant enhancements in both the availability and quality of water. These improvements stem from our focused efforts in managing and conserving groundwater and surface water resources.

Key interventions—

- pond deepening,
- strengthening of check dams,
- installation of rainwater harvesting systems, borewell drilling, and clearing of river inlets—have together increased water storage capacity.

Till the date

Pond Deepening- 145 Village pond
Check dam Re-Strenghtning – 30

Farmers Benifitted -1760

Storage capacity Increase –
2171435Cum.

Current year

Pond Deepening -
05 Village pond

Check dam Re-
strenghtning-01

Farmer -300 famer
Land irrigated-
1800 Acre



8.0%
Increase
in Revenue



9.00 %
TDS Reduction



Rs 1200
Reduce in health
expenses Monthly



Roof Top Rainwater Harvesting

Project Highlights

- 355 RRWHS units built across 355 homes, positively impacting more than 1,760 people.
- TDS levels below 100 meeting WHO standards for safe drinking water.
- First-time rainwater harvesting enabled for the community, ensuring quality drinking water and reducing financial burdens

Vision:

- To transform in to water-positive village, ensuring the community has access to quality drinking water

Impact:

- The initiative ensured quality drinking water, alleviated financial burdens, and improved the overall health of the community. It also promoted long-term water security and sustainability for Modhva.



(Sustainable Solution for Drinking water):



1760+
Residents benefited



97.73% Less
TDS than local
municipality water
Gundiyaali – 4410 TDS



Rs. 1125
monthly Saved
on drinking
water



Rs. 3000
yearly saved on
health expense

Coastal Biodiversity

Mangrove Restoration Success – Luni Coast

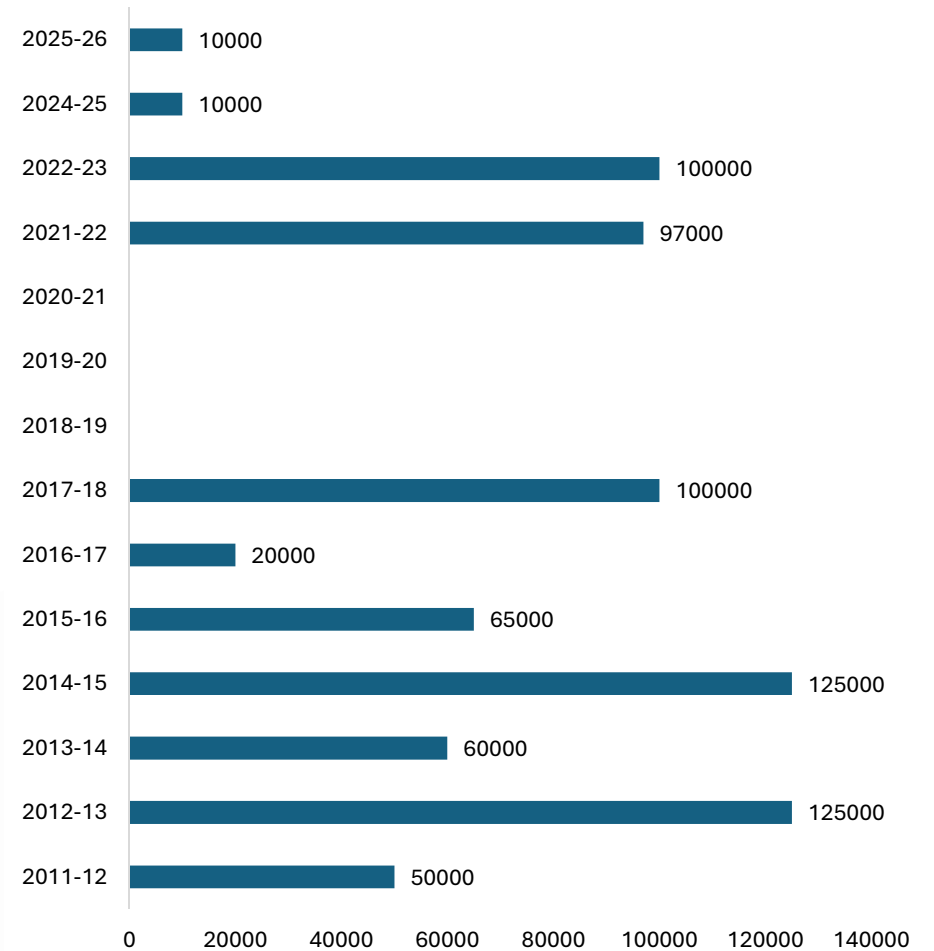
Initiated in 2010, the mangrove restoration project led to the development of 162 hectares of dense mangrove forest along the Luni coast.,

Additional 20 hectares of multi-species mangroves were established, with all plantations meticulously maintained and regularly monitored.

These flourishing ecosystems now support a rich diversity of marine life and migratory birds, making a significant positive impact on the local environment.



Number of Mangrove



Terrestrial Biodiversity

Vruksh Se Vikas – Massive Drive

Beginning in 2014, we have initiated a transformative effort by conducting widespread tree planting campaigns in partnership with local communities and forestry authorities.

Adani Van:

Adani Foundation has initiated the 'Adani Van' project, aimed at planting extensive areas with medicinal, fruit-bearing, and bird-friendly trees to create optimal habitats for nesting and resting. This initiative employs the Miyawaki plantation method alongside a drip irrigation system. The development of the Van involves active community participation, with Adani Foundation providing maintenance for three years.

Within six months, we have established six Adani Vans, planting 33330 trees across 24 acres in the villages of N Khakhar, Borana, and Dhrub.



Till Date **17** Adani Van **1.22** Trees **@58** acres

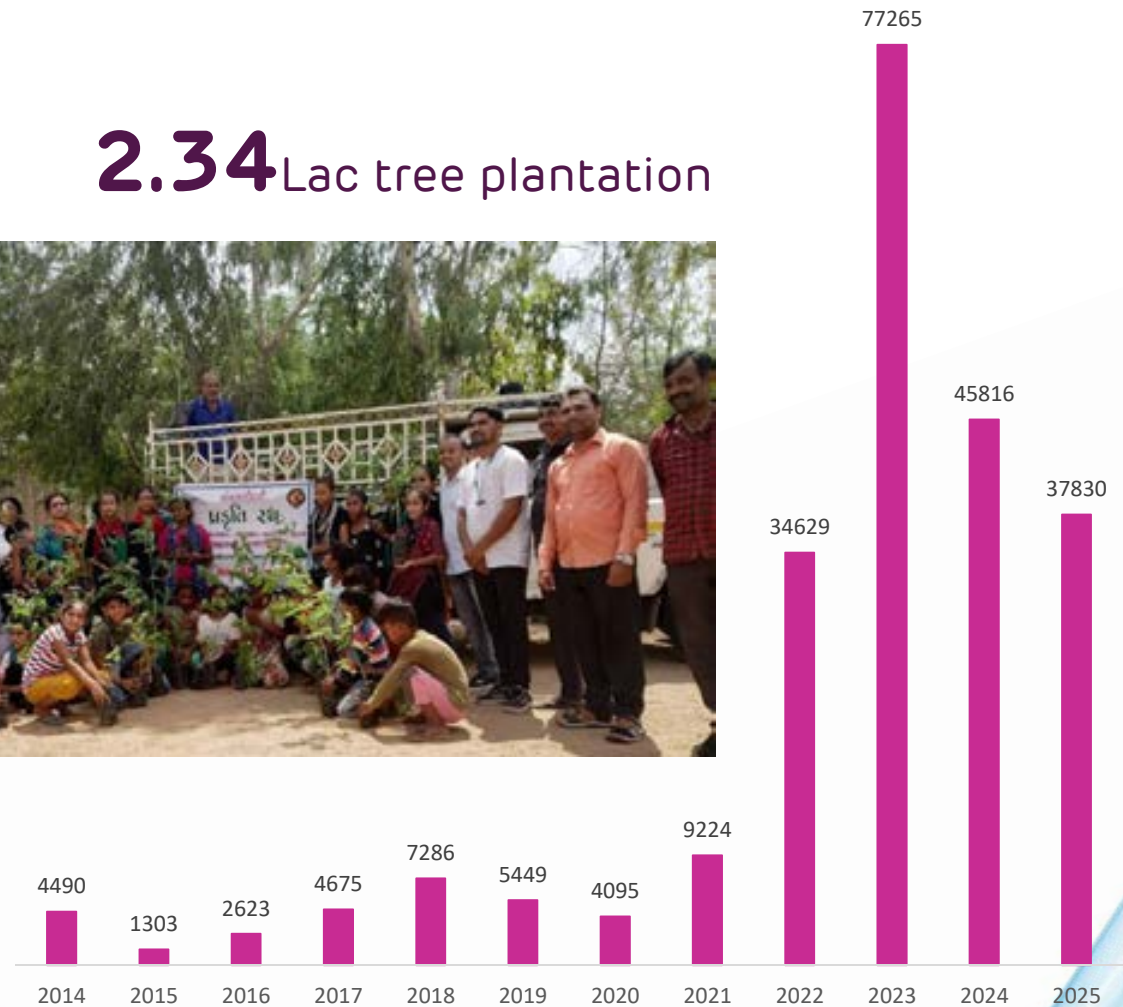
Vruksh Se Vikas – Massive Drive

Prakrutik Rath: Fostering Community Engagement Through Environmental Initiatives

Prakrutik Rath is a distinctive program that unites communities to plant trees in schools, temples, and public areas. Having distributed the Rath moves from village to village, encouraging active involvement. This method not only boosts local greenery but also deepens the community's bond with nature and promotes environmental stewardship.

Under our Vruksh Se Vikas initiative, we have planted 2.34 Laca trees so far, enhancing the ecosystem and supporting carbon sequestration. This program provides enduring advantages for both the environment and the surrounding communities.

2.34 Lac tree plantation



River Cleaning Initiatives – Bhuki & Kevdi Rivers

Objective: To enhance water resources, restore ecological balance, and foster active community participation for healthy rivers and a better future.

Phase 1: Assessment & Planning

- Baseline surveys conducted
- Engagement with stakeholders

Phase 2: Cleaning Operation

- Manual and mechanical removal of debris and polythene bags
- Segregation and disposal of waste

Phase 3: Awareness & Capacity Building

- Community workshops
- Distribution of reusable cloth bags
- Installation of waste collection points

Phase 4: Monitoring & Sustainability

- Regular water quality checks planned
- Setting up "River Watch Committees"



Pond deepening and Renovation – Jam Bhuraji Pond

Introduction

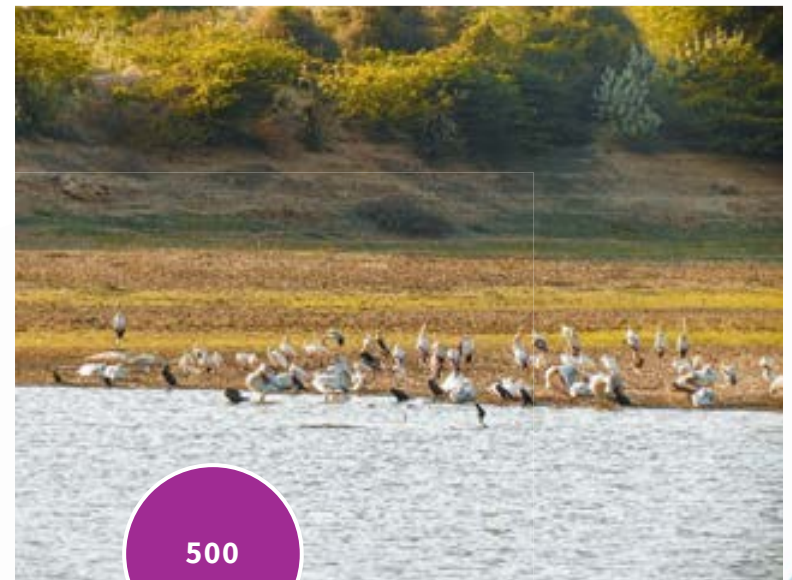
Jam Bhuraji Pond, located in Khavda (historically Kunaria), Kutch, Gujarat, is a vital water body supporting the local community, livestock, wildlife, and traditional cultural practices. In 2024/25, the pond underwent a significant deepening and renovation, aiming to address water scarcity and enhance ecological resilience.

Background

- **Village History:** Kunaria is a 350-year-old village, originally settled by Rajput and Luhana communities. The land was granted by Jam Saheb, and the village is known for its unique “Pagdi” ceremony, which appoints a new Jam for 40 villages.
- **Pond Construction:** The pond was initially constructed in 2012 under drought relief efforts by Bani Vikas Trust and Sujlam Suflam Yojana. It was renovated and deepened in 2024/25 by Adani Foundation.

Project Rationale

- **Water Scarcity:** The region faces frequent droughts and water shortages, impacting agriculture, livestock, and daily life.
- **Ecological Need:** The pond is a critical habitat for birds and wildlife, and its health directly affects local biodiversity.
- **Community Demand:** The pond serves as the main water source for 350 villagers, livestock from four villages, and nearby Maldhari communities.



7000
cum

Increased Storage: Deepening has significantly increased the pond's capacity,

3500

Reliable water supply for irrigation, livestock, and household use.

10
Types

Biodiversity Boost: Migratory Birds

500

Community Cohesion Resilience: :

Project Utthan



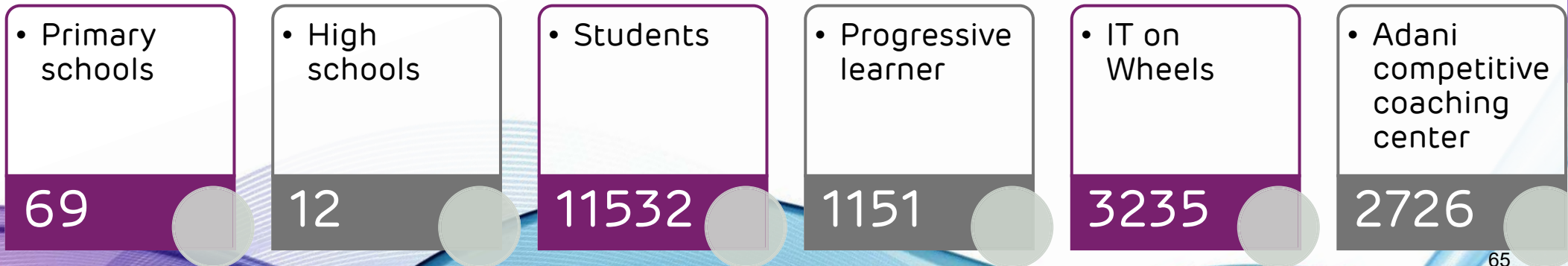
FLAGSHIP EDUCATION PROGRAM

- Strengthening Government Primary Schools**
 - Adopting and upgrading government primary schools & High school to model schools.
- Appointing an Utthan Sahayak**
 - Assigning a dedicated facilitator in each school to act as a catalyst for change.
- Providing Resources and Facilities**
 - Ensuring schools are equipped with necessary resources and infrastructure
- Introducing Vedic Math's & Abacus**
 - Increasing students' logical and mathematical skills through Vedic Math's and Abacus training.
- Capacity Building for Government School Teachers**
 - Conducting training programs to improve teachers' skills and teaching methods.
- Special Focus on 'Priya' Vidyarthi's (Progressive Learners)**
 - Providing additional support and tutoring for progressive learners.
- Training Students for Competitive Exams**
 - Preparing students for various competitive examinations.



Project Utthan: Empowering Education at the Grassroots since 2018

Initiated by the Adani Foundation in partnership with the Government of Gujarat, Project Utthan is a pioneering effort to uplift learning outcomes in government schools. Through targeted academic support, enriched environments, and community involvement, the project aims to build strong foundational skills and reduce dropout rates among students.



Key Strategic Initiatives of Utthan

Main streaming Progressive learners

- 2776 students of classes 4 & 5 were assessed.
- 1151 students emerged as progressive learners
- Personalized learning through different activities and TLM
- 220 students mainstreamed.

Library Activity

- Library books issues & Activities planned every Saturday.
- 45000+ Books issued.
- 300+ Oasis workshop arranged to increase reading habits of students.



IT on wheels

- 1187 primary & 1448 high school students are learning basic computer skills.
- Students gain essential computer skills, enhancing their digital literacy and preparing them for future academic and career opportunities.



Mothers Meet

- Mothers' meetings conducted every second Saturday in Utthan schools.
- Over 95,00 mothers have joined.
- Guidance on exams, scholarships, and healthy eating.
- Home visits and discussions on academic performance.

Competitive Exam

- 1050 passed and 21 students made it to the merit list.
- 2726 students are preparing for exams like JNV, NMMS, PSE, and CET.
- Meetings with 560 high school parents to encourage their support.

Impact in Action

Gunotsav & Board Results

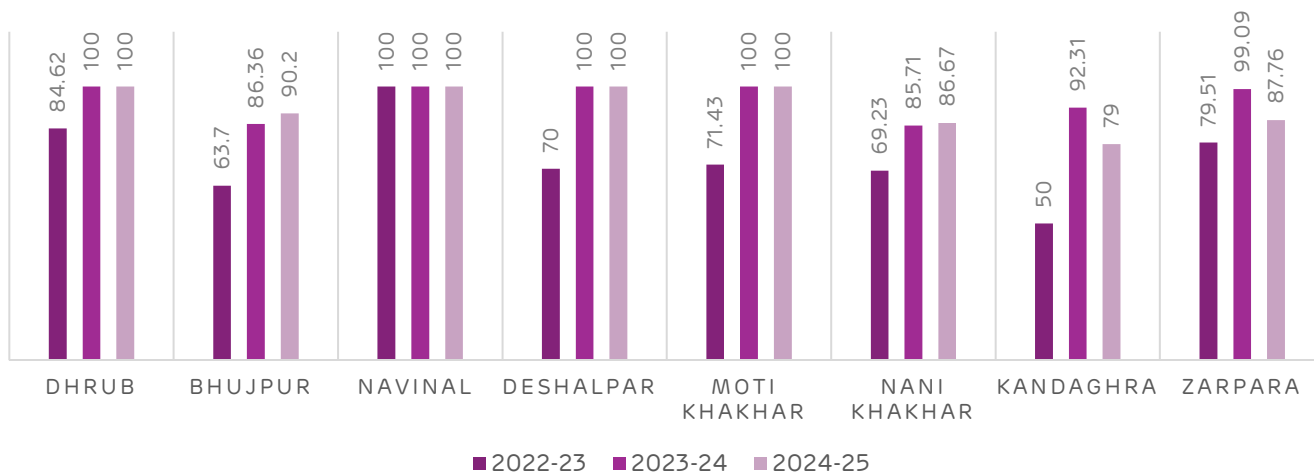
4 High Schools Achieved 100% Pass Rate in Results

Gunotsav Primary School Performance

- **Gunotsav Results:** Gunotsav grades are assessment by GoG as part of its statewide initiative to assess and enhance the quality of education in government schools.
- All Utthan-supported schools showed a marked rise in Gunotsav grades, with many moving up to A & B categories—reflecting the positive impact of targeted academic and co-curricular interventions.

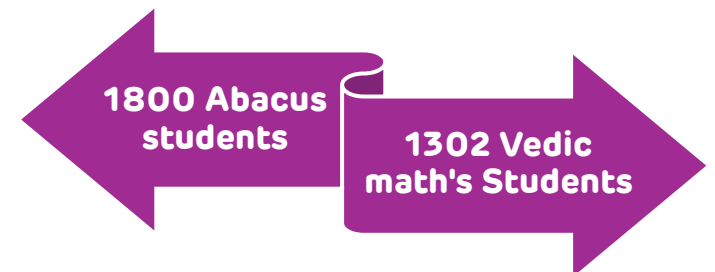


BOARD RESULT ANALYSIS



Abacus & Vedic Maths

Utthan initiative has introduced Abacus and Vedic Mathematics in 54 primary and 08 high schools. Abacus is a tool used for performing arithmetic calculations, while Vedic Mathematics is an ancient system of Indian mathematics that simplifies complex calculations.





Celebrating Learning, Culture & Growth Through Day celebration

- Monthly Celebrations : Utthan Adani Foundation organizes 1–2 themed days each month across schools to enrich the learning experience.
- Engaging Activities : Events include cultural programs, competitions, and recreational games that spark creativity and participation.
- Joyful Learning Environment : These celebrations foster enthusiasm, improve student engagement, and make learning more enjoyable.
- Positive Impact : Regular celebrations have led to increased attendance, improved confidence, and stronger school-community connections.

Day celebration - **10,000+** Students Participated from various school



360° Career Guidance for Utthan High School Students

- Adani Foundation has launched a comprehensive career guidance program for all Utthan High School students, powered by personalized psychometric assessment.
- The initiative begins with a deep evaluation of each student's interests, strengths, and aspirations, generating a tailored career report.
- Based on these insights, students receive focused one-on-one counseling to explore suitable career paths and make informed decisions.
- This 360° approach bridges the gap between education and employability, equipping youth with clarity, confidence, and direction.
- It fosters self-awareness, future readiness, and aligns with the Foundation's mission to nurture holistic youth development.

Career guidance – **1400+** students powered by Psychometric assessment

Adani Vidya Mandir

Bhadreshwar

Adani Vidya Mandir, Bhadreshwar (AVMB) is a model institution dedicated to transforming lives through free, inclusive, and holistic education. Serving students from Economically Weaker Sections, especially the fisherfolk community, AVMB provides comprehensive support—uniforms, books, stationery, nutritious meals, and quality learning—at no cost.

The school fosters a nurturing environment where every child is empowered to dream big and achieve their potential. Through structured pedagogy, co-curricular engagement, and strong community ties, AVMB ensures that learning goes beyond textbooks. Its emphasis on values-based education, cultural identity, and student leadership prepares learners for the challenges of the 21st century.

Aligned with NEP 2020 and UN SDG 4 (Quality Education), AVMB champions equity, creativity, and lifelong learning—building a foundation for a brighter, more inclusive future.



AVMB

Academic Excellence

- 100% pass rate in Class 10 SSC Board Exam (2024–25); 2 students secured A1 grades
- Average score rose to 75.41%; subject-specific teacher training and inter-school collaboration
- Bharat Ko Jano exam participation and structured assessments

Co-Curricular & Cultural Growth

- 587 students engaged in CCA activities; winners at Kala Mahakumbh and National Singing Competition
- Celebrations: Ashadhi Bij, Guru Purnima, Independence Day, Promise Wall tribute
- Storytelling, Rakhi making, Doodle the Google competitions

Infrastructure & Institutional Support

- Free provision of academic essentials and meals
- Balvatika Praveshotsav welcomed 80 new learners and 120+ parents
- Teacher training in Adobe Express.

Community Engagement & Leadership

- Interactive PTMs, student-led event planning, and cultural hosting. Empowered students with leadership roles

Wellness & Sports Achievements

- Yoga Day with 205 students; National Sports Day participation
- Kho-Kho and Athletics: multiple wins and district-level qualifications
- Dedicated coaching and mentorship for physical development



Celebrating
Excellence and
Holistic
Development

100%
result in 10th board
examinations

Project Udaan

- Adani Foundation's Project Udaan empowers youth through immersive educational tours to key Adani Group facilities, offering real-world exposure beyond the classroom.
- Students gain firsthand insights into industries like ports, power, and refineries, sparking curiosity and ambition for future careers.
- The initiative nurtures entrepreneurial thinking, leadership qualities, and a vision for innovation among school and college students.
- Faculty participation strengthens academic-industry linkages, enriching the learning ecosystem.
- Project Udaan has become a catalyst for inspiring young minds to dream big and pursue meaningful, future-ready paths.

Igniting Aspirations in Youth

229 institute visit

5 Corporate visit

16380 Participants



Community Health

Adani Foundation – Advancing Healthcare & Community Well-being

- Adani Foundation's healthcare mission is rooted in the belief that quality medical care should be accessible to all, especially underserved communities. Through initiatives like Mobile Health Care Units (MHCU), general and special health camps, medical support, and rural clinics, the Foundation delivers preventive and curative services directly to those in need.
- Focused on community health, awareness, and sustainability, it also runs programs on addiction recovery and supports labor colonies with regular medical outreach. Aligned with the vision of equitable healthcare, the Foundation's efforts contribute to SDG 3 (Good Health & Well-being).



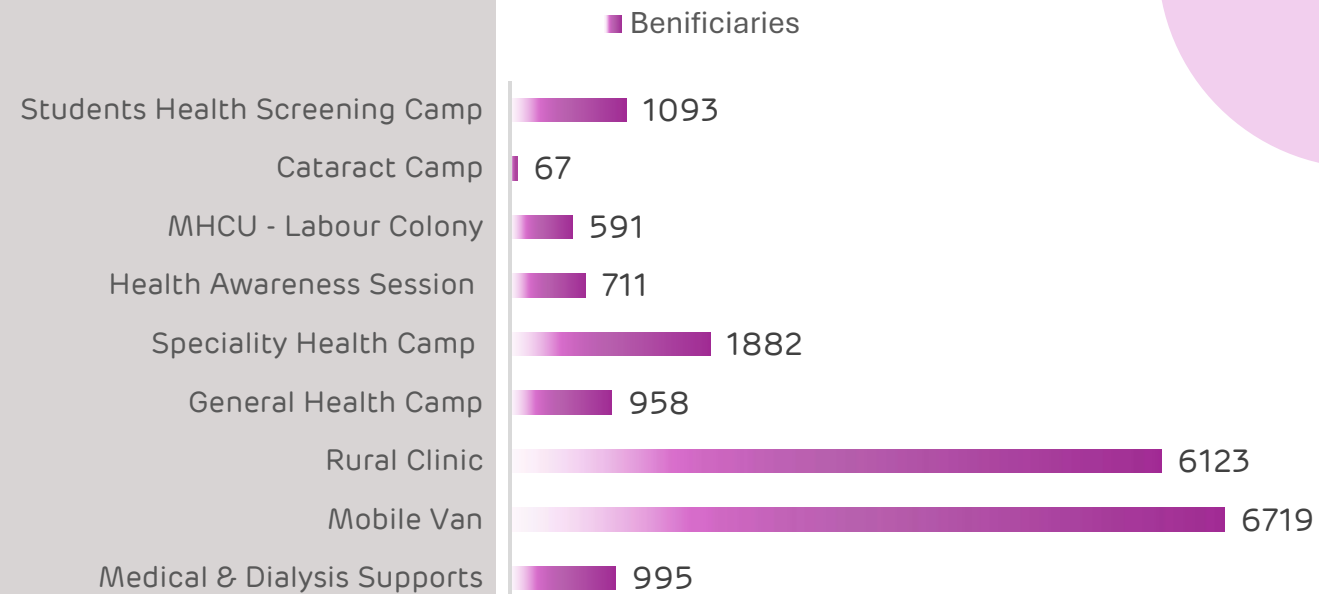
Community Health

Adani Foundation shows a strong commitment to community health through diverse healthcare initiatives. It ensures accessible medical care for underserved and remote populations. These efforts promote early diagnosis, better health outcomes, and increased awareness.

The Foundation's proactive approach drives large-scale, meaningful impact in public health across rural and urban areas.



BENEFICIARIES



Health

Mobile Health Care Units, Rural Clinic Services & Medical Support

- Adani Foundation's Mobile Health Care Units and Rural Clinics have transformed healthcare access in remote regions, delivering consistent medical support directly to the doorstep of underserved communities.
- These services have significantly improved health outcomes, built trust in formal healthcare systems, and reinforced the Foundation's role as a catalyst for inclusive and impactful public health development.

- **9867 individuals** benefited from MHCU and Rural clinic services.
- **33%** average savings on healthcare-related costs.
- **42%** People are aware and become health Conscious
- Adani Foundation's medical support program has provided critical care to 1,071 underprivileged patients, addressing serious health issues like kidney and heart conditions at Adani Hospital Mundra.
- In life-threatening cases, patients are stabilized and referred to GKGH, Bhuj, with full coordination for advanced treatment—ensuring no one is left behind in their journey to recovery.



29-Villages
31-MHCU
Stoppage
7-Rural clinic



TB Awareness & Nutritional Support Program

- Adani Foundation organized a focused TB awareness initiative in Mundra Block, enhancing health literacy among affected individuals through expert-led sessions.
- Patients received vital education on symptoms, medication, hygiene, diet, and lifestyle from healthcare professionals including the District TB Health Officer.
- The program promoted early detection, treatment adherence, and holistic recovery practices such as regular exercise.
- Continuous care and monitoring ensured sustained impact, reinforcing the Foundation's commitment to inclusive and resilient community health.



Awareness and Screening Drive in Mundra Schools

- Adani Foundation conducted health and hygiene awareness sessions across primary schools in Mundra Block, fostering lifelong wellness habits among children and educators.
- Over 584 students and teachers participated in interactive sessions focused on hygiene practices and healthy living.
- Comprehensive health screenings were carried out for 1,093 students, enabling early detection of health issues and timely intervention.
- Core topics included handwashing, dental care, nutrition, personal cleanliness, and environmental health.
- The initiative significantly boosted health awareness and preventive care among school children, reinforcing the Foundation's commitment to nurturing healthier communities.

Beneficiaries – **1093** Health & Hygiene Awareness

Sustainable Livelihood Development



Women Empowerment

82

SHG

• Women were mobilized into SHGs through formal registration, laying the foundation for collective growth and financial inclusion.

• (80 SHGs)

12

Skill Building

• Tailored workshops and hands-on training empowered members with entrepreneurial, financial, and operational skills.

• (12 Workshop – 1000 Women's)

60

Exposure & Learning

• Exposure visits to successful enterprises inspired SHG members, boosting confidence and sparking innovative ideas.

52

Need-Based Support

• Adani Foundation provided timely support—equipment, funding, and guidance—based on each group's evolving needs and goals.

1450

Community Impact

• SHGs now uplift entire communities—enhancing household income, promoting leadership, and driving social change.

"CHETNA" - initiative with gender diversity

- Women Mobilization & Employment Facilitation : Adani Foundation, in partnership with Unnati Portal and Adani Solar, mobilized and counseled women and their families, enabling them to confidently enroll, attend interviews, and secure jobs.
- Empowerment Through Opportunity : Women from Kutch began working in formal roles, gaining financial independence, self-confidence, and inspiring broader community acceptance of female workforce participation.

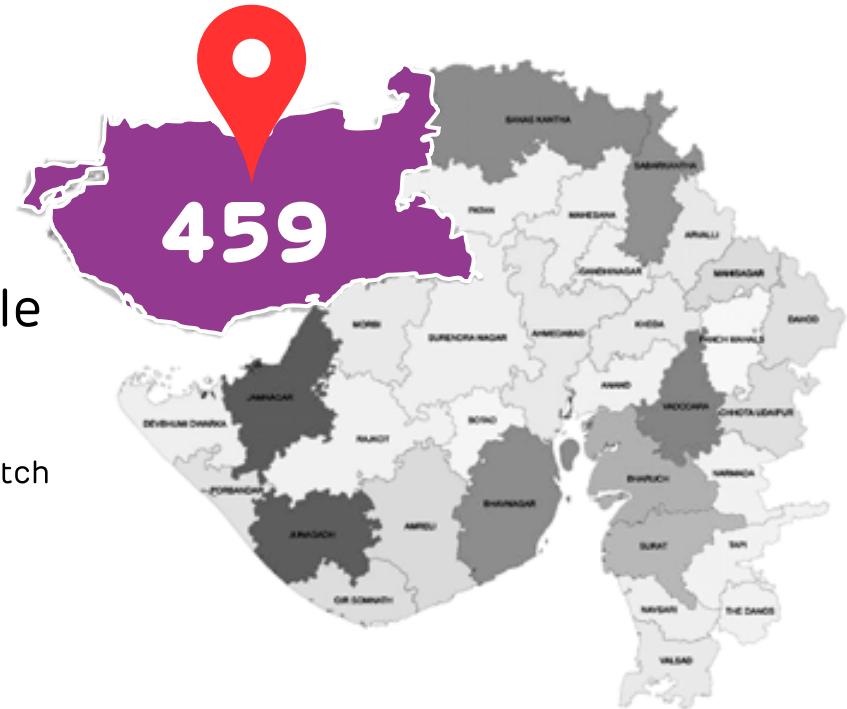
Till Now

600+ Female

Joined Adani Solar
@Pan India

459 are from Kutch

76.50%



Rs. 1.8 lakhs/annum
12th pass candidates

Rs. 2.16 lakhs/annum
Graduate candidates



Creating Opportunities
for Women



Mobilization and
Counseling



Parental
Engagement



Travel
Assistance



Interview
Support

Trees & Fodder: Growing Green, Sustaining Life

Objectives

- Promote environmental conservation through afforestation and land restoration
- Support rural livelihoods by strengthening agricultural sustainability
- Foster community participation in ecological development
- Monitor and enhance the effectiveness of green initiatives

17 Adani Van Sites

1.22 Lacs Trees Planted

16 Villages

Estimated increase in green cover (area or 58 acres)



Activities

- **Tree Plantation Drive:** Identified suitable locations for afforestation and community greening
- **Fodder Support Initiative:** Provided regular fodder supply at all core villages, Ensured livestock health and supported sustainable farming practices
- **Sustainability :** Engaged with local communities to align conservation goals, fostering long-term environmental stewardship and rural empowerment.



Impact

- **Ecological Balance:** Increased green cover and biodiversity in targeted villages
- **Agricultural Sustainability:** Improved fodder availability boosted livestock productivity and farmer income
- **Community Empowerment:** Strengthened local ownership of environmental projects
- **Long-Term Resilience:** Enhanced environmental awareness and stewardship across rural areas

Swawlamban

Objectives

- **Enable Access to Government Schemes :** Facilitate awareness, documentation, and enrollment for Divyang individuals in welfare programs.
- **Promote Educational & Career Readiness:** Provide study kits, guidance, and resources for competitive exam preparation and job opportunities.
- **Enhance Mobility & Daily Living** Support with medical certificates, bus passes, and assistive equipment to improve independence and quality of life.

Divyang Support & Scheme Facilitation



Activities

- Conducted awareness drives and assisted with document verification to help Divyang beneficiaries enroll in government schemes.
- Facilitated access to welfare programs like Sant Surdas and marriage assistance, along with issuing medical certificates and bus passes for improved mobility.
- Provided exam preparation kits and assistive equipment, while celebrating Divyang Day through job placements and recognition.
- Implemented the **Swavlamban Project** to promote self-reliance and skill development among differently-abled individuals.

Impact

- **Social Inclusion & Dignity** Divyang individuals gained access to entitlements, boosting confidence and community participation.
- **Improved Livelihood Opportunities** Job placements and exam support opened pathways for financial independence and career growth.
- **Strengthened Rural Outreach** Village-level engagement ensured that even remote beneficiaries received timely support and recognition.

Swawlamban : Divyang Support & Scheme Facilitation

- Government Scheme Facilitation: Divyang individuals supported with medical certificates, bus passes, Sant Surdas benefits, and marriage assistance through documentation and enrollment help.
- Empowerment & Inclusion: Provided competitive exam kits, assistive equipment, and job placement support, fostering self-reliance and social dignity under the Swawlamban Project.



Activity	
Job Fair	105
Sawavlamban IG Support	92
AF Equipment Support	177
Competitive exam	62
AF Neo motion EV	48
Total	484

Scheme Detail	Gov. Support Rs/Month.	Total Beneficiaries	Total Amount per Month (INR) last 4 year
Widow Pension	1250	663	23315100
Bal seva Ayog	2000	49	3430000
Divyang pension	1000	62	759000
Niradhar Pension	1000	126	3755000
Palak Mata Pita	3000	5	696000
Bus pas	Free ST	515	-
Divyang Govt sadhan sahay	8000	175	1400000
Divyang certificate	0	573	-
Total		2168	31955100

Fisherfolk Community

Empowering Fisherfolk Community

Objective

- To empower the fisherfolk community by improving access to education, creating employment opportunities for youth, and providing essential facilities that support long-term development and social upliftment.

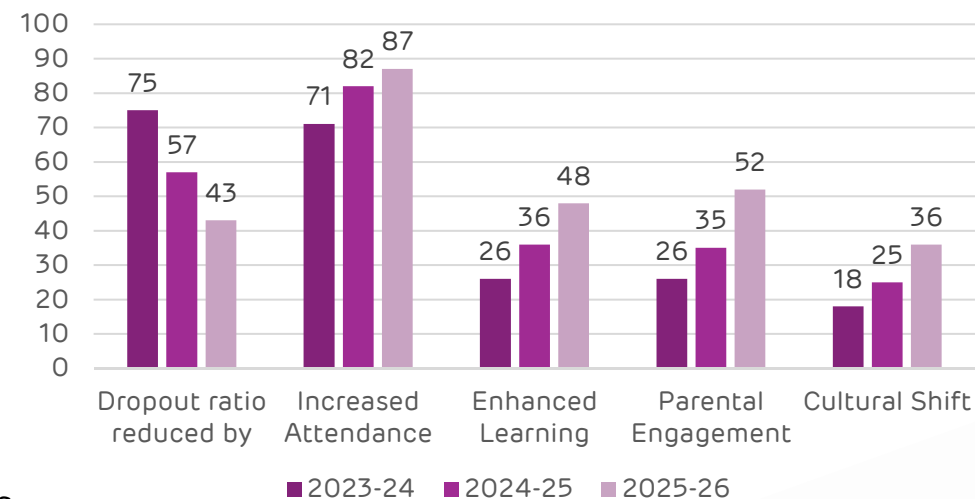
Activity

- Distributed education kits to HSC and graduation-level students, including notebooks, guides, stationery, and study bags.
- Facilitated job opportunities and skill development for youth through community engagement and support programs.
- Provided daily transportation for 86 school-going children to ensure consistent access to education.
- Awarded scholarships totaling ₹3,58,765 to 34 students for higher secondary and technical education.

Impact

- Increased school attendance and reduced dropout rates among fisherfolk children.
- Enabled financially challenged students to continue higher education without barriers.
- Strengthened youth empowerment and community resilience through education and employment support.

Impact of Fisherfolk Project



Empowering Fisherfolk Community



Job initiatives:

Acting as a bridge between industries and fisherfolk youth, the Adani Foundation facilitated job placements for 30 fisherfolk as RTG operators, in the HR department, and as supervisors in APSEZ companies.

In the APSEZ area and colony, 45 fisherfolk youth have been offered professional painting roles. To ensure they are skilled for the role, they underwent comprehensive training in partnership with Asian Paints.

This initiative has enhanced their livelihoods and provided sustainable employment opportunities.

Vashat Nameada	Population	Water Quantity
Luni Bandar	384 (116 HH)	17.5 kl
Bavdi Bandar	535 (107 HH)	20 kl

Potable water Distribution:

Providing access of potable Drinking water Facilities to Nine fisherfolk vashat on Daily bases, either By Water tanker or Linkage with Nearest Gram panchayat.

More than 5000 Fisherfolk Population are getting benefit which impact on their health and well-being.

Community Infrastructure Development Initiative

Objectives

- Enhance rural and coastal infrastructure to improve quality of life
- Strengthen access to sanitation, education, and community spaces
- Promote sustainable development through water conservation and ecological restoration
- Empower communities with better connectivity and public amenities

Activities

- Constructed common gathering sheds, Samajik Vikas Kendras, and community centers
- Built digital libraries and training centers to promote education and skill development
- Developed approach roads, culverts, and entry gates for improved mobility
- Renovated and built Gaushala sheds and Gauchar land for livestock support
- Installed sanitation facilities including toilet blocks and pink toilets in schools
- Deepened ponds, cleaned rivers, and desilted dams for water conservation
- Supported civil works in crematoriums and public spaces
- Restored roads and infrastructure in fisherman settlements and remote areas

Impact

- Improved access to essential services and public spaces for thousands of villagers
- Strengthened rural connectivity, boosting local trade and transport
- Enhanced hygiene and sanitation, especially for women and schoolchildren
- Revived water bodies, improving groundwater levels and agricultural sustainability
- Supported livestock and dairy-based livelihoods through Gaushala infrastructure
- Fostered digital literacy and community learning through educational facilities
- Promoted inclusive development and social cohesion across multiple villages
- Enabled long-term resilience and environmental stewardship in underserved regions

Community Infrastructure Development Initiative

3

Pond deepening



4

Digital Library



9

Common gathering Shed



2

Gaushala Development



25

RRWHS



2

Community Center



2

Check dam strengthening



24 Km.

Restrengthening of Approach Road



AGEL KHAVDA





Education – Project Utthan:

- Supported **12 high schools** in Khavda through the Utthan initiative, expanding coverage to the entire region.
- Deployed **Utthan Sahayaks** to strengthen core subjects like Maths, Science, and English.
- Engaged **Community Mobilizers** to promote school enrollment and retention, especially for girls.
- Conducted **scholastic and co-scholastic activities** to enhance academic performance and holistic development.
- Visible improvement in student learning outcomes after **three years of continuous educational support**.



1500+
Students benefited



54.49%
Increase in admissions



43.11%
Rise in Girls' admission

Activities	Beneficiaries	No. of Schools
Utthan project in Khavda	1500+ Students	12 High Schools
Sports and Music Equipment, Library cupboard & books	1000+ students	Supported in 12 High schools and 2 Primary Schools
Education Kit Support (Utthan Notebooks & Bag)	1000+ students	Supported in 12 High schools
Tournament for 12 High school (Badminton & Cricket)	500+ people	12 High schools



Community Health

- **Specialist Healthcare Access:** Deployed expert doctors to Khavda CHC and conducted multi-specialist health camps in remote villages, ensuring regular consultations and treatment.
- **Maternal Health Support:** Facilitated safe transportation and medical care for 166 pregnant women from border villages, improving maternal outcomes.
- **Community Impact:** Over **5,000 patients** benefited from specialist services and **900+ villagers** received direct care through outreach camps.



Adani Arogya Karyakram Khavda CHC OPD:

Gynec.	Pedia.	Ortho	General	Ophtho.	Total
1402	2078	257	344	973	5054

Specialty Health Camp in Khavda Villages:

Gynec.	Pedia.	General	Ortho	Ophtho.	ANC Women	Total
214	238	246	95	74	66	653



42

Villages benefited



5,187

villagers benefited by medical services

Women Empowerment:

- Formed **9 SHGs** and enrolled **95 women** into the Khavda Mahila Vikas Sangathan, promoting savings and financial inclusion.
- Conducted **85 SHG meetings** and **24 business sessions** to build entrepreneurial skills and livelihood awareness.
- Reached **610 women** through empowerment activities, strengthening leadership, financial literacy, and community bonds.



CID – Water Conservation



- Constructed 13 rainwater harvesting ponds to store monsoon water for community and wildlife use.
- Installed 6 drinking water wells in remote villages to improve daily access to clean water.
- Enhanced public health and sanitation by providing reliable water infrastructure in underserved areas.



Climate Action:

- Created Adani Van by planting 2,000 trees, boosting green cover in Khavda.
- Promoted environmental sustainability and climate resilience through afforestation efforts.
- Engaged school children in plantation care, fostering ecological awareness and community participation.

AGEL Dayapar



Water Conservation



- Planned **expansion and deepening of 9 village ponds** to increase rainwater retention and storage.
- Held **consultative meetings with local communities** to finalize pond locations and encourage grassroots involvement.
- Aimed at **enhancing groundwater levels** and ensuring reliable water supply for farming and livestock needs.



SLD – Kamdhenu:



- Awareness meetings on modern dairy farming in villages, engaging local cattle owners.
- Organized vaccination camps across villages, covering 1,647 animals (1,410 camels + 237 cattle).
- Improved livestock health and productivity by reducing disease risk and promoting sustainable care practices.



Community Health:

- General health camps in five villages, reaching underserved rural populations.
- Conducted student health check-ups at Dumra during AGEL Foundation Day.
- Partnered with ICDS teams for women and child health awareness sessions.
- Provided follow-up care for Neo Motion wheelchair beneficiaries to enhance mobility.
- Ensured referrals and community engagement, with 9 patients sent to GKGH Bhuj and active participation from local leaders.



SLD

- Initiated Adani Van with MOU signing, aiming to create a model for inclusive community development.
- Celebrated 29th Foundation Day with a Mega Volunteering Program, engaging 50+ employees and 560 students in health, safety, and environmental activities.

Education

- Distributed 620 school kits and organized experiential learning activities during AGEL Foundation Day, benefiting 560 students.
- Laid the foundation stone for a Nature Class cum Open Theatre, promoting outdoor learning and environmental awareness.



Benefited **923**
with direct
healthcare services.

AKBPTL Tuna

Education : Utthan

Introduction

- Adani Foundation signed an MoU with DPEO to implement **Project Utthan** in **5 primary schools** across Anjar taluka, including Tuna and nearby villages.

Activities

- Appointed **Utthan Sahayaks**, supported **1339 students**, and ran **competitive coaching** and **English sessions**.
- Conducted **library activities**, **mothers' meetings**, and **home visits** to boost learning and parental involvement.
- Celebrated key days like **Teachers' Day** and **Hindi Diwas** to promote inclusive education.

Impact

- Identified **350 progressive learners**; **50 students mainstreamed**.
- Issued **7500+ books** and engaged **1500+ mothers** in academic support.
- Strengthened **government schools** through personalized learning and community participation.



Health

- Organized **general health camps** at Vira and Rampar villages, benefiting **344 patients** through early disease detection and basic treatment.
- Raised **awareness on hygiene, nutrition, and lifestyle diseases**, improving health literacy in underserved communities.
- Conducted **multi-specialty health camps** in Tuna CSR villages, offering gynecology, pediatrics, and eye care services to **244+ patients**.
- Referred **6 patients** to GKGH Bhuj for advanced care, ensuring timely diagnosis and improved healthcare access.



Awareness sessions



- Conducted health and hygiene awareness sessions across Mundra Block primary schools, engaging 247+ students and teachers.
- Promoted daily hygiene practices and healthy lifestyle habits to prevent infections and boost overall well-being.
- Completed health screenings for 240 students, supporting early detection and timely care.



Climate Action:

- 2 ponds deepening in Rampar Tuna to enhance water retention and support groundwater recharge.
- Developed "Adani Van" green zone with tree plantation, promoting biodiversity and ecological balance.
- Installed drip irrigation and fencing to ensure sustainable growth and protection of the plantation.



Adani Skills & Education



Vision

- Empower youth with future-ready skills by bridging education and employability gaps, fostering sustainable development and local job creation.

Mission

- Deliver industry-relevant training through finishing schools.
- Collaborate with communities and industries for inclusive employment.
- Boost regional growth by aligning skills with local job markets.

Education

Objectives

- Set up a Finishing School in Mundra Site for advanced sectoral training.
- Launch hands-on skill development projects.
- Organize job drives and community outreach.
- Partner with Unnati Life for localized career support.
- Encourage entrepreneurship and vocational education.

Challenges Addressed

- Academic qualifications without practical skills.
- Limited industry exposure and job readiness.
- Education-employment disconnect causing underemployment and migration.

• **45 Job drives**

• **4,500 Youth participated in the interview process.**

• **Over 1,200 candidates were successfully selected.**

Adani skills & Education

Skills

Vision

- To empower women through skill development, enabling financial independence and fostering community growth.

Mission

- To provide high-quality, hands-on training in traditional and modern vocations such as beauty therapy, mud work, dori work, artisan card making, and moti work—equipping women with the tools to start their own businesses.

Objectives

- Deliver specialized training programs through Adani Foundation.
- Promote self-employment and entrepreneurship among women.
- Preserve and enhance local crafts and skills.
- Create sustainable livelihood opportunities within the community.



Training	Numbers of women
Beauty therapy	80
Mud Work	40
Dori Work	32
Artisan card making	68
Moti work	10

Event



Under the "Swavalamban" program, 50 differently-abled individuals were empowered with self-employment resources and electric wheelchairs, promoting independence and dignity. The initiative inspired enthusiasm and hope, guided by the spirit of Seva Hi Sadhana, and reinforced Adani Foundation's commitment to inclusive development.



Adani Foundation organized an exam prep camp at GIMS Bhuj for 62 Divyang candidates in Kutch, offering study kits and expert guidance. The initiative promotes equal opportunity and self-reliance, reflecting the Foundation's commitment to inclusive development.

Event



Adani Foundation organized a medical camp during Navratri to support pilgrims walking to Mata no Madh. With doctors, medicines, and emergency transport, the initiative ensured health and safety while honoring cultural devotion. The camp not only provided essential medical care but also strengthened community trust through compassionate service and cultural alignment.



Adani Foundation inaugurated a new Balvatika at Zarpara School, creating a nurturing early learning space for young children. The initiative benefits 38 girl students, promoting foundational education and inclusive growth. This effort reflects the Foundation's commitment to empowering communities through quality education.

Event



Adani Foundation, extended resource support to 50 women entrepreneurs from 5 SHGs. The initiative aimed to strengthen their entrepreneurial journey by providing essential tools, training, and opportunities —empowering women toward sustainable livelihoods.



Adani Foundation celebrated Foundation Day with JNV Dumra students through a series of impactful activities, including tree plantation, environmental awareness sessions, safety training, and health check-ups. The initiative aimed to foster ecological responsibility, personal well-being, and community engagement among young learners.

Event



Adani Foundation employees actively participated in the Employee Volunteering Program, contributing to the distribution of nutrition kits at GK General Hospital. This initiative reflects their commitment to community welfare and promoting better health outcomes.



At Bhujpur, over 50 women received training in parlor services, empowering them to start and manage their own small businesses. Many participated during vacations or spare time to enhance their skills and boost self-employment opportunities. This initiative promotes economic independence and skill development among rural women.

Event



To support higher education among students from the fishing communities of Mundra and Mandvi talukas, Adani Foundation distributes educational kits annually. This year, over 80 children benefited from the initiative, which also included transportation arrangements to ensure better access to learning resources.



The renovation of Mamal Sagar near Bhujpur has enabled water storage of over 22,500 CUM, significantly benefiting more than 50 farms in the area. This initiative has also led to a notable improvement in groundwater levels, supporting sustainable agriculture and local water security.

Event



A 2-kilometer stretch of road in the Deshalpar (Kanthi) farm area was cleaned and treated with GSB, significantly improving local transportation. This development benefits orchard residents by easing school commutes for children and facilitating smoother market access for farmers to transport their produce.



In the villages of Tragadi and Modhva, a community shed was constructed to support the local fishing community. This facility will serve as a valuable space for social gatherings, events, and collective activities, benefiting all residents in the area.

STORIES

Empowering Dreams— From the Tides to Triumph



Hasan Kadar's journey began in the fishing village of Tragadi, where his family's daily life was shaped by the rhythms of the sea. Although the expectation was for him to follow the family tradition, Hasan dreamed of something greater—a career in engineering that would allow him to chart his own course.

He attended primary school in Tragadi and later completed high school in Nana Bhadiya, demonstrating an unwavering thirst for knowledge. However, the financial realities of his family's situation threatened to halt his studies after graduation. Hasan understood well that achieving ambitious goals often requires either substantial resources or a fortunate break.

At a time when his future looked uncertain, the Adani Foundation extended a helping hand. Their financial support enabled Hasan to enroll in a diploma program in electrical engineering, where he threw himself into his studies and excelled academically.

Today, Hasan is not only advancing in his profession but also serves as an inspiration to those around him.

"Today, Hasan stands as a successful engineer. He wholeheartedly acknowledges the pivotal role played by the Adani Foundation in his journey, expressing, "Dreaming of something and achieving it are separated by a vast distance. For me, my dream of becoming an engineer felt unattainable. But the Adani family appeared as a blessing, turning my dream into reality."

STORIES

A Journey of Grit and Gratitude: Najir's Remarkable Achievement



Najir Manjaliya, a bright student from the fishing village of Bhadreswar in Kutch, overcame financial challenges to pursue his dream of education. In 2023, he joined Adani Vidya Mandir Bhadreswar in Class IX and quickly adapted to its disciplined and nurturing environment. With unwavering dedication and support from his teachers, Najir excelled academically and scored an impressive 93.33% in his Class X SSC Board Examination. Grateful for the guidance he received, Najir now aspires to become an IAS officer, embodying the transformative power of education and perseverance.

STORIES

Perseverance Enabled through Adani Foundation Support



Gafurbhai Luhar, born in 1973 in Motikhakhar village in Gujarat's Mundra taluka, experienced paralysis in both legs at the age of five due to illness and complications from medical treatment. Despite living with a 65% disability, he continued his education with the assistance of his father, completing up to the seventh standard.

Following the passing of his parents, Gafurbhai resided with his elder brother but sought independence by selling vegetables locally. He was provided a three-wheeled cycle by the Adani Foundation; however, challenging road conditions and the 400-meter distance to his shop presented significant mobility barriers. Seasonal changes further exacerbated these difficulties.

Upon sharing his challenges with an Adani Foundation representative, Gafurbhai was subsequently provided with an electric wheelchair. This assistance greatly improved his mobility, enabling him to travel between his home and his shop efficiently, and participate in community activities independently. He acknowledges the support received from the Adani Foundation in enhancing his quality of life and appreciates their responsiveness to his situation.

STORIES

Journey of Healing and Resilience:



Tirthavandan Maharaj Saheb, a 50-year-old ascetic recognized for his disciplined and spiritual way of life, resided within a family comprising four brothers and two sisters. Notably, his younger brother, aged 19, had also committed to an ascetic lifestyle. Despite his dedication, Maharaj Saheb encountered significant health challenges that tested his resilience. Approximately one year ago, Maharaj Saheb underwent a routine hernia repair in Mumbai. Unexpectedly, he experienced severe postoperative pain at the surgical site, which resulted in six months of immobility and substantial limitations in walking and daily activities. Seeking further evaluation, he traveled to Surat, where an MRI identified post-operative neuritis of the inguinal nerves, considered responsible for his persistent symptoms. Upon his arrival at Adani Hospital in Mundra, Maharaj Saheb was welcomed by a compassionate team of healthcare professionals who provided thorough and attentive care. The treatment plan, carefully tailored to his unique needs, included advanced pain management, physiotherapy, and ongoing support to address his post-operative complications. Over the course of his stay, Maharaj Saheb gradually regained strength and mobility, which marked a significant turnaround from his previous state of immobility. With the support of hospital staff, Maharaj Saheb made a strong recovery and can now walk and engage in daily spiritual practices. He expressed deep gratitude to the Adani Foundation.

STORIES

An Initiative by the Adani Foundation



The Tejasvi Saheli Group, established in 2017 under the aegis of the Adani Foundation, serves as a notable example of community-driven women empowerment. The group originated in Baroi village with 12 women who, post-tailoring training at the Adani Skill Development Centre, sought to achieve economic independence.

With Adani foundational support and resources the Tejasvi Saheli Group started manufacturing school bags and clothing, steadily expanding their market to nearby towns like Bhuj and Anjar. Demonstrating adaptability, the group quickly pivoted during the COVID-19 pandemic to manufacture masks for a government contract, ensuring ongoing income while serving public health needs. Their entrepreneurial evolution continued in 2021 as they diversified into handicrafts, formed strategic partnerships, and participated in exhibitions, which significantly boosted their monthly earnings.

By 2024, the group had grown to 17 members, acquired additional equipment, opened a dedicated center, and secured major orders for designer Navratri attire, resulting in members earning between ₹13,000 and ₹14,000 monthly.

Till the date cumulative earnings of the Group stand at ₹44,96,600 This journey exemplifies how targeted support, skill development, and market responsiveness can drive sustainable economic empowerment for women within a community.

STORIES

"Empowering Independence



Alarkhiya Jusab, aged 48, is a resident of Mota Paiya village of Khavda Taluka. Born with a disability affecting both legs, has relied on manual mobility since childhood. Following the loss of their father, daily responsibilities and challenges increased his Struggle significantly.

After his elder brother's marriage and subsequent relocation, he became solely responsible for the care of his elderly mother and household tasks. To support the family, he rented a small cabin in Khavda from a local village leader and stocked it with essential goods to earn an income. Despite these efforts, substantial obstacles remained, faced difficulties to returning home due to the distance of the bus stop and frequent refusal by passing vehicles to provide transportation,

Previously, traversing the village manually had subjected Alarkhiya to ridicule. Upon learning of his Struggle , we contact and assessed and support a battery-operated vehicle which has paly pivotal role to improve his quality of life.

Now, he is able to commute daily with ease and provide enhanced care for his mother. This case highlights the transformative role of focused community support and accessible technology in promoting independence, dignity, and improved well-being.



Honorable Governor
of Gujarat Visited
Mundra Solar Pvt
Limited – Female
Technical Solar
Associate

Handing over Process by
Honorable Governor of
Gujarat at Bhopa Wandh Solar
Village



Bhoomi Pujan for Gaushala and Adani Van in Wanki, a Library in Beraja, and a Library cum Education Center in Mota Bhadiya. Additionally, the pond beautification and deepening work was initiated in Kandagra.



Appreciation letter from important stakeholder(s)

॥ श्री महात्म ॥ ॥ श्री श्री कल्याण नमः ॥
 ६०६ १२० नं. ६-२१००/६०६.

श्री मुरलीधर गौसेवा ट्रस्ट
 नाम : मुंढरा, ता. मुंढरा-६०६.

सन्मान पत्र

हाता सन्मान समारंभ - २०२५

**अदाणी इण्टर्नेशनल
 युवा चारणा सहयोग**

आपकी द्वारा श्री मुरलीधर श्री सेवा ट्रस्ट-मुंढरा में १६ रुद्रयोग कक्षा में १६ मठ आने आपकीला काली सीमे...
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आपना आभारी...

श्री मुरलीधर गौसेवा ट्रस्ट-मुंढरा

॥ वेद विना मति नही,
 गाय विना गति नही ॥

श्री समाधिषा वा.वि.प्र.शाळा नं. १
 ता.मुंढरा-६०६.
आभारपत्र

**परम रनेहीश्री
 अदाणी इण्टर्नेशनल
 मुंढरा.**

आपी श्री समाधिषा वा.वि.प्र.शाळा -१ परिवार हर्षणी लायणी अनुभवुं ऐ के की अदाणी इण्टर्नेशनल (जेएचएचएच फिलान्-मुंढरा) मुंढरा विद्यालय दिनेने प्रयाण्य आपीने चाला कला तैयतना अनेक विष प्रोग्राम चलाणी रह्या ऐ. तेना काली मुंढरा विद्यालयमें प्रतिगीत करुं यवुं ऐ.
 सन्मान आ प्रोफेसर पीडीने अने प्रोफेसर सेठे "रुद्रयोग प्रोफेसर" तेना घडी श्री समाधिषा वा.वि.प्र.शाळा -१ चालाने आला फेटीयने मर्द अने चाल मनेत ऐ. ते वैश्वीक कर्षीमें भूय ५ टैपयोगी कनेत ऐ. तेमच चालामें पराविशुलतरी चालापर अन्वयना माटे आपकी चला परीचामें टप पर्यायी अने कुलुषिड करीनुं भूय ५ टैप अने टैपयोगी कर्षी करेत ऐ. ते अदर अने.अने.सी. अने चाला परिवार आपकीने भूय भूय इतय पूरुड अन्वयन व्यक्त करे ऐ.
 अदियचामें पला चालामें अदाणी इण्टर्नेशनल अने रुद्रयोग प्रोफेसर अंतगत विधीष कर्षी यव अने आनकोना वैश्वीक कर्षीमें अने चाला संकुलामें टैपयोगी री तेवी अर्पण रुद्र योगेयना...

दिनांक : १६/०३/२०२५
 १६०६ १२० नं. ६-२१००/६०६ श्री समाधिषा वा.वि.प्र.शाळा नं.१ मुंढरा-६०६.

आभार पत्र

**आहरणीय चंडतीनेल शाह
 अदाणी इण्टर्नेशनल, मुंढरा.**

शुभ भारत सह साथे श्लाववानुं डे अदाणी इण्टर्नेशनल नी समाज माटे प्रेरणादायक महिला सशक्तिकरण नी कामगीरी तने करी रह्या ऐ ते अमारा माटे प्रेरणा अने प्रोत्साहन आपी रह्या ऐ आप ना सहकार अने मार्गदर्शन हेठण श्री समुद्ध इण्टर्नेशनल नांना कपाचा व्दास महिलाओ तया जाणडे माटे प्रवृति तेमच शेजगार मणी रहे तेवा प्रयासो हाश धरीने छीने श्री समुद्ध इण्टर्नेशनल ना प्रभुष हेमाक्षी टिच कुमार चाला तरद्वयी छेत्ता अण वर्षथी आप ना सहकार अने मार्गदर्शन हेठण मुन्दा तातुडाना नांनाकपाचा ग्राम नी जहेनो साथे मणीने संमोली तेमच शान्तीवल प्रेमपलेक्ष भाते साती रहेली कुड सीस्टर से स्वराहाय शुभ शुभ व्दास जहेनो पोतानी शेजगारी मेणवी रही ऐ ते अदर श्री समुद्ध इण्टर्नेशनल वती अने आपना सहयोग अदर आभार व्यक्त करीने छीने तेमच आगण पण आपणा सहकार नी अपेक्षा सह...

हेमाक्षी टिच कुमार चाला तेमच टिच
श्री समुद्ध इण्टर्नेशनल, नांना कपाचा

Annexure – 3

RISK ASSESSMENT STUDY AND PREPARATION OF CONTINGENCY PLAN FOR MARINE OIL SPILLS AT ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD., MUNDRA



Final Report

JULY 2025

Client



ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD
Mundra



Environ Software Pvt. Ltd.

#60/4, Environ Towers, 4th Floor, Hosur Main Road, Electronic City, Bangalore - 560 100

Certificate of Endorsement

I hereby certify that:

1. The oil spill contingency plan for the facility under my charge has been prepared with due regard to the relevant international best practices, international conventions, and domestic legislation.
2. The nature and size of the possible threat including the worst-case scenario, and the resources consequently at risk have been realistically assessed bearing in mind the probable movement of any oil spill and clearly stated.
3. The priorities for protection have been agreed, taking into account the viability of the various protections and clean up options and clearly spelt out.
4. The strategy for protecting and cleaning the various areas have been agreed and clearly explained.
5. The necessary organization has been outlined, the responsibilities of all those involved have been clearly stated and all those who have a task to perform are aware of what is expected of them.
6. The levels of equipment, materials and manpower are sufficient to deal with the anticipated size of spill. If not, back-up resources been identified and, when necessary, mechanisms for obtaining their release and entry to the country have been established.
7. Temporary storage sites and final disposal routes for collected oil and debris have been identified.
8. The alerting and initial evaluation procedures are fully explained as well as arrangement for continual review of the progress and effectiveness of the clean-up operation.
9. The arrangement for ensuring effective communication between shore, sea and air have been described.
10. All aspects of plan have been tested and nothing significant found lacking.
11. The plan is compatible with plans for adjacent areas and other activities.
12. The above is true to the best of my knowledge and belief.
13. I undertake to keep the plan updated at all times and keep the Indian Coast Guard informed of any changes through submissions of a fresh certificate of endorsement.

Seal

Signature :


Name

Designation : Dy. Conservator

Organization: Adani Ports and SEZ Limited, Mundra

Date:

Place:

	<i>Adani Ports and Special Economic Zone Ltd, Mundra</i>	<i>Conetnts</i>	<i>Rev.No: 04 Dt: 12th July 2025 Doc No: ENVR 2022-003-R4</i>
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CONTINGENCY PLANNING COMPLIANCE CHECKLIST

Port Authority: APSEZL


Description		Compl ied Yes/ No	Remarks
RISK ASSESSMENT			
1	Whether the facility produces/ handles/ uses/ imports/ stores any type of petroleum product	Yes	Petroleum products are directly transferred from vessels through pipelines
2	Whether risk assessment is done	Yes	Chapter-2 Page No. 17 & Chapter-4 Part-B report
3	Who did the risk assessment		Environ Software Pvt Ltd
4	Whether maximum volume of oil spill that can occur in the worst-case scenario is considered	Yes	25000 T Chap2, refer Para 2.5.3-page No: 21 & Chapter-4 Part-B report
5	Whether relative measure of the probability and consequences of various oil spills including worst case scenario are taken into account	Yes	Chapter2 refer para 2.5.3 Page No. 23 & Chapter-4 Part-B report
6	Whether all types of spills possible in the facility are considered including Grounding, Collision, Fire, Explosion, Rupture of hoses	Yes	Chapter2 refer para 2.1.1 Page No. 17 & Chapter-4 Part-B report
7	Please specify the list of oils considered for risk assessment	Crude, HSD & Fuel Oil	Chapter2 refer para 2.8 Page No. 24 & Chapter-4 Part-B report
8	Whether the vulnerable areas are estimated by considering maximum loss scenario and weather condition	Yes	Chapter2 refer para 2.12 Page No. 31
9	Whether impacts on the vulnerable areas are made after considering the Marine protected areas, population, fishermen, salt pans, mangroves, corals and other resources within that area	Yes	Chapter2 refer para 2.12- & 2.13-Page No. 31,32 & Chapter-3 Part-C report
10	Whether measures for reduction of identified high risks are included by reducing the consequences through spill mitigation measures	Yes	Chapter7 refer fig.7.1 Page No. 66
11	Whether steps have been considered to reduce risks to the exposed population by increasing safe, distances by acquiring property around the facility, if possible	Yes	Chapter 7 refer fig 7.1 Page No. 66
12	Whether risk levels are established for each month after considering the probability with tide and current and consequences of each such spill	NA	
13	Whether prevention and mitigation measures are included in the plan	Yes	Chapter8 refer para 8.1 Page No 84
14	Whether the spill may affect the shoreline. (length of the shoreline with coordinates)	Yes	Part-B report, chapter 5-OS modelling tables (Jan, July, Oct) page nos. 58-66
15	Whether time taken the oil spill to reach ashore	Yes	Part-B report, chapter 5-OS

	in each quantity of spill in various months are mentioned in the plan		modelling tables (Jan, July, Oct) page nos. 58-66
16	Whether sensitivity mapping has been carried out	Yes	Part-C report, chapter 3, refer para 3.1-page no. 5
17	Does the sensitivity mapping clearly identify the vulnerable areas along with MPAs, corals, fishermen community, salt pans, mangroves and other socio- economic elements in the area	Yes	Part-C report chapter 3, refer para 3.1-page no. 5
18	Do the sensitivity maps indicate area to be protected on priority	Yes	Part-C report Annexure-1 refer fig A.1.8-page no. 37
19	Does the map indicate boom deployment locations	Yes	Part-C report Annexure-1 refer fig A.1.1(a), (b)-page no. 35
20	Whether any Marine. Protected Area will be affected	Yes	Part-C report chapter 3, refer para 3.15-page no. 17
21	Whether total number of fishermen likely to be affected is mentioned in the plan	No	
22	Whether any salt pan in the area is going to be affected	No	
23	Whether any mangroves in the area will be affected by a spill	No	
Preparedness			
24	Whether any containment equipment is available	Yes	Chapter4, refer para 4.2 Page No. 43
25	Whether any recovery equipment is available	Yes	Chapter4 refer para 4.2 Page No. 43
26	Whether the facility is having any temporary storage capacity	Yes	Chapter4 refer para 4.1 Page No. 43
27	Whether location of the oil spill response equipment is mentioned in the plan	Yes	Chapter4 refer para 4.1 Page No. 43
28	Whether suitable vessels available for deploying the boom, skimmer etc	Yes	Chapter4 refer para 4.4 Page No. 44
29	Whether OSD held with facility	Yes	5000 Ltrs – Page No: 50
30	Whether the OSD held with the facility is approved for use in Indian waters	Yes	
31	Whether the facility has MoU with other operators for tier-1 preparedness	Yes	Oil companies, HMEL Operators
32	Whether the list of oil spill response equipment available with each agency in MoU is deliberated	Yes	Chapter 9 refer para 9.1 page no. 89
33	Whether the facility has any MoU with private OSRO	Yes	Chapter 9 refer para 9.4 page no. 91
34	Whether the procedure for evoking the mutual aid is clearly described in the plan	Yes	
35	Whether additional manpower is available	Yes	Chapter 10 refer para 10.2.3 page no. 106
36	Whether list of approved recyclers is mentioned in the plan	Yes	Chapter 10 refer para 10.2.1 Page No 105
37	Whether NEBA (Net Environmental Benefit	Yes	Part-D report, chapter 1,

	Analysis) has been undertaken		refer 1.2-page no. 2
38	Whether the areas from priority protection have identified in the plan	Yes	Part-D report, chapter 2, refer para 2.2-page no. 13
39	Whether relevant authorities and stakeholders were consulted for NEBA and during the areas for priority protection	Yes	Part-D report chapter 3
40	Whether District administration has been appraised of the risk impact of oil spills?	Yes	Part-D report
Action Plan			
41	Whether the plan outlines procedure for reporting of oil spills to Coast Guard	Yes	Chapter 2, refer para 2.6-page no. 22
42	Whether the oil spill response action is clearly mentioned	Yes	Chapter 3, refer para 3.1-page no. 36
43	Whether the action plan includes all duties to be attended in connection with an oil spill	Yes	Chapter 3, refer para 3.1 page no. 36
44	Whether the action plan includes key personnel by their names and designation viz. COO, ICO	Yes	Chapter 5-page no. 54
45	Whether alternate coverage is planned to take care of the absence of a particular person [in cases where action plan is developed basis names]	Yes	
46	Whether the plan includes assignment of all key coordinators viz. the Communication Controller, Safety Coordinator, Emergency management team, Administration and Communication Coordinator and Safety Coordinator	Yes	Chapter 10-page no. 93
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	Yes	Chapter10 Page No. 93
48	Whether approved recyclers are identified for processing recovered oil and oily debris	Yes	Chapter10 Page No. 104
49	Whether the shoreline likely to be affected is identified	Yes	
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2015	NA	
51	Whether the spill incident and its consequences are informed to fishermen and other NGOs for environment protection through media	NO	
Training and Exercises			
52	Whether mock fire I emergency response drills are specified in the plan	Yes	Chapter 5 refer para 5.2, page no. 54
53	Whether the mock drills cover all types of probable oil spills	Yes	Chapter 5 refer para 5.2, page no. 54
54	Whether the plan mentions list of trained manpower	Yes	Chapter 5 refer para 5.3, page no. 55
55	Whether records for periodic mock drills are maintained in a well defined format	Yes	Quarterly
56	Whether the plan to updated according to the findings in mock-drills and exercises	Yes	

57	What is the frequency of updation / review of contingency plan?	Yes	As an when required
58	Periodicity of joint exercise with mutual aid partners	Yes	
59	Frequency of mock-drills for practice	Yes	Twice in a year Chapter 12 Page no.131
60	Whether the records for periodic mock drills are maintained in a well defined format	Yes	Chapter 5
61	Frequency of updation / review of contingency plan	Yes	As an when required
We, hereby, declare that the all information appended above and true and correct to my knowledge or belief			
Date	Chief Conservator / Installation Manager		
VERIFIED			
Date	(District Commander ICG) or his representative		
Date	Regional Commander ICG)or his representative		

This is to state that at the request of Adani Ports & SEZL (AP &SEZL), the undersigned persons have prepared the Oil Spill Contingency Plan (OSCP). This OSCP has been prepared for oil spillage assessed based on the Risk Assessment carried out for various Port activities including loading / unloading operations of Crude / HSD / FO at berths, SPM, subsea pipeline leakage and Vessel collision / Grounding.

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CONFIDENTIALITY CLAUSE

The report has been prepared based on studies 1. Hydrodynamic, 2. Oil Spill fate and weathering characteristics 3. Environmental Sensitivity Mapping and 4. NEBA carried out for preparation of OSCP for Adani Ports & SEZL as per the work order dated 19th February, 2022 and is considered confidential. No part of this report may be release to any outside organization unless explicitly advised by the owners in writing.

Issued By:
Environ Software Pvt Ltd

Prepared by

Dr N M Anand

Dr G S Reddy

Dr. Rashmi

Reviewed by
Ms. Smitha, Environmental Engineer

Report Revision Record

Document No.	ENVR 2022-003-R1				Page:	

Introduction of

ABOUT ENVIRON

Environ Software Pvt. Ltd.

Environ Software (P) Ltd was incorporated in October 1998 and is located at Bangalore- the Silicon Valley of INDIA. It has a team of highly skilled and dedicated staff, specializing in Coastal Engineering, Hydraulics, Mechanical Engineering and Computer Science & Engineering. Environ is a multi-disciplinary software development and consulting firm focusing primarily on solutions to problems involving Air, Water and Soil pollution through the in-house, state-of-the-art computational tools. It is capable of solving a wide variety of coastal and marine pollution related problems that include prediction of currents and tides, flood forecasting, morphological changes of estuarine bed and effects on marine population due to discharge of various industrial pollutants and construction of marine structures.

The company is also capable of predicting the spread of various pollutants in air media, emitted from the industries and vehicles. Environ also provides numerical solution to the problems related to sub-surface flows and transport of pollutants. The company also provides full service on field monitoring studies to measure and assess conditions in oceans, coastal areas, lakes, rivers and in air pollution monitoring.

Apart from dealing with complex environmental issues the company is developing a sophisticated Computational Fluid Dynamics (CFD) software, with appropriately chosen numerical methods and physical models for solving Fluid flow, Heat Transfer and Radiation problems. It is capable of solving incompressible, compressible, and two phase

Hydrodyn™



flows etc, with different integrated solvers. The company is also concentrating on the development of dedicated software for a specific application because the user is more oriented in many other things than looking for new developments in numerical methods.

Environ products are absolutely user friendly which requires minimal training. The highlights of the products of Environ are interactive, high quality Pre- and Post-Processor utilities which promises enhanced performance.

Environ was developed softwares for Library Automation, Institutional Management and Company Automation etc. based on client/Server, Internet/e-Business and Wireless Application tools.

STRATEGIC AREAS

Scientific Simulation Software

Scientific simulation software products are self-contained, absolutely user friendly and integrated with pre- and post processor utilities.


- Air Pollution Simulation Models (APSM)
- Surface Water Pollution Simulation Models (SWPSM)
- Ground Water Pollution Simulation Models (GWPSM)
- Noise Pollution Simulation Models (NPSM)
- Fluid Dynamics Simulation Models (FDSM)

Consultancy Services offered

Internet and e-Business Development

- Complete e-business solution
- Business to Customer and Business to Business Solutions
- Web Design and Consultancy
- Support & Maintenance of launched web sites
- Wireless Applications

Client/Server Applications

	<i>Adani Ports and Special Economic Zone Ltd, Mundra</i>	<i>Conetnts</i>	<i>Rev.No: 04 Dt: 12th July 2025 Doc No: ENVR 2022-003-R4</i>
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- Modelling of Air, Water, Ground Water Pollution & Fluid Dynamic and Heat Transfer Applications
- Environmental Modelling & Impact Assessment
- Risk Assessment/Analysis
- Hazardous Waste water Management
- Library Management System for complete library automation
- Customized Application Development viz. Inventory control, Accounts etc.
- Medical Transcription Monitoring System

1. Development of Scientific Simulation Software for

- Air Pollution, Surface Water pollution and Ground Water Pollution and Noise pollution problems

2. Consultancy Services offered for

- Modelling of Air, Water, Ground Water Pollution & Fluid Dynamic and Heat Transfer Applications
- Environmental Modelling & Impact Assessment
- Risk Assessment/Analysis, Hazardous Waste water Management

3. Internet and e-Business Developmentr

- Complete e-business solution
- Business to Customer and Business to Business Solutions
- Web Design and Consultancy
- Support & Maintenance of launched web sites
- Wireless Applications


4. Client/Server Applications

- Library Management System for complete library automation
- Customized Application Development viz. Inventory control, Accounts etc.
- Medical Transcription Monitoring System.


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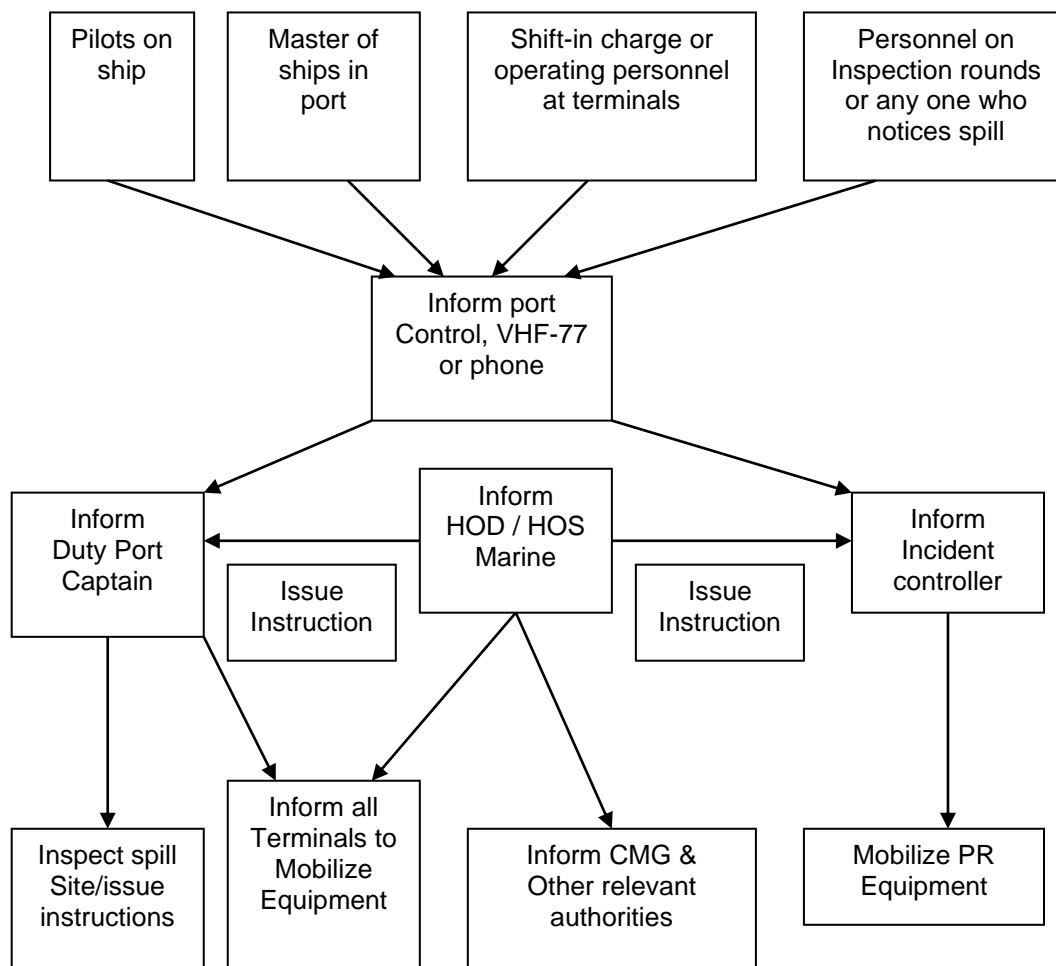
ABBREVIATIONS

APSEZL	Adani Ports & Special Economic Zone Limited
ADIOS	Automated Data Inquiry for Oil Spills
CC	Communications Coordinator
CCA	Central Coordinating Authority
CGHQ	Coast Guard Head Quarters
CIC	Chief Incident Controller
CISF	Central Industry Security Force
CMG	Crisis Management Group
CMT	Crisis Management Team
COC	Communication and Operations Center
CTTL	Chemical Terminal Trombay Ltd.
DCA	District Coordinating Authority
DCC	District Contingency Committee
DHQ	Coast Guard District Head Quarters
DNV	Det Norske Veritas
ECC	Emergency Control Center
EG	Environment Group
ESI	Environmental Sensitivity Index
HFO	Heavy Fuel Oil
HM	Harbour Master
IAP	Incident Action Plan
IC	Incident Controller
IDRN	Indian Disaster Resource Network
IM	Incident Manager
IMD	India Meteorological Department
IMO	International Maritime Organization
IMT	Incident Management Team
IOCL	Indian Oil Corporation Ltd.
IPIECA	International Petroleum Industry Environmental Conservation Association
JD	Jawahar Dweep
LAG	Local Action Group
LCA	Local Combat Agency
LO	Logistics Officer
LST	Local Action Group Support Team
MARPOL 73/78	International Convention for the Prevention of Pollution from ships 1973 as modified by the protocol of 1978

MMd	Mercantile Marine Department
MoU	Memorandum of Undertaking
MPC	Marine Pollution Coordinator
MRU	Marine Response Unit
NEBA	Net Environmental Benefit Analysis
NFPA	National Fire Protection Association
NOS-DCP	National Oil Spill Disaster Contingency Plan
NRT	National Response Team
OPRC Convention	International Convention on Oil Pollution Preparedness, Response and Co-operation 1990
OSC	On screen Coordinator
OSD	Oil Spill Dispersant
OSR	Oil Spill Response
OSRO	Oil Spill Response Organization
OSRO-M	Oil Spill Response Organization-Manager
OSRO-S	Oil Spill Response Organization-Specialist
PC	Port Control
POC	Participating Oil Company
POL	Petroleum, Oil and Lubricants
SA	Statutory Agency
SC	Shoreline Coordinator
SCBA	Self-Contained Breathing Apparatus
SRV	Spill Response Vessel
UNCLOS	United Nations Convention on Laws of the Sea
VHF	Very High Frequency

OILSPILL CONTINGENCY PLAN

Contingency Chart to deal with Oil Spill



FINAL MEASURES

- Coordinate at District, State, National level including MOST if crisis level 2 or 3
- Informs Coast Guard-clean up contractors
- Restore berth operational
- Question witnesses
- Complete maritime accident report
- Give press reports
- Survey and cost damage to port installation
- Hold meeting of all concerned parties
- Seek compensation
- Distribute final report to concerned authorities.

PREFACE

Adani Ports and Special Economic Zone Limited (APSEZL), Mundra has awarded the project to M/s Environ Software Pvt Ltd to carry out the Risk Assessment Study, Sensitivity area mapping and preparation of Oil Spill Contingency Plan for Tier-1 Oil Spill Response (OSR) facility for (APSEZL). This report contains the Strategy Plan & operation plan which describes the scope of the plan including the geographical coverage, oil spill modeling studies, perceived risks, spill response and clean-up strategy, equipment, storage facilities, responsibilities and action plans, communication, etc.


The report also presents the characteristics and weathering processes of oil, the impact of oil spills on the marine environment and agencies to be informed in case of emergency. The report elaborates on the strategy plan for the oil spill as per IMO guidelines as well as the responsibilities of regional and national oil spill combating agencies.

Marine Sensitivity Atlas has been prepared for areas all along the coasts of Gulf of Kutch region. Environmental sensitivity mapping also done based on the available data of environmental, biological and industrial information.

The report also includes specific instructions for responders, once the spill occurs, response plan based on NEBA studies for combating operations for spilled oil. This is to ensure that emergency action by responders gets underway promptly and in an orderly manner. The statutory regulations, area of operations, training and competence is also included in the report.

We express our gratitude to Mr. Yogesh Nandaniya, Mr. Sudhakar Singh, Capt. Sachin Srivastava Head-Marine Services, Mr. Sanjay Kewalramani COO-TAHSL, Capt. Rajat Garg, Mr. Mangal Choudhary of **APSEZL** for their assistance and suggestions during the preparation and successful completion of this project. We are thankful to the above officers for providing information on oil spill contingency plan and acknowledge the valuable information provided by them.

Dr. G. S. Reddy
(Managing Director)

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EXECUTIVE SUMMARY


APSEZL, Mundra handles the majority of its cargo and liquid products traffic through the South and West port terminals. There are several berths and Jetties at Mundra for berthing of cargos. Two subsea pipelines connect the onshore to the IOCL, HEML SPMs. There are 11 Container Berths, 16 Multi-purpose Berths, 1 LNG Jetty and two SPMs with back-up facilities at Mundra for berthing cargo vessels and oil tankers. Two subsea pipelines connect the SPMs (IOCL and HEML) to onshore oil terminals at Mundra.

The location of Cargo Berths, SPMs and marine facilities of **APSEZL** are situated approximately at 572000m Easting and 2515500m Northing. The berths are located in the north bank of Gulf of Kutch at Mundra. The berths are operating for cargo operability and potential to meet the future demands. Sufficient clearance to the existing surroundings has been maintained, including a minimum encroachment into the greenbelt and adequate distance to populated areas. The layout of the complex allows space for future extension, without compromising desired safety and separation distances within the complex or to adjacent port activities.

The main objective of the study is to carry out risk analysis of oil spills for various activities of port operations and to assess the impact of major accidental hazards from the facilities on the marine population and property within and outside the battery limit of the facilities and on coastal environment. Results of the study will be useful in preparation of response plan for containment of oil spills, in case if it occurs during loading / unloading operations / accidents. The results will also be useful in developing a meaningful emergency and response plan.

At present **APSEZL**, Mundra has the responsibility to deal with Tier-1 oil spill within port limits. The **APSEZL**, Mundra has entered into MOU with neighboring ports and others to deal with Oil spills. The funding is by ports and others. The Consultant assessed the OSR Equipment available with the Port and agencies in the vicinity of **APSEZL**, Mundra. The existing mechanism to deal with Tier-1 oil spill response through a specialist agency where there is no capital cost and manpower by the **APSEZL**, Mundra is appropriate in the present circumstances.

Based on Gap Analysis a new Equipment list is suggested which incorporates some of the recommendations of NOS DCP-2018.

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The following studies were carried out as integral part of Oil Spill Contingency Plan

A. Quantitative Risk Assessment of oil spill for AP & SEZL

The oil spill risks at **APSEZL**, Mundra are evaluated in consideration with the probability of a spill occurring and the consequences. The risk assessment has been made considering many factors i.e., Frequency of vessel movement, Operation time of the port, Vessel condition, Performance of vessel crew, Traffic density, Weather conditions, Type of oils handling, relevant past data, identification of Hazard, Frequency, Consequence and risk estimation.

After carrying out the detailed study of the offshore facilities which include the surface facilities viz., platforms, berths / Jetties, vessels and subsurface pipelines and all other associated infrastructure required for port operations of **APSEZL**, Mundra, the causes of spill scenarios identified are as following.


- Operations at Berth
- Spills due to Collision/Grounding in the Tanker route
- Bunker/ fuelling operations
- Ship distress / sinking
- Spill due to rupture in subsea pipeline corridor (size of crack-1")
- Rupture of export line due to movement and landing along the coast.
- Bunkering of HSD / Crude for vessels

Based on the above factors and failure frequency of port operation facilities, the following spill quantity are estimated.

- Spill due to Loading arm failure at Jetty: (167 m³, at pumping rate of 10000 m³/h crude oil for 1 min)
- Spill due to rupture of sub-sea crude oil pipeline from refinery to shore tanks: (2611 tons of crude for 36 hrs)
- Spill due to Tanker Collision at Jetty having capacity between 1,00,000-3,00,000 metric tons (25000 tons)
- Spill due to collision or grounding in the Tanker route (25000 tons)

The following spill locations were identified based on port operations.

- Crude oil spill of 700t at selected SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Fuel oil spill of 700t at selected West Port(S5), Vessel route(S7), LNG Jetty(S8), South basin (S9), Mundra Ports(S11), MICT/AMCT(S12)
- Crude oil spill of 10000t at SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Crude oil spill of 25000t at SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Fuel oil spill of 100t at selected West Port (S5, S6), LNG Jetty(S8), South basin (S9,

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- S10), Mundra Ports(S11), MICT/AMCT(S12), East Basin(S13), North Basin(S14)
- HSD oil spill of 50t at selected West Port(S5), LNG Jetty(S8), South basin (S9), Mundra Ports(S11)
 - HSD oil spill of 20t at selected West Port(S6), South basin (S10)

Continuous Spills

- Crude oil spill of 10000 m³/hr for 1 min at selected SPM-HMEL(S1), SPM-IOCL(S2)
- Crude oil spill of 10000 m³/hr for 1 min at selected VLCC Jetty (S15)
- Crude oil spill of 10000 m³/hr for 1 min at sub-sea pipeline route (S3)

The details for estimating the quantitative risk assessment at spill locations are discussed in **PART-B-OILSPILL MODELING STUDIES** of the report.

B. Assess Oil Spill trajectory in the worst-case scenario in different weather and sea conditions;

The prediction of fate and transport of oil spill plays a major role in the analysis of risks due to oil spills. It is computed based on the surface water currents and wind speed.

Modeling the hydrodynamic processes is an integral part for modeling the fate and transport of oil spills. The basic oil-spill model developed at Environ Software (P) Ltd was used in the present work to estimate the risk assessment due to oil spills for various weathering and meteorological conditions.

Hydrodynamic modeling studies carried out using the Hydrodyn-FLOSOFT for predicting tidal levels and current for a period of one year (12 months). For all possible port facilities, spring and neap tide conditions has been simulated. The details for Hydrodynamic modeling studies are discussed in **PART-A-HYDRODYNAMIC MODELING STUDIES** of the report.

Fifteen spill locations at and around Adani Port and SEZ Limited, Mundra regions and 35 oil spill scenarios are considered for oil spill simulations.

Details of Oil Spill Scenarios


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Table 4.4. Details of Oil Spill Scenarios

Comp. Runs	Spill Location	WD (m)	Spill Qty	Type of oil	Spill Location Co-ordinates
A SPMs					
1	SPM-HMEL (S1)	29.50	700 tons	Crude	69° 37' 23.19" E, 22° 40' 59.06" N
2			10000 tons	Crude	
3			25000 tons	Crude	
4			10000 m ³ /h for 1 min	Crude	
5	SPM-IOCL (S2)	28.45	700 tons	Crude	69° 39' 14.05" E, 22° 40' 47.21" N
6			10000 tons	Crude	
7			25000 tons	Crude	
8			10000 m ³ /h for 1 min	Crude	
B VLCC Jetty					
9	Spill Location (S15)	15.71	700 tons	Crude	69° 40.78' E, 22° 43.6' N
10			10000 tons	Crude	
11			25000 tons	Crude	
12			10000 m ³ /h for 1 min	Crude	
C Pipeline					
13	Crude oil spill of 2611 tons at the pumping rate of 12500 m ³ /hr (2611 Tons of crude for 36 hrs) along the pipeline corridor at a select (midway) point of subsea pipeline in the pipeline routes. -- Spill point: (S3)	21.20	12500 m ³ /hr for 3hr	Crude	69° 39' 43.35" E, 22° 42' 36.39" N
D Tanker Route					
14	Instantaneous crude oil spill of 25000t along the tanker route at select location. Spill point: S4	22.54	25000 tons	Crude	69°32'11.38" E, 22°36'1.13" N
E West Basin (berths)					
15	100 tons (due to Berthing incident/ collision) at the West Basin berths (FO) Spill point: S5	14.61	100 tons	FO	69°34'13.99" E, 22°45'15.54" N
16	50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the West Basin berths (HSD) Spill point: S5		50 tons	HSD	69°34'13.99" E, 22°45'15.54" N

17	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berths -- Spill point: S5		700 tons	FO	69°34'13.99" E, 22°45'15.54" N
18 & 19	In the maneuvering basin: <ul style="list-style-type: none"> ○ 20 Tons of HSD oil due to Tug Impact (HSD) ○ 100 Tons of FO due to Tug Impact Spill point: S6	14.48	20 Tons 100 Tons	HSD FO	69°34'22.75" E, 22°45'5.33" N
20	Along the vessel route at one location: Instantaneous oil spill of 700t along the tanker route at a select location. (FO): Spill point: S7	17.08	700 tons	FO	69°33'40.66" E, 22°43'36.31" N
F	LNG berth				
21	100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: S8	13.76	100 tons	FO	69°33'40.66" E, 22°43'36.31" N
22	50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the LNG berth (HSD) –Spill point: S8		50 tons	HSD	69°33'40.66" E, 22°43'36.31" N
23	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth-- Spill point: S8		700 Tons	FO	69°33'40.66" E, 22°43'36.31" N
G	South Basin (berths)				
24	100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: S9	14	100 Tons	FO	69°39'38.08" E, 22°43'32.54" N
25	50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the South Basin berths (HSD) – Spill point: S9		50 Tons	HSD	69°41'3.53" E, 22°43'50.33" N
26	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth -- Spill point: S9		700 Tons	FO	69°41'3.53" E, 22°43'50.33" N
27 & 28	At the turning circle: <ul style="list-style-type: none"> ○ 20 Tons of HSD oil due to Tug Impact 	17	20 Tons 100 Tons	HSD FO	69°41'33.62" E, 22°44'6.49" N

	<ul style="list-style-type: none"> 100 Tons of FO due to Tug Impact Spill point: S10				
H	MMPT				
	At the existing MPT1 berth: : Spill Point S11				69°42'20.45" E, 22°43'32.17" N
29	100 tons (due to Berthing incident/ collision) at the berth (FO) -- Spill point: S11	20.80	100 Tons	FO	69°42'20.45" E, 22°43'32.17" N
30	50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the berth (HSD) – Spill point: S11		50 Tons	HSD	69°42'20.45" E, 22°43'32.17" N
31	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth : Spill point S11		700 Tons	FO	69°42'20.45" E, 22°43'32.17" N
I	MICT / AMCT Berths:				
	At the existing MICT / AMCT Berths: : Spill point S12				69°42'56.30" E, 22°44'36.69" N
32	100 tons (due to Berthing incident/ collision) at the (FO) - Spill point S12	15.12	100 Tons	FO	69°42'56.30" E, 22°44'36.69" N
33	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth - Spill point S12		700 Tons	FO	69°42'56.30" E, 22°44'36.69" N
34	100 tons (due to Berthing incident/ collision) at the East Basin berths (FO) Spill point: S13	20.0	100 Tons	FO	69° 45' 37.58" E 22° 47' 10.73" N
35	100 tons (due to Berthing incident/ collision) at the North Basin berths (FO) Spill point: S14	0.5	100 Tons	FO	69° 41' 35.79 E 22° 46' 6.76 N

Hydrodyn-OILSOFT, a dedicated software for oil spill trajectory modeling was used for prediction of oil spill scenarios at selected locations in and around **APSEZL** facilities for various meteorological and hydrological conditions considering the worst-case oil spill scenario of instantaneous / continuous spills. The output of the model indicates the amount of spill that can

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take place and time taken by the spill (Hourly/Day basis) to reach the shoreline or protected areas such as mangroves, environmentally sensitive receptors, eco-sensitive zones, etc.). From the oil spill modelling studies, the following conclusion could be drawn.


- The spill volume and time taken to reach the coast and losses during its movement have been calculated.
- The percentage of spill volume reaching the coast, extent of oiling on the coast in metres, likely vulnerable areas, spill analysis, have been calculated.
- Resources such as tidal flats, islands and coastal areas which are likely to be threatened from oil spills have been identified.
- It can be concluded that the spills would move towards Sikka coast, Kalubhar Island, Mundra Port and Vadinar coastal Zones during early of January.
- During the early of July, spills would move towards towards Kandla, Adani Port boundaries within 2 hours from spill start. Some spill scenarios such as Tanker Entry shows the spill staying in open ocean for long period of time.
- It can be noticed that the spill oil would reach Sikka and Vadinar coast. Some spill scenarios such as Tanker Entry, shows the spill staying in open ocean for long period of time.

The details for Oil spill trajectory and weathering studies are discussed in **PART-B- OIL SPILL FATE AND TRAJECTORY MODELING STUDIES** of the report.

C Environmental Sensitivity mapping of the areas likely to be affected by the oil spill

The objective of the study is to produce a tool for oil spill responders by providing an overview of resources vulnerable to oil spills, i.e., natural resources (Mangroves, Mudflats, Reef flats, Sandy Area, Sea Birds/Birds Nesting Area, Marine Mammals (Dolphins, Dugongs, Whales), Turtle Nesting Areas, Marine National Park, Marine Sanctuary, Forest Area) and Human activities (Fishing zones, Industrial Sea water Intakes, outfall, Ports, jetties etc.)

The Environmental Sensitivity Index has been prepared based on the latest satellite information as well as available secondary data information of Gulf of Kutch region. This study is made as a part of the preparations for Risk Analysis study of oil spills in the Mundra region, Gulf of Kutch. The study covers the region between latitude Lat 22° 44' 18.89" N and longitude 69° 46' 42.67" is in Mundra region. The entire area of Gulf of Kutch has been divided into 12 zones and collected all marine sensitive information and prepared the Environmental sensitivity Index Mapping and Atlas based on IMO guidelines for the **APSEZL**, Mundra area.

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Identified the most sensitive site and resources potentially exposed to oil spills due to the handling of crude oil in the **APSEZL**, Mundra region. The coastal sensitive areas including biological, industrial and socio-economic resources are identified and prepared Environmental Sensitivity Index (ESI) mapping of the areas likely to be affected by the oil spill. The details of ESI are discussed in **PART-C: SENSITIVITY INDEX MAPPING** of the report

D. Oil Spill Response equipment and manpower to deal with the assessed quantity of the oil spill

Various response options (Mechanical equipment's, in-situ burning, dispersants and shoreline booming) have been discussed based on various spill scenarios of **APSEZL**, Mundra considering coastal marine sensitivity analysis of Gulf of Kutch region. The Net Environmental Benefit Analysis (NEBA) has been formulated considering all available response options for oil spills and selected the techniques that will provide the best opportunities to minimize consequences for the environment.


The study has been divided the potential relative Impact ranging from 1 (None) to 4(High). Likewise, the impact modification factor was also divided from 1 (None) to 4 (High) for four categories of response options (Mechanical equipment's, in-situ burning, dispersants and shore line booming). The intermediately ranges for both axes were then further divided to provide some more definition to the matrix. The risk ranking matrix for this NEBA was based on Environmental, Industrial and Biological sensitive areas risk assessment matrices generated.

The NEBA process is to evaluate the consequences of Natural Attenuation, which serves as a baseline. All subsequent rankings are relative to the baseline, i.e., are conditions better or worse for each resource when using each individual response options. Using the risk ranking matrix requires estimating the proportion of the resource affected, and how long it will take the resource to recover. Based on the total impact mitigation score and ranking of High (4), Low (- 4) was assigned.

Based on the NEBA analysis selected best multiple response options are mechanical and dispersants among other response options available for APSEZL Mundra

NEBA studies has been carried out based on available response options to be prepared as a part of Oil Spill Contingency Plan for **APSEZL**, Mundra region. The details of NEBA studies are discussed in **PART-D: NET ENVIRONMENT BENEFIT ANALYSIS** of the report.

In accordance with the National Oil Spill Disaster Contingency Plan (NOSDCP) all the Ports are required to maintain Tier-I Oil Spill Response (OSR) facilities. Accordingly, **APSEZL**, Mundra has

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to set up and sustain Tier-I (up to maximum spill volume of 700 Tonnes) OSR facilities in Mundra in co-ordination with neighboring companies operating at these Ports. For this purpose, APSEZL, Mundra and other Participating Companies (HMEL) has executed a Memorandum of Understanding (MOU) for sustenance of Tier-1 OSR facilities for combating oil spills at and surrounding area within Mundra region. The oil spill response facilities and required manpower are estimated based on risk assessment study and oil weathering condition to deal with expected quantity of spill and should be placed in the vicinity of **APSEZL** has been provided in the Annexures.

E. Comprehensive oil spill contingency plan (OSCP) for the APSEZL, Mundra

The report consists of the following sections

Strategy section


This part consists of oil spill risk assessment, response objectives and strategies, organization and details of response equipment's. This section is designed to help responders understand in advance the expected oil spill scenarios, the ways and means to respond effectively and to minimize pollution of the environment. This part of the plan is from **Chapter 2** to **Chapter 6**.

Action and operation section

This section includes specific instructions for responders, once the spill occurs, on what to do and how to do, for each oil spill incident. This is to ensure that emergency action by responders gets underway promptly and in an orderly manner. This part is from **Chapter 7** to **Chapter 10**.

Data directory

This part includes information on Coastal facilities, Access roads, Telephones, Hotels, shoreline resources available with various organizations, Sensitivity area Mapping, primary oil spill equipment available, communication facilities etc., statutory regulations, area of operation, training and competence, weathering data on Hydrodyn-OILSOFT, Mud flat shore cleanup techniques, OSD Specifications, Oil Spill Management plan of **APSEZL**, oil spill response decision tree, IMO Guidelines on OSR to areas full of. This part is Chapter 11.

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PROJECT TEAM OF ENVIRON SOFTWARE (P) LTD

Name of the Person Involved	Project Designation	Role and Responsibility
Dr G S Reddy	Project Leader	Assessing the data required Managing the team and Supervision of data inputting the model Analyzing the output data Report preparation
Ms. Smitha Dr Rashmi Ms. Jyoti Kerkar Mr. GS Pavan Reddy Mr. Rajesh Ms. Lakshmi	Team Members	Data interpretation & Simulation runs Prepare the tools for report preparation Preparing the input data for model Simulation runs Digitizing the satellite Maps Graphical outputs preparation Report preparation

1. INTRODUCTION

1.1 Contingency Plan:

Oil spill contingency planning is the process of developing a suitable spill response capability that is in compliance with the local regulatory framework and commensurate with the oil spill risks of an organization or facility. This document provides guidance on the contingency planning process for potential oil spills in or on water following an accidental release of oil into the marine or aquatic environment during the handling, transport, production or storage of oil products.

The intensity of marine traffic has increased tremendously along the Indian coasts, especially increase of oil tankers for transporting the petroleum products. Hence, there is an increased risk of occurrence of oil spills along the vessel route, Berth/Ports during terminal operations. The spills also occur due to collision/grounding of vessels. The oil spills will lead to marine environmental pollution and damage the ecosystem including marine infrastructure facilities of Ports and Harbors. Hence, oil industries and ports should have individual capabilities to handle the response activity in case of spills. The procedures prepared at various levels for handling the spills is called as the Contingency Plan. The study area as shown in Fig 1.1 provides a location of APSEZL, Mundra including cargo berths / Jetties and SPMs.

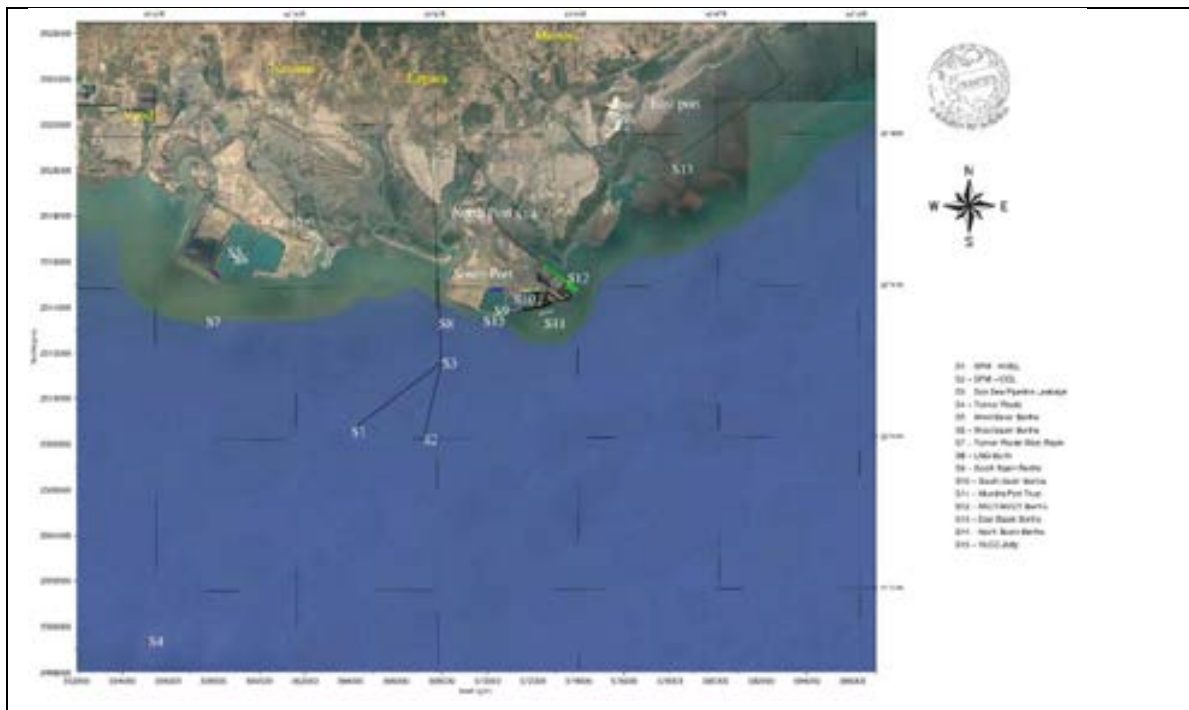


Fig.1.1 Cargo berths / Jetties of APSEZL, in the Mundra region, Gulf of Kutch

1.2 Description of operations at APSEZL, in Mundra

The APSEZL, Mundra, is located (Lat 22° 44' 18.89" N, long 69° 41' 35.62" E) at Mundra in Gulf of Kutch, protected by the southern / northern coast of Gulf of Kutch. The deep waters in the Gulf provide ample shelter for shipping throughout the year. The entrance of the Ports which has approaches from the mouth of Gulf of Kutch at Okha, at a distance of about 90 km from Mundra.

The approach channels to the APSEZL ports are deepened to meet the requirement of cargo vessels. With good lighting arrangements navigation is allowed at the port round the clock.

APSEZL, Mundra has been operational since Oct 1998 when the construction of primary infrastructure and a multi-purpose terminal for dry and liquid Bulk cargo was completed. Presently APSEZL, Mundra has 11 Container Berths, 16 Multi-purpose Berths, 1 - LNG, 1 - VLCC and 2 - SPMs with back-up facilities.

The location of the Berths situated at Mundra is approximately at Latitude: 22° 44' 18.89" N, Longitude: 69° 41' 35.62" E. The berths are located in the northern bank of Gulf of Kutch region. The berthing jetties are for operating vessel operability and has the potential to meet the future demands. APSEZL has developed Cargo berths, approaches and turning circles to handle vessels at the Berth.

APSEZL, Mundra, currently owns and operates several marine facilities located at Mundra, Gulf of Kutch. The Mundra port facility is located on the West Coast of India in Gulf of Kutch about 50 km west of Kandla in District Bhuj of Gujarat state.

The APSEZL, Mundra handles the majority of its dry and liquid products traffic through the South, West terminals. There are several berths and Jetties at Mundra for berthing of cargos. Two subsea pipelines connect the onshore to the IOCL, HEML SPMs (Fig.1.1).

APSEZL, Mundra has developed various marine facilities which include four mega scale basins i.e., South Basin and West Basin at Mundra in last five years. Fig.1.2 gives the overall layout of the Mundra port facilities and, Fig.1.3, Fig.1.4 gives the zoomed-up portion of the port layout considered for this study.


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Fig.1.2 Overall layout of the APSEZL, Mundra port facilities showing spill locations selected



Fig.1.3 Zoomed portion showing marine facilities of South Basin and spill locations selected

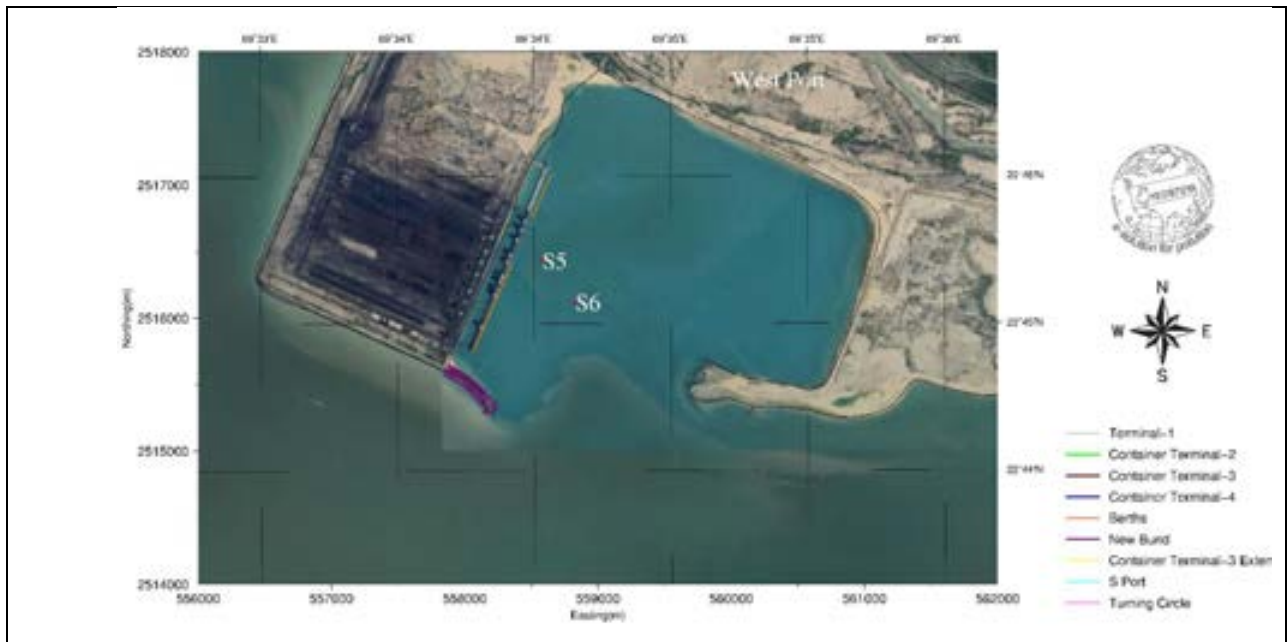


Fig.1.4 Zoomed portion showing marine facilities of West Basin and spill locations selected

Existing berths and Proposed Jetties

There are 16 existing berths at MMPT 1, MMPT 2, MMPT 3, MICT, AMCT catering to liquid, Container as well as General cargo. APSEZL, Mundra is under progress for expanding the Terminal-2 and Terminal-3 for handling container and dry cargos.

West Basin

West Basin is about 10 nautical miles west of the existing terminals of Mundra port. Four Berths are located at approx. 22° 45' 14.82" E and 69° 34' 6.23" N, off Tunda Wandh falling in Taluka Mundra. The basin is also planning to expand with 3 more additional berths for handling dry cargo. Two power plants are located North of these berths, in barren waste land. National Highway 8A extension passes through north side of the power plant sites at a distance of approximately 6 km.

South Basin

The south basin is in western side of the existing port on Navinal Island. Six berths are located at approx. 22° 44' 18.89" N, 69° 41' 35.62" E. It has presently 6 operational berths. It has an enclosed turning basin and necessary back up area. The basin is also planning to expand with two container berths (CT-5) for handling Container cargo.

VLCC Jetty:

The development of jetty facilities is in progress for handling VLCC at Mundra for Crude oil operations.

The oil spill risk analysis studies are to be carried out for all these facilities within the Mundra port limit which comprise of the SPMs, West basin, South basin, LNG Jetties, proposed VLCC jetty and existing berths as shown in Fig.1.1, Fig.1.2, Fig.1.3, Fig.1.4 and Fig.1.5. Hence, mathematical modeling studies for predicting the fate and oil spill trajectory due to spills if any at Port operations facilities for various seasons is mandatory for OSCP. Oil spill modeling is to be carried out as part of the Oil Spill Contingency Plan to identify the suitable combating operations for controlling the spills.


1.3 Purpose of the Plan

APSEZL, Mundra is committed to properly manage any oil spill incident that may arise during the course of the port operational activities in order to minimize the impact on personnel, environment, ecology, socio-economy, property, company's financial position and its reputation. As part of regulatory requirements, APSEZL, Mundra is mandated to establish an Oil Spill Contingency Plan (OSCP) for Tier-1 response capabilities, duly approved by the regulatory authorities, and which includes an effective response system with trained personnel and a pre-established organization structure as well as the capability to mobilize and respond to the spill incident in the least amount of time. The primary purpose of the plan is to facilitate the implementation of the necessary actions to stop or minimize the discharge of oil/chemicals and to mitigate its effects using best response facilities and use of oil spill dispersants (OSD).

1.4 Objectives of the Plan

The objectives of the OSCP are:

- To establish a rapid and effective system for detection and reporting of spills, with adequate measures for preparedness for oil and chemical pollution;
- To facilitate rapid and effective response to spill events with adequate measures to protect the health and safety of personnel, community, socio economic resources and protection of the marine environment;
- To establish appropriate response techniques to prevent, control, and combat oil and chemical pollution during spills, and disposal of contained material in an environmentally sound manner;
- To establish the communication channels essential for the coordination of tasks needed to deal with a pollution incident, and
- To ensure that the plan provides an integrated response together with the National Oil Spill Disaster Contingency Plan (NOS-DCP 2018).

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1.5 Applicability and Geographical Limits of the Plan

This OSCP provides the response procedures and arrangements available for oil spill incidents during the port operations in the APSEZL, Mundra limits. It assigns roles and responsibilities for different personnel during an emergency.

The plan covers all spill incidents that occur within the block area and are likely to affect the marine environment and coastline along the block area. It must be noted that this document is not restrictive in nature and is developed in order meet requirements specified under statutory requirements presented for handling oil spill emergencies. The level of response will be guided by the response strategies defined in this document and will be governed by the severity of the spill event, its effect on the health and safety of the employees and contractors, impacts on the environment and Port reputation.

The scope of this plan extends to the entire area and beyond depending upon the trajectory of the spill. The geographical coordinates of the spill locations in the Mundra region as shown in Figure.1.1. The locations within the limits of study domain are Ports, Port operational facilities at South / West / MPT port facilities etc. The sensitive areas including berths / jetties, mangrove vegetation, biological resources are to be protected with better response plan adopting well-planned tactical response methods.


1.6 Authorities and Responsibilities

Prevention of accidental oil spillage is APSEZL, Mundra first priority. Port operating facilities will be designed, installed and operated in such a manner so as to minimize possibility of oil spills. Facilities, resources and support provided by third parties are also required to meet international pollution prevention design and operation standards.

The Oil Spill Contingency Plan (OSCP) has been prepared based on National Oil Spill – Disaster Contingency Plan (NOS-DCP) and the provision of Merchant Shipping Act, 1958 and Major Port Trusts Act, 1963.

Risks of oil spills associated with APSEZL, Mundra operations are and as such several measured for oil spill contingency planning were taken by port.

APSEZL, Mundra shall be responsible for any clean-up responses and all other incidental and consequential costs of whatsoever nature resulting from oil spills due to their activities/ operations. APSEZL, Mundra Man (Manager) is incident Response Coordinator. The Port is committed to integrate in its operations ways to identify oil spill risks, prevent oil spills, and to implement appropriate changes in its contingency plan for spill response and clean-up strategies. To achieve this, APSEZL, Mundra policy will be to:

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- Respond immediately to any oil spill incident with the objective of protecting Marine & Human life and to minimize environmental impacts;
- Work and consult with appropriate government bodies and the local community to address any issues relating to oil spills in a timely manner;
- Provide adequate training and information to enable employee and contractors to adopt environmentally responsible work practices and to be aware of their responsibilities in the prevention and clean-up of oil spill.
- Develop emergency plans and procedures so that incidents (accidental releases) can be responded to in a timely manner.
- Develop and maintain management system to identify, control and monitor risks and to comply with Statutory Regulations and Industry Guidelines.
- Assess the situation and take timely and appropriate action where third-party interests are involved, such as products or chartered vessels from nearby ports / agencies etc.
- Ascertain that each identified employee is responsible for the implementation of this policy in association with his specific duties. This includes contractors and employees.

1.7 Coordinating Committee

Crisis Management Group (CMG) will be the coordinating committee for oil spill response operations under Facility level oil spill contingency plan for APSEZL, Mundra. Oil spill response plan identifies the APSEZL, Mundra spill response organization, team responsibilities, communications and the procedures to respond all possible oil spill emergencies within the Port limits.


The assigned duties with respect to conduct of operation as mentioned here under will accordingly be required to be discharged by each On Scene Commander (OSC) (in the event of multiple ops). On Scene Coordinator (OSCo)/ Chief OSCo is responsible for undertaking all possible and feasible actions to respond to spill and direct the response team / teams at site. He is to decide the best response action required to be adopted as per situation and guide the response team/ teams accordingly.

The callout system for an oil spill incident is identical to any other emergency as contained in disaster management plan of APSEZL, Mundra. Emergency Control Team (ECT) will arrange mobilization of additional resources like Emergency Response Team (ERT) as when, required.

Emergency Control Team

The ECT will comprise the following members

- Chief Operating Officer APSEZL, Mundra
- Incident Control Officer (HOS – Marine / Duty Port Captain)
- Site Emergency Coordinator (Senior Pilot and Duty Radio Officer)

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- Fire Coordinator (HOS – Fire / HOS -Safety)
- HOS – Security / Duty Security officer
- Medical Superintendent
- Marine Pollution Coordinator – Manager (Marine /Pollution Control)
- Traffic Coordinator - Duty Port Captain
- Communications Officer (Duty Port Captain / Marine Control in-Charge)
- Chief Emergency Controller (Head -HSE)
- Civil Coordinator (HOS – Environment Cell / HOS Estate)
- Marine Engineering Coordinator (HOS – SPM / Diving Team in-Charge)
- HOD – Corporate Affairs
- HOS-Legal & HOD Estate

1.7.1 Statutory Requirements

As a part of this Plan, the port, facility or the identified ECT (Emergency Control Team) is responsible to undertake spill mitigation operations apart from managing, acquiring and maintaining oil spill response equipment and resources appropriate for response as per the Risk Category-A (NOSDCP-2018). Equipment, resources and personnel will be stockpiled at one or more suitable location/s as necessary to meet response requirements within shortest period.

The ECT is responsible for executing all the response mechanisms and procedures identified by the Plan and maintain trained personnel to undertake the operations.


An oil spill contingency plan is based on the understanding of the regulatory framework in which the assets and operations are located and in which the planning and response actions will be carried out.

This section summarizes the relevant national and international legislations related to oil spill response.

1.7.2 Enforcement Agencies and Authorities

At national level, various regulations have been formulated to ensure that oil spills are adequately notified and handled with least impacts on the aquatic and terrestrial environment along with public health and safety.

- Merchant Shipping Act 1958 and Amendment in 2003: This Act requires oil companies to clean up any oil spill from offshore petroleum related activities whether at sea or ashore.

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- Environment Protection Act 1986 and EIA Notification, 2006: The Ministry of Environment and Forests and Climate Change (MoEF & CC) while granting environmental clearance to oil and gas projects requires the company to establish oil spill control capabilities.
- Section 32 of the Water (Prevention and Control of Pollution) Act 1974: The Gujarat State Pollution Control Board (GPCB) holds the power to prevent discharge of hazardous and polluting materials into the sea or tidal waters.
- Coast Guard Act, 1978: The Act requires every owner, operator of a port facility, oil installation, and offshore installation to prepare and implement oil spill disaster contingency plan.
- Petroleum and Natural Gas (Safety in Offshore Operations) Rules, 2008 (PNGSOOR), G.S.R. 469(E): These Rules have been formulated through Sections 5, 6 and 7 of the Oilfields (Regulation and Development) Act, 1948 (53 of 1948). It requires operators to undertake risk assessment related to activities and prepare safety management systems and emergency response plans pursuant to the provisions of the Rules.

Indian Coast Guard

The Indian Coast Guard is the national coordinating authority for marine oil spills. Under the Coast Guard Act, 1978, the CG is responsible for control of pollution at sea and protection of marine environment. Indian Coast Guard has prepared and implemented a National Oil Spill Disaster Contingency Plan (NOS-DCP). As per the Act, all spills are required to be reported to the Coast Guard. In the event of a spill, the nearest Coast Guard station will be notified. When a spill is reported, the Coast Guard will monitor the movement of spill while APSEZL, Mundra takes the response measures.


Oil Industry Safety Directorate (OISD)

Oil Industry Safety Directorate (OISD) is a technical directorate under the Ministry of Petroleum and Natural Gas that formulates and coordinates the implementation of a series of self-regulatory measures aimed at enhancing the safety in the oil and gas industry in India. OISD maintains a database of accidents taking place in the oil industry and also investigates the major incidents, therefore has to be notified of incidents in offshore installations.

1.7.3 Statutory Requirements

International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)

MARPOL 73/78 is the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978. The Protocol desires to achieve the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances. The Convention includes regulations

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aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes.

- Annex I: Regulations for the Prevention of Pollution by Oil;
- Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk;
- Annex III: Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form;
- Annex IV: Prevention of Pollution by Sewage from Ships;
- Annex V: Prevention of Pollution by Garbage from Ships; and
- Annex VI: Prevention of Air Pollution from Ships.

Regulation 37 of MARPOL Annex-I require that oil tankers of 150 gross tonnage and above and all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). Regulation 17 of MARPOL Annex-II makes similar stipulations that all ships of 150 gross tonnage and above carrying noxious liquid substances in bulk carry an approved shipboard marine pollution emergency plan for noxious liquid substances. The latter may be combined with a SOPEP and should be referred to as a Shipboard Marine Pollution Emergency Plan (SMPEP).

The SOPEP/ SMPEP must include:


- Procedures for reporting oil pollution incidents.
- List of authorities and persons to be contacted in the event of an incident.
- Detailed description of immediate action to be taken to reduce or control discharge of oil following an incident.
- Procedures and point of contact for coordinating spill response actions with national and local authorities.

The International Maritime Organization (IMO) has produced the following guidelines to facilitate the preparation of such plans:

- Guidelines for the Development of Shipboard Marine Pollution Emergency Plans, 2010 Edition which includes Guidelines for the development of Shipboard Oil Pollution Emergency Plans (SOPEP) (resolution MEPC.54 (32), as amended by resolution MEPC.86(44)).
- Guidelines for the development of Shipboard Marine Pollution Emergency Plans of Oil and/or Noxious Liquid Substances (Resolution MEPC.85 (44), as amended by resolution MEPC.137 (53)).

MARPOL also gives guidelines for reporting pollution incidents to the authorities and outlines standard report formats.

International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990

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The IMO's Marine Environment Protection Committee developed this Convention to provide a framework for international cooperation for combating major oil pollution incidents. The Convention has the following key elements:

- precautionary and preventative measures are important in the avoidance of oil pollution in the first instance;
- prompt and effective action is essential to minimize possible damages in the event of pollution;
- contingency planning needs to be emphasized and the role of the oil and shipping industries should be included within these plans;
- the need for mutual assistance, international cooperation and information exchange (on response capabilities and reporting incidents);
- the 'polluter pays' principle; and
- the importance of related international instruments on liability and compensation, including the 1992 Civil Liability Convention (1992 CLC) and the 1992 Fund Convention.

Article-3 of the International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990, also requires operators of offshore units under the jurisdiction of Parties to have oil pollution emergency plans or similar arrangements which must be coordinated with national systems for responding promptly and effectively to oil pollution incidents.


1.8 Mutual aid Agreement

For the port activities suitable agency will be hired for supporting logistics for port operations. As a part of the service, necessary emergency services will also be sought from the port authority.

As per the National Oil Spill Disaster Contingency Plan (NOS-DCP), all Ports or facilities handling oil and oil products are required to maintain Tier-I Oil Spill Response (OSR) capabilities to undertake response activity within their area of operation.

Accordingly, the ports of APSEZL, Mundra is required to set up and sustain Tier-I OSR facilities in Mundra region in co-ordination with HMEL operating at these Port. For this purpose, APSEZL, Mundra and other Participating viz. HMEL, Mundra have executed a Memorandum of Understanding (MOU) for sustenance of Tier-1 OSR facilities for combating oil spills at and in surrounding area within Adani Mundra / GOK.

Under the said MOU, it has been decided to put in place Tier-1 Oil Spill Response Services in Mundra Region for conduct of Oil Spill Operations and mitigation of Pollution within the identified area of operation.

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1.9 Geographical Limits of the Plan:

The scope of this plan extends to following locations facilities stretched and facilities over a geographical area of more than 100 Sq Km with multiple operations going on same time.

- Ports of Adani
- Transshipment facilities at APSEZL, Mundra
- Adani West and South Ports
- Kandla Port, Essar Port at Vadinar, Coast Guard Jetty
- Intake and outfalls

1.10 Interface with ROSDCP and NOSDCP


National Oil Spill Disaster Contingency Plan is aimed at coordination of resource agencies to combat an oil spill in Indian waters and also spells the actions required of oil handling facilities i.e., to prepare contingency plans for respective facilities and to develop Tier-I response capabilities and also to report oil spills.

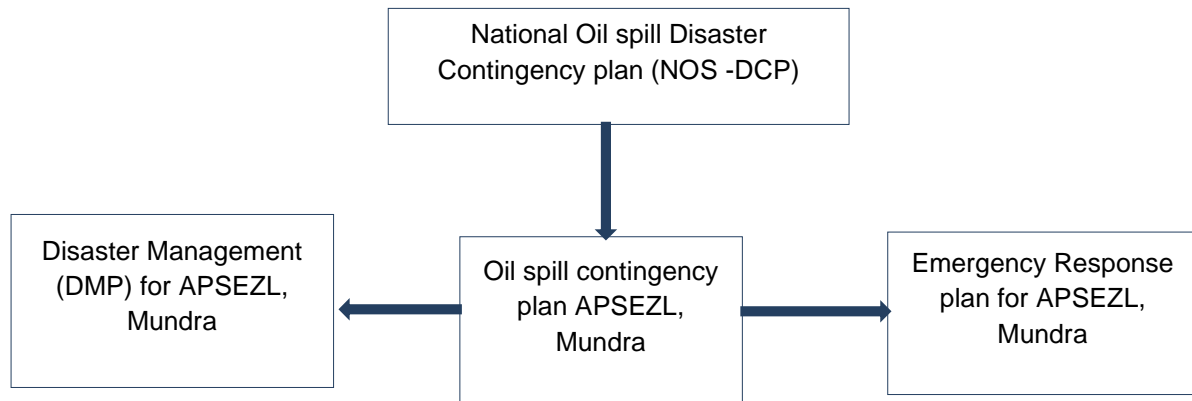
Render resources for pollution response when called for, Report Oil Spills, prepare contingency plans for respective spill scenario, set up Tier-I response facilities and Use of Oil Spill dispersants (OSD) in accordance with Plan.

Of the three tiers of response envisaged and planned to handle a spill situation in consonance with quantum of spill, Tier-1 is the primary and first step of responses, to be mounted by the facility where the spill takes place.

While, NOS-DCP outlines the response activities as per Tier system of addressable of spill, the facility plan is the instrument to address the spill scenario at local level. Tier-1 being the first and primary response level has to be executed and undertaken by the facility handling polluting cargo, for which purpose drafting of a CP is the primary requirement.

A spill situation could arise out of an incident or a number of incidents that could be either natural or man-made leading to emergencies. In the event of multiple emergencies, while the spill response will be undertaken as per this Plan, response to other emergencies will be as per APSEZL, Mundra Emergency Response Plan. This plan interfaces with following documents as illustrated below:

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This Oil Spill Contingency Plan has the direct interface with the following plans, manual, guideline and standards of APSEZL, Mundra and Port Operational program:

- APSEZL, Mundra – Disaster Management Plan
- Regional Oil Disaster Contingency Plan (ROSDCP)
- National Oil spill Disaster Contingency plan (NOS -DCP)

2. QUANTITATIVE RISK ASSESSMENT OF OIL SPILLS

The oil spill may generally occur either from transportation or from offshore facilities which include the surface facilities viz., platforms, berths / jetties, vessels and subsurface pipelines and all other associated infrastructure required for the transport / port operations. The spilled oil moves in the directions of resultant wind and current and finally gets stranded in the coast or in the sea. If the spill reaches the coast, it will damage the coastal sensitive areas, which are to be protected with proper response equipment in a planned response manner.

The risk is to be assessed that are posed to sensitive areas in and around of APSEZL, Mundra regions and then address those problems by identifying suitable response methods to prevent biological / industrial / socio-economic sensitive areas from exposure to oil spill and how best to advise the local authority of the dangers that could be posed by the spill and how to address them and to repair the damage done by the spill.

2.1 Identification of Port Operational activities and Risks


APSEZL, Mundra currently owns and operates several marine facilities located at Mundra, Gulf of Kutch. The Mundra port facility is located on the West Coast of India in Gulf of Kutch about 50 km west of Kandla in District Bhuj of Gujarat state.

The APSEZL, Mundra handles the majority of its dry and liquid products traffic through the South and west, terminals. There are several berths and jetties at Mundra for berthing of cargos. Two subsea pipelines connect the onshore to the IOCL, HEML SPMs.

The location of the APSEZL is situated at Mundra at approximately Lat 22° 44' 18.89" N, long 69° 41' 35.62" E. The berths are located in the North bank of Mundra region. The berthing jetties are for operating vessel operability and potential to meet the future trends. APSEZL, Mundra has developed berths, approaches and turning circles to handle vessels at the Berth.

Existing berths and Jetties

There are 21 existing berths at MMPT 1, MMPT 2, MMPT 3, MICT, AMCT catering to liquid, Container as well as General cargo. M/s Adani also planning to expand MPT-T2 for handling dry cargos.

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West Basin

West Basin is about 10 nautical miles west of the existing terminals of Mundra port. Four Berths are located approx. at 22° 45' 14.82" E and 69° 34' 6.23" N, off Tunda Wandh falling in Taluka Mundra. The basin is also planning to expand with 3 more additional berths for handling dry cargo. Two power plants are located North of these berths, in barren waste land. National Highway 8A extension passes through north side of the power plant sites at a distance of approximately 6 km.

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The south basin is in western side of the existing port on Navinal Island. Six berths are located approx. at Lat 22° 44' 18.89" N, long 69° 41' 35.62" E. It has presently 6 operational berths. It has an enclosed turning basin and necessary back up area. The basin is also planning to expand with two container berths for handling liquid cargo.

VLCC Jetty:

The development of jetty facilities is in progress for handling VLCC at Mundra for Crude oil operations.


Hence, mathematical modeling studies for predicting the fate and oil spill trajectory due to spills if any at Port operations facilities for various seasons is mandatory for OSCP. Oil spill modeling to be carried out as a part of Oil Spill Contingency Plan to identify the suitable combating operations for controlling the spills.

Oil Spill Scenarios Including Worst Case Discharge

Evaluating oil spill risks requires consideration of two factors, namely the probability of a spill occurring, and the consequences.

The potential oil spill scenarios from the APSEZL, Mundra marine facilities and associated activities are summarized in the next sections. In practice, due to preventive actions such as training, operating procedures and engineered solutions, potential spills are likely to be smaller. Larger oil spills being extremely unlikely.

The events and scenarios presented here are indicative only. Though accounting every eventuality is not practicable, however the above scenarios represent a broad cross section of possible oil spill incidents. The credible release quantities given are only an indication but the actual oil spill may vary significantly.

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Risk Assessment Methodology

Risk Assessment exercise is primarily for the concern of environmental pollution caused by accidental spillage of oil in and around the APSEZL, Mundra Port facilities. The factors which may influence the risk includes the followings:

- Exposure time of the port due to transit of ship
- Performance of ship's crew, including pilot
- Hydrographic and meteorological conditions;

The present Risk Assessment exercise has been carried out in stages as follows:


- ✓ Gathering of relevant information and data;
- ✓ Hazard Identification;
- ✓ Frequency Estimation;
- ✓ Consequence Estimation;
- ✓ Risk Estimation.

The oil spill may occur generally during transportation of crude/fuel oil from the offshore facilities which include the surface facilities viz., platforms, berths / jetties, vessels and subsurface pipelines and all other associated infrastructure required for the transport operations. The causes of oil spill during operations of APSEZL in the Mundra region along the North Coast of Gulf of Kutch are broadly defined under the following sections.

2.1.1 Sources of oil spill:

At various port operational facilities that can lead to the oil spill are given below: Also, worst case scenario i.e. Worst case volume and likely volume can be mentioned.

- Operations at Jetty / berth - loading / unloading
- Spills due to Collision/Grounding in the Tanker route
- Bunker/ fuelling operations
- Ship distress / sinking
- Spill due to rupture in subsea pipeline corridor (size of crack-1")
- Rupture of export line due to movement and landing along the coast.

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2.2 Failure frequency of pipeline, transfer and storage tank

The damage of pipelines is subjected number of factors such as corrosion, age of pipeline, life of pipeline and length. The reliability data of pipelines are presented here from the international database and hence these can be taken as indicative.

The probabilities of pipe ruptures are presented below:

$d \leq 50$ mm	$1 \times 10^{-10}/\text{m hr.}$
$50 < d \leq 150$ mm	$3 \times 10^{-11}/\text{m hr.}$
$d > 150$ mm or greater	$1 \times 10^{-11}/\text{m hr.}$
Sub-Sea pipeline failure	$6.1 \times 10^{-12}/\text{m hr.}$

where 'd' is the diameter of pipe

The probability of hose failures is presented below:

Loading arm failure	$3 \times 10^{-8}/\text{hr.}$
Flexible hose pipe failure	$4 \times 10^{-5}/\text{hr.}$
Atmospheric storage tank failure rate	$3 \times 10^{-4}/\text{yr}$


Flow lines	Partial rapture	$1.25 \times 10^{-5} / \text{year}$
Flow lines	Total rapture	$1.25 \times 10^{-5} / \text{year}$
Block value		$3-11'' - 1.08 \times 10^{-4}/\text{year}$
Flange Joints		$3-11'' - 5.56 \times 10^{-5}/\text{year}$

Based on the above failure frequency, it is apparent that the failure rate of the flexible hose pipe ranks higher. The failure rate of above ground pipeline depends on the pipe size and its length. As the pipe diameter increases, the failure rate decreases and as the length increases, the failure rate increases. The failure rate of underground pipeline is relatively much lesser compared to that of above ground pipeline. The underground pipelines are well designed to take care of corrosion etc.

Based on the past 10 years accidental data, it is observed that the frequency of oil spills is around 1.7×10^{-6} per cargo vessel transferred.

2.2.1 Quantity of oil leaked – pipelines

The quantity of oil spilled can be calculated based on size of the rupture and also for hole leaks taking account the diameter of hole and flow rate. The formula for total calculation is

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Volume of spill = $2\pi rLv$

r = radius of pipeline

L = length of pipeline

v = flow velocity

2.3 Sub-sea Pipeline Damage

There was a pipeline leakage at Bombay high and observed the flow and pressures monitored continuously at platform and Uran terminal after the pumping has been stopped. Before stopping pumping, the leak rate is high due to higher pressure than hydrostatic pressure and leak rate would reduce gradually after stopping the pumping. The details of spill volumes are furnished in Table 2.1.

Table 2.1 Pipeline spill volume (m³)


Time in hours after rupture	Spill Size
1	1900
3	3400
6	5300
12	9000
24	13500
36	14100

In case of total rupture of the 48" pipeline running from SPM to onshore oil terminal, the pump will be shutdown automatically within few minutes and the volume of spill would be around 20 m³ only.

The failure rate of loading arm is extremely low because of the sophisticated safety systems incorporated in the design.

2.4 Cargo Operations or Transfer frequencies

Since 1974, International Tanker Owners Pollution Federation Limited (ITOPF), London has maintained a database of oil spills from tankers, combined carriers and barges. This covers all accidental spillages except those resulting from acts of war. The database (Table.2.6) contains information on both the spill itself (amount and type of oil spilt, cause and location) and the vessels involved. For historical reasons, spills are generally categorized by size (<7 tons, 7-700 tons and >700 tons) although the actual amount spilt is also recorded. Information based on nearly 10,000 incidents, found that the vast majority (85%) fall into the smallest category i.e., <7 tons. Information is gathered from both published sources, such as the shipping press and other

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specialist publications, and also from vessel owners and their insurers. Not surprisingly, information from published sources generally relates to large spills, often resulting from collisions, groundings, structural damage, fires and explosions, whereas the majority of individual reports relate to small operational spillages. The details of the spills occurred based on the ITOPF data collected are presented in Table. 2.2


Table- 2.2: Number of oil spills occurred during 1974 to 2010 and their causes and the spill quantity

	<7 Tones	7-700 Tones	>700 Tones	TOTAL
OPERATIONS				
Loading/Discharging	3157	385	37	3579
Bunkering	562	33	1	596
Other Operations	1250	61	15	1326
ACCIDENTS				
Collisions	180	337	132	649
Groundings	237	269	160	666
Hull Failures	198	57	55	310
Equipment Failures	202	39	4	245
Fires & Explosions	84	33	34	151
Other/Unknown	1975	121	22	2118
TOTAL	7845	1335	460	9640

Table-2.2 gives the number of oil spills occurred along with quantity of oil spilled and the operations associated during 1974 to 2010. It is found that, most spills from tankers result from routine operations such as loading, discharging and bunkering which normally occur in ports or at oil terminals, the majority of these operational spills are small with some 81% involving quantities of less than 7 tons and accidents involving collisions and groundings generally give rise to much larger spills, with at least 4% involving quantities in excess of 700 tons.

The exact quantity of spill from each of the above incident is difficult to predict due to the variables of operating conditions and the length of risk exposure. Maximum risks associated with the events may be considered while devising the oil spill contingency plan. The spill scenarios range from extremely negligible quantities to enormous quantities in rare catastrophic events. The simulation of oil spills does not vary significantly in various scenarios except for the magnitude of impact zone and the quantity involved in such impacts. The software is intended to use for specific scenarios, through a few simulations are made in this report considering the worst-case scenarios.

The failure rate of loading arm is extremely low because of the sophisticated safety systems incorporated in the design. Accidental release of any chemical due to catastrophic rupture of

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tanks and ship collision are also relatively very low. The impact due to failure of storage tanks and ship collisions on environment are very high because of the large quantity released when compared to the pipe failure.

For the purpose of simulation, the below given scenarios are taken into account considering the above spill risks.

2.5 Operational Leakage


2.5.1 Spill due to Loading arm failure at Jetty: (pumping rate of 10000 m³/hr crude oil for 1 min)

Crude pumping rate from the tanker will be around 6500 m³/hr to 10000 m³/hr. In the present study, maximum pumping rate of 10000 m³/hr has been considered to assess the risk on a higher side. The Safety Break Away Coupling in the crude oil transfer hose will be activated within few seconds in the event of hose rupture or failure. Again, for the sake of assessing higher risk, a response time of 1 min is considered to estimate the amount of oil that would spill at the Jetty. Thus, the quantity of crude oil spill has been estimated as 167 m³ in the event of loading arm failure.

2.5.2 Spill due to rupture of sub-sea crude oil pipeline from refinery to shore tanks: (2611 Tons of crude for 36 hrs)

Crude oil pumping rate from the tanker will be in the range of 12500m³/hr – 6500 m³/hr. In the present study, to assess the maximum risk the pumping rate of 12500 m³/hr has been considered to be on higher risk side. The minimum wall thickness of sub-sea crude oil pipeline is 15.6 mm and the maximum thickness is 24 mm. Moreover, all along, 5 inches concrete cladding is provided on the surface of the pipeline. Hence crude oil pipelines designed, constructed and laid as per the international norms are safe and leakages are extremely rare during its designed life. However, a rupture of size 1” has been assumed for assessing the quantum of oil spill through sub-sea pipeline.

Pump discharge pressure on-board will be 10 kg/cm² at tanker manifold and crude oil thus will be pumped to the COT tanks without any boosting device in-between. As the level in the tanker depletes, discharge pressure would also be reduced. Moreover, with the distance the crude oil pressure inside the pipe drops. For the sake of assessing the amount of oil spill in case of rupture of sub-sea pipeline, a pressure of 10 kg/cm² and a water column height of 20 m have been considered.

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In the present study, for the sake of assessing the amount of oil spill in case of rupture the response has been considered as 36 hr for quantification of oil spill. Accordingly, the quantity of Crude oil spill has been estimated to be 2611 tons-

2.5.3 Spill due to Tanker Collision at Jetty having capacity between 1,00,000-3,00,000 metric tons

Crude Oil is received at Jetty by ocean tankers having capacity between 1,00,000 - 3,00,000 metric tons. Crude oil is pumped to shore tanks by pipeline from the SPM. In the present scenario, collision of the vessel at the jetty or tanker route with another vessel enroute to other terminals can cause partial damage to the vessel's cargo tanks (not more than 3 Nos. Cargo tanks) leading to a maximum oil spill of about 700 tons to 25,000 tons of crude oil. Hence, in the present study the probable quantities of crude oil spills due collision at Jetty are considered as 700 tons, 10000 tons and 25,000 tons.

2.5.4 Spill due to collision or grounding in the Tanker route


Tankers are expected to call at the Jetty frequently to load these oil products. These tankers may meet accidents like collision with other vessels or grounding in the vicinity of the Jetty. In case of such accidents the spillage may vary depending on the size of the tanker, the extent of damage and number of cargo tanks ruptured. In the present study the probable quantity of spills in the tanker route considered for modelling is about 25000 tons.

As can be seen above the spill scenarios mentioned above range from extremely negligible quantities to enormous quantities in rare catastrophic events. The simulation of oil spills does not vary significantly in various scenarios except the magnitude of impact zone and the quantity involved in such impacts. The software is intended for use by the client for specific scenarios, through a few hypothetical simulations are made in this report considering the worst-case scenarios.

The failure rate of loading arm is extremely low because of the sophisticated safety systems incorporated in the design. Accidental release of any chemical due to catastrophic rupture of tanks and ship collision are also relatively very low. The impact due to failure of storage tanks and ship collisions on environment are very high because of the large quantity released when compared to the pipe failure.

2.6 Risk assessment of oil spill in APSEZL, Mundra area

- a) Oil spill risk analysis and modeling studies for **APSEZL** at operating facilities in Mundra Region, Gulf of Kutch (**Part B of the report**)

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b) Mapping of Marine Sensitive areas in the Coastal areas of Gulf of Kutch region (**Part-C of the report**)

The two documents mentioned above deal extensively with oil spill risk analysis & trajectory and mapping of marine sensitive areas based on the available data information. These two studies follow the structure of and are compliance with the "IPIECA-A guide to contingency planning for oil spills on water and are aligned with the Indian coast guard "National Oil Spill Disaster Contingency plan" These important documents provide all details of the local environment, risks of the oil spill Tier-I credible spill, fate of the spills, sensitivity mapping of the area and local, regional and country wide response capabilities.

These documents shall be used in conjunction with the oil spill response plan.

2.7 Spill locations and scenarios

Based on above oil spill risk analysis the following 15 oil spill scenarios are considered for simulations as shown in Fig. 2.1.

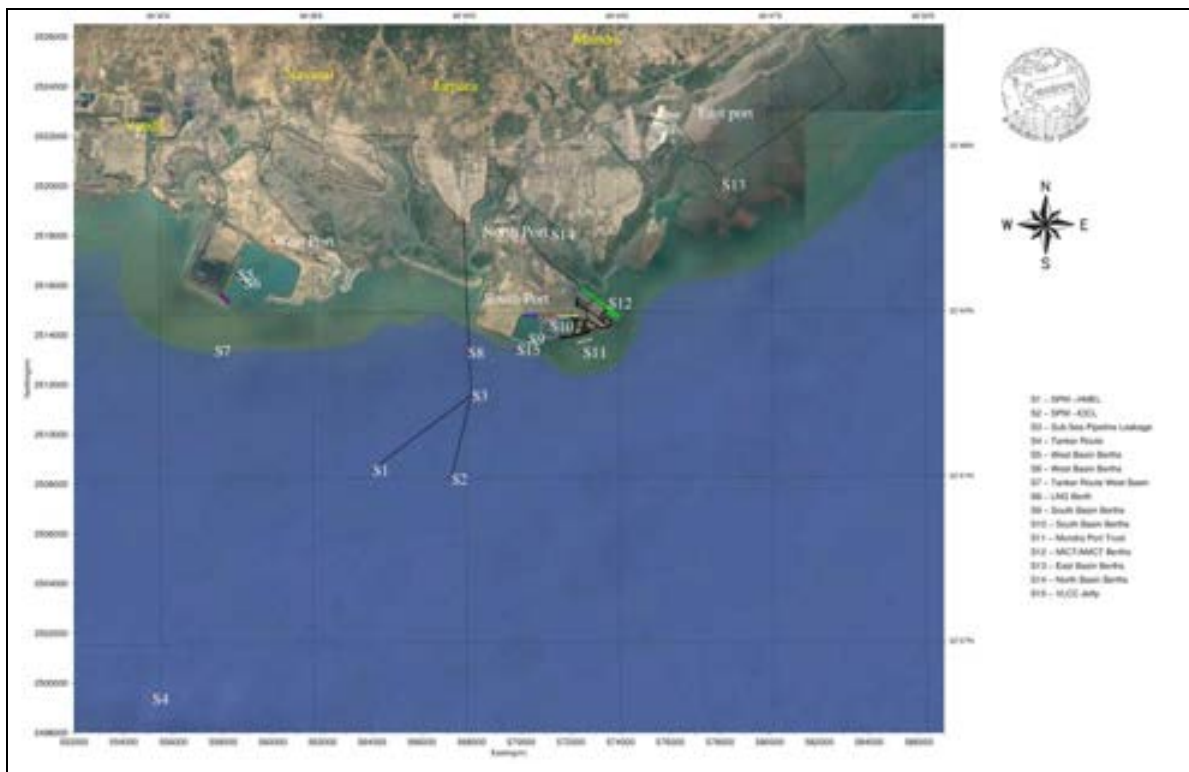


Fig.2.1 Spill Locations considered in **APSEZL** at Mundra region

- SPMs (S1, S2)
- VLCC Jetty (S15)
- Sub-sea pipeline(S3)

- Tanker entry into the Ports (S4)
- Adani West Port berths (S5, S6, S7)
- LNG Berth (S8)
- Adani South Port berths (S9, S10)
- Mundra Port (S11)
- MICT / AMCT Berths (S12)

The following are oil spill risks identified in terms of quantities and spill types

- Crude oil spill of 700t at selected SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Fuel oil spill of 700t at selected West Port(S5), Vessel route(S7), LNG Jetty(S8), South basin (S9), Mundra Ports(S11), MICT/AMCT(S12)
- Crude oil spill of 10000t at SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Crude oil spill of 25000t at SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Fuel oil spill of 100t at selected West Port (S5, S6), LNG Jetty(S8), South basin (S9, S10), Mundra Ports(S11), MICT/AMCT(S12)
- HSD oil spill of 50t at selected West Port(S5), LNG Jetty(S8), South basin (S9), Mundra Ports(S11)
- HSD oil spill of 20t at selected West Port(S6), South basin (S10)

Continuous Spills


- Crude oil spill of 10000 m³/hr for 1 min at selected SPM-HMEL(S1), SPM-IOCL(S2)
- Crude oil spill of 10000 m³/hr for 1 min at selected VLCC Jetty (S15)
- Crude oil spill of 10000 m³/hr for 1 min at sub-sea pipeline route (S3)

2.8 Types of Oil Likely to Spilled

Oil Type

The majority of oil handling at Port area will be crude oil. The International Tank Owners Pollution Federation (ITOPF) classifies oil into four (4) groups based on their specific gravity. Typically, crude oils will fall into Group 2 (with specific gravity 0.8 – 0.85, API 35 – 45) or Group 3 (with specific gravity 0.85 – 0.95, API 17.5 -35). The behaviour of a particular crude oil may differ from the general pattern depending on its properties and environmental conditions at the time of the spill.

The other oils that will be used for Cargo / tankers are fuel oils. The specific gravity of Fuel oil is typically in the range of 0.9-0.95 (API 25 – 35) and viscosity 6.5 cst / 50°C. Fuel oil will spread slowly on water and should evaporate less quantity within a few days upon release onto the sea

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surface. Evaporation can be enhanced by higher wind speeds, warmer water and air temperatures. A small percentage may also dissolve.

The following characteristics of oils are used for modelling study

Table.2.3 Type of oils selected for oil spill modelling studies

Chemical and Physical Properties	Fuel Oil	Crude Oil	HSD
Sp. Gr	0.9	0.85	0.86
API	25.72	41.27	25.72
Surface Tension	0.0028Nm ⁻¹	0.003Nm ⁻¹	0.0028Nm ⁻¹
Viscosity of Oil	6.5X10 ⁻⁶ m ² /s	3.822X10 ⁻⁶ m ² /s	3.822X10 ⁻⁶ m ² /s
Molar Volume	0.0002 m ³ /mol	0.0002 m ³ /mol	0.00023 m ³ /mol
Wax content (%)	912-19%	12-19%	03-44%
Pour point (°C)	35 deg C	18 to 30 deg C	60 C - 180 C

2.9 Hazardous Noxious substances (HNS) Spills

HNS spills involve a wide range of chemicals and other substances that can pose significant hazards to human health, marine life, and the environment. Effective response to HNS spills requires specialized knowledge and resources due to the diverse properties of these substances.


HNS constitutes gas, liquids and solids phase which when spilled in water will purely Float (F), Evaporate (E), Sink(S) or Dissolve (D) or in certain combinations of these physical characteristics discussed below.

Evaporators

The volatile liquids are less dense than sea water and has low solubility and forms vapor cloud the same way as that of gas. The Liquid (LPG) which forms vapor substance and dissolves in the water and vapors may form flammable over the water surface.

Floaters:

Non-volatile liquids are less dense than the sea water. The floating substance may not significantly evaporate and dissolve. Some non-volatile liquids are not significantly evaporated, but slowly dissolves. Some son-volatile liquids are slowly evaporated, without dissolving in water. A floating substance can either slowly evaporates or get dissolved (0.15%). The extent of solubility will determine whether toxic concentrations might occur in water. This type of product will completely disappear with time.

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Dissolvers

Dissolver is a substance which dissolves in water and does not rapidly evaporate. The degree of solubility of the substance and the turbulence in the water column will determine whether toxic concentrations in the water column will occur. Such substances will dissolve in water and will rapidly evaporate.

Sinkers

Sinkers comprises of products which are denser than sea water, and; when the density of a liquid is higher than that of sea-water, then the solubility is considered to differentiate between sinkers and a sinker/ dissolver:


The physical and chemical properties of HNS handled at Port is furnished in Annexure-17.

2.10 Probable Fate of Spilled Oil

The physical and chemical characteristics of spilled oil change almost immediately when spilled in the marine environment due to evaporation, dispersion, emulsification, dissolution, oxidation, sedimentation and biodegradation. All of these processes that set in together are collectively referred to as oil weathering and decide the final fate of spilled oil and quantities that would need to be removed physically. If the oil is persistent and does not vaporize immediately or disperses and comes ashore, then the costs in terms of clean up, damages and economic losses can be considerable. Some of the weathering processes that spilled oil goes through and the time duration of these processes which are important for emergency response and need to be taken into account by the responders, are provided in Table 2.4 below:

Table.2.4: Oil Weathering Processes

Process	Description	Importance	Time Frame
Evaporation	Conversion of liquid to gaseous state. Lighter fractions are lost first.	Major process accounting for loss of oil. At 15°C gasoline will evaporate completely over a 2-day period, 80% of diesel fuel and 40% of light crude, 20% of heavy crude and about 5- 10% of Bunker C fuel.	< 5 days
Emulsification	Small water droplets get mixed into liquid oil. Water content will reach 50-80%.	Will increase the amount of pollutant to be recovered by a factor of 2 - 4.	Onset may be delayed but emulsification process will start rapidly.
Natural	Breakup of an oil slick	Removes oil from water surface	< 5 days

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Process	Description	Importance	Time Frame
Dispersion	into small droplets		
Dissolution	Mixing of soluble oil components into water	Water soluble components are most toxic	< 5 days
Biodegradation	Breaking of oil by microbes into smaller compounds and finally to water and carbon dioxide	Rate depends on oil type, temperature, nutrients, oxygen and amount of oil	Weeks to months
Formation of tar balls	Breakup of heavy crudes and refined oils into small patches with long persistence	Hard to detect	Days to weeks

In this present study, the oil type considered is ‘weathering’ type which is typically used for all the oil spill trajectory prediction studies. Non weathering oil is an oil type that does not change chemically or physically over time in the marine environment. Weathering processes like evaporation, emulsification etc., affect spills and no-weathering oils doesn’t considered these processes hence the trajectory oil spill analysis for non-weathering type represents worst case scenario.

The processes of spreading, evaporation, dispersion, emulsification and dissolution are most important during the early stages of a spill whilst oxidation, sedimentation and biodegradation are long term processes which determine the ultimate fate of oil. Fig.2.2 shows schematic diagram of weathering processes with time.

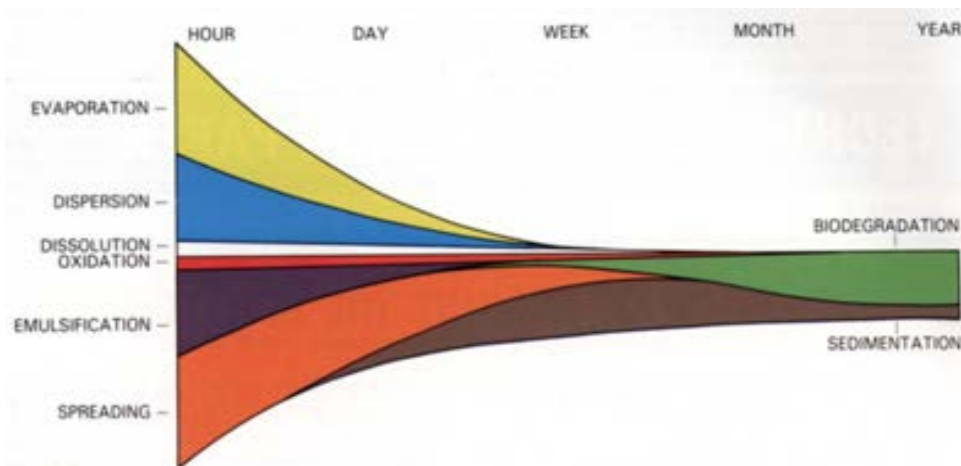


Fig.2.2 shows schematic diagram of weathering processes with time.

2.11 Appearance and Thickness of Oil Slick

Depending on the properties of the spilled oil, the thickness of oil slick can range from a tenth of a micron to hundreds of microns. The colour of oil film post spreading is a good measure of quantity of oil that may be contained within the slick.

- When direct light from the sun contacts a very thin oil film (<0.1 micron; μm), much of the light is reflected back to the observer as grey or silver sheen.
- If the film is thicker (perhaps 0.1 to 3 μm), the light passes through the film and is reflected off the oil-water interface and back to the viewer. The observer will then see a film that can range from rainbow to darker-colored sheens.
- For very thick films (> 3 μm), the light is absorbed and the slick appears dark colored (i.e., black or brown) to the observer. However, the viewer can no longer determine film thickness based on colour. If the slick is dark-colored, the observer cannot tell whether the film is 3 μm or 100 μm thick.

In order to quantify oil thickness, the following thumb rules are used:

Table.2.5: Appearance and Thickness of Slick

Appearance	Thickness
Silver Sheen	0.0001mm
Rainbow sheen	0.003 mm
Light brown/ Black slick	0.1 mm
Dark brown/ Black slick	> 1 mm

To determine an approximate quantity of spilled oil in the event of a spill, the following formula is used:

$$V = L \times W \times T / 100$$

Where, L = Length of slick (in metres)

W = Width of slick (in metres)

T = Thickness of slick (in mm)

V = Volume of spilled oil (in cubic metres)

2.12 Development of oil spill scenarios including worst case spill

Spill Size

In the present study, series of scenarios considered based on operational activities, a worst-case scenario and logarithmic multiple up to 25000 tons (instantaneous) and 550 m³ (continuous) has been considered for the model study.

Simulations were made for the following scenarios at Adani Mundra region:

Table.2.6 Details of Oil Spill Scenarios

Comp. Runs	Spill Location	WD (m)	Spill Qty	Type of oil	Spill Location Co-ordinates
A SPMs					
1	SPM-HMEL (S1)	29.50	700 tons	Crude	69° 37' 23.19" E, 22° 40' 59.06" N
2			10000 tons	Crude	
3			25000 tons	Crude	
4			10000 m ³ /h for 60 sec	Crude	
5	SPM-IOCL (S2)	28.45	700 tons	Crude	69° 39' 14.05" E, 22° 40' 47.21" N
6			10000 tons	Crude	
7			25000 tons	Crude	
8			10000 m ³ /h for 1 min	Crude	
B VLCC Jetty					
9	Spill Location (S15)	15.71	700 tons	Crude	69° 40.78' E, 22° 43.6' N
10			10000 tons	Crude	
11			25000 tons	Crude	
12			10000 m ³ /hr for 1 min	Crude	
C Pipeline					
13	Crude oil spill of 2611 tons at the pumping rate of 12500 m ³ /hr for 60 sec (2611 Tons of crude for 36 hrs) along the pipeline corridor at a select (midway) point of subsea pipeline in the pipeline routes. -- Spill point: (S3)	21.20	12500 m ³ /hr for 3hr	Crude	69° 39' 43.35" E, 22° 42' 36.39" N
D Tanker Route					
14	Instantaneous crude oil spill of 25000t along the tanker route at select location. Spill point: S4	22.54	25000 tons	Crude	69°32'11.38" E, 22°36'1.13" N
E West Basin (berths)					

15	100 tons (due to Berthing incident/ collision) at the West Basin berths (FO) Spill point: S5	14.61	100 tons	FO	69°34'13.99" E, 22°45'15.54" N
16	50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the West Basin berths (HSD) Spill point: S5		50 tons	HSD	69°34'13.99" E, 22°45'15.54" N
17	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berths -- Spill point: S5		700 tons	FO	69°34'13.99" E, 22°45'15.54" N
18 & 19	In the maneuvering basin: <ul style="list-style-type: none"> ○ 20 Tons of HSD oil due to Tug Impact (HSD) ○ 100 Tons of FO due to Tug Impact Spill point: S6	14.48	20 Tons 100 Tons	HSD FO	69°34'22.75" E, 22°45'5.33" N
20	Along the vessel route at one location: Instantaneous oil spill of 700t along the tanker route at a select location. (FO): Spill point: S7	17.08	700 tons	FO	69°33'40.66" E, 22°43'36.31" N
F	LNG berth				
21	100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: S8	13.76	100 tons	FO	69°33'40.66" E, 22°43'36.31" N
22	50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the LNG berth (HSD) –Spill point: S8		50 tons	HSD	69°33'40.66" E, 22°43'36.31" N
23	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth-- Spill point: S8		700 Tons	FO	69°33'40.66" E, 22°43'36.31" N
G	South Basin (berths)				
24	100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: S9	14	100 Tons	FO	69°39'38.08" E, 22°43'32.54" N
25	50 Tons (due to Berthing		50 Tons	HSD	69°41'3.53" E, 22°43'50.33" N

	incident/ collision (diesel oil tanks) at the South Basin berths (HSD) – Spill point: S9				
26	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth -- Spill point: S9		700 Tons	FO	69°41'3.53" E, 22°43'50.33" N
27 & 28	At the turning circle: <ul style="list-style-type: none"> ○ 20 Tons of HSD oil due to Tug Impact ○ 100 Tons of FO due to Tug Impact Spill point: S10	17	20 Tons 100 Tons	HSD FO	69°41'33.62" E, 22°44'6.49" N
H	Mundra Port				
	At the existing MPT1 berth: : Spill Point S11				69°42'20.45" E, 22°43'32.17" N
29	100 tons (due to Berthing incident/ collision) at the berth (FO) -- Spill point: S11		100 Tons	FO	69°42'20.45" E, 22°43'32.17" N
30	50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the berth (HSD) – Spill point: S11	20.80	50 Tons	HSD	69°42'20.45" E, 22°43'32.17" N
31	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth: Spill point S11		700 Tons	FO	69°42'20.45" E, 22°43'32.17" N
I	MICT / AMCT Berths:				
	At the existing MICT / AMCT Berths: : Spill point S12				69°42'56.30" E, 22°44'36.69" N
32	100 tons (due to Berthing incident/ collision) at the (FO) - Spill point S12	15.12	100 Tons	FO	69°42'56.30" E, 22°44'36.69" N
33	700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth - Spill point S12		700 Tons	FO	69°42'56.30" E, 22°44'36.69" N
34	100 tons (due to Berthing incident/ collision) at the East Basin berths (FO) Spill point: S13	20.0	100 Tons	FO	69° 45' 37.58" E 22° 47' 10.73" N
35	100 tons (due to Berthing	0.5	100 Tons	FO	69° 41' 35.79 E

	incident/ collision) at the North Basin berths (FO) Spill point: S14				22° 46' 6.76 N
--	--	--	--	--	----------------

Results of scenario:

Hydrodyn-OILSOFT is a dedicated software for oil spill trajectory modeling. This software is used for the prediction of oil spill scenarios in the Mundra region for various meteorological and hydrological conditions.

Knowledge of probable movement of an oil slick gives a distinct advantage while planning response strategies. Thus, for instance, no major clean-up operation is necessary if the modeling results indicate that the spilled oil would remain at sea thereby sparing the shore ecology. On the contrary, if modeling results are suggestive of shoreward drift and predict that particular ecologically sensitive or important areas would be hit, effective counter measures such as deployment of deflection booms, containment and recovery of oil etc. can be effectively taken.


The results of various numerical runs are discussed in the following sections. The detailed results of the simulations are available in the tabular form in the oil spill risk analysis (**PART-B of the OSCP**).

During the year representative spill locations in Adani Mundra would move towards coastal areas during all seasons depending on the spill residence time as delineated in **Part-B of the OSCP**.

The behavior of slick movement is more or less similar in various scenarios irrespective of quantities of oil spilled. The area of oil spread differs depending on the source quantities. The details of spill losses during its movement and time taken to reach the coast boundaries from all locations have been discussed in **Part-B of the OSCP**.

2.13 Environmental sensitivity index mapping

The mapping of the sensitivity of the environment to accidental oil pollution is an essential step in oil pollution preparedness, response and coordination efforts. 'Sensitivity' relates to the efforts of accidental marine pollution involving hydrocarbons. Sensitivity mapping has been prepared which provides a basis for the definition of priorities for protection and clean-up to the On-scene commander, on-site responders and information to plan the best suited response strategy to the decision makers. Sensitivity mapping has been used to support the development of the response strategy for oil spill contingency plan. Elements which have been considered sensitive to oil spill are: protected areas, important areas for biodiversity, sensitive ecosystems, critical habitats, endangered species, and key natural resources.

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Sensitivity maps prepared has covered the areas of coast at risk of spillage originating from the facilities and provide information about the various types of environments that may be affected by a spill (sand beached, rocky coast, marshes, etc.) for which the clean-up equipment should be suited. Sensitivity maps prepared also included the mapping of coastal, sub-tidal habitats and information on the potential impact of dispersed oil in the water column so as to support the decision on the use of oil spill dispersant.

The shorelines are of high priority areas for protection because they are difficult to clean once the spill washed to shore. According to the sensitivity and importance of the shoreline, the following order of priority is set in shoreline cleaning:


- Marshes and mangroves.
- Coral reef flats which are exposed at low tide.
- Raised fossil reefs with undercuts which allow the floating oil to penetrate boulder and Cobble beaches.
- Pebble and cobble beaches.
- Beaches of mixtures of sand, pebbles and cobbles.
- Exposed beach rock.
- Port harbour/Jetty/Berth

The details of the environmental sensitivity map including ecologically sensitive areas and economic resources for the APSEZL, Mundra have been provided as Part-C of the OSCP.

2.14 Environmental resources, priorities for protection

Amenity areas, economically important tourist and recreation facilities, bathing beaches, ecologically sensitive areas, industrial or drinking water intakes, fisheries, Marine culture, sea birds, marine mammals and other resources likely to be threatened shall be identified. In most of the oil spill incident, it may not be possible to prevent some oil coming ashore, and in some circumstances, it might be advantageous to deflect the oil to a another less important chosen place onshore. It is therefore necessary to decide in advance which areas are to be given priority for protection. Before making such decisions, a wide variety of interested parties should be consulted.

The environmental sensitivity with key ecologically sensitive areas and economic infrastructures Mundra surrounding areas are

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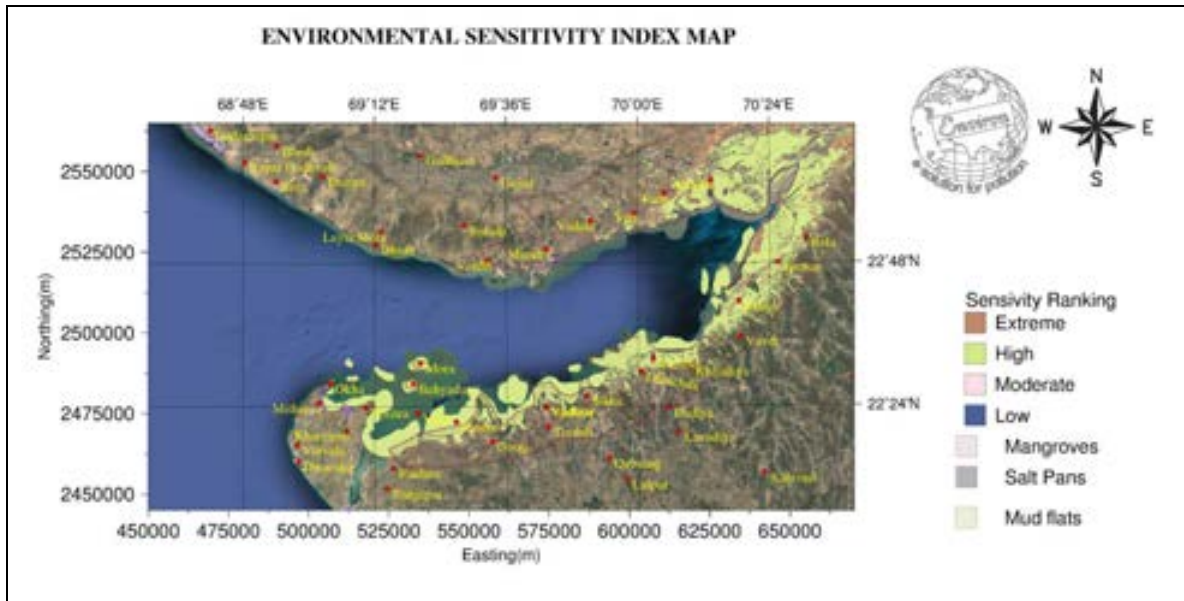


Fig 2.3: Sensitive areas along the block

It is endowed with a great diversity of natural ecosystems, of which the major systems are salt pans, intertidal zones, sand dunes, mangroves, creeks and Open Ocean. The biological sensitive resources are discussed in detail below.

Biological Resources


Various Biological resources are discussed in Part-C (Sensitivity Mapping Studies) of the report which are sensitive to oil spills. As per the IMO standards, each species indicated with symbol and color. Species that are especially vulnerable to the effects of oil spills are Bird, Fish, and Marine Mammal. The Biological resources, which are vulnerable to the effects of oil spills are categories are then further divided by grouping species together by similar taxonomy, morphology, life history, and/or sensitivity to spilled oil.

When a biological resource exists in a small area (such as a bird nesting site), it is indicated by a symbol. When a biological resource encompasses a larger area, it is represented by a polygon with a specific pattern and color.

The information of all categories of biological resources is displayed on shoreline sensitivity maps is provided in Part-C of the report.

Industrial Resources

Various industrial resources i.e., Intake, outfalls, Port /Jetty, salt pans that are vulnerable to oil spills is discussed in Part-C of the report and also shown in Annexure-2. They are indicated by a symbol with specific pattern and color.

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Human Use Resources

Human-use resources that may be either negatively impacted by an oil spill or used as access points for oil spill cleanup are typically marked with a symbol. Most human-use features (such as public beaches and aquaculture facilities) exist in a small area and are represented by human – use point symbols. Larger areas such as parks, preserves, protected areas, and wildlife refuges are shown as polygons.

The area from Okha to Kandla is marked by number of creeks, mangrove vegetation, Mudflats, salt pans, APSEZL installations and number of landing points etc. The coastline from Positra to Bedi stretching south into Gulf of Kutch is highly developed in terms of manmade structures and has large extends of mudflats with mangrove vegetation and marine sensitive areas. The further stretch up to Navalakki is the hub of commercial activity and includes Adani, Kandla Port Installations.

All categories of sensitive zones along the coastal areas of APSEZL region as well as creeks are displayed on ESI maps which are to be protected and placed at Annexure-2 of Part-C of the report.


2.15 NET ENVIRONMENTAL BENEFIT ANALYSIS (NEBA)

The objective of a NEBA is to consider all available response options for an oil spill and select those techniques that will provide the best opportunities to minimize consequences for the environment. This section of the report provides an overview of the approach used to prepare the NEBA in support of oil spill response planning for Adani Ports and SEZ Limited, Mundra. The analysis is largely based on information discussed in **Oil spill Modeling Studies (Part-B of the OSCP)** and **Marine Sensitivity Area Mapping (Part-C of OSCP)**.

This qualitative, NEBA analysis was conducted for oil spill contingency planning purposes, and is dependent upon a variety of input sources. It is intended to address the overall risk for the oil spills. Because it is intended to be a broad analysis of a large-scale event, there is no specific season or trajectory analysis that will account for every possible spill scenario. However, it should represent likely exposure risks and levels of concern.

To conduct this study, the following important factors were considered and/or employed:

- The comprehensive trajectory modeling using state-of-the-art models and including oil spill scenario carried out (**PART-B** of the project report)
- Risk matrix which has been prepared based numerous other studies;

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- Design of a scenario representing a high-volume discharge incident for this area; and
- Use of the above assumptions that were conservative and evaluated maximum extent of the impact.

Recommendations Concerning Response Options

All of the response options evaluated offer the potential for a net improvement over natural attenuation, and none have material adverse consequences. All of them should be discussed and considered when developing an oil spill response plan. It is always assumed that a combination of response techniques will be used, as appropriate, to minimize oil exposure to sensitive resources and to promote rapid recovery of the ecosystem as a whole. The OSRP provides information on the integration and activation of multiple response options for this Project Area.

However, the response options vary greatly in their potential effectiveness in association with a large-scale scenario, as summarized below (from least to most beneficial):

- **On-water In-situ Burning (ISB)** – This response option is severely restricted by seasonal day length, year-round weather conditions and strong tidal currents and large tidal ranges, most of spill trajectories reached the coast before proper weathering and logistical constraints. As a result, it is unlikely to offer substantial Net Environmental benefits.
- **On-water mechanical recovery** – On-water mechanical recovery resources are generally easier to obtain and deploy in larger numbers. The option is viable for open waters in the Mundra Port region. This option is effective for smaller, confined spills, the estimated oil recovery for large-volume scenarios is generally associated with low ecological benefit.
- **Shoreline protection and recovery** – As a result of the high probability of shoreline contact indicated in trajectory spill modeling studies (**PART-B**), this response option will have more overall effect, except in the cases where spills are moving away from the shore. The deployment of shore line protection and recovery gears are quite difficult due to the fact that the existence of very strong tidal currents as well as large tidal ranges and most of the coastal zonal areas the west coast are inaccessible by road. Due to the above reasons, this is not showing much Net benefit over Natural attenuation.
- **Dispersant application** – This response option was shown to be effective in substantially reducing surface oil in treated areas. While it can be very effective in treating fresh oil, surface oil reduction is predicted to be 40-60% in the first 4 days of the spill. Crude oil concentrations in the upper 10 to 20 m of the water column would increase

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in treated areas for a very short period, but would rapidly dilute and therefore not pose a long-term risk to the ecosystem. Quick application of dispersants within an hour is highly recommended offering Net environmental Benefit to the Higher Deg

3. EQUIPMENT, SUPPLIES AND SERVICES

There are a number of techniques to remove the oil floating on the sea. The spill combating equipment's should be selected in relation to the assessment of the risk of spills and to the defense of agreed priorities for protection. The equipment must be chosen for the anticipated range of weather conditions and oil types. Various equipment's used are: booms, skimmers, absorbents, dispersants/bioremediates and burning. NEBA Studies has been carried out based on APSEZL, Mundra facilities, coastal geo-information and port operational conditions. Recommended multiple response methods i.e., mechanical equipment or dispersants /bioremediates based on NEBA studies, put into use in case of oil spill.

3.1 Equipment and Supplies


The response equipment required for mounting an operation consists of equipment for offshore and shoreline operations and could include following spill equipment's

Offshore & shoreline Equipment's

- Booms, Skimmers, Absorbents, boats / tugs / response vessel
- Protective clothing for everybody (including boots and gloves), spare clothing.
- Cleaning material, rags, soap, detergents, brushes.
- Equipment to clean clothes, machinery, etc., with jets of hot water.
- Plastic bags (heavy duty) for collecting oily debris.
- Heavy duty plastic sheets for storage areas especially for the lining of temporary storage pits.
- Spades, shovels, scrapers, buckets, rakes
- Ropes and lines
- Anchors, buoys
- Lamps and portable generators
- Whistles
- First Aid material.

Other special equipment which may be used are:

- Workboats
- Trucks / cars (four-wheel drive)
- Radio transmitter / receivers
- Workshop / repair facilities
- Bulldozers, mechanical scrapers and similar earthmoving
- Equipment

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- Vacuum trucks
- Tank trailers
- Life vests
- Explosive meters

The response operations carried out for both offshore and onshore as discussed below.

3.2 Offshore Operations:


The minimum oil spill equipment required for response in terms of containment, recovery and disposal will be maintained at APSEZL at Mundra and onboard the tugs fitted with fire contain remote controlled fire monitors. The equipment maintained at marine control room will be the first to be deployed for containment and would be augmented by movement of additional equipment as required by the situation. The details of total equipment required for response operations are as follows.

Sr. No	ITEM	QTY	CAPACITY
1	Inflatable boom for Fast Response	2000 m	
2	Weir Type Skimmer	2	50m ³ /hr
3	Multi Skimmer	2	50 m ³ /hr
4	Vacuum Skimmer	2	30 m ³ /hr
5	Floating storage tank	2	10 m ³
6	Oil spill Applicator with spray arms type with 2 nozzles	1	
7	Bio Remediation (lit)	2000L	
8	Dispersants-type-III	3000L	
9	Personnel Protective Kit	30	
10	Oil Absorbent Kit	2	

The list of equipment available with Adani Ports and SEZ Limited, Mundra is given in the Appendix-15

3.3 Shoreline operations

Shoreline operations will be undertaken by local civil administrative as per their contingency Plan. Taking into account the spill movement and area sensitivity, the Equipment will be mobilized along with manpower to the site by the local administrative authority. The procedures laid down in Operations Manual will be available for reference to clean up teams along with expertise held with responders. The details of spill equipment for shore cleanup are as follows.

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Sr. No	ITEM	QTY	CAPACITY
1	Shoreline Cleanup Equipment's Mini Vacuum pumps capacity (25 m3)	2	
2	Floating storage tank (10T)	2	
3	Absorbent (oil only) 80 L Kit for quick oil spill response	1	
4	Sorbent pads 20-inch x 20 inch (nos)	500	
5	Sorbent Boom size min 5inch dia, min length 5 feet	250	

Based on the oil spill modeling study, it has been observed that an oil spills at berth locations / SPM / tanker route will reach the coast within hours (Part-B: Report). Accordingly, the resources required for Tier-1 response plan are estimated as below:


3.4 Additional equipment and response

While, the equipment held with response team will be available for initial and first response, the additional requirements would be met from equipment held by participating companies being addressed by this Plan. As per the NOS-DCP18 (Appendix-15), the ports are under Category-A as per the risk Category, hence, additional equipment's are to be procured listed in Appendix-15 for compliance with NOSDCP.

In the event of a decision being taken by the team managing the spill, the equipment held with the participating units will be made available to response teams. The details of equipment held at different locations are placed as follows.

Additional equipment and location

LIST OF RESOURCES AVAILABLE-ADANI PORTS and SEZ LIMITED, MUNDRA						
Tugs Available for Oil Spill Containment						
Name of Tug	Type	BHP	OSD	AFFF	Capacity (cum/Hr)	BP
Dolphin No. 4	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 7	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 10	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 11	ASD (DSV)	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 14	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 15	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 16	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 17	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 18	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Brahmini	ASD	2000 x 2	3000 ltr	2000 ltr	1200	65
Bitarni	ASD	2000 x 2	3000 ltr	2000 ltr	1200	65
Khushboo	Fixed screw	401 X 2	-	-	-	10
<p>Dolphin No. 4, 7, 11, 14, 15, 16, 17, 18, Brahmini and Bitarni are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required. The tugs are also fitted with a fire curtain and remote-controlled fire monitors.</p> <p>All above ten Tugs have class notation as Harbour Tugs and are certified to work within</p>						

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the Harbour limits only.

2. Reception Facility: 12" pipe line, connected to a slop tank at chemical tank farm.

Dolphin 11 has firefighting system of 1200 m³/hr along with 20 ton lifting "A" frame and diving support facility.

Location of Oil Spill Equipment: The Oil Spill Equipment stored in SPM Store.

RESOURCES/EQUIPMENTS WITH AVAILABLE APSEZL, MUNDRA

ITEM	Available in the present
Inflatable Booms with accessories (Material: Neoprene/rubber/neoprene rubber)	2000
Fence Boom (Material: Neoprene/rubber/neoprene rubber/PU/PV)	235 m
Skimmer (20 TPH 50% weir type, 50% Brush type)	(2+2)
OSD Applicator with Spray arms type along with 02 Nozzles system and 02 hand lancers (No)	4
Oil Spill Dispersant (chemical dispersant) (litres)	5000
Bio remediation (litres)	0
Flex barge 10 Tons (no)	2
Weir boom 100 m with minimum 02 weirs with power pack and accessories (nos) Or Integrated containment cum recovery system with power pack and accessories	4
Sorbent boom size min 5-inch dia, min length 5 feet (no)	500
Sorbent pads min 20-inch X 20 inch (no)	2000
Shoreline cleanup equipment – Mini vacuum pumps capacity 25 m ³	2
200 m shoreline sealing boom with power pack and accessories (material: neoprene/rubber/neoprene rubber) (nos)	3
VOC Portable Monitor	0
Level A protection:	5
Level B protection	10
Level C protection	20
Level D protection	30
Work Boats	4
Tugs	4
IMO Level 1	20
IMO Level 2	18
IMO Level 3	7

Facilities in the marine control room

1. Tidal stream guage: this can accurately read the prevalent rate of flow and direction of current.
2. Tide guage: for accurately calculating the height of tide at any given time.
3. Wind guage: for direction and speed of wind
4. VHF sets (fixed and portable) with complete range of marine frequencies to be used for field operations.

In the event of an ongoing spill or a spill that requires declaring of Tier 2 or 3 responses, the additional equipment and manpower held with any other OSRO or facility will be sourced in an accelerating manner including resourcing from the National / international spill handling companies. Contact details of companies holding equipment in India and International OSROs are listed below.

LIST OF ADDITIONAL RESOURCES AND INTERNATIONAL OSROs

1. Australian Marine Oil Spill Centre

PO Box 305
Victoria 3214
Australia
Tel + 61 3 5272 1555 Fax + 61 3 5272 1839
Mail: amose@amosc.com.au
Web: <http://www.aip.com.au>

2. Fast Oil Spill Team


C/o PIM 40 G 23 Tour Elf
92078 Paris- La Defense Cedex France
Tel: + 33 1 4744 5636 Fax : + 33 1 4744 2677
Mail : giefost@club-internet.fr

3. Oil Spill Response Ltd

Oil Spill Services Centre
Lower William Street Northam
Southampton SO1 1 QE, UK
Tel: + 44 1703 331 551 Fax: + 44 1703 331 972
Mail: osrl@osrl.co.uk
Web: <http://www.oilsillresponse.com>

4. Petroleum association of Japan

Oil Spill response Department
Keidanren Building
9-4, 1 – Chome, Ohtemachi
Chiyoda- Ku,
Tokyo 100, Japan
Tel: + 81 3 3279 3819 Fax: + 81 3 3242 5688
Mail: mail@pcs.gr.jp
Web : <http://www.pcs.gr.jp>


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3.5 Inspection, maintenances, and Testing

The oil spill response equipment will be maintained in highest state of operational readiness. This is achieved through a planned maintenance, inspection and testing program. A record of inspection, maintenance and test will be maintained.

The response team will be responsible for regular testing and mock drills. All personal assigned with the task of operation of this equipment are adequately trained and their level of competency will be maintained by conducting regular exercises.

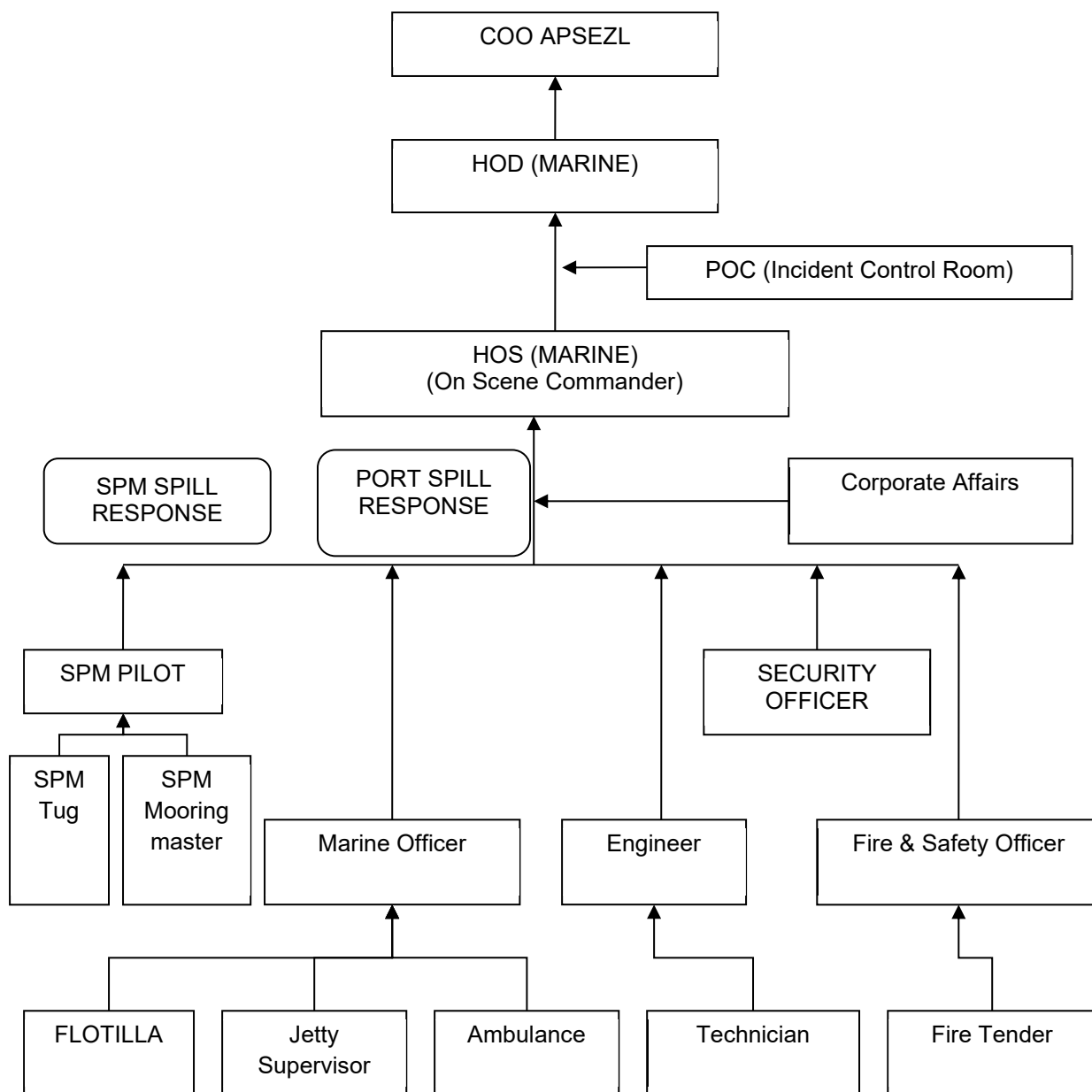
Hands on training to personnel will be given by actually deploying the equipment and checking their effectiveness. Similarly, crew of support vessels will also be kept trained by regular, periodic training and exercises.

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4. OIL SPILL MANAGEMENT

Management of the oil spill response operations will be undertaken by a Spill Management Team involving personnel and having various levels of responsibilities in their existing operational areas.

The Organization Chart for Oil Spill Response is giving below.



4.1 Crisis Management Team (CMT) / Chief Operating Officer (COO)

CMT is the primary unit for incident management and is composed of senior manager from various departments for providing advice and resources and take on the spot decision to meet any immediate requirements arising during the response operation.

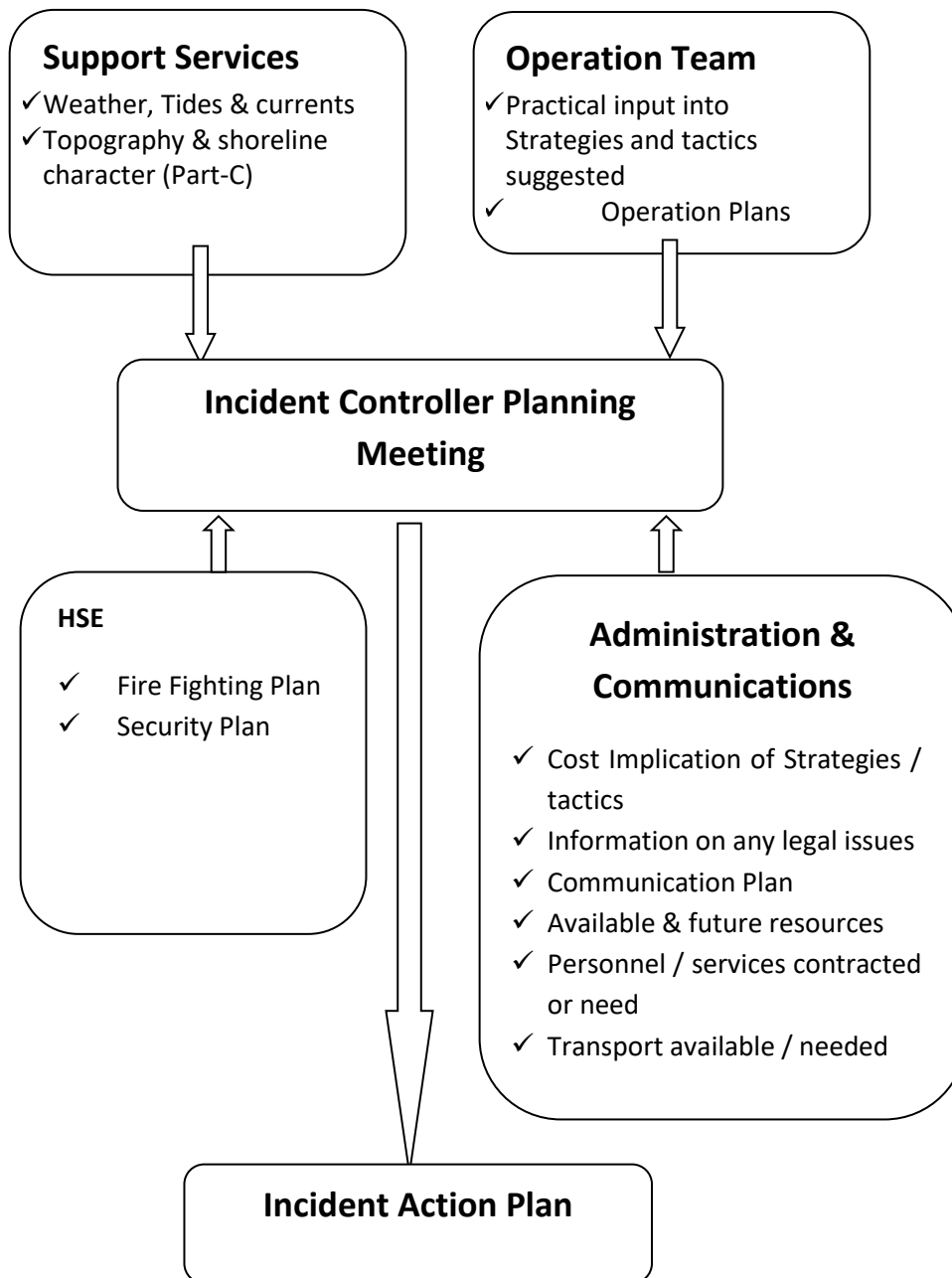
The major functions that would need to be carried out by CMT to discharge the Plan are as per table 4.1

Table.4.1: Major functions of Crises Management Team

Field operations	✓ Initiation, Control of Operations and response activity
	✓ Emergency Control room functions
	✓ Implementing tired response and disposal
	✓ Shoreline cleaning (when initiated through this CP)
	✓ Planning and strategy
Admin and logistics	✓ Victuals
	✓ Transport
	✓ Additional manpower and equipment
	✓ Security
Technical matters	✓ Cargo ops, availability of response items, repairs
Liaison	✓ Communication- operational and with other
	✓ Government / non govt. authorities, Media
Legal	✓ Documentation of damages, claims and
	✓ compensation, notifications
Health and safety	✓ Medical assistance

4.2 Incident Organization Chart

CMT is the primary unit for incident management and is composed of senior manager from various departments for providing advice and resources and take on the spot decision to meet any immediate requirements arising during the responses. Organizational chart as follows



4.3 Financial Authorities

The financial Authorities of APSEZL, Mundra is as per the existing organization structure. At the time of the crises, the need of the hour will be understood and requirements of OSC / ERT will be met at a faster rate than normal. Since all head of Department (HODs / HOS marine) would be available, immediate on the spot approval will be accorded.

4.4 Functional Designations

Following functional designations stand identified and notified through the Plan, to give effect to this Plan:

- i. Chief Operating Officer APSEZL Mundra
- ii. Incident Control Officer (HOS – Marine / Duty Port Captain)
- iii. Site Emergency Coordinator (Senior Pilot and Radio Officer)
- iv. Fire Coordinator (HOS – Fire / HOS -Safety)
- v. HOS – Security / Duty Security officer
- vi. Medical Superintendent
- vii. Marine Pollution Coordinator – Manager (Marine /Pollution Control)
- viii. Traffic Coordinator - Duty Port Captain
- ix. Communications Officer (Duty Port Captain / Duty Radio Officer)
- x. Chief Emergency Controller (Head -HSE)
- xi. Civil Coordinator (HOS – Environment Cell / HOS Estate)
- xii. Marine Engineering Coordinator (HOS – SPM / Diving Team in-Charge)
- xiii. HOD – Corporate Affairs
- xiv. HOS-Legal & HOD Estate


4.5 Manpower availability (on-site, on-call)

As per the policy of port, the marine department would be providing required man power for all the OSR activities. However, various departments providing assistance of water craft, vehicles, cranes etc. for movement of men and material: would provide necessary manpower and their departments, as required, so as to continue the OSR operations uninterrupted.

4.5.1 A float Operations and Response Team/ Teams

In an emergency, the personnel available at or near the incident site play vital role. This concept is made use of in nominating the key persons. It is necessary to nominate a functionary as the Incident Controller who is invariably a shift-in-charge of the facility. The Incident Controller tackling the emergency in real times requires the support from various other services i.e., Fire & Safety, Medical Services covering communication, transport and personal functions etc. A key person for each of these services therefore, should be nominated.

Overall, in charge of these activities is Chief Operating Officer – Mundra Port. The different functional coordinators, designated, will co-ordinate with Chief Controller in their respective functional areas. It is suggested that key personal chart be developed, giving the names, designation, telephone nos. of top-level personnel who will act as coordinators in different disciplines/services. The duties and the responsibilities of various Key Persons and Coordinators

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need to be written down on a chart and should be made available across the organization at the site / location.


Roles & Responsibilities of key persons

Incident Control Officer – (HOS – Marine / Duty Port Captain)

- Directs and co-ordinates all field operations at the scene of the accident
- Assess incident/crisis at site, nature, location, severity, casualties, resource requirement
- Classifies incident - Advises Exe. Controller, Civil Defense, Dy. Conservator, Traffic Manager - regarding crisis severity status and emergency level, wind direction, temperature, casualties and resource requirements.
- Conducts initial briefing to Chairman
- Activates elements of the terminal emergency plan/ site response actions
- Protect port personnel and the public
- Directs security/firefighting/oil spillage/gas leakage/vessel accidents/natural calamities, cargo operations shutdown
- Search for casualties and arrange first aid and hospitalization
- Brief or designate a person to brief, personnel at the incident scene
- Determine information needs and inform Crisis Management Group
- Coordinates all functional heads in field operations group to take action
- Manages incident operations to mitigate for re-entry and recovery
- Coordinate search and rescue operations
- Arrange evacuation of non-essential workers to assembly points –outside port
- Arranges tugs, mooring boats and pilot(s) for sailing vessel(s)
- Co-ordinates actions, requests for additional resources and periodic tactical and logistical briefings with Site Emergency Coordinator
- Coordinate incident termination and cleanup activities
- Instructs various emergency squads as necessary

Site Emergency Coordinator – (Senior Pilot and Radio Officer)

- Direct operations from the emergency control center with assistance from Crisis Management Group
- Take over central responsibility from the Site incident controller (SIC)
- Decide level of crisis and whether to activate off site emergency plan
- Instruct SIC to sound appropriate alarm
- Direct the shutting down, evacuation and other operations at the port
- Monitor onsite and off-site personal protection, safety and accountability

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- Monitor that casualties if any are given medical aid and relatives informed
- Exercise direct operational control of the works outside the affected works
- Monitor control of traffic movements within the port
- Coordinate with the senior operating staff of the fire, police and statutory authorities
- Issue authorized statements to the news media
- Review and assess possible developments to determine the most probable course of events
- Authorize the termination of the emergency situation by sounding the all-clear siren-continuous long single tone siren for one minute
- Control rehabilitation of affected areas after emergency
- Arrange for a log of the emergency

Fire Coordinator – (HOS - Fire / HOS -Safety)

- (Under the direction of the Incident Control Officer)
- Announces fire incident point over the public address system and evacuates workers to the assembly points
- Informs fire station immediately and leads firefighting team to the incident location
- Informs SIC if external fire tender / fire-fighting equipment / materials/mutual aid is required
- If necessary, arranges and activates other fire-fighting equipment
- Arranges safety equipment e.g., fire suits, protective gloves and goggles, breathing apparatus
- In liaison with Civil Engineering Department, ensures that adequate water pressure is maintained in the fire hydrant system/at the area supply
- Maintains adequate records

HOS - Security / Duty Security Officer

- Directs, gate security and facilitates evacuation, transport, first aid, rescue
- Controls the entry of unauthorized persons and vehicles-disperses crowd
- Permits the entry of authorized personnel and outside agencies for rescues operations without delay. Liaises with State police
- Allows the entry of emergency vehicles such as ambulances without hindrances
- Ensures that residents within port area are notified about disaster and instructs to evacuate if necessary
- Ensure that all people are aware of the assembly points, where the transportation vehicles are available
- Ensure that the people are as per the head count available with the assembly point section of that area

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- Liaise with the Chief Medical Officer to ensure first aid is available at the assembly points
- Carry out a reconnaissance of the evacuated area before declaring the same as evacuated and report to SIC.

Medical Superintendent


- Direct medical team
- Set up casualty collection center arrange first aid posts
- Arrange for adequate medicine, antidotes, oxygen, stretchers etc.
- Contact and cooperate with local hospitals and ensure that the most likely injuries can be adequately treated at these facilities e.g., burns
- Advise Chief Emergency Controller on industrial hygiene and make sure that the facility personnel are not exposed to unacceptable levels of toxic compounds
- Make arrangements for transporting and treating the injured
- Inform the hospitals of the situation in case of a toxic release and appraise them of the antidotes necessary for the treatment
- Maintain a list of blood groups of each employee with special reference to rare blood groups
- Liaise with Govt. Hospitals/Red Cross

Marine Pollution Coordinator – Manager (Marine / pollution control)

- Minimizes the impact of an accident on the environment for which it would develop methodologies to control hazardous spills
- Monitors cooperation with emergency response squads to conduct the actual cleanup work during and after the emergency.
- In case of fire and specially if the fire involves toxic/flammable materials, to ensure responsible actions for containing the run off fire water and other water from the damaged units
- Determines the level of contamination of the site as a result of the accident
- During cyclones/floods arranges sand bags and transfers important plans and documents to higher levels

Traffic Coordinator – Duty Port Captain

- Directs operation staff
- Prepares vessels to vacate from berth
- Arranges to protect cargo in vicinity from damage
- Arranges to segregate and shift cargo in sheds
- Submits consolidated list of dangerous goods in port including tankers in port and tank farms in port area

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- Coordinates with ship owners / agents/C & F agents/stevedores

Communications Officer – (Duty Port Captain / Duty Radio Officer)

- Ensure telephone operator/signal room advises entire emergency team
- On receipt of instructions from the chief Incident controller, notifies the fire brigade/police/hospitals/district collector/mutual aid partners
- Keep the switchboard open for emergency calls and transmit the same to the concerned personnel effectively
- Refrain from exchanging any information with authorized persons unless authorized to do so by the Chief Incident Controller
- Maintains contact with other vessels through VTMS

Chief Emergency Controller – (Head - HSE)

- Inform district emergency authorities-District Collector, Medical Officer-Coast Guard Pollution control -Inspector of factories-Inspector of Dock Safety & Health,
- Activate the off-site plan if necessary
- Liaise with Jt. Secy./Director MOST (Ministry of Shipping) or relevant Govt. authority
- Inform the media

Civil Coordinator – (HOS – Environment cell / HOS - Estate)

- Inform Gujarat Pollution Control Board and other environmental agencies about the incident for getting necessary guidance
- Instruct the contractors to carry out urgent civil works if required
- Hire the barges for collecting the spilled oil, if required


Marine Engineering Coordinator – (HOS – SPM / Diving Team in-charge)

- Organize the tugs for combating the pollution
- Start the rigging of pollution combating equipment on tugs/launches
- Hire additional crafts if required

HOD- Corporate affairs:

- Collect detailed information periodically and liaise with press about the incident
- Arrange transport facilities, if required
- Inform local authorities/District Collector about the incident (as per EAP)

HOS - Legal & HOD - Estate:

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- Issue notice under Major Port Trusts Act, Indian Ports Act(Prevention & Control of Pollution) Rules, etc.; to the defaulting master/owner/agent
- Arrange for settlement of claims related to the pollution (as per EAP)

The functions of response team can be assigned to an identified and qualified OSRO also. In such an event of nomination, all functions with respect to response team and On Scene Co-coordinator will be carried out by the OSRO or OSRO representative, while, CMT and CIC will continue to function hitherto.

Response resources like equipment to be deployed having been identified in terms of quantity and location, additional resources like Spill Response Vessel (SRV) and work boat etc. along with responders would be as per identification and notification by CMT leader. In the event of an OSRO being assigned the responsibility to provide resources, OSRO will have to mobilize the different units.

4.6 Availability of additional manpower

The response team is to comprise of a Manager, Specialists, responders, response workers apart from the crew of the vessel or work boat assigned to response duties. The team and additional resource composition are


- (i) Incident Manager / OSRO Manager
- (ii) OSC- Incident Controller/On Scene Coordinator
- (iii) SR Vessel and Captain
- (v) Responders
- (v) Vessel crew
- (vi) Work boat, master and crew

Additional responders or additional teams could be assembled during response ops as the requirement demands.

4.7 Advisors and experts – Spill Response, Wildlife, and Marine Environment:

Advices as felt necessary is to be sought from the commanding officer, ICG, Jamnagar, who look after such affairs related to oil spill response of Gujarat State Commander Coast Guard Region, Jamnagar may be approached in case, any need arises or as directed by CO, ICG.

Advice on wild life and marine environment is provided Ministry Environment and Forest and Gujarat State Government Department

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In case, it is felt that private consultant / advisor opinion is required, Clean Sea Enterprise at Mumbai may be contacted in consultation with the component authority

4.8 Training / Safety schedules and drill / exercise programmed

4.8.1 Training:

APSEZL, Mundra personnel, who have a role / responsibility for oil spill response and emergency management, shall undergo training appropriate to their role / responsibilities.

APSEZL, Mundra will ensure that their emergency response personnel, who are required to operate oil spill equipment, undergo training for effective deployment of equipment and devices.

Masters of Tugs and APSEZL, Mundra Vessels are to ensure that their crews are fully trained in department of equipment and devices held on board.

4.8.2 Drill / exercise program

The purpose of exercises and drills is to test the knowledge of persons and members associated with response activity and maintain them in the highest state of readiness and professional competence. The exercises would aim to assess acquaintance of response teams with operation ability and initiation of Plan and also the knowledge of operational parameters.


For this purpose, it is required to conduct both in house training and evaluation exercises and also multi agency co-ordination exercises.

In addition to classroom training, the responders would need to go through regular internal and external exercises that would include deployment of equipment to demonstrate level of proficiency. With respect to management of operations in consonance with the plan, it is desirable to conduct real time CP exercises with all industrial stack holders involved. Such an exercise conducted at a large magnitude would need to incorporate the staff from APSEZL, Mundra Participating Companies and the Indian Coast Guard and scheduled as mutually agreed.

The purpose of exercises and drills would be to check the following:

1. Organizational and Planning

- a. Knowledge of Contingency Plan and Procedures
- b. Personnel Notifications and Staff Mobilization
- c. Ability to operate as per CP and Operations Manual

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2. Operational Response

- a. Oil spill assessment
- b. Response equipment selection
- c. Containment strategies
- d. Spilled oil recovery techniques
- e. Disposal of recovered oily water and contaminated material

3. Response Support

- a. Communications
- b. Logistics
- c. Personnel support
- d. Documentation

Types of exercise

Exercise requirement as per contract is to conduct internal and external exercise. In addition to classroom training exercise are include deployment of equipment to demonstrate satisfactory of proficiency. External exercises are to incorporate with the staff from APSEZL, Mundra, participating companies and the Indian Coast Guard.

Type A: Internal exercises lasting approx. one day for ensuring OSR readiness of all equipment, services and personnel.

Type B: Emergency response exercise (Tier-1) is to be conducted twice in a year

Type C: This exercise designed to test either specific scenarios or emergency plans includes external participation (i.e. mutual aid, govt. agencies)

5. COMMUNICATION AND CONTROL

5.1 Incident Control Room and Facilities

The core operational team discharging the functions of incident control, administration and management is designated as Crisis Management Team/s (CMT) operating from the identified persons unless the magnitude of operations dictates manning of any particular operation by one operator only. (As far as practicable, both functions should be located at same site.)

Any person who observes a spill or gets an information of a spill or observes a situation that could lead a potential spill, may pass the available information with maximum possible details to any one control centre located in the Port Administrative building.

In the event, the response activity is assigned by the APSEZL to an OSRO, the OSRO will appoint a manager in addition to incident manager to undertake the responsibility of meeting the demands of response teams.


A permanent location is to be designated as Communication and Ops Centre (COC) by the authority responsible for execution of this plan. Both functions are to be manned by different of – port control, control and operations Room, Harbour master, by fastest means available (All incidents of soil whatever magnitude are to be reported to HM by Port Control Room or COC)

Contact Details

Port Control (MMPT Marine Control)	Landline- APSEZL, Mundra	02838-255739
	VHF – APSEZL, Mundra	VHF Channel -77 & 16
COC (MMPT Marine Control)	Landline No	02838-255739
	Mobile	98252 28673
	VHF	VHF Channel -77 & 16
Harbour Master / CIC	Landline – APSEZL, Mundra	02838-277727
	Mobile	6359883102

5.2 Field Communication Equipment

An effective inter-facility communication system among various departments/ agencies will be maintained with Operators. Communication will be established during the port operation in Mumbai and with the operators.

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5.2.1 Equipment

The communication centre is to be provided the following equipment

- VHF - 4 Nos.
- Walkie talkies – as per the number of response teams and functional team leaders
- Telephone (Landline or wireless) – 2 Nos,
- Computer and printer with internet and projector facility


5.2.2 Publications

- Copy of CP and appendixes
- Details of CMT, OSRO organization and their contact details
- Charts of Mundra harbor, Tide Table
- Large scale charts showing layout of POL and cargo berths
- GA plan of a typical oil tanker
- Location map of jetties, berthing and landing facilities available in Mumbai estuary along with facilities available
- Telephone contact directory of all emergency aid and medical services, port offices and local administration authority
- OSRP of APSEZL, Mundra and HMEL

5.3 Reports, Manuals, Charts and Incident Logs

The log incident Report from (as per sample below) has been developed to ensure that the basic information required to formulate a response to an Oil Spill Emergency is obtained during the notification (if required). Port Control / Harbour Master / Communication and Ops Centre will complete the form and dispatch to the concerned authorities by the fastest means. In all cases, the original status report forms will be handed over to ECT, who in turn would maintain the fastest means. In all cases, the original status report forms will be handed over to ECT, who in turn, would maintain record of all such documents.

The personal Log forms and the Continuation Sheets are to be used during the emergency response to record the contacts and actions carried out during the emergency. After "stand-down" the Personal Log Form and the Continuation Sheets, are numbered, signed and handed over to the Harbour Master. All incident logs and records will be maintained.

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INCIDENT LOG

INCIDENT INFORMATION

INCIDENT TITLE (Name of Vessel) -----

Incident Number (Sq number/ dd /mm/ yyyy)-----

1.DETAILS

Time of recording (24 hr format) Date
.....

Day.....

Person / Organization reporting incident

Name Designation

Contact number

2. INCIDENT

Name of VESSEL Location

Position (if not alongside) Latitude

Longitude

Sounding.....

Incident details

Time (Of incident, 24 hrs format) Date

Cause of spill

Type of oil

Estimated quantity of spill


Details of damage to vessel / installation

3. COMMENTS

1. Recorded by Name -----

Time -----

Note: FOUR COPIES OF INFORMATION ARE TO BE RECORDED. RETAINING ONE FOR OFFICE RECORD, THREE COPIES ARE TO BE CIRCULATED ONE EACH TO CHIEF INCIDENT CONTROLER OSC / RESPONDER/ INCIDENT CONTROLER VESSEL MASTER

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The personal log form (and continuation sheets) has been developed to allow all personnel involved on the emergency response to maintain a personal log of event. The personal log forms and the continuation sheets are to be used during the oil spill response to record the contacts and activities carried out during such emergency.

Incident Logs are must for logging of all the events taking place. This will help in preparation a comprehensive incident report on a day-to-day basis as well as on completion of operation.

After the repose work is over, the personnel log form (as per sample below) and the continuation sheet are to be numbered, signed and handed over to the Deputy Conservator.

PERSONAL LOG (ALL MEMBERS OF SPILL RESPONSE ORGANISATION)

Incident Title -----Number----- ----(as per)

Date -----

Name -----Designation (as per C P) -----

Time of Rx / Forwarding Info	Activity requested by/ demanded of another Member/s
Observations on days operations	

Note – Copy of Personal Log is to be handed over to COC daily or as earliest as possible on completion of a schedule

6. INITIAL PROCEDURES

Oil spill being one of the emergencies in the potential list of emergencies in the port operations, the initial activation of emergency plans commences from the site level irrespective of the magnitude of the event. Since not all the emergencies lead to oil spills, the activation of emergency response is oriented towards the required technical and operational mitigation APSEZL, Mundra Emergency Response Plans at the site, project and port level (Tier-1) takes precedence to the oil spill response plans in the initial events.

The initial actions that will be taken by APSEZL, Mundra in the event of an oil spill will comprise of following procedures, as detailed subsequently:

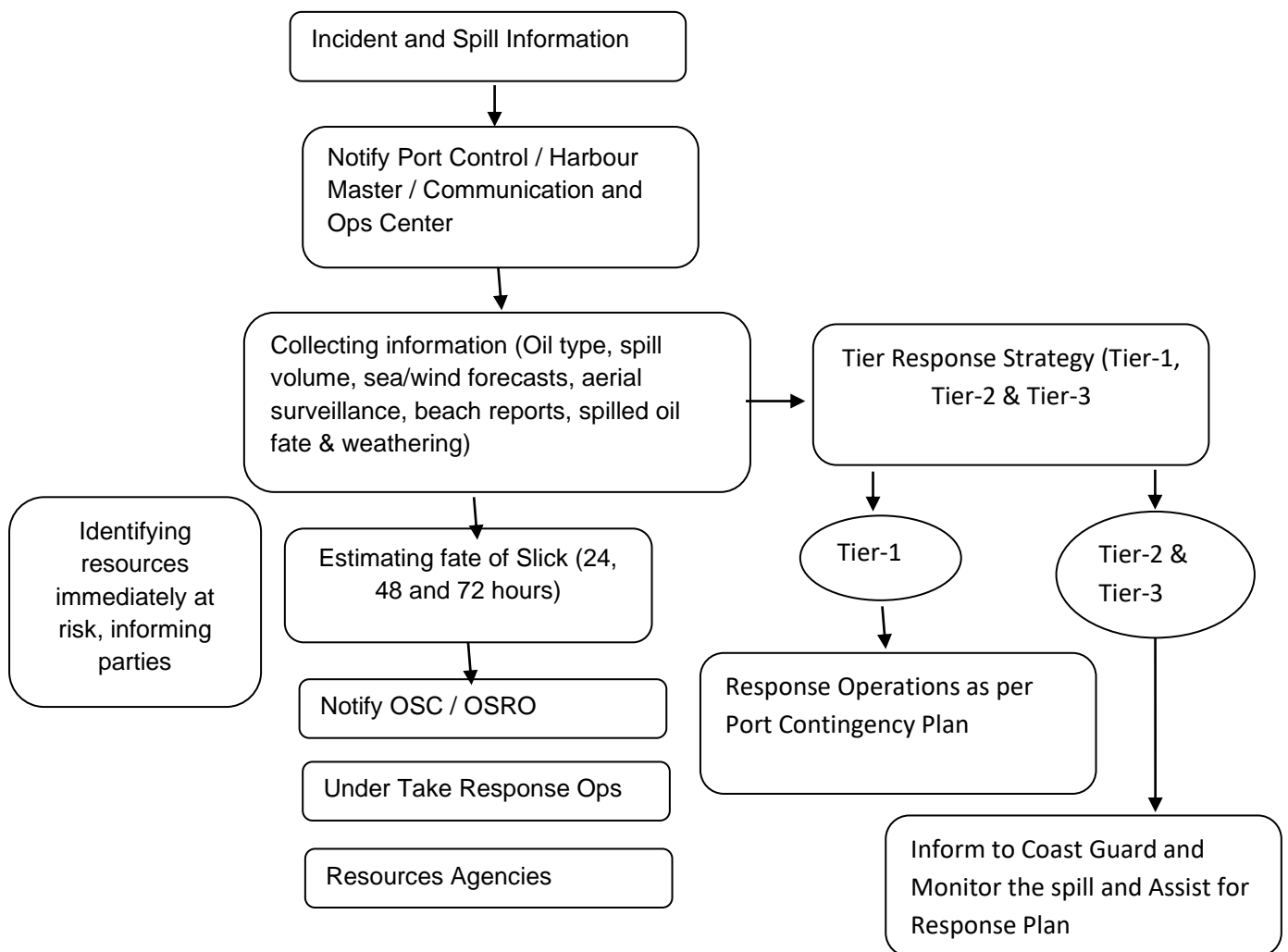


Fig.6.1 Flow chart for Incident and information


6.1 Notification of oil spill to Concerned Authorities

A trigger to activate emergency response can be done by any individual either working in Port Administrative roles or in contractual arrangements based on his initial observations or inferred potential threats in the process or hazards involved in operations. The escalation of emergency from the observer to the Port Control / Harbour master must be fast and unhindered. Following communication channels shall be used by the individuals at the work site to communicate emergency:

- **Shout about the event** – viz., leak, spill, fire, gas release, collapse, fall, etc. depending on the event so as to catch the attention of others in the vicinity.
- **Hand signals:** When there is no other means of communication, hand signals shall be used to convey the above events.
- **Walkie-talkies and other marine communications:** when the individuals have proper communication facilities viz. walkie talkie, VHF or mobile phones, the details of the incident shall be communicated to Port Control / Harbour master.

Once the nature, source & quantity of oil spill is assessed then the following procedure to be followed for notifying the oil spill

- 1) In the event of an oil spill, the spill observer will alert and notify the Port authorities of the spill. The spill will be reported to the Port Control / Harbour master. Preliminary information on the location of the spill, spill size, oil type, release rates and any injuries will be provided to the Port Control / Harbour master (**Appendix – 5 Prescribed Formats**). The Port Control / Harbour master will thereafter notify the Agent / response Agencies. In case the Port Control / Harbour master is activated, the Crisis Management Team Leader will be notified.
- 2) A preliminary estimate of the response Tier will be undertaken by the OSC. The OSC will allocate appropriate Tier level using guidelines given in earlier sections. *ECT* will be activated for Tier-1 spills while *EMT* will be activated for Tier 2/3 spills.
- 3) The spill event will also be reported to the APSEZL, Mundra Authority, Indian Coast Guard and other relevant authorities by the CMT Leader, in the prescribed formats. The CMT Leader and OSC will also have the responsibility to manage and mobilize external resources. If required, the CMT Leader will liaise with *ECT* for information and support requests.
- 4) The OSC will also need to collect information on the oil type and sea/ wind forecasts of the region which will assist in handling the spill. Aerial surveillance will be initiated if required to assess the extent of the spill and record the size and location of the slick. The response team deployed onshore in case of spill reaches the shore will also be instrumental in generating reports

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- 5) The fate and movement of the slick will be estimated as part of the initial response actions. Assessment of oil slick trajectory will be undertaken as per the following:
 - a. Obtain information on tides, direction / speed of current and wind.
 - b. Using the information on current and wind, predict the trajectory and speed of the spill movement.
 - c. Draw the slick on a chart (map) with co-ordinates, showing position and predicted the movement of the oil
 - d. Record observations on form provided in **Appendix - log Book Format**.
- 6) The colour of the oil on water will indicate its thickness. The volume of oil will be calculated based on the area and colour of oil visible from the aerial observation.
- 7) Once the size and movement of the spill are known, it is possible for the Incident Controller to assess the potential danger to people and nearby installations, and if necessary, to set safety exclusion zones. The predicted movement of the slick is also important for guiding responders to the right locations for clean-up. The Incident Controller must also gather additional key information about the incident from the On-Scene Commander.

6.1.1 Reporting of oil spill incident

In case of reporting of oil spill incidents, the following information is to be provided by the incident observer.


- Location of the spill
- Likely source of the spill
- Area impacted at the time of observation
- General observation of movement of slicks (based on winds and currents)

Upon receipt of such first information report, the same should be forwarded to the CMT leader through the fastest means of communication through the channels defined above. The person intimating about the incident (including near miss) shall not be made responsible for any actions relevant to spill response unless he is a member of the team relevant to the response. Prompt intimation of such incidents and near misses shall be encouraged by Mundra Port as a part of incident reporting and management system. Concerned authorities will be intimated according to the statutory requirements.

6.2 Preliminary Estimate of Response Tier

6.2.1 Preliminary Assessment of the Incident

The OSC along will make a preliminary assessment of the incident by contacting the person reporting the spill. If needed, the OSC may take assistance/ guidance from ICG Coordinator and other Government Agency. The following will be the broad objectives:

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- Evaluating the magnitude and impact of the discharge or threat of discharge on the public health, welfare, and the environment
- Determining in which jurisdiction the incident occurred
- Determining or confirming the responsible party
- Determining or confirming the source of the spill
- Assessing the need for state assistance; and
- Assessing the feasibility of removal and determining the equipment needed to remove the oil.

6.2.2 Containment and Control

Clean-up actions must begin as soon as possible to minimize the effect on natural and other resources. These actions shall include locating the source of the discharge and preventing any further spillage, placement of containment boom to control the spread of oil and to protect sensitive areas, measuring and sampling, physical removal of the oil from water and land, the use of chemicals to herd or disperse the oil, and in-situ burning. The official coordinating response to the spill must address many questions, including:

- How large an area will the spill cover?
- How thick will the slick be?
- How fast and in what direction will the slick drift?
- When and where will the oil hit the shoreline?
- What will happen to the oil if it is not removed?
- What is the value and sensitivity of the resources at risk?
- The answers to these questions will determine what response actions are taken.


6.3 Notifying Key Team Members and Authorities

The port authorities such as, HOD-Marine, Fire Officer and other HODs will be informed over phone /Mobile phone, and same be also logged at ECR. Upon confirmation of the incident with Authority reporting spill, inform to CMG and initiate notifications to the CG for all larger spills of more than 700 tons and intimation to international experts for response reediness.

6.4 Manning Control Room – MMPT Marine Control

The Emergency Control Room (ECR) would function with the members of Emergency Control Team (ECT) and they will consist of following:

- HOD-Marine Services
- HOS-Marine Services

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- SPM In-Charge
- Duty Port Captain
- Security In-charge
- Radio Officer

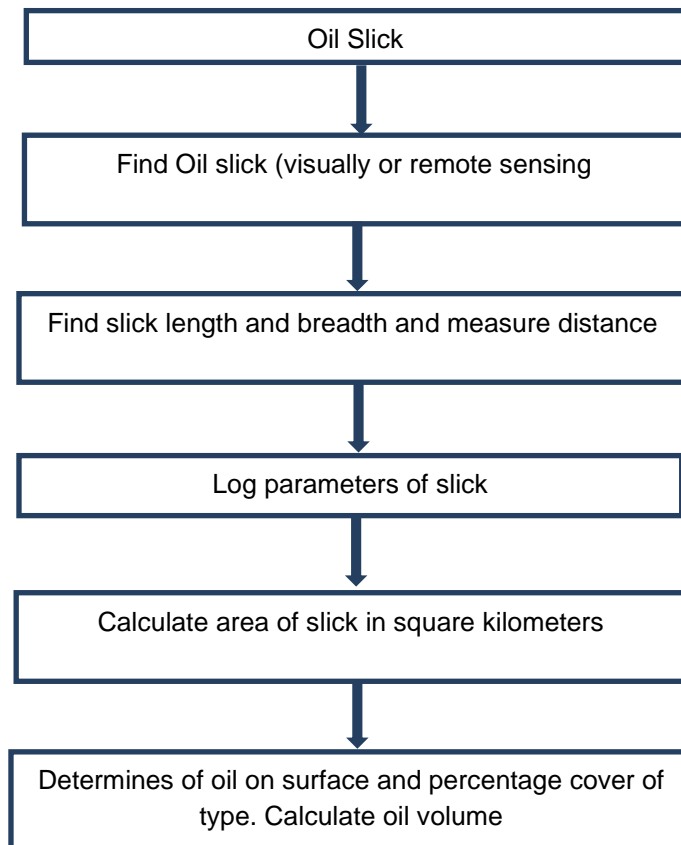
6.5 Collecting Information (oil type, sea/ wind forecasts, aerial surveillance, beach reports)

In case of oil spill reported, intimate to various department of Port Organization. The department will notify the following information to OSRO / Agencies

- i. Marine department will provide all the relevant data i.e., Tide conditions at that time, Tide timings, Current, Wind direction / speed, Weather forecast for 3 days next to that day to ECR. The Vessel movements, Vessel position in harbour, Water crafts availability for pollution response activities. Relevant Navigation Charts and any other important data / information available may also be provided to ECR. Also, number of Security personnel available at that time will be made available.
- ii. Security department to provide information regarding availability of type and number of vehicles available for transportation of men and equipment's. Also, number of Casual labors available at that time will be made available.
- iii. Fire department to indicate readiness about FIRE CONTINGENCY including OILFIRE and also number of spare Life Jackets available.
- iv. ECT is ensure that no individual working/supervising/observing OSR operations/Exercise without life jackets "ON"
- v. OSC is to collect following information immediately in case of oil spill

Surveillance and tracking of oil at sea immediately after the spill, carry out the surveillance for assessing the quantity and of spilled oil:

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The OSC is to collect the following information immediately in case of oil spill, with the help of Master of the vessel/aircraft.

- Time spill occurred
- Position in Latitude/ Longitude and also with reference to any prominent land mark
- Visual appearance, apparent thickness of oil and extent of area covered
- Percentage cover of various thickness of oil
- Existing weather condition and weather forecast
- Current, tide and wind conditions;
- Immediate availability of support vessels, equipment and man power specifying time factor as well
- Estimate oil spill trajectory and likely area and time of its landfall;
- Volume of each oil type.
- General comments on oil appearance (shape, direction of movement).
- General comments on weather.
- Appearance of oil at sea.

Code	Colour	Oil Type	Thickness	Volume/km ²
1	Silvery	Sheen	0.0001mm	0.1m ³
2	Iridescent	Sheen	0.0003mm	0.3m ³
3	Black/dark brown	Crude/Fuel Oil	0.1mm	100m ³
4	Brown/Orange	Emulsion	1mm	1000m ³

Movement of oil on the sea surface: Oil will move at 100% of the current speed and approximately 3% of the wind speed.

6.6 Estimating fate of Oil Slick (24, 48 and 72hours)

While predicting the movement of the oil spill, state of tide and currents along with prevailing wind must be taken in to account. Schematic diagram of weathering process with time and typical fraction of Crude Oil is shown the following figure.

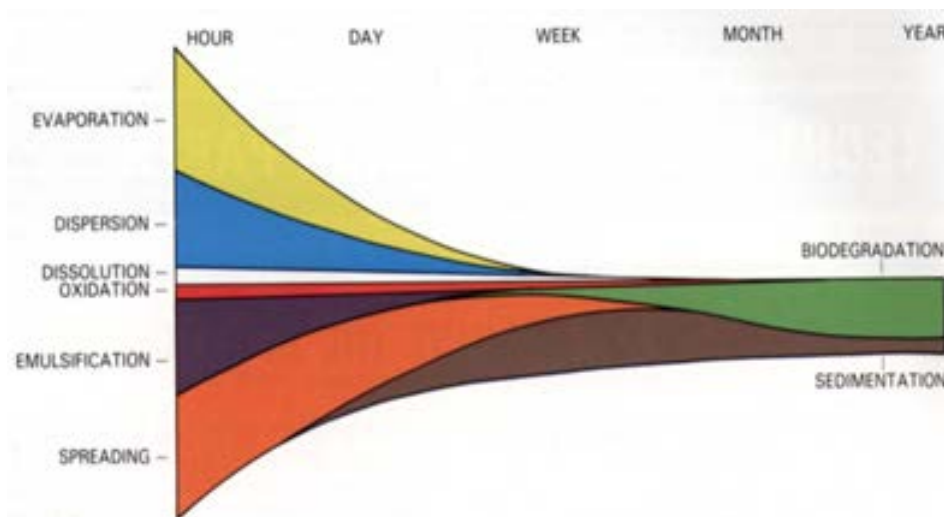



Fig.6.2: Schematic diagram of weathering process with time and typical fraction of Crude Oil

6.7 Identifying Resources Immediately at Risk, Informing Parties

The resources immediately at risk can be mangroves adjacent to the Port area, nearby Port Area. Depending upon the place of spill, the resources at risk will be found out.

Based on initial observations & assessment of oil spill and inputs from oil spill modelling studies, the resources at risk is to be identified by OSC. Relevant stakeholders/ parties to be informed to take appropriate action.


Continuous watch on working frequencies used by ships, port and terminal for POL cargo ops

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- Watch on Ch 16 at all times
- Log all information on in respect of an oil spill (with maximum details) received through keeping watch or from any other source
- In case of first receipt of information, pass all the details regarding spill to CMT leader to facilitate complete or partial activation of team or response actions by OSRO
- Pass all information regarding spill to OSRO and duty vessel or Tug assigned response duties
- Remain in constant touch with designated response team leader and response/support vessels as per working channel decided for operations
- Collect weather information on from MET dept on weather conditions in the area including wind direction & speed, tide condition and other weather parameters (all received information is to be logged)
- Provide weather data to operational teams as demanded

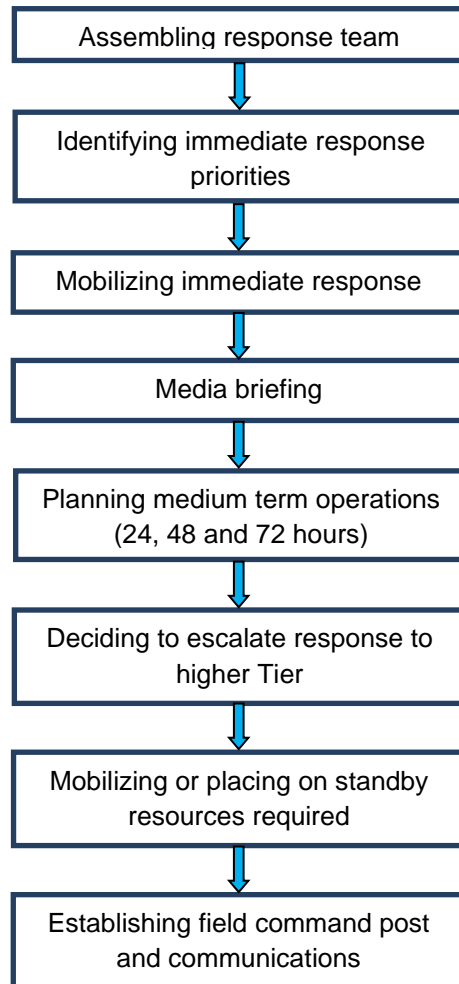
6.7.1 Oil Spill Modeling Studies

The fate weathering characteristics of spilled oil is predicted for various hydrological, Meteorological and oceanographical conditions. The details of computational various sceneries are presented in detail (Report-Part-B)

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7. OPERATION PLANNING

The response operations planning will follow the initial response actions. The procedures to be adopted have been discussed below:



- 1) After assessing the Tier of response based on the size, type and fate of spill, the CMT will initiate the response operations. The immediate response priorities will be identified and immediate response options will be mobilized. The response priorities for APSEZL, Mundra will be in the following order:

People residing in fishing villages and other establishments along the coastline and personnel on board the vessels

- a. Environmentally sensitive areas
- b. Assets i.e. rig/supply vessels
- c. Minimum reputational damages

- 2) The CMT will release a media briefing for ensuring that the information pertaining to the spill event is well communicated to the relevant authorities and coastal communities. The onshore response base at the nearest Ports (Adani) will also notify the coastal communities/stakeholders through verbal and written communication channels.
- 3) Once the spill has been assessed thoroughly, the decision on which response strategy to use is crucial in the first few hours of the spill. The preferred strategy for an offshore spill has been presented below and detailed subsequently:

RESPONSE OPS 1: Monitor, Evaluate and Sample: when spill is drifting away from coast and if the oil is headed towards the shore

RESPONSE OPS 2: Containment and Recovery

RESPONSE OPS 3: Dispersant Application

RESPONSE OPS 4: Shoreline Protection and Deflection Booming

RESPONSE OPS 5: Shoreline Clean-up: *in case the spill reaches the shore*

RESPONSE OPS 6: Waste Management

- 4) The response operations will be monitored by the OSC on continuous basis through records and hourly reports from the response team. Based on the ongoing response operations, it will be the responsibility of the CMT Leader, in consultation with OSC, to decide whether the response Tier has to be escalated to the next level and intervention of relevant authorities such as Indian Coast Guard will be required to handle the spill event.

7.1 Assembling full Response Team


Area of operation of this Plan being confined to APSEZL, Mundra. All responses and actions would get limited to coastal zone and within the Mundra region.

7.1.1 Crises Management Team /s (CMT)

The core operating team discharging the functions of Incident control, administration and management is designated as Crises Management Team/s(CMT) operating from the identifier control center located within in the port Administrative Building.

7.1.2 CMG

Apart, from the designated CMT, another senior level team designated as Core Management Group (CMG), headed by the respective head of APSEZL, Mundra, will get activated in times of major spill crises that may require liaison with senior level state, center authorities or other

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agencies. The functions of CMG will be same as CMT (as mentioned in 9.1) with a view to provide support to operations in terms of administrative requirements, CMG will assemble on the recommendations of Chief Incident Controller.

This Plan formulates the policies and strategies to be followed on case of a response and to be executes on the ground by CMT along with response team or Oil Spill Response Operation (OSRO)

The operational spill prevention provision of the CP will be discharges by three CMTs – headed by Chief Incident Controller, one each for the area of Jurisdiction of APSEZL, Mundra. Duties and responsibilities of all the three teams would largely remain the same – as spelled in this Contingency Plan (CP), with additions and amendments undertaken by each team as per operational situation and requirements particular to their area of operation. Each team would be responsible for operations in their respective area of jurisdiction.

7.2 Identifying Immediate Response Priorities


Major actions that would be required to be taken when a spill occurs are mentioned below. While, some actions like containment are required to be initiated immediately following a spill, some actions like shore line clean up etc. will get initiated in due time. The purpose of fast response is to minimize hazards to human health and environment the following response is accordingly addressed through the Contingency Plan and Operational Manual.

- Stoppage of discharge and containing spill within a limited area
- Defining size, position and content of spill, direction, and speed of movement and likelihood of affecting sensitive habitants
- Notification to private companies or governments agencies responsible for cleanup actions
- Movement of trained personnel and equipment to site.
- Initiation of Responsibility
- Ensuring safety of responsible personnel and public
- Oil Removable and disposal

Crises Management Team (CMT), with the help of oil slick movement simulation data and prevailing weather condition, would priorities which are to be protected first. By selecting the appropriate strategy, the CMT can derive an indicative strategy path to mitigate the effects of an oil spill, consistent with safe practice and net environmental benefit.

7.3 Mobilizing Immediate Response

The moment oil spills detected; the actions initiated should be part standard drills carried out i.e

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- i. Operation department to sound alert to various departments to start preparing for OSR activities.
- ii. HOD-Marine to muster ERT, carry out briefing about nature of oil spill, start preparations for the movement of OSR equipment's. Safety equipment's, teaches, lifelines life jackets working gloves rain coat, communication equipment sect be checked for their corrections
- iii. Security department to mobilize vehicles at the assembly place i.e. Near port head office building
- iv. ECT to coordinate with ECR to take stock of the situation.


The OSR equipment, both on-board vessel and onshore, have been sourced keeping in mind a Tier-1 response of 700 tons of crude that can be responded to, in one full day of ten working hours. This equipment will be operated keeping existing weather conditions in mind. For adverse conditions, no response will be effective. During normal weather conditions, advancing skimming system will be operated from the vessel that will keep on operating at 3 knots speed. Once the advancing system is in place and the recovery started, the oily water mixture will be pumped into the vessel tanks or the floating towable tank as per the availability. CMG Officers at Administrative office and OSC will exchange internal communication and keep incident appraised. Clean-up actions must begin as soon as possible to minimize the effect on natural and other resources. These actions shall include locating the source of the discharge and preventing any further spillage, placement of containment boom to control the spread of oil and to protect sensitive areas, measuring and sampling, physical removal of the oil from water and land, the use of chemicals to disperse the oil. The official coordinating response to the spill must address many questions, including:

- How large an area will the spill cover?
- How thick will the slick be?
- How fast and in what direction will the slick drift?
- When and where will the oil hit the shoreline?
- What will happen to the oil if it is not removed?
- What is the value and sensitivity of the resources at risk?
- The answers to these questions will determine what response actions are taken.

Dispersants shall be used as per the Indian Coast Guard policy and Guidelines for use of Oil Spill Dispersants (OSD) in Indian waters. The OSC must obtain clearance from the Indian Coast Guard before applying chemical dispersants.

RESPONSE OPS 1: MONITOR, EVALUATE AND SAMPLE

- 1) This is the preliminary action that must be taken once a spill has been confirmed. Following a Oil Spill on water this should be CMG first response as it must be recognized that sometimes

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the safest and most efficient response will be to let the product naturally dissipate, whilst at the same time employing safety measures.


- 2) Aerial surveillance provides the best option for monitoring a spill; however visual observation from sea level may be the only option initially. This will not give a reliable overall picture especially for larger oil spill events. As practically possible, aerial surveillance will commence to monitor and assess the oil spill. Aerial surveillance will enable:
 - a. Determine the size, quantity and location of the slick
 - b. Determine the movement of the slick
 - c. Noting of any changes in appearance and distribution of the slick
 - d. Forecasting of areas at risk
 - e. Reporting of effectiveness of response measures

- 3) Aerial surveillance will be used to direct containment, recovery operations and offshore dispersant. It can also be used to assess and monitor the successfulness of these strategies.
 - a. Before take-off:
 - i. take the equipment: Map/Chart, polarizing sunglasses, stopwatch, calculator, notebook, pencils, GPS (handheld with remote aerial and spare batteries), digital camera and spare batteries, and multiple surveillance reporting forms,
 - ii. Obtain latest weather forecasts and current conditions
 - b. During the flight:
 - i. start observation at an altitude of >1500ft or >450m for a good overall picture
 - ii. ensure there is a good viewing window, or consider flying with door open
 - iii. ensure there are communications with the pilot

- 4) Prior to flying, obtain information last known position of slick(s) and plot on a map. Manual plotting or oil spill modelling can provide an estimation of the slick position. On water oil moves at approximately 100% of current speed and direction, and 3% of wind speed and direction. Computer modelling of oil fate and trajectory will have to be undertaken, if required.

- 5) If there is an uncertainty as to the exact location or extent of spill, a spiral pattern can be used to investigate the area of interest. The shape and thickness distribution of fairly fresh oil spills depend on the oil properties, wind and currents. The wind spreads and elongates the spill, eventually cutting it into windrows and finally fragmenting. The thickest patches move furthest downwind to what is termed the "leading edge" of the slick. Where practical, long search legs should be aligned at 90 deg. to the direction of the prevailing wind to increase the chances of oil detection as wind rows will lie parallel to the wind direction.

- 6) Fly the length and width of the slick and record the time taken and the aircraft speed. Once the speed and times to fly the length and width are recorded, the area can then be calculated.

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7) The next step is to conduct an oil spill sampling. The technique for oil spill sampling has been presented below:

Table 7.1: Technique for Oil Spill Sampling


S. No.	Technique for Oil Spill Sampling	
1	Equipment	Sampling from an oil slick itself and submission of the samples require use of correct and necessary equipment (oil sample boxes). Each oil sample box contains detailed instructions with a description of sampling including gathering, referencing, labelling storage and forwarding procedure.
2	Frequency	For offshore spills a minimum of 1 sample per slick per day where possible.
3	Sample Size	<ul style="list-style-type: none"> • Un weathered oils that are liquid and subsequently free of water - 10ml; • Oil exposed to sea surface and forming water-in-oil emulsion 'chocolate mousse'-10ml; • Over size water discharge of 100 ppm from a moving tanker or 15 ppm from a fixed source is suspected- 1litre of discharge; • If such quantities cannot be collected, sampling of any quantity should still be attempted;
4	Collection method	<ul style="list-style-type: none"> • Skim the oil off the surface of the water with great care, ensuring maximum oil content and minimum water. A bucket may be required to collect the sample initially; • Avoid using metal tools containing nickel / vanadium-based alloys to collect the sample, as these are contained naturally within any crude oils and therefore may cause problems when analysed; • Any collection of lumpy tar/waxy pollutant should be placed directly into sample containers, with no attempt to hear or melt these samples; • Oil collected attached to floating debris, or seaweeds etc., should be placed along with the debris/seaweeds directly into the sampling container; • The sample containers should be sealed and labelled as soon as possible to minimize the evaporation of the oil's higher fractions.
5	Container Sealing, packing and Transporting	<ul style="list-style-type: none"> • Where possible, all samples should be securely packed, and sealed using screw topped containers and fireboard boxes to ensure safe carriage of the samples; • Sample containers should be glass with a large neck and a screw cover and a seal which would not be affected by oil, e.g. no waxed caped seals; • All sample containers should be sealed with a tamper proof seal; • Any bags should be sealed with a label which is signed with overlap on bag and label; • Plastic/metal containers are discouraged as can react with the sample and interfere with analysis; • Samples should be stored in a refrigerator/ cold room at less than 5°C in the dark; • When transporting the materials, dangerous good instructions should be followed; • Vermiculite should be used to surround the samples in the box for protection and to absorb any seepage; • Each sample should be clearly labelled with an identification number, date,

S. No.	Technique for Oil Spill Sampling
	time, location, and signature of the sampler, these details should also be recorded on a log form.


- 8) The weather conditions will be continuously monitored. Factors that should be considered when assessing oil spill movement and weathering include:
- a. Currents
 - b. Tides
 - c. Weather (including wind direction and speed)
 - d. Wave height (sea state)
 - e. Sea temperature, salinity
 - f. Spill size / volume (m³)
 - g. Spill thickness (estimated by color e.g. sheen, rainbow)
 - h. Type of oil spilt (viscosity, pour point, specific gravity, dispersion, evaporation)

RESPONSE OPS 2: OFFSHORE CONTAINMENT AND RECOVERY

- 1) Effective offshore recovery requires trained operators, suitable equipment, well maintained equipment, vessel logistics, aerial support, temporary storage, transportation and waste disposal.
- 2) Even in the most ideal conditions recovery rates will never be and are actually more likely to be around 10 — 20%. The faster the response, the better the recovery rate as the spill will have had less time to spread and fragment.
- 3) Operations are unlikely to be possible in wave heights exceeding 2m (failure of boom with oil being washed over) or in winds of more than 35 km/hr.
- 4) Vessels suitable to deploy offshore boom must have sufficient deck space to house boom reels and power packs and sufficient vessel power rating (bollard pull) to tow the boom. Typically, these vessels need to have a low smooth stern without a rail. In addition, vessels need sufficient deck space to allow safe crew movement. To accommodate these arrangements minimum deck sizes are:
 - a. Deck space to stow 2 x 10 ft containers safely and allow personnel movement
 - b. At least 2m stern to deploy and inflate the boom.
 - c. Offshore boom towing vessel at least a 1.5 tones bollard pull and 400 hp engine
- 5) Steps to carry out offshore containment and containment techniques are listed below:

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- a. Identify the thickest concentrations of oil. Aerial surveillance is the best method of directing vessels to the most concentrated area of the spill to conduct containment and recovery operations.
 - b. Sites for containment and recovery operations should be selected where the collection will reduce the likelihood of the oil impacting sensitive sites.
 - c. Ensure communication can be established between the aircraft and the vessel either or via the command team.
 - d. Deploying containment boom will limit further of the oil and concentrate the oil for recovery. Eddies behind the booms are an indication that they are towed too fast. Maximum speed is dependent on the amount of oil contained in the boom, boom characteristics and wave conditions. Typically, a speed of 0.5 – 1.0 knots is required for effective operations.
 - e. Oil lost under the boom will appear as or droplets rising 2-10m behind the boom. Sheens will often be present even when the boom is functioning well.
 - f. When towing a sectioned boom that has been joined in a 'U' configuration, an odd number of sections of boom should be used to prevent having a join in the center of the boom from which oil can more easily escape.
 - g. To avoid sharp stress or snatching on a towed boom, lines between boom ends and the vessel should be of sufficient length. 50 m or more would be appropriate for towing a 400 m length of boom.
- 6) Steps to carry out recovery of spilled oil and recovery techniques are listed below:
- a. Skimmers that are used to recover oil from the water all incorporate:
 - i. an oil recovery element
 - ii. notation or support
 - iii. pump or vacuum device to transfer recovered oil and water to a temporary storage device
 - b. Skimmers will need continuous maintenance by specially trained staff with a supply of spare parts
 - c. The effectiveness of a skimmer is determined by how quickly it can collect the oil, and how well it minimizes the water to oil ratio collected.
 - d. Recovered oil could be pumped into an inflatable storage barge or the recovery oil tank of a standby vessel.
 - e. Wave motion reduces the effectiveness of most skimmers. In calm waters better performance can be achieved if the skimmer is suited to the viscosity of the oil in question.
 - f. Floating debris, both natural (e.g. sea weeds, sea grasses, trees and branches) and manmade (e.g. plastic, glass, timber) can affect a skimmer's performance. Skimmers

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may need trash screens and regular unblocking where debris is common, such as near urban areas or the mouths of river.

RESPONSE OPS 3: DISPERSANT APPLICATION


- 1) The use of dispersants should be the primary response strategy to prevent the oil from coming onshore due to the limitations of booming operations offshore, the time taken to deploy the booms, the encounter rate due to the spreading of the oil and also sea conditions. However, dispersants will be used only on crude oils which do not disperse naturally and after obtaining the approval from the Indian Coast Guard.
- 2) The effectiveness of the dispersant on the oil slick must be monitored, and this is best done by observing the sprayed area. Where there is a coffee-colored plume in the water, this generally indicates effective dispersion of the oil. Where the oil has resurfaced there will be black patches.
- 3) Dangers to consider during dispersant operations are - fire or explosion risk, exposure of personnel to dispersant, weather conditions allow safe operation of vessels and aircraft and ability to control aircraft in the aerial spraying zone.
- 4) For effective use of dispersants, following considerations to be noted:
 - a. Dispersant should only be applied to crude and not light oils such as diesel or heavy oil such as HFO.
 - b. Dispersant effectiveness will decrease as the viscosity of oil increases.
 - c. It is unlikely that dispersant will be effective on emulsified crudes.
- 5) Steps to carry out dispersant application by vessel has been outlined below:
 - a. Aerial surveillance should be utilized for all dispersant application operations to direct operations and monitor the effectiveness. The dispersant operation must be at the thickest portion of the slick (leading edge) and not the thinner iridescent silvery sheen areas. Dispersant application should be considered in offshore and near shore to prevent oil entering environmentally sensitive areas onshore.
 - b. The following techniques should be utilized during dispersant application:
 - i. Vessel speed should normally be between 5 - 10 knots.
 - ii. The spray arms or spray nozzle should be mounted at the bow to avoid the effect of the bow wave which can push the oil beyond the spray width. The bow wave will also provide the required mixing energy. Dispersant should be applied when steaming into the wind.

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- iii. Agitation will be required to produce the required mixing energy. In calm sea states the bow wave of the vessel should be sufficient. Applying dispersant in conditions above a Force 5 is not recommended as the turbulence will cover the oil and spray droplets will be blown away.
 - iv. Typically, the most efficient dispersant to oil ratio (DOR) is 1:20, but on fresh oils, this can be a lot less (1:100). The correct application is determined by the pump rate and the vessel speed (knots). For most modern chemical dispersants, an application rate of approximately 1:30-1:50 (DOR) should be applied. Refer to the manufacturer's information for application rates
 - v. A visual check of the Spray area will indicate dispersant effectiveness. A grey / coffee color plume indicates successful dispersion. Spraying too much dispersant will result in a cloudy white plume, too little and there will be no effect.
- c. Below guidelines should be followed during dispersant application:
- i. Do not spray if the slick gets close to fishing boats
 - ii. Dispersant should be applied by trained operators, with proper safety equipment, and with experience in use of the spray equipment
 - iii. Do not use dispersants in water depths LESS THAN 20m. Reason: insufficient depth for adequate dilution and possible impacts on seabed (benthic) marine life
 - iv. Ensure the dispersant has been approved for use and any necessary authorization has been granted
 - v. All dispersants should be clearly labelled and stored with the appropriate supporting documents.

RESPONSE OPS 4: SHORELINE PROTECTION AND DEFLECTION BOOMING

- 1) Areas that should be protected include environmental and socio-economic sensitivities, with consideration of the time of the year. Protection booming is generally feasible across small bays, inlets and river mouths with currents (< 1 knot) and breaking waves < 1.5 ft (0.5 m) and on straight coastline areas to protect specific sites, where breaking waves <1.5 ft (0.5 m).
- 2) Deployment of shoreline protection will be supervised by trained Response Teams deployed to location that can assist in training and local personnel such as the Fire Service and volunteers. A local workforce would be to provide manpower.
- 3) Due to the long inter-tidal zone of the coastline, it will not be practical to use booms from the shoreline for protection. If any deflection booming is to be done, it has to be deployed beyond the surf zone from the coastline. This can be done by deploying the offshore booms in a


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deflection configuration which will require two boats - however the limitation will be the area covered by a single length of boom.

- 4) For deflection booming the length of the boom has to be towed in a straight line between two vessels and angled in such a manner to deflect the oil away from the coastline concerned. Deflection booming operations must be done as far away from the shoreline as possible. Knowledge of the depth of the water is important to allow for sufficient under keel clearance for the vessels and also the draft of the boom.
- 5) Where possible, protective booms should be deployed at an angle to the approaching slick to divert oil away from any sensitive area, for example bird breeding grounds. When wave amplitude exceeds 1.5ft (0.5m) or currents exceed 3 knots, protective booms should be moved to calmer waters if possible as boom are likely to fail. Booming will be ineffective if the current speed at right angles to the face of the boom (due to water current or speed of towing vessels) exceeds 0.75 knots.
- 6) The use of oil snares strung on ropes is also a practical strategy to prevent or minimize oil from stranding on the shoreline. In order to implement this strategy, the following need to be considered.
 - a. The snares need to be deployed beyond the low water mark of the inter-tidal zone and surf zone.
 - b. Suitable shallow draft boats will be required - Using the fishermen and their boats will be the most practical approach.
 - c. The snares attached to ropes will have to be tied to stakes at intervals of about 50 meters, parallel to the coastline.

RESPONSE OPS 5: SHORELINE CLEAN-UP

- 1) The purpose of shoreline clean-up should be to produce a net environmental benefit. Clean-up techniques can be damaging and, in some circumstances, oiled shorelines are best left to recovery naturally.
- 2) In many areas, bays and other inshore areas may also be somewhat protected from the extensive contamination by the flushing action of tidal currents and the natural outflow of streams and rivers. As a result, much of the shoreline may not require a widespread active cleaning effort unless it is heavily contaminated.
- 3) Where active shoreline clean-up is required, priorities for restoration can be established based on both the environmental sensitivity and oil persistence factors. Preference should be given to in-situ cleaning techniques such as in-place washing of rocky shores, use of shoreline cleaning agents, in-situ burning and bioremediation. Use of these techniques will minimize the amount of oily material collected and subsequent hauling requirements.

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- 4) In general, heavily contaminated areas should be cleaned first so that bulk oil is not remobilized impacting Other areas:
 - a. Stage 1: Removal of heavy contamination and floating oil
 - b. Stage 2: Clean-up of moderate contamination, stranded oil and oiled beached materials.
 - c. Stage 3: Clean-up of lightly contaminated shorelines and removal of oily stains.
- 5) Appropriate techniques to use will depend on the characteristics of both the area oiled and of the oil, but include:
 - a. Natural recovery
 - b. Low or high pressure ambient or warm water flushing
 - c. Manual clean-up
 - d. Mechanical removal, e.g. graders, scrapers, vacuum systems
 - e. Sediment relocation
 - f. Absorbents
 - g. Washing
- 6) Following options for shoreline oil recovery and temporary storage will be considered:

a. Vacuum trucks

- i. Vacuum trucks are a highly effective and rapid means of recovering and transporting liquid oil.
- ii. They are most effective when there are large volumes of oil contained in a particular location, can be used to recover oil from land or water, but may be limited by difficult access to the spill areas.
- iii. Vacuum skimmers should not to be used with volatile oil. Ideally a duckbill or manta ray skimmer head should be fitted to the suction nozzle as these provide the most efficient means of recovering a thin layer of oil.

b. Portable skimmers and pumps

- i. Portable skimmers and pumps are used to collect small to moderate concentrations of oil, or to pump larger volumes from areas where trucks are unable to go.
- ii. Hand held vacuum units are ideal for recovering oil that is floating on a very shallow layer of water.
- iii. Weir Skimmers require calm, still water and are good for all low viscosity oils. Oleophilic skimmers can be used in 'choppy' water, recover 90% oil to water, and are good for low to medium viscosity oils.
- iv. Oil should be pumped to a temporary storage location (tank, 55-gallon drums, pillow tanks, lined pit) which is safe, above flood levels, protected from rain, and sited to allow ease of access for future collection and transfer of the oil.

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c. Manual recovery and sorbents

- i. Sorbents are produced in a variety of forms (booms, pads, sweeps, snares, granules etc.) for use in specific locations and for specific types of oil spill clean-up.
- ii. Sorbents are generally best used for absorbing minor spills of oil on hard surfaces, and for final clean-up of spills (e.g. helping to remove sheen or to wipe oily residue off solid objects).

d. Temporary storage

- i. Fast tanks can be used for collecting recovered oil/water mixtures. Containers used for temporary storage must be tough and resistant to puncturing. Free-standing containers must be adequately strong to contain the weight of oil.
- ii. Excavated pits may be used for storage and should be lined with heavy gauge plastic (PVC) sheeting to minimize soil contamination.

7) In the stage of final clean-up, the endpoint should be determined for each oiled site. Endpoints should be realistic and obtainable for the spill conditions.


RESPONSE OPS 6: WASTE MANAGEMENT

- 1) Oil spill response operations have the potential to generate liquid and solid wastes. The types and quantities of waste materials largely depends on the amount of oil that reaches the shoreline and on the specific clean-up methods employed.
- 2) Waste from an oil operation includes:
 - a. recovered oily wastes
 - b. non-oily materials generated from the operation and supporting activities
 - c. materials contaminated with solvents, dispersants and fuels, gray water and unoiled wastes.
- 3) The types and volumes of waste generated by response activities are determined by the response objectives set during the spill management.

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Table.7.2: Techniques for Waste Disposal

Technique	Effect on waste stream	Type of Waste
At-sea response options	Recovery operations will give potentially rise to a large quantity of waste oil and water for treatment. The type of oil spilled will have an effect on resultant waste; in particular viscous and waxy oils will entrain debris and can create large volumes of waste. They can also	<ul style="list-style-type: none"> • Oiled equipment/ vessels/ PPE • Recovered oil/ oily water • Oiled vegetation • Oiled sorbent materials • Oiled flotsam and jetsam/ debris

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	present severe handling difficulties.	<ul style="list-style-type: none"> • Animal carcasses
Dispersant Application	Waste concentrations are minimal as the oil is dispersed in the water column and allowed to biodegrade naturally.	<ul style="list-style-type: none"> • No hydrocarbon waste is generated • PPE • Empty dispersant drums/ considerations
Shoreline Clean up	The type of oil spilled will often have an effect on the amount of oily waste generated. Waste segregation and minimisation techniques are critical to ensure an efficient operation. These should be established at the initial recovery site and maintained right through to the final disposal site. Waste sites should be managed in such a way as to prevent secondary pollution.	<ul style="list-style-type: none"> • Oiled equipment/ vessels/ PPE • Animal carcasses • Recovered oil/ oily water • Oiled vegetation • Oiled sorbent materials • Oiled beach material • Oiled flotsam and jetsam/ debris

7.4 Response Techniques for HNS Spill

This response techniques for spilled HNS in water is discussed in Table.7.3 The response method has a specific designation *-marks indicate groups of substances for which the methods are applicable.

Table:7.3 Application of various response techniques to different behavior groups

Group	Gas Phase		Liquid and Solid Phase (F, FD, D, SD, S groups only)									
	G	G D	E	E D	F	F D	F	F D	D	D	S	S
Predicting the spread in Air	*	*	*	*	*				*			
Predicting the spread in on water surface					*		*	*				
Predicting the spread in in water body		*		*				*	*	*	*	
Monitoring the spread in air	*	*	*	*	*				*			
Monitoring the spread in water body		*		*				*	*	*	*	*
Combating water soluble gas clouds		*										
Combating spills that float on water							*					
Combating spills that dissolve in		*		*				*	*	*	*	

water												
Combating spills that sink to the bottom											*	*

Group designations

G	Gas	F	Floater
GD	Gas/Dissolver	FD	Floater/dissolver
E	Evaporator	DE	Dissolver/Evaporator
ED	Evaporator/dissolver	D	Dissolver
FE	Floater/Evaporator	SD	Sinker/Dissolver
FED	Floater/Evaporator/ Dissolver	S	Sinker

Response Techniques

A number of response options for HNS spills as discussed in the following sections


- Response operation for gases or volatile liquids type of spills
- Response operation for floaters type of spills
- Response operation for dissolvers type of spills
- Response operation for sinkers type of spills

The effectiveness of these methods can be limited by chemical type and weathering, weather and sea state, or logistics. The response actions need to be taken as fast as possible to prevent escalation. The details for spill response techniques for HNS spill is furnished in Appendix-18

7.5 Media Briefing

APSEZL, Mundra has designated staff that will interact with press, public, govt. and media briefing during emergency. The most important aspect of retaining the credibility of a company is to release the first press statement immediately after a major incident. As the news channels and print media are expected to react quickly to an incident for the purpose of "first reporting" and "breaking news", it is important to get prepared to issue the first press statement at the earliest possible moment. The EMT and CMT leaders shall coordinate with the site team to get as much information as possible to draft a press statement with the help of Public Affairs Coordinator. The information must be:

- Specific and accurate to the extent of the event at the time of reporting
- Activities currently hand to minimize and control

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- Immediate projected plans for mitigation Information should not reflect any projections or perceptions of consequences or damage details (as they require assessment)
- No contradictory points in the statement
- Not attributing to a particular cause (as it would require investigations later)
- The key facts and messages to be included in further statements will be agreed between Group media, Business and country crisis Team leaders during conference calls.
- Group media will then distribute final statements to all crisis teams and other internal audiences as appropriate. NB: only final drafts should be used to minimize confusion.
- Additional useful facts on the specific crisis as well as relevant background information and generic Q and A's should be proactively sent to group media by Business and country communications colleagues as quickly as possible.
- Group media will disseminate agreed answers or statements on board questions areas being asked by the media. Business and country communications colleagues will ensure the necessary information is provided as quickly as possible.
- Group media will provide a synopsis of key issues in media coverage to all crisis teams Business and country communications colleagues will provide input as appropriate.

The draft statement prepared by the Public Affairs coordinator must be vetted by the EMT/ CMT Leader (as the case may be) and seen by the Head of Departments perspective before release. As the time is the essence of the effectiveness to deal with the media, all these actions must be parallel worked out with consultations among the leaders irrespective of their locations and timelines. The authorized personnel of Corporate Communication dept. shall release the statement through the applicable outlets (viz. print/ TV or web). The format of the press release statement is placed in "APPENDIX-12"

7.6 Planning Medium-Term Operations (24-, 48- And 72-Hours)

The likelihood of oil spill taking place are from two factors mostly, during vessel operations and secondly due to collision / grounding.

Since, during vessel operation, OSRO personnel as well as vessel staff present at the site, any spill taking place could be tackled immediately as response time will be less and spill damage control could be done quickly. Therefore, quantity of oil spilling into water is expected to be minimum and the spill could be controlled easily. In this case, dispersants, sorbents may be used and whole operation is likely not to last more than 24 hours. In fact, OSR items are kept handily in OSRV to use any time.

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However, in case of oil spill occurring due to collision, it is certainly going to be at a higher magnitude. As, when the collision takes place, every body's attention is likely towards safety of the vessel i.e. to avoid vessel getting grounded, avoid colliding with other vessels, preventive actions against fire or carryout firefighting, damage control action against folding as soon. It is anticipated that in case of collision the oil spoil is likely to occur due to rupture of or crack in fuel tanks.

In case of rupture fuel tanks, a sudden gush of oils will be there, and for some time it would be incontrollable. By that time any effective damage control action is taken, a substantial amount of oil would have already gone overboard. This would necessitate immediate oil containment measures, as well as starting oil recovery action. This spill recovery action may go well beyond 48 hours, keeping weather and sea condition in mind, because one does not know at what time of the day or night accident takes place which will determine the time delay in appreciation of the situation and mobilization of OSR team and equipment's. It may clearly be understood that appreciation of oil slick between sunset and sunrise is quite difficult and at times it may be fully incorrect, hence slight time delay may be anticipated.

Such incidents don't happen quite often, but very rarely. Hence regimes of OSR and equipment's shall be maintained at all times.

The oil spill scenario through crude fuel tank / tanks is not very different than previous one, because due to cracked / fractions / material failure occurred in the fuel oil tank / tanks, oil would continue leaking in a small /moderate rate. But it would be difficult to locate the source / point of oil leak and by the time source / point of leak is detected, suitable action is initiated and leak is arrested, a sizable quantity of oil would have already been over board. Detection of oil leak will become more difficult if the crack / fracture develops after some time due collision realter structural stress and ship is secured alongside jetty with the damaged / leaking side situated between ships ode and jetty. The problem will become more compounded if the accident takes place after sunset during sever monsoon conditions and detection of oil slick in the night would be really quite difficult. Like above aerial (i) here also one cannot deploy OSR men and equipment's preciously and reaction time to deploy OSR men and equipment, subsequently recovery of spilled oil is going to take more or less the same time.

Here are the vessels taken on consideration are visiting ships of various sizes in all weathering conditions but not the minor vessels or tug boats

7.7 Deciding to Escalate to Response to Higher Tier

When the spill response action has been initiated by ECT and ERT has started the recovery action, spill incident reporting has been made to concerned authorities, and then if OSC feels that quantum of oil spilled appears to be much more than what was reported earlier and the oil spill needs to be re-assessed and deserves a higher response, he informs the same to ECT.

At this juncture, the OSC and members of ECT should re-inspect the spill site and assess the oil slick thickness, its size, status of spilled oil and decide accordingly. If ECT is convinced that spill report deserves upwards revision and the level of Tier Response needs to be raised, it should take necessary steps to raise the oil spill reporting level. This decision will help to initiate higher oil spill response activities as well as alert other neighboring agencies, with whom APSEZL, Mundra has the MOU with oil companies, Coast Guard Authorities, Port authorities, Pollution Control Board, Hospitals, and other organizations.


The procedure of informing all concerned agencies / organizations of higher spilled oil threat perception remains the same. However, care is to be taken in spill assessment and giving exact quantum of oil spilled as large difference in quantity of spilled in water and oil recovered from water may not be interpreted in a correction fashion.

7.8 Mobilizing or Placing on Standby Resources Required

When the decision to raise the Tier level of oil spill has been/ is being taken, a review of APSEZL, Mundra own spill response capability is also to be done simultaneously. Once it is felt that additional resources are required, the concerned agencies are to be alerted immediately, and mobilization action for those equipment/ items should be initiated without losing any time. It should be borne in mind that mobilization of resources from out stations is a time consuming and cumbersome exercise, therefore it should be calculated well before the anticipated arrival time of the Pollution Response Equipment on account of:

- (i) Transportation time by rail/ road/ sea/ air.
- (ii) Time taken by Custom/ Government formalities.
- (iii) Time taken in loading/ unloading.
- (iv) Availability of specialized loading / unloading machineries and accessories.
- (v) Availability of suitable berthing facility for the craft intended to be used.

It is also very important to keep in mind as who is going to operate that pollution response equipment which are being mobilized. In case the equipment is coming with one set of man power, then from where their relief would come and in case only equipment is provided then, do

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we possess required trained manpower for operating this equipment? All such matters are to be deliberated upon in detail by the OSC and ECT together during operation/ exercise planning stage itself. Otherwise, it would be very difficult to mobilize desired manpower at the eleventh hour.

For obtaining additional equipment the local Oil Companies and nearby ports, with which APSEZL, Mundra may have a contact, are to be contacted. Requirement of extra manpower to meet the requirement of running this equipment has to be thought off well in advance.

APSEZL, Mundra has having all oil spill equipment readily placed nearby the ports, which can be mobilized at any eventuality. The Indian Coast guard is fully equipped and trained to deal with TIER II and TIER III spills.

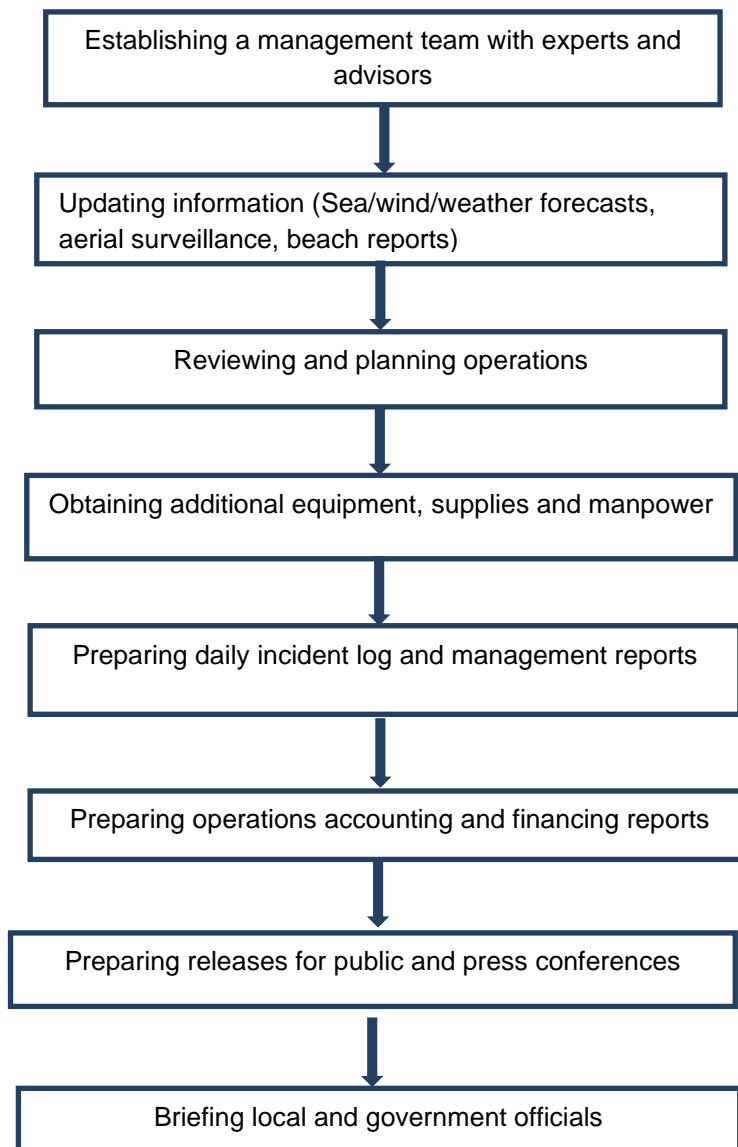
7.9 Establishing field Command Post and Communications

The OSC will be equipped with portable VHF and mobile phone. The OSR team leaders would also be having hand held VHF sets (They can also be provided with mobile phones). Therefore, establishing filed command post is considered not necessary, unless the spill of large magnitude.

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8. CONTROL OF OPERATIONS

Local control of operation will rest with Expert selected within the Adani (OSC) and work in the coordination with Indian Coast Guard and internal Port Administration expert groups (CMT). Security aspect of the pollution area should be considered and unauthorized persons gaining access to the area to be restricted. A safety zone (Exclusion Zone) of 500mtrs surrounding oil slick will be established to avoid hindrance in the oil spill cleaning process.



- 1) Once the response action mechanism is decided, the OSC will establish a response management team with experts and advisors who will support APSEZL, Mundra with the response operations. The team will consist of wildlife and marine experts to provide inputs with respect to ecologically sensitive areas.

- 2) The OSC will maintain updated information on sea, wind and weather forecasts, aerial surveillance, beach reports, etc. to ensure smooth response operations. Ready reckoners will be maintained for reference by the response team. The response operations will be reviewed on ongoing basis by the OSC and ECT Leader and any changes in planning will be communicated to the response team.
- 3) If case additional equipment, supplies and manpower will be required for the response operations, the OSC will notify the ECT. The Logistics Controller will be responsible for ensuring that the resources reach the contaminated site at the earliest from the resource base.
- 4) Daily incident log and management reports will be prepared and maintained by the OSC till the spill is completely under control. Subsequent accounting and financing reports will also be developed and shared with the corporate ECT.
- 5) The CMT will be responsible for preparing releases for public and press conferences on the response operations. All local and government officials will be briefed on periodic basis under the spill is controlled and the shoreline clean up works are completed.

8.1 Establishing Management Team with Experts and Advisors


Incident management team comprises of well-trained high-level professionals, experts in the field. APSEZL, Mundra has access to the national and internal special training related to oil spill response and emergency management. APSEZL, Mundra has MOU with HMEL for supporting Oil Spill Response operation. For attending to spills of higher magnitude (Tier-2 and above) will inform Coast Guard and support for oil spill response Plan.

The OSR have a stock of equipment available at their Base which is ready on round the clock basis for mobilization on an authorized call from the members. A list of APSEZL Advisor Committee is

1. COO 2. HOD-Marine 3. HOS-Marine 4. Duty Port Captain.

8.2 Updating information (Sea/ Wind/ Weather Forecasts, Aerial Surveillance, Beach Reports)

The Marine Control (MMPT) is entrusted the responsibility of providing initial information of area pertaining to wind direction & speed, water current, tide position at the time of oil spill, high water & low water timings, sea condition, swell and wave heights, weather forecasts & existing weather warning, navigational warnings, any Coast Guard in contact, any other relevant information

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available. All this information is to be provided to ECR automatically the moment information about the oil spill is received.

All this information is to be automatically updated as and when they are received. In addition, regular inputs on the state of coastal areas are to be obtained from local sources.

8.3 Reviewing and Planning Operations

The ongoing operations will be assessed and reviewed as, when the ECT considers it necessary or suggested by OSC. This is necessary to upgrade the level of operations or scale down the operations due to different prevailing factors. Review of operations is an ongoing process and accordingly the planning is to be reoriented to maximize the utilization of men and machinery without compromising on safety of both. Here operational rest to men and machinery should also be kept in mind, because response teams can be rotated at regular intervals but continuous running machinery also needs rest after certain stipulated continuous running hours.

8.4 Obtaining additional Equipment, Supplies and Manpower

Logistic support is one of the key functions of ECT, which work under Logistic Department of APSEZL, Mundra, which provides and maintains personnel, materials, facilities and services as and when required by EMT. The assignment of any member of the ECT to a function will be made by OSC, of substitute, taking in consideration the sponsor competencies available at any time at site and the type of incident. These assignments will be likely to change during the action as and when additional staff becomes available. The ECT may contact any other staff and in case they are reachable, request their involvement in incident Management activities at site or elsewhere.


In the event of an ongoing spill or a spill that requires declaring of Tier 2 or 3 responses, the additional equipment and manpower held with any other OSRO or facility will be sourced in an accelerating manner including resourcing from the National / international spill handling companies. Contact details of companies holding equipment in India and International OSROs are listed below.

LIST OF ADDITIONAL RESOURCES AND INTERNATIONAL OSROs

1. Australian Marine Oil Spill Centre

PO Box 305
Victoria 3214
Australia
Tel + 61 3 5272 1555 Fax + 61 3 5272 1839
Mail: amose@amosc.com.au
Web: <http://www.aip.com.au>

2. Fast Oil Spill Team

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C/o PIM 40 G 23 Tour Elf
92078 Paris- La Defense Cedex France
Tel: + 33 1 4744 5636
Fax : + 33 1 4744 2677
Mail : giefost@club-internet.fr

3. Oil Spill Response Ltd

Oil Spill Services Centre
Lower William Street Northam
Southampton SO1 1 QE, UK
Tel: + 44 1703 331 551 Fax: + 44 1703 331 972
Mail: osrl@osrl.co.uk
Web: <http://www.oilsillresponse.com>

4. Petroleum association of Japan


Oil Spill response Department Keidanren Building
9-4, 1 – Chome, Ohtemachi Chiyoda- Ku,
Tokyo 100, Japan
Tel: + 81 3 3279 3819
Fax: + 81 3 3242 5688
Mail: mail@pcs.gr.jp
Web : <http://www.pcs.gr.jp>

8.5 Preparing Daily Incident Log and Management Reports

OSR is overall in-charge of operations, he will delegate suitable and available persons to carry out the above function. Log sheets are to be filled for running of all operations and equipment as early as possible, since filling it later increases the chances of vital information getting missed. However at the end of the day, preferably time ending at 20:00 hours starting from 20:01 hours of the previous day, (or it may be from 08:01 hours to 08:00 hours of the previous day) a Daily Summary of events is to be prepared and submitted to the leader of ECT, who in turn would prepare the report consulting all the members of the ECT and forward it to management.

This report should cover following details as minimum:

- (a) Manpower deployed
- (b) Equipment deployed
- (c) Weather conditions encountered
- (d) Amount of oil recovered from sea
- (e) Amount of oil transferred for storage & disposal
- (f) Progress on shore cleaning efforts (as the case may be)
- (g) Difficulties encountered
- (h) Lessons learnt

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The details of log sheet to mention action taken daily and observations made is furnished in “APPENDIX-5”

8.6 Preparing Operations Accounting and Financing Reports

ECT Leader is overall in charge of operation. It will be financial responsibility to prepare accounting and financing report. Claims should be based on expenses actually incurred that these are made as a direct expense of an incident and that the expense incurred are reasonable. The following aspects are to be considered while assessing cost of an oil spill combating, operating and prepare of claims:


- a) Delineation of the area affected describing the extent of pollution and identifying the most heavily contaminated. This may be best presented as a map or chart accompanied with photographs.
- b) Summary of events including a description of work carried out in different areas and the working methods chosen in relation to the circumstantial evidence linking as pollution with the ship involved in the incident (e.g. chemical analysis).
- c) Labour costs (numbers and categories of workers, rates of pay days, hours worked, total Costs etc.).
- d) Data on which work was carried out (daily or weekly costs).
- e) Material costs (consumable materials, utilized fuel, food shelter facilities, etc.).
- f) Finance shall assist ECT Leader in (preparing /scrutinizing) settling claims under the Guidance of CFO.

8.7 Preparing Releases for Public and Press Conferences

Information to media is to be release by the person identified through respective Media policy of the Organization. In the event of non-authorization of any one person, the Media release will be made by person nominated by him after authorization of the Organization.

The daily report of actions taken on a particular day as prepared by COC and OSC is to be shared with the person nominated to brief the media. Each press brief is too cleared by authorized person prior being provided to media.

While, providing factual details and information to media assists in passing the situation reports to public likely to be affected by a spill, it is advisable not to sensualize information with unwanted figures or actions that could shock or distress the public.

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Most of the factual information like precautions required by public to be taken with respect to fishing activity, closure of beaches, demand for beach cleaning volunteers could be disseminated through media.

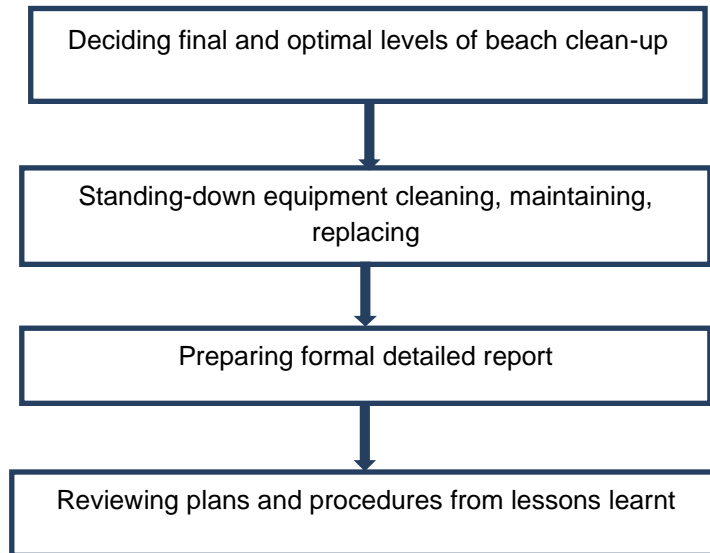
8.8 Briefing Local and Government Officials

Port has designated staff who will interact with press, public, Govt. and media briefing the details of emergency after clearance from ECT. In case of oil spill designation will be addressed to Incident Commander for managing the Media some of the General Guidelines that need to be followed:

- Ensure that in all communication care for human life and welfare is demonstrated Above everything else;
- Provide as much information as possible based upon facts only and refrain from Assigning any cause or speculation towards the incident;
- In case a suitable reply cannot be framed for the caller take a number and offer to call back later or transfer to an individual who would be able to answer;
- Avoid any comments or statement that could be constructed as anger or distaste for a person or persons or any particular policy;
- Treat the media with respect – they need to be on our side.
- Be precise and to the point.
- Ensure that the Media is aware that they would be able to get accurate information only from the Company and that they would like the facts to be known.
- Anticipate in advance what queries may come and be prepared.
- The ECT or any other authorized personnel, must issue press releases and statements only.
- Ensure that relatives are advised prior to the names of any personnel being made public.
- Prior to the Next of Kin being informed by the police DO NOT release the names of any casualties to next of kin, the press or the public.

9. TERMINATION OF OPERATIONS


9.1 Termination of response operations



- 1) After obtaining the mutually agreed & desired outcome of the spill operations, the response operations will be terminated. A post spill evaluation will be conducted. The final and optimal levels of beach clean-up will be decided and recorded.
- 2) All the equipment used for the spill response operations will be cleaned and maintained accordingly. An inventory of items that has been consumed will be prepared and list of supplies that need to be replaced will be made.
- 3) The OSC in consultation with the CMT Leader and onsite response team will prepare a formal detailed report including the details of the spill, actions taken, levels of clean up, etc. The report will be used for internal reference purpose within the organization. The current OSC and related procedures will be reviewed and updated based on lessons learnt.

9.2 Deciding final and optimal level of Beach Clean-up

The coastal stretches of Gulf of Kutch are varied in terms of biologically, industrially and socio-economically sensitive. The coast also has large stretches of Mangroves with mud flats. The tidal flats will be exposed during low tide conditions and currents are stronger during flood and ebb in the central channel. Hence, the hydrological features of the estuary will influence the distribution / spread of spilled oil and rapidly moves towards the coastal stretches.

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The cleaning up of shoreline beaches are the most important in view of public interventions. Since, the clean-up of shoreline is very tedious and complex in execution alone, APSEZL, Mundra will coordinate the local administration, to involve local authorities (e.g. PCB and other civic bodies) in decision making process.

It would always be borne in mind that while in effort to clean up it should not end up doing more harm than good. It will be also be prudent to seek the advice of ecology experts from State Pollution Control Board and from other authorities/ agencies i.e. Indian Coast Guard, Central Pollution Control Board, State Forest and Fisheries department officials.

NEBA (Net Environmental Benefit Analysis) shall be taken into account deciding on selecting the best response option or optimal clean-up of beaches, Mangroves and other environmentally sensitive locations. Inspect segments/ section of shoreline that Clean-up Operations team declare ready for sign-off before final approval. Some stretches are required booms for protections of APSEZL, Mundra and marine sensitive area along the Gulf of Kutch.


Responsibility: Shoreline Assessment Team.

Methods:

- Operations notify the Shoreline Assessment Team Coordinator that a segment is ready for inspection.
- Inspect the segment against agreed-upon clean-up endpoints (preferably using the same team that did the original survey). The original field sketch can be very helpful for evaluating effectiveness of the clean-up.
- Identify additional clean-up needed using standard shoreline assessment terminology forms and sketches, or develop special forms for this purpose
- Recommend segment for final inspection.
- Recommend any longer-term monitoring or iterative procedures needed.

9.3 Standing-down equipment, cleaning, maintaining, replacing

It is important to remember that emergencies can be immediately followed by another one, hence it is of utmost importance to maintain the inventory of equipment. Hence, used equipment will be cleaned and maintained, if required to be replaced at the earliest. It will be the direct responsibility of the operators of the equipment to restore after the operations. All the spill equipment and machines are to be cleaned as per the OEM's guidelines, necessary maintenance to be carried out and then equipment stored in in their respective places.

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9.4 Preparing formal Detailed Report

After the operations are complete, the OSC is to be prepare the detailed report covering all the aspects of the oil spill cleanup, which will include success and failures as well as per the prescribed format. The report contains all detailed elements of incidents, including daily actions, response and Communication, parties involved, equipment used also containing financial and strategy report summary. The report is to be forwarded to HOD-Marine for submission to CMT.

9.5 Reviewing Plans and Procedures from Lessons Learnt


A detailed and comprehensive review of plans will be carried out in the light of the incident will immensely help in improving standards of safety quality of response and quickness of the response. A through debriefing, brain storming and lesson learning session will be held under the guidance of CMT Leader. The report received from IC/OSC and gives its recommendations to the CMT of port administration for further action.

9.6 Investigation

Every oil pollution incidence is followed by investigation both by the Port as well as Nodal agencies in order to assist such investigations complete and accurate records, as specified below, shall be maintained

1. Certificates and records of equipment issued by regulatory authorities.
2. Log Book showing weather and details of the incidents.
3. Chronological record of loading / discharging bunkering including agreed plans of such loading/ discharging/ bunkering.
4. Brief report on spill including: i) Time, ii) Location, iii) Cause and, iv) Type of oil.
5. Samples of spilled oil shall be taken as per procedures described.
6. Estimate of amount spilled and the process of such estimation
7. Copies of notification & update reports
8. Record relating to direction and rate of spread
9. Weather reports and recorded weather in log book and
10. Where possible photographic evidence shall also be collected. Such photograph records shall be identified with date, time and location.

Where any original evidence is demanded by Nodal Authorities, photocopies of such evidence be retained and the concerned authority shall request to certify the same as true copy of the original.

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10. DATA DIRECTORY

10.1 MAPS/CHARTS

10.1.1 Coastal facilities, Access roads, Telephones, Hotels, etc.

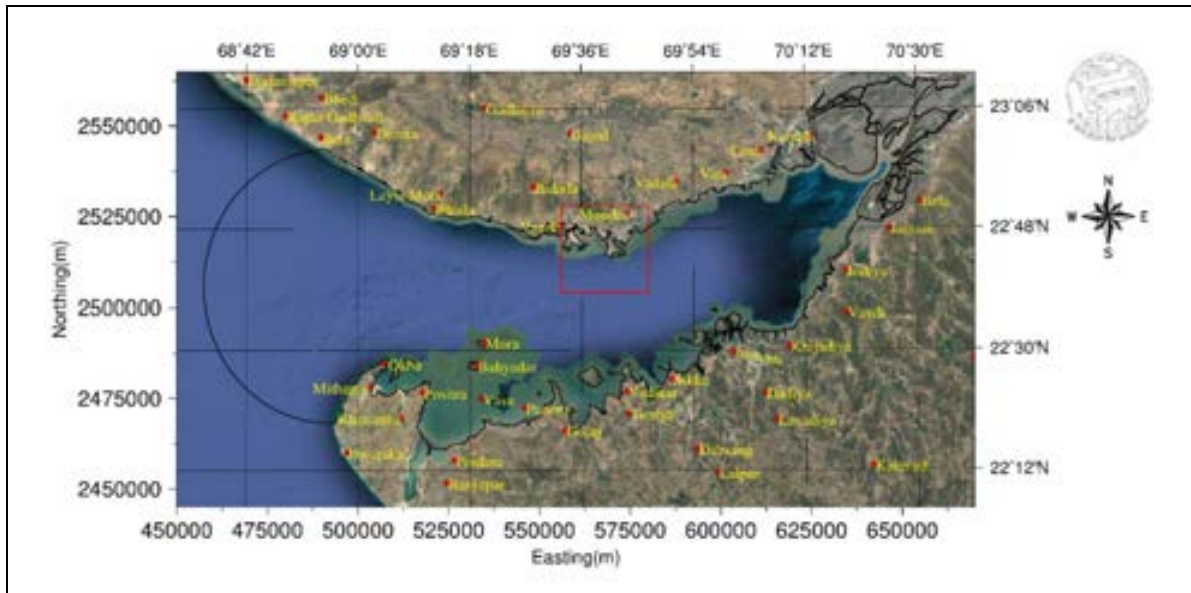


Fig.10.1 Google Map showing APSEZL facilities in the Mundra region

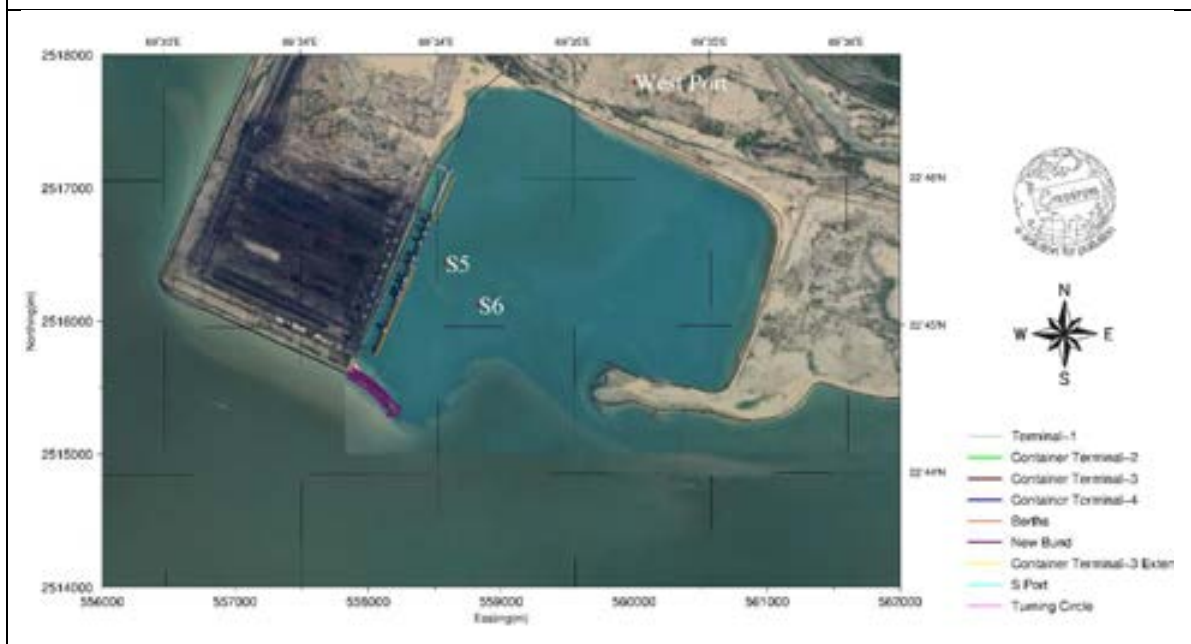



Fig.10.1(a) Google Map showing Adani West Port facilities in the Mundra region

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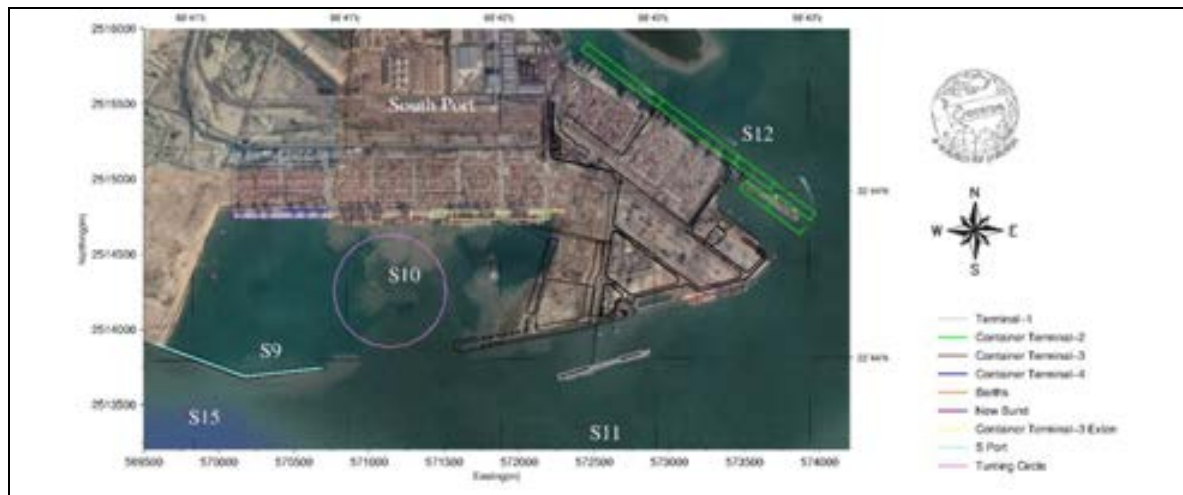


Fig.10.1(b) Google Map showing Adani south Port facilities in the Mundra region



Fig.10.2 NHO Chart Showing Mundra region, Gulf of Kutch

Table.10.1 Contact Details of Spill Information Center

SI No	Address of Centre	Contact Details
1	Indian Coast Guard Headquarters. National Stadium Complex Coast Guard DHQ -1(GJ). Near RGT College ... Okha Port, Gujarat – 361 350	Tel: 02892 263421. Fax: 0-22 24333727
2	Indian Coast Guard Headquarters. CP25+RRF, Vadinar, Gujarat 361010	Tel: 0-22 – 24222696 Fax: 0 – 22 - 24222696
	Indian Coast Guard Headquarters. gh-4 garden, udhyog bhavan, Sector 11, Gandhinagar, Gujarat 382011	

Table.10.2 Contact Details of District Administrative Authorities

Place Name	Address of Centre	Contact Details
Bhuj (Kutch)	District Collector Office Near Circuit House, Mandvi Road, Nr. Mota Bandh, Bhuj (Kachchh) Gujarat – 370001	Phone: +91 2832 250650 Fax: +91 2832 250430 Email: collector-kut@gujarat.gov.in
Jamnagar	District Collector Office, Jilla Seva Sadan, Sharu Section Road, Jamnagar - 361002	Collector, Jamnagar <ul style="list-style-type: none"> • +91 288 2555869 • +91 288 2555899 • collector-jam@gujarat.gov.in
Khambhalia	District Collector Office 1st Floor, Lalpur Bypass Road, Dharampur, Khambhalia, Gujarat - 361305	<ul style="list-style-type: none"> ☐ 91 2833 232805 ☐ +91 2833 232102 ☐ collector-devbdwarka@gujarat.gov.in

Table.10.3 Contact Details of Gujarat Fisheries Development Council

SI No.	Address of Centre	Contact Details
1	Commissioner of Fisheries 3rd Floor, Block no-10, Jivraj Mehta Bhavan, Gandhinagar, Gujarat 382010	Phone No: -079- 232-53729 Fax No:- 079-232-53730

Table.10.4 State Pollution Control Board – Regional Offices

	Address of Centre	Contact Details
Gandhi nagar	Gujarat Pollution Control Board Paryavaran Bhavan, Sector-10A, Gandhinagar-382010.	Phone: (079) 2323 2152 Fax : (079) 2323 2156, 2322 2784, 2323 2161 gpcbchairman@gmail.com , chairman-gpcb@gujarat.gov.in Member Secretary:
Morbi	Regional Center RR4F+6P7, Scientific Vadi, Sardar Nagar, Morbi, Gujarat 363641	Tel : 02822 228 001
Jamnagar	Regional Center Sardar Patel Commercial Complex, Rameshwar Nagar regional centre Kasturba Gandhi Vikas Gruh Marg, Bedi Bandar Road Jamnagar- 361 008	Telephone (0288) 2752366 Fax: (0288) 2753540 Email: ro-gpcb-jamn@gujarat.gov.in
Bhuj	Regional Centre Katira Commerical Complex-1, Nr.Manglam 4 Rasta,Sanskar Nagar, Nr.I.Tax Ofic,Bhuj 370001	Telephone: (02832) 250620 Fax: - Email: ro-gpcb-kutw@gujarat.gov.in

10.1.2 Coastal Charts, Currents, Tidal Information Prevailing Winds

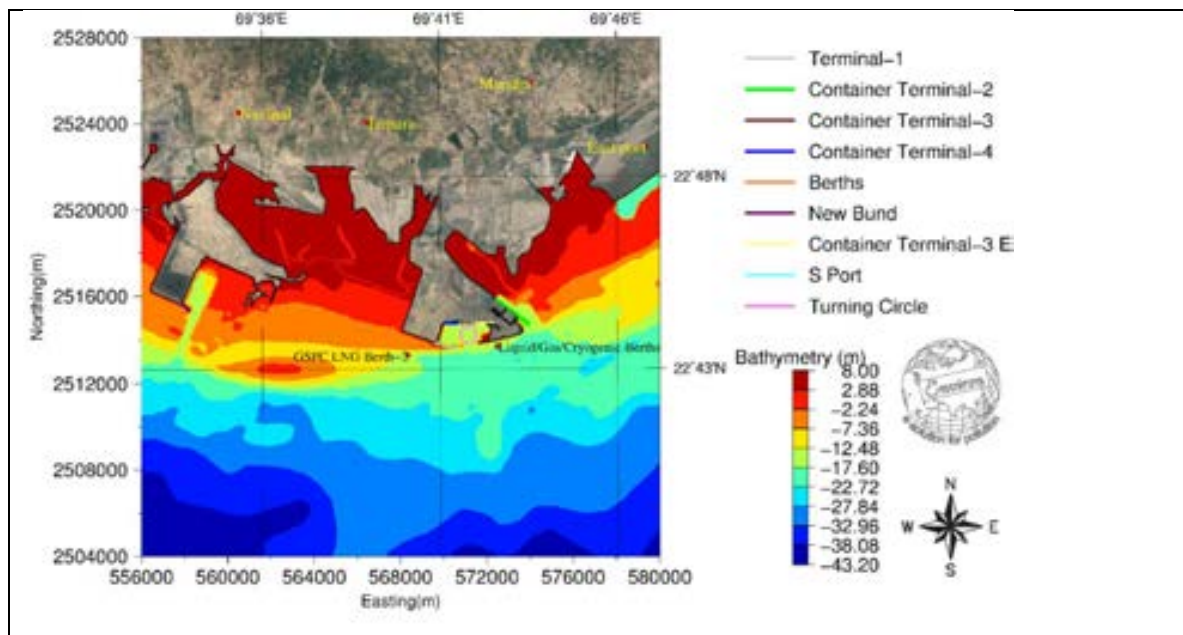


Fig.10.3 Map showing interpolated bathymetry of APSEZL and surrounding areas.

Tide and Current information

Tide:

The tidal planes were assessed and shown in Table below

The Highest Astronomical Tide (HAT) is estimated to be about +6.4 m above chart datum (CD), and the Lowest Astronomical Tide (LAT) to be at 0.0 m CD.

Table: Tidal information at Mundra

Tide	Height (m) above CD
Mean High Water Springs	5.8
Mean High Water Neaps	4.6
Mean Low Water Neaps	2.1
Mean Low Water Springs	1.0

Currents

Currents in the approaches to the port are dominated by the tidal flows, with predictable variations over diurnal, monthly and annual time scales. Currents in this part of the Gulf flow parallel to the natural sea-bed contours. Currents can be relatively strong, with speeds in excess of 3.0 Knots reported at sometimes of the year. The Admiralty Chart shows currents off Navinal point to be 3.0

Knots East & West bound. It is observed that the currents are usually aligned with the bed contours and are stronger in deeper waters off the coast. The impact of future development over the existing coast-line can be determined by the change in current speed resulting from the proposed developments.

Waves


In past HR Wallingford (HRW) has studied the wave climate considering wave energy from locally generated waves and swell propagating in to the Gulf of Kachchh from the Arabian Sea. The results of the study carried out by HRW are presented in the Table below.

Design Waves at Mundra

Direction Sector (°N)	Return Period (years)	Inshore Direction (°N)	Hs (m)	T2 (sec)
210	1	222	1.2	5.0
	5	222	1.4	5.3
	20	221	1.6	5.8
	100	221	1.8	6.1
240	1	226	1.5	5.4
	5	226	1.7	5.8
	20	225	1.8	6.1
	100	225	2.0	6.5
270	1	239	1.4	5.5
	5	236	1.7	6.3
	20	236	1.8	6.7
	100	235	2.0	7.4
300	1	240	0.8	5.2
	5	240	0.9	5.6
	20	239	1.0	6.2
	100	238	1.2	6.7

Cyclones

Cyclonic disturbances strike North-Gujarat, particularly the Kachchh and Saurashtra regions, periodically. These disturbances generally originate over the Arabian Sea. Generally during June, the storms are confined to the area north of 15°N and east of 65°E. In August, the initial stages, they move along the northwest course and show a large latitudinal scatter. West of 80°E, the tracks tend to curve towards north. During October the direction of movement of a storm is to the west in the Arabian Sea. However, east of 70°E some of the storms move north-northwest and later recurves northeast to strike Gujarat-north Mekran coast.

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Wind

There are strong winds at times at Mundra Port. The wind directions are shown in Figure below. In the period lasting over months March to May the wind direction is generally SWW (225° - 250°) and velocity varies from 20 to 25 Knots. June through August the wind direction is predominantly SW and velocity varies from 25 to 30 Knots with short gusts going up to 35 to 40 Knots. Towards end of September and through October wind direction changes to NE with velocities ranging from 7 to 10 Knots. Direction remaining same the velocity varies 10 knots to 25 Knots in the period November to January. February is the calm period when wind direction is southerly with velocity in the range of 7 Knots. Stormy weather may generate winds having velocity up to 100 Knots which should be taken as the worst-case scenario for design of tall structures and heavy-duty cranes.

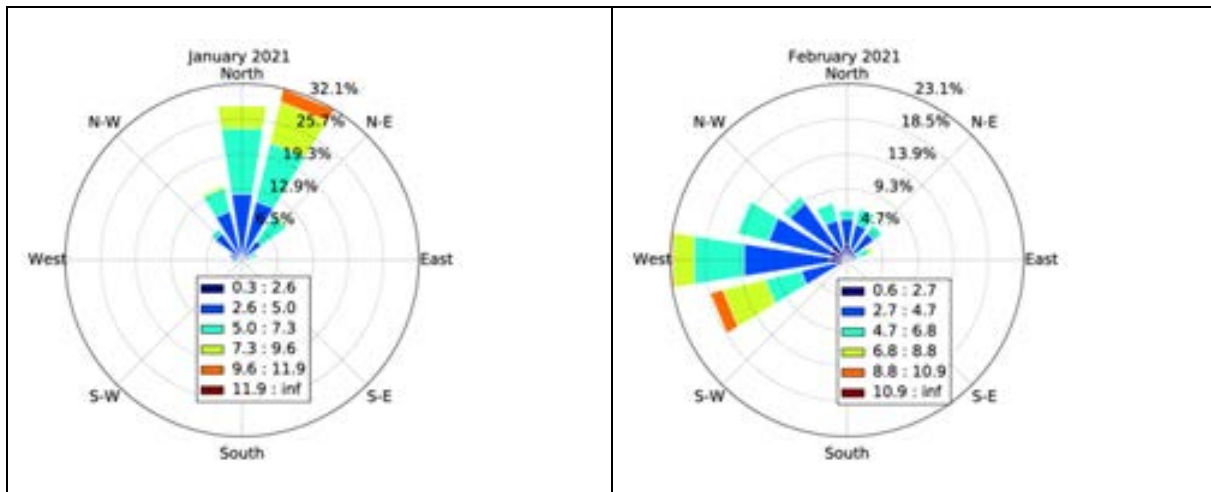


Fig.10.4(a) Wind Rose diagram for the month of January 2021

Fig.10.4(b) Wind Rose diagram for the month of February 2021

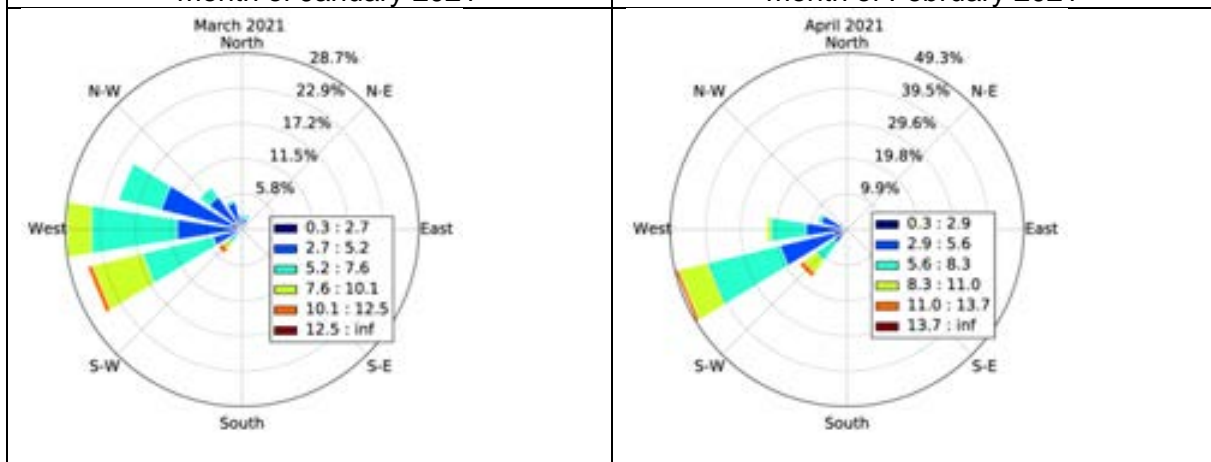


Fig.10.4(c) Wind Rose diagram for the month of March 2021

Fig.10.4(d) Wind Rose diagram for the month of April 2021

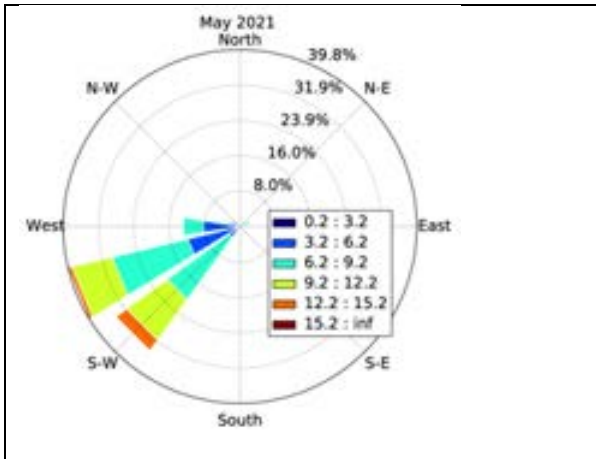


Fig.10.4(e) Wind Rose diagram for the month of May 2021

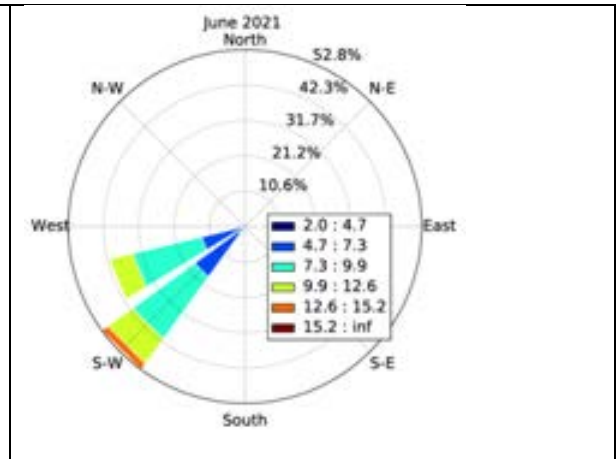


Fig.10.4(f) Wind Rose diagram for the month of June 2021

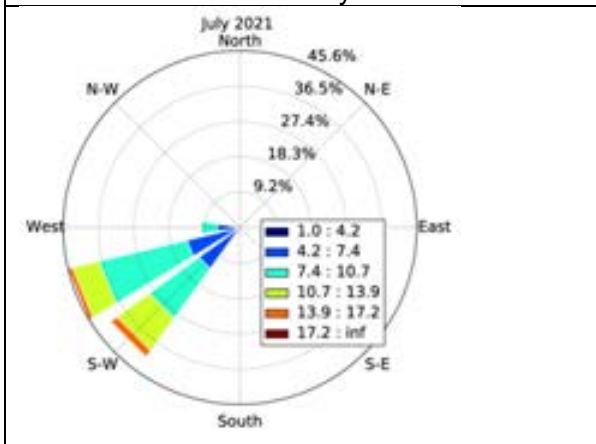


Fig.10.4(g) Wind Rose diagram for the month of July 2021

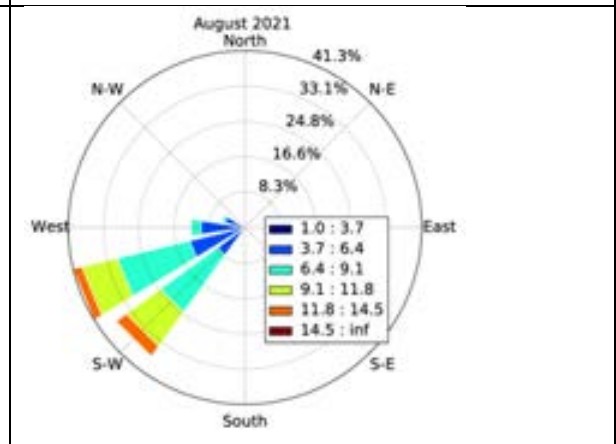


Fig.10.4(h) Wind Rose diagram for the month of August 2021

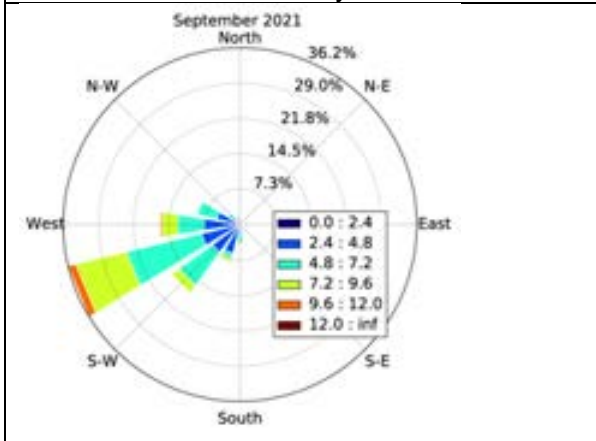


Fig.10.4(i) Wind Rose diagram for the month of September 2021

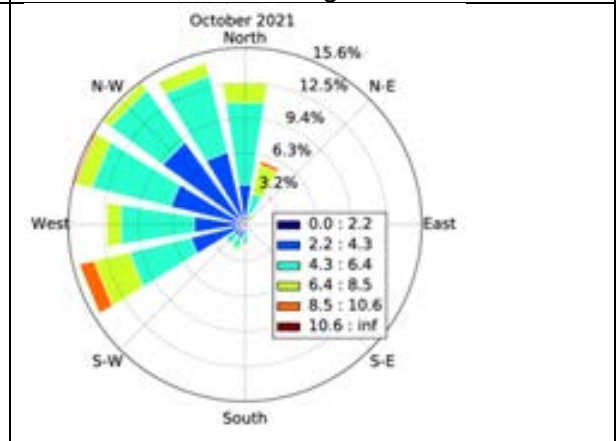
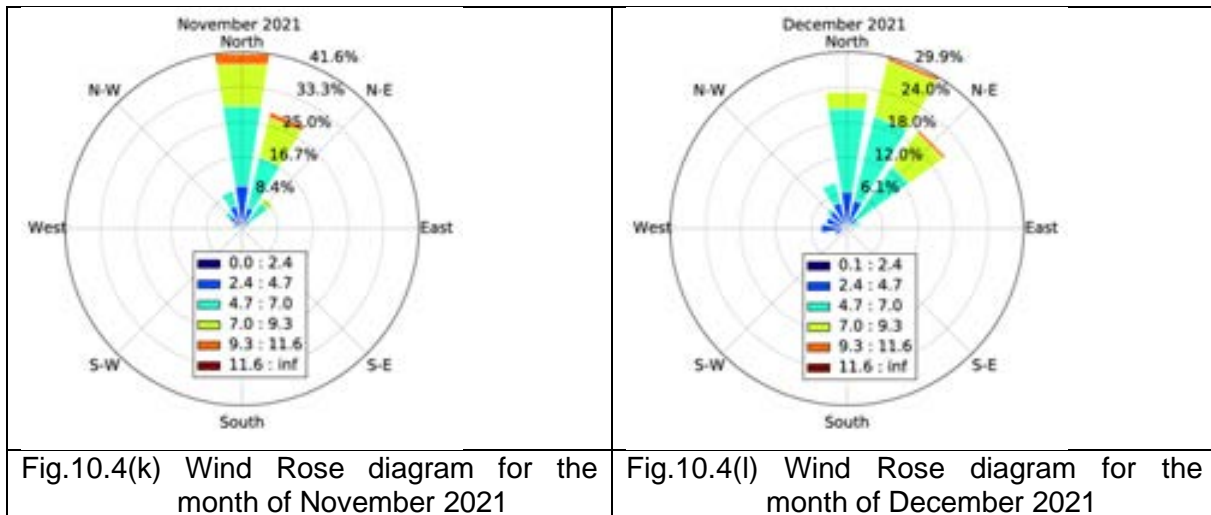


Fig.10.4(j) Wind Rose diagram for the month of October 2021



Rainfall:

The climate of the region has a regular seasonal variation determined by the occurrence of 2 Annual monsoons. The southwest monsoon period extends from June to September. November to March is the period for the North East monsoon. Most of the Annual rainfall occurs during the south west monsoon, the average monthly rainfall being about 45 cm. The average annual rainfall over 20 years is 193 cm.

Humidity & Temperature:

Relative humidity ranges from 61% to 87% being the highest in the monsoon period. During the winter months (Nov-Jan) relative humidity ranges from 61% to 72%. Mean daily temperature ranges from 24 Degrees C to 33 Degrees C except during the winter period when the minimum temperature may fall to about 19 Degrees. The hotter months are March, April, May and June.

10.1.3 Risk Locations and probable Fate of Oil

As with any oil transportation, oil spill risks are associated with Adani port operations. They may vary from a few litres of accidental spill of crude oil / Fuel Oil from offshore vessels to several thousands of tons of oil during collision / grounding situations. In line with the standard industry practice, APSEZL, Mundra is also prepared to mitigate spills of importance from routine operations (Tier-1), while oil spill situations of higher magnitude are dealt with industry co-operation and external intervention. However, it is required to have a fair understanding of the risks and probability of spills arising out of its operations and their consequences due to movement and landing along the coast.

The operations of APSEZL, Mundra are broadly defined under the following:


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- Vessel operations- loading / unloading
- Vessel collision, or grounding
- Bunker/ fuelling operations
- Vessel distress / sinking
- Pipeline ruptures /accidental spills from sub-sea/over the sea/shore approach (in the tidal zone) pipelines
- Rupture of export line

The exact quantity of spill from each of the above incident is difficult to predict due to the variables of operating conditions and the length of risk exposure. Maximum risks associated with the events may be considered while devising the oil spill contingency plan. The spill scenarios range from extremely negligible quantities to enormous quantities in rare catastrophic events. The simulation of oil spills does not vary significantly in various scenarios except for the magnitude of impact zone and the quantity involved in such impacts. The software is intended to use for specific scenarios, through a few hypothetical simulations are made in this report considering the worst-case scenarios.

Instantaneous spills (Ref. Fig.11.5)

- Crude oil spill of 700t at selected SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Fuel oil spill of 700t at selected West Port(S5), Vessel route(S7), LNG Jetty(S8), South basin (S9), Mundra Ports(S11), MICT/AMCT(S12)
- Crude oil spill of 10000t at SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Crude oil spill of 25000t at SPM-HMEL(S1), SPM-IOCL(S2), VLCC Jetty (S15)
- Fuel oil spill of 100t at selected West Port (S5, S6), LNG Jetty(S8), South basin (S9,S10), Mundra Ports(S11), MICT/AMCT(S12)
- HSD oil spill of 50t at selected West Port(S5), LNG Jetty(S8), South basin (S9), Mundra Ports(S11)
- HSD oil spill of 20t at selected West Port(S6), South basin (S10)

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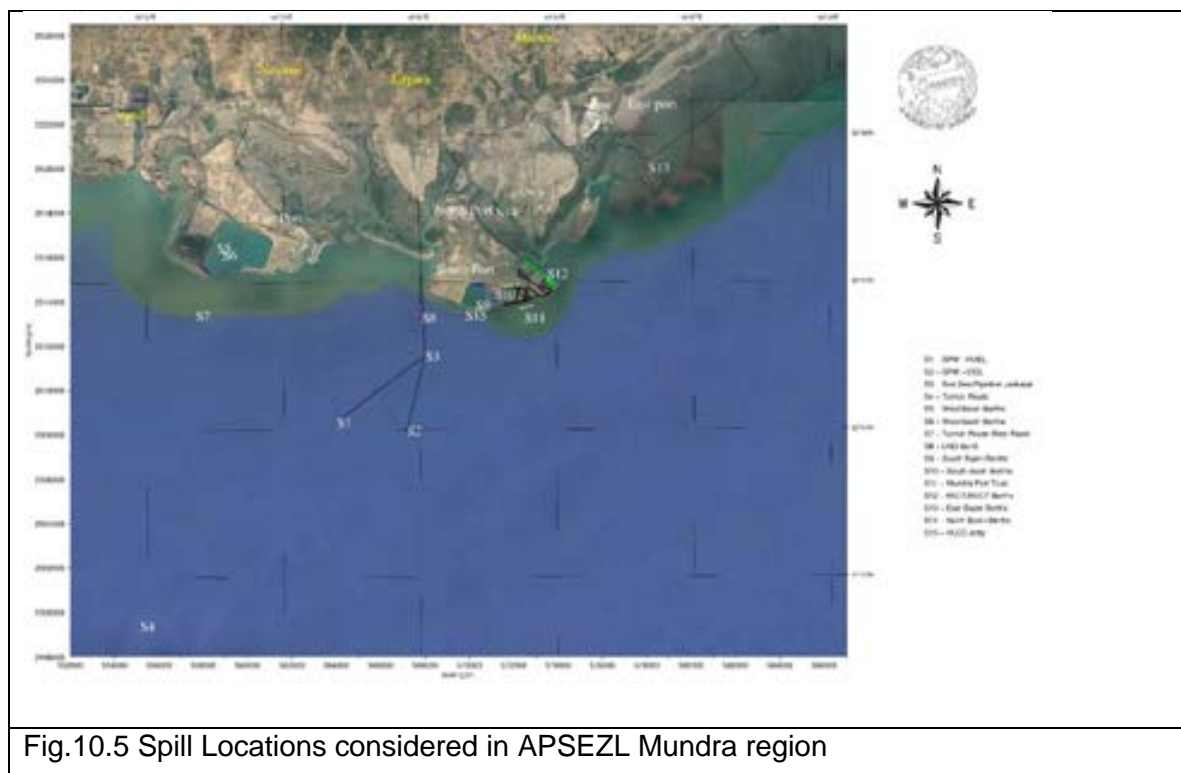


Fig.10.5 Spill Locations considered in APSEZL Mundra region

Continuous spills (Ref. Fig.11.5)


- Crude oil spill of 10000 m³/hr for 1 min at selected SPM-HMEL(S1), SPM-IOCL(S2)
- Crude oil spill of 10000 m³/hr for 1 min at selected VLCC Jetty (S15)
- Crude oil spill of 10000 m³/hr for 1 min at sub-sea pipeline route (S3)

The spill scenarios range from extremely negligible quantities to enormous quantities in rare catastrophic events. The simulation of oil spills does not vary significantly in various scenarios except the magnitude of impact zone and the quantity involved in such impacts.

Detailed Maps and charts for all spill scenarios including probable fate of oil are discussed extensively in PART-B of the report (PART-B: OIL SPILL FATE AND TRAJECTORY MODELING STUDIES)

The following are the risk locations in the Harbour zones of APSEZL, Mundra

- RIL Ports & Terminals, New Bedi Port, Essar Jetties in southern side of Gulf
- Bedi Port, Kalubar Tapu, mora island, Narara Reff, Pirotan Island
- Vadinar Oil Terminal, Borl, Mandvi Beach, Modhva Beach, Tata power Limited (CGPL) intake and outfalls, Adani West Port, Adani South Port, Tuna Port, Kandla Ports, BTC Port Navlakhi
- Sikka coast
- Adani Ports (South, East, West and North)

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10.1.4 Sensitivity Area Mapping of Gulf of Kutch

The coast of Gulf of Kutch has tidal flats, mangroves and sand bars etc (Fig.11.6). There is a need to protect the ecosystem and marine environment during the oil handling activities. The resources likely to be threatened are discussed in PART-C of the Report:

The coastal areas of Gulf of Kutch coast abound in marine wealth and industrial activities. It is endowed with a great diversity of natural ecosystems, of which the major systems are salt pans, intertidal zones, sand dunes, mangroves, creeks and Open Ocean. Vulnerability index of shores in order of increasing vulnerability to oil spill damages as per Gundlach and Hayes 1978.

SENSITIVE AREAS

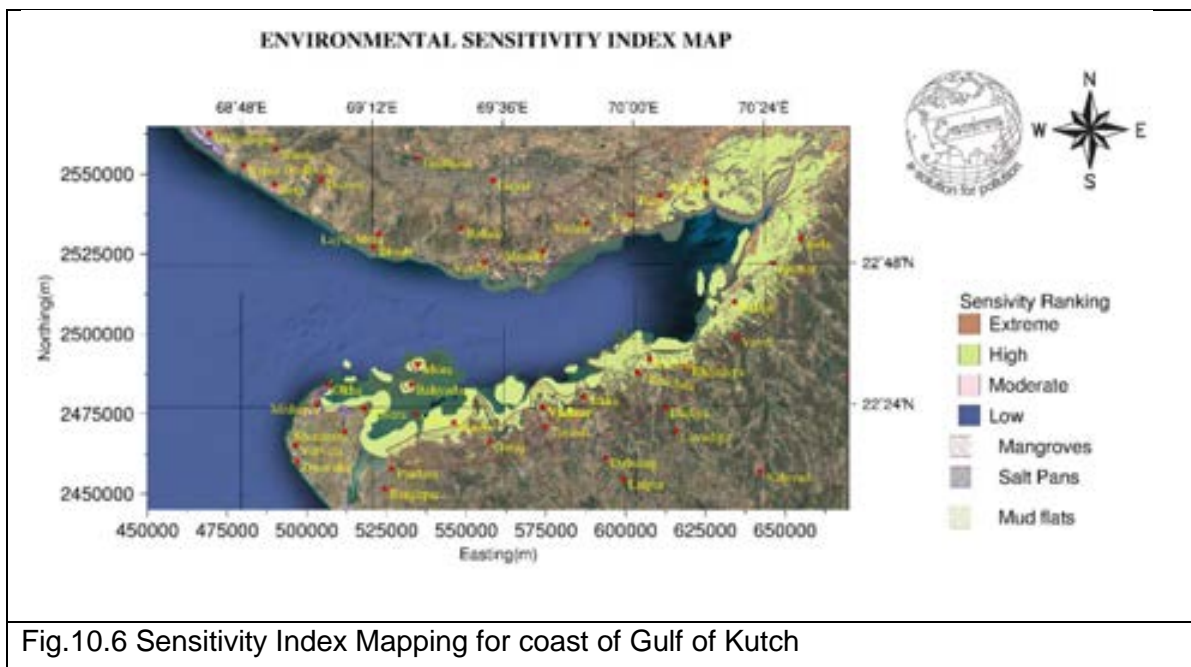



Fig.10.6 Sensitivity Index Mapping for coast of Gulf of Kutch

10.1.5 Sea Zones and Response Strategies

Sea zones can be classified based on depth of water i.e. deep water and shallow water zones. The response strategy will be different for different sea zones. The response options i.e. dispersant and burning can be done for deep water zones where there are not much marine life and the same response options cannot be used for shallow water since the marine activities will be exist along the coasts.

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Response strategy for sea zones has been discussed in section 3.3

10.1.6 Coastal

Response strategy for coastal zones has been discussed in section 3.5

10.1.7 Shoreline zones and clean-up strategies

A number of shoreline response strategies are available as per table below, but shorelines should be assessed so see whether these are suitable. This will depend on:

- Rate and likelihood of natural cleaning
- Access for personnel and machinery
- Nature and distribution of the Oil/HNS
- Shoreline character
- Availability of personnel and machinery
- Safety issues
- Environmental sensitivity to Oil/HNS and cleanup methods

Table 10.5: Application of techniques to different shoreline types

PRIMAY CLEANUP					
	Pumping / skimming	Mechanical removal	Manual removal	Natural recovery	Comments
Rocks, Boulders and Artificial structures	V	NA	V	+	Poor access may prevents pumping /skimming. Exposed/ remote shorelines best left to natural recovery
Cobbles, Pebbles and shingle	V	X	V	+	Exposed / remote Shorelines best left to natural recovery
Sand	V	+	V	+	Heavy equipment only applicable on firm beaches
Mud flats marshes and mangroves	+	X	+	V	Operation preferably carried out on the water from small, shallow drought vessels.


FINAL CLEANUP							
	Low pressure flushing	High Pressure washing/Sand	Dispersants	Natural organic sorbents	Batch recovery	Natural recovery	Comments
Rocks, Boulders and Artificial structures	NA	V	+	+	NA	V	Avoid excessive abrasion of rocks/artificial structures. Cleanup of boulders difficult and often gives poor results.
Cobbles, Pebbles and shingle	V	X	+	+	+	+	If load bearing character good, consider pushing oil led material to surf zone to enhance natural recovery.
Sand	V	X	+	NA	+	+	Solid oil can be recovered using beach cleaning machines. Enhance natural recovery by ploughing/harrowing
Mud flats marshes and mangroves	+	X	X	+	NA	V	Operations should preferably be carried out on the water from small, shallow-drought vessels.

V : Viable + = Possibly useful X = Not recommended NA : Not Applicable

10.1.8 Oil and Waste storage disposal sites

An efficient and monitored disposal of waste includes immediate classification, segregation, packing and labelling source.

	Packaging	Storage Capacity(m ³)
ON WATER	On board Storage	100 to >1,000
	Barges	10 to 10000
	Flexible / towards bladders or tanks	500 to 15000
SHORELINE	Plastic bags or sacks	0.25 to 15,000
	Super sacks	0.5 to 2.5

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	Barrels or drums	~0.2
	Portable tanks	1 to 5
	Skips or dumpsters	10 to 40
	Lined pits	Up to 200
	Vacuum trucks	7.5 to 20

WASTE DISPOSAL OPTIONS

WASTE	PRIMARY OPTION	SECONDARY OPTION	ALTERNATE OPTION
Fresh Oil	Refining	Fuel blending	Ex-Situ burning
Weathered	Fuel blending	Land Treatment	Landfill
Emulsions	Fuel Blending	Land Treatment	Landfill
Hydraulic Fuels	Refining		
Oil debris	Incineration	Open burning	Landfill
Oily PPE	Incineration	Landfill	
Oily Sand / Gravel	Ex-situ burning	Land treatment	Landfill
Oily sorbents	Fuel blending	Incineration	Landfill
Oily Wastewater	Electrocoagulation treatment		
Animal car cases	For research	Incineration	
Domestic waste	Incineration	Landfill	
Non oily debris	Incineration	Landfill	
Pallets	Recycle/reuse	Open burning	Landfill
Paper board	Recycle/reuse	Open burning	Landfill
Drums	Recycle/reuse	Landfill	
Hazardous wastes	Social handling storage treatment		

Table 10.6: Approved Waste Handling Contractors:

Sl. No.	Name	Waste Permitted and Quantity allowed
1	M/s. Daya Lubricants Pvt. Ltd. Bldg. No. 11, Waliv Phata, Prime Industrial Estate, Sativali Road, Village Valiv Phata, Vasai (E), Thane 401208	Used Oil 3000 KLA Waste Oil 14400 KLA
2	M/s. North East Lubrica Pvt. Ltd. S. No. 404, Abitghar, Tal- Vada, Dist. Thane – 421 303	Used Oil 9000 KLA Waste Oil 9000 KLA
3	M/s. Deepak & Company B 20, Road No. 16, Wagle Industrial Estate, Thane – 400 604	Used Oil 18500 KLA

4	M/s. Tax Oil Lubricants Pvt. Ltd. R-591, MIDC Industrial Area, Rabale, Navi Mumbai – 400 701	Waste Oil 12960
5	Chemicals Pvt. Ltd. Plot No. A-10, MIDC Industrial Area, Ambernath, Dis. Thane	Used Oil 6000 KLA Waste Oil 8550 KLA
6	M/s. Meghani Enterprises H-14, Shah & Diwan Industrial Complex, Udyognagar Chintupada, Mahim Village, Palghar, Dist. Thane	Used Oil 4500 KLA
7	M/s. Al Ali Mohammed Industrial Sr. No. 57-1/2, Village Ghatesh Khurd Khanivali Road, Tal- Wada, Dist – Thane - 421303	Used Oil 6000 KLA Waste Oil 18000 KLA
8	M/s. Tribo Lubes Pvt. Ltd. Takai Adoshi Road, Village Honad, Post- Saigaon Survey No. 13/7A, 14/3, 15/16, Tal – Khalapur, Dist – Raigad	Used Oil 7500 KLA Waste Oil 9000 KLA
9	M/s. Spear Petroleum Pvt. Ltd. 152, A, 15 th Floor Maker Chamber No. III, Nariman Point, Mumbai – 400 021	Waste Oil 11000 KLA
10	M/s. Balaji Rang Udyog Pvt. Ltd. Plot No. 44, MIDC Taloja Industrial Area Taloja, 410 208 Dist. Raigad	Waste Oil 15000 KLA
11	M/s. Shiva Petrochem Synth Specialists Ltd. Plot No. 2/3, Shah & Divan Indl Area, Opp. BIDCO Studio, Vill – Mahim, Palghar, Dist. Thane	Used Oil 10800 KLA

10.1.9 Sensitive Maps / Atlas


Environmental Sensitive Maps has been prepared based on available data of environmental, biological and industrial sensitive areas of various seasons covering the entire coast of Gulf of Kutch and Adani port regions. The study covers the region between longitudes of 68°E and 71°E and the latitudes of 22°N and 23°N. The sensitivity map as shown in Fig.11.6.

The detailed description of mapping of sensitive areas has been discussed in Part-C of report **(PART-C: OF THE OSCP)**

10.2 LISTS


10.2.1 Primary oil spill equipment

Table 10.7: LIST OF OSR EQUIPMENT/ITEMS AT Adani Ports & SEZL

SL No	Description of Resources	Qty
	Canadine fence boom (reel model 7296/8496 with power pack,towing	1 no
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1	bridles and tow lines-235 meter)	
2	Power pack with boom reel with hydraulic hoses	2no
3	Power pack-20kv with boom reel with hydraulic hoses	2no
4	Lamor side collector system (recovery capacity 123 m ³ /hr (side collector LSC-3C/2300(01C02-P536). Oil transfer pump OT A 50 with oil transfer hose set	2no 2sets
5	Lamor minimax 12m ³ skimmer	2sets
6	Power pack for skimmers with hydraulic hoses	4no
7	Power pack -20 KV for skimmers with hydraulic hoses	1no
8	Floating tank(25m ³)	1no
9	Foot pumps for floating tank	6no
10	Oil spill dispersants	5000ltr
11	Portable dispersant storage tank: 1000 ltr capacity	1no
12	Portable pumps	2no
13	Two -way hydraulic maneuvering panel	2no
14	Oil containment boom -length 2000 meters, height-1500 mm, draft-900mm, free board-600mm	2000 mtr
15	Current buster room -fasflo-75 (for response in fast current)	2no
16	Skimmer -KOMARA 15 duplex skimmer system with floating IMP 6 PUMP	4no
17	12.5T flexible floating storage tank (PUA).	3no
18	Diesel driven transfer pump for flex barge	2no
19	Site hose kit for the transfer pump for flex barge	2no
20	3" and 2" hose adaptor for transfer pump and hose	2no
21	Shoreline cleanup equipment	
22	Mini vac system	5no
23	OSD applicator =oil dispersant spry unit (20 ltr) for use on beach and inter tidal zones	2no
24	Startank with capacity 1000 liter(10m ³)	2no
25	Sorbent boom pack (12.5cm*4m)	500 mtr
26	Sorbent pad	2000 nos

In the event of oil spill, Traffic, Mechanical as well as Civil department of APSEZL Mundra shall provide required facility with regard to catering, housing, transportation, field sanitation and shelter etc

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Additional support equipment's shall be hired as per requirement by emergency coordinator and Mumbai Port will be delegated this duty.

10.2.2 Sources of manpower

Sources of Manpower:

The following are the sources of manpower to combat any oil spill incident in APSEZL, Mundra:

- A. OSR Manpower
- B. Adani Port Fire Department
- C. Adani Port Employees and Workers
- D. Adani Crisis Management Team
- E. Volunteers from Colleges and Other Maritime Colleges near to shore.

A: OSR Manpower:


MANPOWER		
1	IMO Level 1	20
2.	IMO Level 2	18
3.	IMO Level 3	7
4.	Other	

1. Adani Ports SEZ Limited, Mundra:

DESIGNATION	APPOINTED MEMBER
Chief Incident Controller (C IC)	Head-Marine
Commander	HOS Marine & DPC
Member Admin & Finance	Head Admin and Head Finance
Member HSE & Media	Head HSE and Head Corporate
Member legal	Head Legal
Member Tech	Head ES

2. DISTRICT ADMINISTRATION

Place Name	Address of Centre	Contact Details
Bhuj (Kutch)	District Collector Office Near Circuit House, Mandvi Road, Nr. Mota Bandh, Bhuj (Kachchh) Gujarat – 370001	Phone: +91 2832 250650 Fax: +91 2832 250430 Email: collector-kut@gujarat.gov.in

 Adani Ports and Special Economic Zone Ltd, Mundra	<i>Maps and Charts</i>	Rev.No: 04 Dt: 12 th July 2025 Doc No: ENVR 2022-003-R4
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Jamnagar	District Collector Office, Jilla Seva Sadan, Sharu Section Road, Jamnagar - 361002	Collector, Jamnagar <ul style="list-style-type: none"> +91 288 2555869 +91 288 2555899 collector-jam@gujarat.gov.in
Khambhalia	District Collector Office 1st Floor, Lalpur Bypass Road, Dharampur, Khambhalia, Gujarat - 361305	<input type="checkbox"/> 91 2833 232805 <input type="checkbox"/> +91 2833 232102 <input type="checkbox"/> collector-devbdwarka@gujarat.gov.in

Contact Details of Gujarat Fisheries Development Council


SI No.	Address of Centre	Contact Details
1	Commissioner Of Fisheries 3rd Floor, Block no-10, Jivraj Mehta Bhavan, Gandhinagar, Gujarat 382010	Phone No: -079- 232-53729 Fax No:- 079-232-53730

State Pollution Control Board – Regional Offices

	Address of Centre	Contact Details
Gandhi nagar	Gujarat Pollution Control Board Paryavaran Bhavan, Sector-10A, Gandhinagar-382010.	Phone : (079) 2323 2152 Fax : (079) 2323 2156, 2322 2784, 2323 2161 gpcbchairman@gmail.com , chairman-gpcb@gujarat.gov.in Member Secretary :
Morbi	Regional Center RR4F+6P7, Scientific Vadi, Sardar Nagar, Morbi, Gujarat 363641	Tel : 02822 228 001
Jamnagar	Regional Center Sardar Patel Commercial Complex, Rameshwar Nagar regional centre Kasturba Gandhi Vikas Gruh Marg, Bedi Bandar Road Jamnagar- 361 008	Telephone (0288) 2752366 Fax: (0288) 2753540 Email: ro-gpcb-jamn@gujarat.gov.in
Bhuj	Regional Centre Katira Commerical Complex-1, Nr.Manglam 4 Rasta,Sanskar Nagar, Nr.I.Tax Ofic,Bhuj 370001	Telephone: (02832) 250620 Fax: - Email: ro-gpcb-kutw@gujarat.gov.in

10.2.3 Local and National Government contacts

Emergency Contact Directory

 Adani Ports and Special Economic Zone Ltd, Mundra	Maps and Charts	Rev.No: 04 Dt: 12 th July 2025 Doc No: ENVR 2022-003-R4
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Note: Below is the contact detail for Emergency Contact directory. Radio officer will circulate the emergency contact detail through email for any changes in contact details. Final update copy of contact detail will available in Radio Room. Entire document will not be revised due to change in contact details.

VHF CHANNELS		
	VTMS VHF CH	16/73
	MUNDRA VHF CH	16/77

List of Important Telephone Numbers of Govt. Officials and other neighboring Organizations (Expert and Advisors) related to Spill Combating Plan

SN.	Company	Name and Designation	Telephone Numbers
1.	APSEZL, Mundra	Chief Operating Officer Head Marine Pollution Response Officer Port Control	02838-6272602838-255727 02838-255727 02838-255761 02838-255739
2.	Kandla Port Trust	Chairman Dy. Conservator Harbor Master Signal Station	02836-233001 / 234601 02836-223585 / 220235 02836-270201 02836-270194 / 549
3	Indian Oil Corporation, Mundra	CM (Ops) Manager (Ops) Control Room	02838- 222194 02838- 222197 02838- 224444
4	Indian Oil Corporation, Vadinar	DGM (Ops) Manager Tech Services Port Control	02833-256527 02833-256464 02833-256555
5	Reliance Petroleum Ltd Jamnagar	Marine Chief Senior Port Captain Port Control	0288-4013607 0288-4013750 0288-4012600 / 4012610
6	The Commanding Officer Indian Coast Guard Station, Mundra	ICGS, Mundra Station Ops Officer	02838 - 271402 & 03 (Tel) 02838 – 271404 (Fax)
7	The Commander Coast Guard Region (North West), Gandhinagar	COMCG (NW) Regional Ops & Plans Officer	079-23243241 (Tel) 079-23243283 (Fax)
8	The Commander No.1 Coast Guard District (Guj), Porbandar	COMDIS-1 District Ops & Plans Officer	0286-2214422 (Tel) 0286-2210559 (Fax)

9	The Commander Coast Guard Region (West) Mumbai	COMCG (W) Regional Ops & Plans Officer	022-24376133 (Tel) 022-24333727 (Fax)
10	The Officer-in-Charge Coast Guard Pollution Response Team (West), Mumbai	PRT (W) Officer-in-Charge	022-23722438 (Tel) 022-23728867 (Fax)
11	Gujarat Maritime Board	Vice Chairman & CEO Chief Nautical Officer	079-23238346 / 23238363 079-23234716
12	Ministry of Environment Govt. of Gujarat	Director (Environment)	079-23252154 / 23251062 079-23252156 (Fax)
13	Gujarat Pollution Control Board	Environmental Engineer	079-232 22756 079-232 22784 (Fax)

List of Important Telephone Numbers of Adani Group Personnel

S.No.	Description / contact person / designation	Telephone Nos.	
		Landline	Mobile
01	Capt. Sachin Srivastava, Head – Marine	02838 - 255727	+91 6359883102
02	Head of Section 1 - Marine	02838 – 255730	+91 6359631088
03	Head of Section 2 - Marine	02838- 255947	+91 6357160037
04	Mr. Sanjay Kewalramani, Head-Marine Technical	02838- 255844	91 9925150056
05	Mr. Yogesh Nandaniya, Manager-SPM	02838- 2562379	91 6359775168
06	Mr. Hari Govindan V	91-2838 - 285072	91 9879104805
07	Marine control, APSEZL	02838 – 255333 / 255761	91 9825228673
08	Port Operation center, APSEZL	02838 –255762	91 9825000949
09	Port security Control, APSEZL	02838 – 289322	91 9825000933
10	Head - Security, APSEZL		+91 9109988165
11	Head - Health, safety & Environment, APSEZL	02838 - 255718	+91 9884869471
12	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035

13	Occupational Health Centre	02838 - 255710	91 8980015070
14	Head-Admin Department	02838 – 255159	+91 8660183841
15	Head Finance	02838 – 255711	+91 9879114993
16	Head Corporate	NA	+91 6358940500

10.2.4 Specification of Oil commonly traded:

OIL HANDLED AT APSEZL, MUNDRA

1. Qatar Crude
2. Persian Gulf Crude
3. Motor Spirit
4. High Speed Diesel Oil
5. Naphtha
6. Furnace Oil
7. Light Diesel Oil
8. Industrial Furnace Oil
9. Reformate / Benzene
10. Maya Crude Oil
11. Arabian Crude Oil
12. Russian Crude Oil

CHARACTERSTICS OF DIFFERENT CLASS OF OILS


OIL TYPE	DENSITY	Viscosity	Pour point C	Flash point C
	(kg/l) At 15C	mPas at 20C		
Crude oil	0.8- 0.95	1-100	+10 to – 35	Variable
Gasoline	0.70 – 0.78	0.5	NA	Less than 0
Kerosene	0.8	2	Less than – 40	38-60
Jet fuel	0.8	1.5-2	Less than – 40	38-60
Diesel oil	0.85	5	-5 to -30	More than 55
Light FO IFO60	0.9	60 at 50 C	+ 50 to -20	More than 60
Medium FO IFO 180	0.9	180 at 50 C	+ 30 to – 20	More than 60
Heavy FO IFO 380	0.99	380 at 50 C	+ 30 to – 20	More than 60

10.2.5 Information sources

APSEZL, MUNDRA OIL SPIL CONTIGENCY PLAN-2019

NATIONAL OIL SPILL DISASTER CONTIGENCY PLAN


IPECA GUIDELINES

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11. CONCLUSIONS AND RECOMMENDATIONS


Based on the relevant studies, carried out Risk Assessment of spills, Contingency Plan for APSEZL, Mundra the following conclusions can be drawn:

- The hydrodynamic model runs have been made for prediction of tides and currents for a period of 1 year.
- Sensitivity mapping has been done for the study area considering environmental, ecological, social, economic and other factors.
- Oil Spill Modeling studies have been carried for various spill scenarios for a period of one year.
- NEBA Study has been carried for selecting best response options based on coastal information and spill scenarios.
- The details of spill volume and time taken to reach the coast and losses during its movement have been furnished in the report for preparedness.
- The percentage of spill volume reaching the coast, extent of oiling on the coast in metres, likely vulnerable areas, spill analysis, have been furnished in the report to estimate the fate of the spill.
- Oil spill contingency plan has been prepared as per NOS-DCP 2018 guidelines and presented in Strategy Plan. Strategy plans have been discussed in detail and formulated based on the risk analysis. Resources required to combat oil spills have been identified and furnished along with specifications.
- Prepared the environmental sensitivity Maps based on biological, environmental and socio-economic sensitive areas.
- Sensitivity Atlas has been prepared for coastal areas of Gulf of Kutch.
- APSEZL, Mundra will be placed an Oil Spill Response Plan and is equipped with certain items like adsorbents / absorbents etc for combating small spills in case of any accidental leakages if any. Certain additional combating equipment's are suggested in the report to cater for the oil spill risk.
- Strategy plan has been discussed in detail and formulated based on the risk assessment study.
- Response plan has been formulated based on the contingency plan.

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General Recommendations

- Priority should be given to combat the oil spills by physical means such as booms and skimmers. Oil Spill dispersants should be used only if necessary, depending on the clean-up situation and assessment of damage that is likely to occur to the environment. Only those dispersants recommended and approved by Indian Coast Guard (ICG) should be put into use only after obtaining permission from ICG.
- Training as per IMO guidelines should be given to the concerned operating staff involved in oil spill combating.
- Mock drills should be conducted twice in a year.

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12. REFERENCES

No	Title	Year	Client_Name
1	Oil spill contingency plan for offshore oil & gas exploration and appraisal in KG_DWHP_2017/1 & KG_OSHP_2017/1 Blocks in Bay of Bengal, East Godavari District, Andhra Pradesh, Gulf of Kutch, Gujarat, Gulfof Khambhat, Maharashtra and Tamil Nadu Blocks	2019	ABC Techno Labs Pvt Ltd, Chennai
2	Oil spill modeling studies for oil field development in KS Block, East Coast and West Coast of India for ONGC, Mumbai	2019	Oil and Natural Gas Corporation (ONGC), Mumbai
3	Modeling studies for predicting the changes in flow regime, sedimentation and in water qualities for the proposed laying of sub-sea pipelines off Modhva Coast, Gulf of Kutch, Gujarat	2019	Eco Chem Sales and Services-Surat, Gujarat
4	Modeling studies for change in flow regime, and oil spill for the proposed Laying of sub-sea Pipelines from Mumbai Refinery to Rasayani through Thane Creek, Maharashtra	2019	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & BPCL
5	Numerical modeling studies for the hydrodynamic behavior, ship navigation simulation studies and oil spill contingency management plan due to the proposed LNG Terminal at Port Blair, Andaman & Nicobar Islands, India	2018	Vimta Labs, Hyderabad & SEIL Nellore
6	Hydrodynamic modeling studies for predicting the changes in flow regime, erosion / deposition due to the proposed development of marine facilities for conveyor belt at Virpur Village, Devbhoomi Dwarka	2017	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
7	Oil spill risk analysis and modeling studies for GSPC LNG Ltd (GLL), at Mundra in Gujarat State, India.	2017	Vimta Labs, Hyderabad
8	Numerical modeling studies for the hydrodynamic behavior, ship navigation simulation studies and oil spill contingency management plan due to the proposed LNG Terminal at Port Blair, Andaman & Nicobar Islands, India	2017	Vimta Labs, Hyderabad
9	Modeling of fate and trajectory of oil spill	2016	BG Exploration and Production (India) Limited, Mumbai
10	Hydrodynamic modeling studies for changes in the flow regime, erosion / deposition due to the proposed development of Cargo Jetty at Vadinar, Gulf of Kutch	2016	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
11	Numerical modelling studies for predicting the impacts on the flow regime & morphology due to the proposed development of cargo berth at MbPT, Thane Creek	2016	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
12	Mathematical modeling for simulation of trajectory, fate and weathering characteristics of HSD oil spill in the coastal waters of Bedi, Gulf of Kutch	2016	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
13	Oil spill modeling studies for an offshore oil & gas exploratory drilling project in the Palar Block in the Bay of Bengal	2016	AECOM & Cairn India Limited, Noida
14	1. Stochastic oil spill modelling, net environment benefit analysis studies and response plan for Adani Hazira Port, Hazira, Surat 2. Mapping of marine sensitive areas in the coastal areas of Hazira, Gujarat 3. Net environment benefit analysis studies and response	2015	Adani Hazira Port Private Limited, Hazira

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	plan for Adani Hazira Port, Hazira, Surat		
15	Oil spill response plan development for Cairn CB/OS-2 Suvali onshore and offshore facility, Gulf of Khambhat , Gujarat	2015	Cairn Energy Pvt. Ltd., Suvali
16	1. Oil spill risk assessment, net environment benefit analysis studies and response plan for Reliance Industries Limited SPM at Hazira, Surat.2. Mapping of marine sensitive areas in the coastal areas of Hazira, Gujarat. 3. Net environment benefit analysis studies and response plan for Reliance Industries Limited SPM at Hazira, Surat	2015	Reliance Industries Ltd., Hazira
17	1. Oil spill risk analysis and modelling studies for ESSAR Bulk Terminal Ltd at Hazira in Gulf of Khambhat, Gujarat 2. Mapping of marine sensitive areaa in the coastal areas of Hazira, Gujarat 3. Net environment benefit analysis studies and response plan for ESSAR Bulk Terminal Limited, Hazira	2015	ESSAR Bulk Terminal Limited, Hazira.
18	Oil spill risk assessment study and contingency planning for Panna-Mukta Oil Fields of BGEFIL, West Coast of India	2015	BG Exploration and Production (India) Limited, Mumbai
19	Oil spill risk assessment for Panna Field	2015	BG Exploration and Production (India) Limited, Mumbai
20	Risk analysis of fuel oil spills during service vessel operations at and around the proposed jetty in the offshore of Bhogat, Arabian Sea	2015	Bhagavathi Anna Lab Pvt. Ltd. Hyderabad
21	Numerical modeling studies for predicting the impacts on flow regime and morphology due to the marine facilities for LNG Jetty, oil spill contingency planning and ship navigation studies at Krishnampatnam, Eastcoast of India	2014	Vimta Labs Pvt. Ltd., Hyderabad
22	Oil spill risk assessment study and contingency planning for Panna-Mukta Oil Fields of BGEFIL, West Coast of India	2014	BG Exploration and Production (India) Limited, Mumbai
23	1. Modeling studies for changes in the flow regime, sedimentation processes due to the proposed development of marine facilities in Chhara Port 2. Mathematical modelling for simulation of trajectory, fate and weathering characteristics of oil spills in the coastal waters off Chhara	2014	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
24	Modelling and simulation of oil spill trajectory for Ravva Oil Field, East Coast of India	2013	Cairn India Limited, Noida
25	1. Oil spill modeling studies for oil field development in Andaman Nicobar Basin in East Coast of India for ONGC, Mumbai. 2. Oil spill modeling studies for oil field development in Cauvery Basin in East Coast of India for ONGC, Mumbai. 3. Oil spill modeling studies for oil field development in Mahanadi Basin in East Coast of India for ONGC, Mumbai.	2013	Oil and Natural Gas Corporation (ONGC), Mumbai
26	Oil spill risk assessment and contingency planning for the marine facilities of Adani Ports and Special Economic Zone Limited, Mundra	2013	Adani Port & Special Economic Zone Limited, Mundra
27	Oil spill risk assessment study and contingency planning for Panna-Mukta Oil Fields of BGEFIL, West Coast of India	2013	BG Exploration and Production (India) Limited, Mumbai
28	Oil spill risk assessment study and contingency planning for Krishna	2013	Oil and Natural Gas

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	- Godavari Basin, East Coast of India - oil spill trajectory and weathering characteristics for spills at well locations GS-15 -1, GS-15-4 and G-1.		Corporation (ONGC), Eastern Offshore Asset
29	Oil spill risk assessment and contingency planning for the coal jetty facility of RIL at Dahej, Gujarat	2013	Reliance Industries Ltd., Mumbai
30	Numerical modeling studies for predicting the impacts on the shore line and morphology due to proposed marine infrastructure activities at Sikka, Gulf of Kutch and validating the changes / impacts with respect to CRZ Regulations 2011	2012	Reliance Industries Ltd., Mumbai
31	Mathematical modeling for simulation of trajectory, fate and weathering characteristics of oil spills and pesticide spills in the coastal waters off Mumbai / Dahanu	2012	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & ICMAM, Chennai
32	Mathematical modeling for simulation of trajectory, fate and weathering characteristics of oil spill and pesticide dispersion in the coastal waters of Thane	2012	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & Maharashtra Pollution Control Board (MPCB)
33	Oil spill risk assessment and contingency planning for the existing marine facilities of Reliance Industries Limited Jamnagar , Gujarat	2012	Reliance Industries Ltd., Jamnagar
34	Risk assessment study of marine oil spills for KPT SPMs and Product Jetty, Vadinar, Gulf of Kutch	2012	CSIR-National Institute of Oceanography (NIO) , Goa & Kandla Port Trust (KPT), Vadinar
35	Oil spill risk assessment study and contingency planning for Krishna - Godavari Basin, East Coast of India	2012	Asian Consultant Engineers Ltd & Oil & Natural Gas Corporation (ONGC)
36	Oil spill risk assessment study and contingency planning for Panna-Mukta Oil Fields of BGEPIIL, West Coast of India	2012	BG Exploration and Production (India) Limited, Mumbai
37	Oil spill risk assessment and contingency planning for KG Basin, East Coast of India	2012	Senes consultants India Limited, Hyderabad & Oil and Natural Gas Corporation (ONGC), Mumbai
38	Oil spill risk assessment and contingency planning for KG , East Coast of India	2012	Oil and Natural Gas Corporation, Mumbai
39	Oil spill risk assessment study for the accidental pipeline ruptures of the 203 km long 30" dia trunk line.	2012	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
40	Oil spill risk assessment and contingency planning for the augmented marine facilities of RDMT Jetty, Dahej, Gujarat	2012	Reliance Industries Ltd., Mumbai
41	Report on numerical modeling studies for predicting the oil spill trajectories & weathering for select cases of spill at FPSO location in KG Basin, East Coast of India for RIL	2012	Reliance Industries Ltd., Mumbai
42	Mathematical modeling for simulation of trajectory, fate and weathering characteristics of oil spills and pesticide spills in the coastal waters off Mumbai / Dahanu- Phase I & II	2012	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & ICMAM, Chennai
43	Oil spill risk assessment due to crude oil leak from the ruptures in the	2012	Oil and Natural Gas

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	30" oil trunk pipeline from Mumbai High to Uran		Corporation (ONGC), Mumbai
44	Oil spill risk assessment due to oil spill in the offshore waters off Mumbai Port	2012	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai
45	Numerical modelling studies for oil spill risk assessment and response plan for RIL Jamnagar marine facilities	2012	Reliance Industries Ltd.
46	Risk assessment study of marine oil spills for existing & proposed extension of jetties & SPMs of Vadinar Oil Terminal Limited at pathfinder inlet, Gulf of Kutch, Jamnagar	2011	Vadinar Oil Terminal Limited (VOTL), Jamnagar
47	Oil spill risk assessment study for IOCL at Vadinar Coast, Gulf of Kutch, Jamnagar	2011	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & Indian Oil Corporation Limited
48	Risk assessment study of marine oil spills for KPT SPMs and Product Jetty, Vadinar, Gulf of Kutch	2011	CSIR-National Institute of Oceanography (NIO), Goa & Kandla Port Trust, Vadinar
49	Comprehensive risk analysis study of existing SPM facilities of IOCL in Gulf of Kutch at Vadinar, Gujarat	2011	Indian Oil Corporation Limited, Pipelines Division, Noida
50	Oil spill risk analysis and contingency plan for Multi Cargo Port by Adani Hazira Port Private Limited, Hazira, Surat	2011	Adani Hazira Port Pvt. Ltd., Surat
51	Oil spill risk analysis and contingency plan for ESSAR Bulk Terminal Limited, Hazira	2010	ESSAR Bulk Terminal Limited, Hazira.
52	Oil spill assessment studies for the oil spill occurred at SPM in the Panna Oil Field	2009	BG Exploration and Production India Limited, Mumbai
53	Oil spill risk assessment study for the extension of proposed marine facilities of Vadinar Oil Terminal Limited product jetties at Vadinar coast of Kutch Jamnagar.	2009	Vadinar Oil Terminal Limited (VOTL), Jamnagar
54	Oil spill assessment studies for the oil spill occurred at coastal waters of Goa	2009	CSIR-National Institute of Oceanography (NIO), Goa
55	Oil spill risk analysis and contingency plan for GMB Ports	2009	Gujarat Maritime Board, Gujarat
56	Oil spill risk analysis and contingency plan for single point mooring off Mundra	2008	CSIR-National Institute of Oceanography (NIO), Goa & HPCL-Mittal Pipelines Limited, New Delhi
57	Oil spill risk analysis for all the operational facilities of Cairn Energy, Gulf of Kutch	2008	Cairn Energy India Pvt. Ltd. (CEIL), Rajasthan
58	Risk analysis of Algeria crude oil spills during unloading operations at and around SPM and pipeline corridor in the offshore of Bhogat, Arabian Sea.	2008	CSIR-National Institute of Oceanography (NIO), Goa & Cairn Energy India Pvt. Ltd (CEIL)
59	Oil spill risk analysis and contingency plan for all the operational facilities of ONGC and its associated operations with respect to oil spill in Bombay High	2008	CSIR-National Institute of Oceanography (NIO), Goa & Oil and Natural Gas Corporation (ONGC)

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60	Oil spill risk analysis and contingency plan for container berths at JNPT, Navi Mumbai	2008	CSIR-National Institute of Oceanography (NIO), Goa & Jawaharlal Nehru Port Trust, Navi Mumbai
61	Oil spill risk analysis and contingency plan for all the operational facilities of BG Exploration and Production India Limited and its associated operations with respect to oil spill in Panna-Mukta Oilfield	2007	BG Exploration and Production India Limited, Mumbai
62	Oil spill risk analysis and contingency plan for proposed SPM of HPCL Visakhapatnam	2007	CSIR-National Institute of Oceanography (NIO), Goa & Hindustan Petroleum Corporation Ltd., Mumbai
63	Oil spill risk analysis and contingency plan for liquid cargo jetty at JNPT, Navi Mumbai	2007	CSIR-National Institute of Oceanography (NIO), Goa & Bharat Petroleum Corporation Limited, Mumbai
64	Oil spill risk assessment study and predicting the shoreline impact due to RIL's SPM operations at Hazira	2007	Reliance Industries Ltd., Hazira
65	Oil spill risk analysis and preparation of oil spill contingency plan for Paradip Port, Bhubaneswar	2006	CSIR-National Institute of Oceanography (NIO), Goa & Indian Oil Corporation Limited, Bhubaneswar
66	Oil spill risk analysis and oil spill contingency plan for IOCL, Port Blair Port	2006	CSIR-National Institute of Oceanography (NIO), Goa & Indian Oil Corporation Limited, Port Blair, Andaman
67	Oil spill risk analysis and preparation of oil spill contingency plan for Budge-Budge Port of Indian Oil Corporation, Kolkata	2006	CSIR-National Institute of Oceanography (NIO), Goa & Indian Oil Corporation Limited, Kolkata
68	Oil spill risk assessment study for marine facilities of ESSAR Oil Ltd at Vadinar Coast off Gulf of Kutch, Jamnagar	2005	Essar Oil Limited, Refinery Division, Jamnagar
69	Oil spill risk analysis and contingency plan for CB/OS-2 block, Gulf of Khambhat	2004	Cairn Energy Pvt. Ltd., Chennai
70	Oil spill risk analysis and contingency plan for Hazira Port, Hazira	2004	Hazira Port Trust Private Limited (HPPL), Hazira
71	Oil spill risk analysis and contingency plan for Ravva Oil Field, East Coast of India	2004	Cairn Energy Pvt. Ltd., Chennai
72	Oil spill risk analysis and contingency plan for BPCL, Mumbai	2003	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & Bharat Petroleum Corporation Ltd., Mumbai
73	Quantitative oil spill risk analysis studies and Oil spill contingency planning for HPCL	2003	CSIR-National Institute of Oceanography (NIO), Goa & Hindustan Petroleum Corporation Ltd. Visakh Refinery
74	Marine emergency management plan for Crude Oil and Pol Jetty of CPCL	2002	CSIR-National Institute of Oceanography (NIO), Goa & Chennai Petroleum

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			Corporation Ltd., Nagapattinam, Tamilnadu
75	Oil spill risk assessment study for IOCL operations at SBMS at Vadinar Coast, Gulf of Kutch, Jamnagar	2002	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & IOCL, Vadinar
76	Oil spill modelling and shoreline sensitivity mapping	2001	CSIR-National Institute of Oceanography (NIO), Regional Center, Mumbai & Dabhol Power company, Dabhol



13. APPENDIX

APPENDIX-1: MODELING OF HYDRODYNAMIC PROCESSES

Modeling the hydrodynamic processes is an integral part of modeling of fate and transport of oil spills. The basic oil-spill model which was used earlier for risk analysis of oil spills (Ref. Projects completed : www.environssoftware.com) and to track the oil-spill trajectories has been further improved to be used in the present work to estimate risks due to oil spills for various weathering and meteorological conditions.


Adani Ports bounded on the coast of Gulf of Kutch, on the north, south and east by Navalakhi. The currents of the region are tide-driven and assumed the water column is well mixed. These features make the numerical modeling task, as a 2-D hydrodynamical model is sufficient to accurately reproduce the tides and currents of the Gulf of Kutch.

The computational runs in order to obtain better accuracy in the prediction of oil spill trajectory and weathering processes, a finer mesh is adopted to represent the study area for modeling purpose. The study covers the region between latitude 22° N and 23°N and longitude 68° 42' E and 70°30' E is in Gulf of Kutch, West coast of India. The model simulated for all months and results are presented graphically. The detailed description of Hydrodynamic Processes is discussed in the report **(PART-A: REPORT ON HYDRODYNAMIC MODELING STUDIES)**

APPENDIX-2: MODELING OF FATE AND TRAJECTORY OF SPILLED OIL

Knowledge of probable movement of an oil slick gives a distinct advantage while planning response strategies. Thus, for instance, no major clean-up operation is necessary if the modeling results indicate that the spilled oil would remain at sea thereby sparing the shore ecology. On the contrary, if modeling results are suggestive of shoreward drift and predict that particular ecologically sensitive or important areas would be hit, effective counter measures such as deployment of deflection booms, containment and recovery of oil etc. can be effectively taken.

Hydrodyn-OILSOFT dedicated software for oil spill trajectory modeling is used for prediction of oil spill scenarios at i) Undetected pipeline leakage (ii)Hose-failure (iii) Spills at Oil Jetties (iv)Collision / Grounding (v)Leakages in creeks (vi)Major accident at oil Jetty / collision & Grounding in the channel route for various meteorological and hydrological conditions. The detailed description of Fate and weathering characteristics of spilled oil for various hydrodynamic and meteorological conditions are discussed in the report **(PART-B: REPORT ON OIL SPILL FATE AND TRAJECTORY MODELING STUDIES)**

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APPENDIX-3: SENSITIVITY INDEX MAPPING AND ATLAS

There is a pressing need of having marine sensitive area Atlas of coastal areas of Gulf of Kutch, West coast of India which can fulfill the requirement of various organizations including the state governments in taking policy decisions. **Environ Software Pvt. Ltd** has been prepared marine sensitive area Atlas of the Gulf of Kutch regions as well as Adani ports with technical inputs from the available data sources. Latest satellite data has been used to map various coastal lands, biological, environmental and geographical features and prepared the sensitivity index mapping with regards to oil spill risk assessment and management. The detailed description of marine sensitive areas discussed in the report (**PART-C: REPORT ON SENSITIVITY INDEX MAPPING AND ATLAS**)

APPENDIX-4: NET ENVIRONMENT BENEFIT ANALYSIS

Net Environmental benefit Analysis Table for selecting suitable response equipment's & Strategy. The spills at selected locations stranded the coast of Gulf of Kutch, West coast of India for various seasons of year 2021. The weathering will take place based on oil on surface.

Zonal representation of the spill standard to the coast or at open sea, volume of oil floating on the surface and oil losses for various tidal conditions are furnished in the Appendix-2 (**Part-B of the report**). The suitable response equipment's will be selected based on NEBA studies discussed in the report (**PART-D: NET ENVIRONMENT BENEFITS ANALYSIS**)

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APPENDIX -5: OIL SPILL REPORT FORM

INITIAL OIL SPILL REPORT FORM PARTICULARS OF PERSON / ORGANIZATION REPORTING INCIDENT

OIL SPILL REPORT FORM
<p>Particular of Person/Organization</p> <p>Reporting Incident</p> <p>Title: Risk Assessment Study, Sensitivity Area Mapping and Preparation of Oil Spill Contingency Plan and Allied Works for Tier-1 Oil Spill Response (OSR) Facility For Adani Port & SEZ Limited</p> <p>Organization: APSEZL, Mundra</p> <p>Telephone/ Mobile / Telex / Fax number: Date / Time: ...</p> <ul style="list-style-type: none"> ➤ Spill Location: SPMs (S1, S2) ➤ VLCC Jetty (S15) ➤ Sub-sea pipeline(S3) ➤ Tanker entry into the Ports (S4) ➤ Adani West Port berths (S5, S6, S7) ➤ LNG Berth (S8) ➤ Adani South Port berths (S9, S10) ➤ Mundra Port (S11) ➤ MICT / AMCT Berths (S12) <p>Type and quantity of oil spill: ... Type: HSD, Fuel oil and crude oil</p> <p>Scenarios: Instantaneous and continuous</p> <p>Quantity: 700t, 10000t and 25000t and 10000 m3/h for 60 sec, 10000m3/h for 1 min..</p> <p>Cause of oil spill : . By accidents involving loading and unloading operations at berth, VLCC, barges, pipelines, storage facilities, Vessel breaking down, transportation, handling, routine maintenance activities etc....</p> <p>Response to spillage, if any :</p> <p>Any other information :</p> <p>.....</p>

DAILY INCIDENT LOG

DAILY INCIDENT LOG - TEAM LEADER - OIL SPILL RESPONSE GROUP

Name..... Rank

Notification received. ONSHORE / OFFSHORE / INSIDE HARBOUR

Time Date

Day Shift

LOCATION OF THE INCIDENT

Name of the VESSEL / PLACE Area.....

Latitude Longitude

Distance from North BreakwaterNM Sounding

Incident occurred Incident Severity (tick one)

Time Date Minor / Major / Tier I / Tier II / Tier III

Brief details of incident and action taken

.....

WEATHER DATA

Wind Speed Wind Direction Sea State

Current Speed Current Direction Visibility

Sea Temperature..... Air Temperature Fog / Mist.....

Rain / Precipitation Humidity Cloud cover

OPERATION DATA

Type of Boom / Booms deployed..... Total LengthIn Depth

Power Pack Running hrs Skimmer Running hrs

Oil Recovered from water Liters / Tons Oil transferred ashoreLitres/Tons

Oil / Sludge cleared from shoreKg Sorbents pads useNos.

O.S.D usedLiters Saw Dust usedKg

LOGISTICS AND MANPOWER

Name and type of the vessel / boats available for assistance

Name and type of the vehicles available for assistance

Manpower utilized ...

Fireman Security Services men Casual LabourersOthers.....

FORM COMPLETED BY

Name

Rank / Designation.....

Signature

Time Date


On completion, this form is to be handed over to OSC, who in turn after his comments would hand over this form to ECR Team Leader. In absence of any OSC it may be handed over to ECR Team Leader directly

PERSONAL LOG FORM (To be forwarded to HSE Manager)		
Form Completed By:		
Name		
Designation		
Signed		Date/...../.....
TIME (24 hour Clock)	COMMUNICATION (To / From)	ACTION / MESSAGE

APPENDIX –6: POLREP INFORMATION

The following information must be provided to the coast guard as and when the facts when becomes available. The information is required to generate POLREP reports to government through the coast guard.

1. Identity of informant
2. Time of information receipt
3. Source of spill
4. Probable Cause of spill
5. Type of oil
6. Color code information
7. Configuration
8. Radius
9. Tail
10. Volume
11. Quantity
12. Weathered or fresh
13. Density
14. Viscosity
15. Wind
16. Wave height
17. Current
18. Layer thickness
19. Ambient air temperature
20. Ambient sea temperature
21. Predicted slick movement
22. Confirm classification of spill size

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APPENDIX -7: POLAR MESSAGES FORMAT

Address		
Date		From To
Identification		Time Group
Serial Number		
Part I (POLAR WARN)	1	Date and time
	2	Position
	3	Incident
	4	Overflow
	5	Acknowledge
Part ii (POLINF)	1	Date and Time
	2	Position
	3	
	4	
	5	Characteristic of Pollution
	6	Source and Cause of pollution
	7	Wind direction and speed
	8	Current or tide
	9	Sea state and visibility
	10	Drift of pollution
	11	Forecast
	12	Identify of observer and ships on scene
	13	Action taken
	14	Photograph or samples
	15	Name of other agencies informed
Part iii (POLFAC)	1	Date and time
	2	Request for assistance
	3	Cost
	4	Pre-arrangements for the delivery
	5	Assistance to where and how
	6	Other agencies requested
	7	Change of command
	8	Exchange of information
	9	Names and number of personnel
	10	Description of equipment
	11	ETA and arrival information
	12	Place of embarkation
	13	Place of disembarkation

APPENDIX -8: OIL SPILL PROGRESS REPORT

Incident name		
Updated by :		
Date :		Time (Local)
Summary of Incident Response Operation :		
Summary of Incident Response Resource Utilization :		
Number of Aircraft:		Number of Vessels m
Dispersant used:	Liters	Length of Boom in use
Number of recovery devices:		Number of storage devices
Sorbent used:	Kg	Bioremediation Used
Number of personnel:		Number of Vehicles:
Specialist Equipment:		
Oil Spill Balance Sheet:		
Total amount of oil spilled:		Tonnes
Total amount of oil recovered:		Tonnes
Outstanding amount of spilled oil:		Tonnes
Mass balance:		Tonnes
Estimated natural weathering:		Tonnes
Mechanically agitated		Tonnes
Chemically dispersed		Tonnes
Skimmer recovered		Tonnes
Sorbent recovered		Tonnes
Manually recovered		Tonnes
Bioremediated::		Tonnes
Other....		Tonnes

APPENDIX-9: OIL SPILL REPORT FORM


Complete the oil spill report form as under using the details of notifications and information known and report to the Adani Ports & SEZL.

Spill Notification Pro Forma

Fax To:

Tele No:

IDENTITY OF OBSERVER / REPORTER		
Full Name:		Organization Company:
Contact Telephone No.:		Contact E-mail:
INCIDENT DETAILS		
Operator / organization / company responsible for incident:		
Date of Incident:		Time of incident:
Installation / facility:	Fixed/Mobile(delete as applicable)	Field Name:
Latitude:	Longitude:	Quad & Block no:
Oil release / Chemical release or permitted discharge Notification (tick below and complete column details as applicable).		
Oil release	Chemical release Notification	Permitted discharge Notification
Max Released (tones):	Quantity Released (kgs):	Max oil discharged (tones):
Min released (tones):	Chemical Name:	Min oil discharged (tones):
Type of oil:	Chemical Use:	Type of oil:
Tier of response (1,2 or 3): (as per Oil pollution emergency Plan)	%Oil if OBM or base oil:	Oil conc. In discharge:
	Warning Label:	Discharge rate M3 / hr
Appearance:	Appearance:	Appearance:
Approx. release area on sea surface (m2 or km2):	Approx. release area on sea surface (m2 or km2):	Approx. release area on sea surface (m2 or km2):
Is release ongoing? YES/NO (if YES notification must be updated & reported each 24 hr period unless otherwise directed by Indian Coast Guard)		
Release since last report (tones):		Total Release till date (tones):
Source of pollution		
Cause of pollution:		
Steps taken to prevent re occurrence / respond to incident:		
Release likely to reach Median Line YES/NO: Shore YES/NO If YES approx location/ time:		
Photograph Taken: YES/NO		Samples taken for analysis:
WEATHER CONDITIONS		
Wind Speed (knots):		Wind Direction (0-360):
Beaufort scale (1-12):		Wave Height (Meters):

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APPENDIX-10: APPLICATION FOR SEEKING COASTGUARD APPROVAL

FOR OSD APPLICATION

Fax To:

Tele No:

IDENTITY OF OBSERVER / REPORTER			
Full Name:		Organization Company:	
Contact Telephone No		Contact E-mail:	
DETAILS OF SPILLS			
Quantity	Particulars of oil	Date of incident	Time of Incident
LOCATION			
Latitude:	Longitude:	Depth of Water	
LOCATION			
Landmark			
Oil Type:			
QUANTITIES OF OIL SPILLED AND SOURCE:			
DESCRIPTION OF SLICKS			
Dimensions		Color	
OTHER METHODS OF RESPONSE BEING APPLIED OR CONSIDERED			
WEATHES CONDITIONS			
Wind Speed (Knots):		Wind Direction (0-360)	
Beaufort scale (1-12):		Wave Height (Meters):	
SENSITIVE AREAS IN PROXIMITY AND TYPE			
PARTICULARS OF OSD			
Name of OSD Held with	Quantity held with	Whether the OSD approved for use in Indian waters-	
Toxicity (LC50 value for 96 hours)	Efficiency	Solubility	

APPENDIX – 11 : PRESS RELEASE FORMAT

INITIAL PRESS STATEMENT FORM - POLLUTION INCIDENT
<p>Public Statement Number 1.</p> <p>An oil spill occurred at hours of date in the facilities of Adani port, West coast of India.</p> <p>The location of the incident is/..... in the offshore of Adani facilities.</p> <p>.....</p> <p>The situation is under control / not yet under control / out of control. The installation involved in the incident / accident is in a stable and safe / unstable and unsafe condition. The Oil spill Response Team in being / has already mobilized to deal with the situation. So far litres/ tonnes of Oil has been recovered.</p> <p>Further statement will be issued in light of any further developments. The news media should contact HSE Manager of the Adhani for any additional information.</p> <p>Signature</p> <p>Name of the installation Manager</p> <p>Date Time</p> <p>Place:</p>
<p>NOTE: When, Typed, this Form must be signed by the installation Manager / Emergency Control Team Leader and forwarded to General Manager. Under no circumstances the press statement be released to the NEWS Media without the approval of the concerned authority.</p>

APPENDIX – 12: LIST OF IMPORTANT TELEPHONE NUMBERS

List of Important Telephone Numbers of Adani Group Personnel

SN.	Company	Name and Designation	Telephone Numbers
1.	APSEZL, Mundra	Chief Operating Officer Head Marine Pollution Response Officer Port Control	02838-6272602838-255727 02838-255727 02838-255761 / 289170 (Fax) 02838-255739
2.	Kandla Port Trust	Chairman Dy. Conservator Harbor Master Signal Station	02836-233001 / 234601 02836-223585 / 220235 02836-270201 02836-270194 / 549
3	Indian Oil Corporation, Mundra	CM (Ops) Manager (Ops) Control Room	02838- 222194 02838- 222197 02838- 224444
4	Indian Oil Corporation, Vadinar	DGM (Ops) Manager Tech Services Port Control	02833-256527 02833-256464 02833-256555
5	Reliance Petroleum Ltd Jamnagar	Marine Chief Senior Port Captain Port Control	0288-4013607 0288-4013750 0288-4012600 / 4012610
6	The Commanding Officer Indian Coast Guard Station, Mundra	ICGS, Mundra Station Ops Officer	02838 - 271402 & 03 (Tel) 02838 – 271404 (Fax)
7	The Commander Coast Guard Region (North West), Gandhinagar	COMCG (NW) Regional Ops & Plans Officer	079-23243241 (Tel) 079-23243283 (Fax)
8	The Commander No.1 Coast Guard District (Guj), Porbandar	COMDIS-1 District Ops & Plans Officer	0286-2214422 (Tel) 0286-2210559 (Fax)
9	The Commander Coast Guard Region (West) Mumbai	COMCG (W) Regional Ops & Plans Officer	022-24376133 (Tel) 022-24333727 (Fax)
10	The Officer-in-Charge Coast Guard Pollution Response Team (West),	PRT (W) Officer-in-Charge	022-23722438 (Tel) 022-23728867 (Fax)

	Mumbai		
11	Gujarat Maritime Board	Vice Chairman & CEO Chief Nautical Officer	079-23238346 / 23238363 079-23234716
12	Ministry of Environment Govt. of Gujarat	Director (Environment)	079-23252154 / 23251062 079-23252156 (Fax)
13	Gujarat Pollution Control Board	Environmental Engineer	079-232 22756 079-232 22784 (Fax)

List Of Important Telephone Numbers Of Adani Group Personnel

S.No.	Description / contact person / designation	Telephone Nos.	
		Landline	Mobile
01	Capt. Sachin Srivastava, Head – Marine	02838 - 255727	+91 6359883102
02	Capt. Divya Gupta, HOS-Marine	02838 – 255730	+91 6359631088
03	Capt. Rajat Garg. , HOS-Marine	02838- 255947	+91 6357160037
04	Mr. Sanjay Kewalramani, Head-Marine Technical	02838- 255844	91 9925150056
05	Mr. Yogesh Nandaniya, Manager-SPM	02838- 2562379	91 6359775168
06	Mr. Hari Govindan V	91-2838 - 285072	91 9879104805
07	Marine control, APSEZL	02838 – 255333 / 255761	91 9825228673
08	Port Operation center, APSEZL	02838 –255762	91 9825000949
09	Port security Control, APSEZL	02838 – 289322	91 9825000933
10	Head - Security, APSEZL		+91 9109988165
11	Head - Health, safety & Environment, APSEZL	02838 - 255718	+91 9884869471
12	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035
13	Occupational Health Centre	02838 - 255710	91 8980015070

14	Head-Admin Department	02838 – 255159	+91 8660183841
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Agencies for Supplying Shore Cleanup Equipment and Safety Gears		
Agency	Address	Contact Number
M/s Envirocare Systems	4-B, Apeejay surrendra House, 4 th Floor, 24, Baroda Street, Mumbai – 400009 Email: envirocaresystems1@gmail.com Web: www.envirocaresystems.net	Phone: (022)23486637.23485474, 23487400. Fax: (022) 23488284
M/s HiTech Elastomers Ltd. Works	798, Rankapur, Nr. Santej Sola-Kalol State Highway, Ta. Kalol Dist. Gandhinagar – 384002. Email: sales@hitechelastomers.com	Phone: +91-2764-286010, 286806,268112. Cell: 9824654669 Fax: +91-2764-286010
M/s Sadhav Shipping Limited	521, Loha Bhavan, P. D'Mello Road, Masjid (East), Mumbai – 400 009. Email: shipping@sadhav.com , osv@sadhav.com Web: www.sadhav.com	Tel: 022-2348 25/24 Fax: 022-2348 25/26


CONTACT DETAILS OF LOCAL ADMINISTRATIVE AUTHORITIES

1. DISTRICT ADMINISTRATION

Place Name	Address of Centre	Contact Details
Bhuj (Kutch)	District Collector Office Near Circuit House, Mandvi Road, Nr. Mota Bandh, Bhuj (Kachchh) Gujarat – 370001	Phone: +91 2832 250650 Fax: +91 2832 250430 Email: collector-kut@gujarat.gov.in
Jamnagar	District Collector Office, Jilla Seva Sadan, Sharu Section Road, Jamnagar - 361002	Collector, Jamnagar <ul style="list-style-type: none"> • +91 288 2555869 • +91 288 2555899 • collector-jam@gujarat.gov.in
Khambhalia	District Collector Office 1st Floor, Lalpur Bypass Road, Dharampur, Khambhalia, Gujarat - 361305	<input type="checkbox"/> 91 2833 232805 <input type="checkbox"/> +91 2833 232102 <input type="checkbox"/> collector-devbdwarka@gujarat.gov.in

2. FISHERIES

SI No.	Address of Centre	Contact Details
1	Commissioner of Fisheries 3rd Floor, Block no-10, Jivraj Mehta Bhavan, Gandhinagar, Gujarat 382010	Phone No: -079- 232-53729 Fax No:- 079-232-53730

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3. STATE POLLUTION CONTROL BOARD – REGIONAL OFFICES

	Address of Centre	Contact Details
Gandhinagar	Gujarat Pollution Control Board Paryavaran Bhavan, Sector-10A, Gandhinagar-382010.	Phone: (079) 2323 2152 Fax : (079) 2323 2156, 2322 2784, 2323 2161 gpcbchairman@gmail.com , chairman-gpcb@gujarat.gov.in Member Secretary:
Morbi	Regional Center RR4F+6P7, Scientific Vadi, Sardar Nagar, Morbi, Gujarat 363641	Tel : 02822 228 001
Jamnagar	Regional Center Sardar Patel Commercial Complex, Rameshwar Nagar regional centre Kasturba Gandhi Vikas Gruh Marg, Bedi Bandar Road Jamnagar- 361 008	Telephone (0288) 2752366 Fax: (0288) 2753540 Email: ro-gpcb-jamn@gujarat.gov.in
Bhuj	Regional Centre Katira Commerical Complex-1, Nr.Manglam 4 Rasta,Sanskar Nagar, Nr.I.Tax Ofic,Bhuj 370001	Telephone: (02832) 250620 Fax: - Email: ro-gpcb-kutw@gujarat.gov.in

APPENDIX-13: CONTINGENCY PLANNING COMPLIANCE CHECKLIST

Port Authority: Adani Ports & SEZL

Description		Complied Yes/No	Remarks
RISK ASSESSMENT			
1	Whether the facility produces/ handles/ uses/ imports/ stores any type of petroleum product	Yes	Petroleum products are directly transferred from vessels through pipelines
2	Whether risk assessment is done	Yes	Chapter-2 Page No. 17 & Chapter-4 Part-B report
3	Who did the risk assessment		Environ Software Pvt Ltd
4	Whether maximum volume of oil spill that can occur in the worst-case scenario is considered	Yes	25000 T Chap2, refer Para 2.5.3-page No: 21 & Chapter-4 Part-B report
5	Whether relative measure of the probability and consequences of various oil spills including worst case scenario are taken into account	Yes	Chapter2 refer para 2.5.3 Page No. 23 & Chapter-4 Part-B report
6	Whether all types of spills possible in the facility are considered including Grounding, Collision, Fire, Explosion, Rupture of hoses	Yes	Chapter2 refer para 2.1.1 Page No. 17 & Chapter-4 Part-B report
7	Please specify the list of oils considered for risk assessment	Crude, HSD & Fuel Oil	Chapter2 refer para 2.8 Page No. 24 & Chapter-4 Part-B report
8	Whether the vulnerable areas are estimated by considering maximum loss scenario and weather condition	Yes	Chapter2 refer para 2.12 Page No. 31
9	Whether impacts on the vulnerable areas are made after considering the Marine protected areas, population, fishermen, salt pans, mangroves, corals and other resources within that area	Yes	Chapter2 refer para 2.12- & 2.13-Page No. 31,32 & Chapter-3 Part-C report
10	Whether measures for reduction of identified high risks are included by reducing the consequences through spill mitigation measures	Yes	Chapter7 refer fig.7.1 Page No. 66
11	Whether steps have been considered to reduce risks to the exposed population by increasing safe, distances by acquiring property around the facility, if possible	Yes	Chapter 7 refer fig 7.1 Page No. 66
12	Whether risk levels are established for each month after considering the probability with tide and current and consequences of each such spill	NA	
13	Whether prevention and mitigation measures are included in the plan	Yes	Chapter8 refer para 8.1 Page No 84
14	Whether the spill may affect the shoreline.	Yes	Part-B report, chapter 5-OS

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	(length of the shoreline with coordinates)		modelling tables (Jan, July, Oct) page nos. 58-66
15	Whether time taken the oil spill to reach ashore in each quantity of spill in various months are mentioned in the plan	Yes	Part-B report, chapter 5-OS modelling tables (Jan, July, Oct) page nos. 58-66
16	Whether sensitivity mapping has been carried out	Yes	Part-C report, chapter 3, refer para 3.1-page no. 5
17	Does the sensitivity mapping clearly identify the vulnerable areas along with MPAs, corals, fishermen community, salt pans, mangroves and other socio- economic elements in the area	Yes	Part-C report chapter 3, refer para 3.1-page no. 5
18	Do the sensitivity maps indicate area to be protected on priority	Yes	Part-C report Annexure-1 refer fig A.1.8-page no. 37
19	Does the map indicate boom deployment locations	Yes	Part-C report Annexure-1 refer fig A.1.1(a), (b)-page no. 35
20	Whether any Marine. Protected Area will be affected	Yes	Part-C report chapter 3, refer para 3.15-page no. 17
21	Whether total number of fishermen likely to be affected is mentioned in the plan	No	
22	Whether any salt pan in the area is going to be affected	No	
23	Whether any mangroves in the area will be affected by a spill	No	
Preparedness			
24	Whether any containment equipment is available	Yes	Chapter4, refer para 4.2 Page No. 43
25	Whether any recovery equipment is available	Yes	Chapter4 refer para 4.2 Page No. 43
26	Whether the facility is having any temporary storage capacity	Yes	Chapter4 refer para 4.1 Page No. 43
27	Whether location of the oil spill response equipment is mentioned in the plan	Yes	Chapter4 refer para 4.1 Page No. 43
28	Whether suitable vessels available for deploying the boom, skimmer etc	Yes	Chapter4 refer para 4.4 Page No. 44
29	Whether OSD held with facility	Yes	5000 Ltrs – Page No: 50
30	Whether the OSD held with the facility is approved for use in Indian waters	Yes	
31	Whether the facility has MoU with other operators for tier-1 preparedness	Yes	Oil companies, HMEL Operators
32	Whether the list of oil spill response equipment available with each agency in MoU is deliberated	Yes	Chapter 9 refer para 9.1 page no. 89
33	Whether the facility has any MoU with private OSRO	Yes	Chapter 9 refer para 9.4 page no. 91
34	Whether the procedure for evoking the mutual aid is clearly described in the plan	Yes	
35	Whether additional manpower is available	Yes	Chapter 10 refer para 10.2.3 page no. 106

36	Whether list of approved recyclers is mentioned in the plan	Yes	Chapter 10 refer para 10.2.1 Page No 105
37	Whether NEBA (Net Environmental Benefit Analysis) has been undertaken	Yes	Part-D report, chapter 1, refer 1.2-page no. 2
38	Whether the areas from priority protection have identified in the plan	Yes	Part-D report, chapter 2, refer para 2.2-page no. 13
39	Whether relevant authorities and stakeholders were consulted for NEBA and during the areas for priority protection	Yes	Part-D report chapter 3
40	Whether District administration has been appraised of the risk impact of oil spills?	Yes	Part-D report
Action Plan			
41	Whether the plan outlines procedure for reporting of oil spills to Coast Guard	Yes	Chapter 2, refer para 2.6- page no. 22
42	Whether the oil spill response action is clearly mentioned	Yes	Chapter 3, refer para 3.1- page no. 36
43	Whether the action plan includes all duties to be attended in connection with an oil spill	Yes	Chapter 3, refer para 3.1 page no. 36
44	Whether the action plan includes key personnel by their names and designation viz. COO, ICO	Yes	Chapter 5-page no. 54
45	Whether alternate coverage is planned to take care of the absence of a particular person [in cases where action plan is developed basis names]	Yes	
46	Whether the plan includes assignment of all key coordinators viz. the Communication Controller, Safety Coordinator, Emergency management team, Administration and Communication Coordinator and Safety Coordinator	Yes	Chapter 10 page no. 93
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	Yes	Chapter10 Page No. 93
48	Whether approved recyclers are identified for processing recovered oil and oily debris	Yes	Chapter10 Page No. 104
49	Whether the shoreline likely to be affected is identified	Yes	
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2015	NA	
51	Whether the spill incident and its consequences are informed to fishermen and other NGOs for environment protection through media	NO	
Training and Exercises			
52	Whether mock fire I emergency response drills are specified in the plan	Yes	Chapter 5 refer para 5.2, page no. 54
53	Whether the mock drills cover all types of probable oil spills	Yes	Chapter 5 refer para 5.2, page no. 54
54	Whether the plan mentions list of trained manpower	Yes	Chapter 5 refer para 5.3, page no. 55

55	Whether records for periodic mock drills are maintained in a well defined format	Yes	Quarterly
56	Whether the plan to updated according to the findings in mock-drills and exercises	Yes	
57	What is the frequency of updation / review of contingency plan?	Yes	As an when required
58	Periodicity of joint exercise with mutual aid partners	Yes	
59	Frequency of mock-drills for practice	Yes	Twice in a year Chapter 12 Page no.131
60	Whether the records for periodic mock drills are maintained in a well defined format	Yes	Chapter 5
61	Frequency of updation / review of contingency plan	Yes	As an when required
We, hereby, declare that the all information appended above and true and correct to my knowledge or belief			
Date	Chief Conservator / Installation Manager		
VERIFIED			
Date	(District Commander ICG) or his representative		
Date	Regional Commander ICG)or his representative		

APPENDIX-14: TRAINING AND COMPETENCY

The Installation Manager in consultation with the Head, HSE shall determine the oil spill training needs and priorities on a regular basis.

Attendance

All the Site ERT members shall attend oil spill response awareness training. Personnel having specific roles to play in the plan shall be trained in areas specific to their needs. IMO divides the OSR training in three different levels, as given below

Level-1

To provide field personnel and Supervisor, responsible for undertaking on site cleanup operations, an overview of the techniques available for recovering spilled oil and cleaning polluted shorelines.

Level-2

Supervisor | On-scene Commander | Incident Controller: To provide senior personnel with the skills necessary to co-operate and supervise response operations, in a timely, organized and effective manner.


Level-3

Administrators and Senior Managers: to provide senior personnel with an awareness of the role and responsibilities requires in the management of spills of national signification.

Training courses are required to meet both statutory and Adani Ports and SEZ Limited, Mundra requirements for oil spill response preparedness and safe operations.


Records

Records demonstrating that personnel have satisfactorily completed the designated training course shall be maintained.

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APPENDIX-15: COMPILATION LIST OF OIL SPILL RESPONSE EQUIPMENT AS PER NOS-DCP-2018 AND AVAILABLE EQUIPMENT WITH Adani Ports & SEZL

Sr. No.	ITEM	As per NOS-DCP 2018	Available in the present
(1)	(2)	(3)	(4)
Pollution response Equipment	Inflatable Booms with accessories (Material: Neoprene/rubber/neoprene rubber)	2000 with 04 power pack	2000
	Fence Boom (Material: Neoprene/rubber/neoprene rubber/PU/PV)	1000 m	235 m
	Skimmer (20 TPH 50% weir type, 50% Brush type)	6	(2+2)
	OSD Applicator with Spray arms type along with 02 Nozzles system and 02 hand lancers (No)	4	4
	Oil Spill Dispersant (chemical dispersant) (litres)	3000	5000
	Bio remediation (litres)	2000	0
	Flex barge 10 Tons (no)	4	2
	Weir boom 100 m with minimum 02 weirs with power pack and accessories (nos) Or Integrated containment cum recovery system with power pack and accessories	4 Or 2	4
	Sorbent boom size min 5-inch dia, min length 5 feet (no)	500	500
	Sorbent pads min 20-inch X 20 inch (no)	2000	2000
	Shoreline cleanup equipment – Mini vacuum pumps capacity 25 m ³	5	2
	200 m shoreline sealing boom with power pack and accessories (material: neoprene/rubber/neoprene rubber) (nos)	3	3
	VOC Portable Monitor	4 Nos	0
	Level A protection: <ul style="list-style-type: none"> • Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA; • Totally encapsulated chemical and vapor protective suit; 	5	

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	<ul style="list-style-type: none"> • Inner and outer chemical resistant gloves; • Disposable protective suit, gloves and boots; 		
	<p>Level B protection:</p> <ul style="list-style-type: none"> • Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA; • Inner and outer chemical resistant gloves; • Face shield; • Hooded chemical resistant clothing; • Coveralls • Outer chemical resistant boots 	10	
	<p>Level C protection:</p> <ul style="list-style-type: none"> • Full-face air purifying respirators • Inner and outer chemical-resistant gloves • Hard hat • Escape mask • Disposable chemical resistant outer boots 	20	
	<p>Level D protection:</p> <ul style="list-style-type: none"> • Gloves • Coveralls • Safety glasses • Face shield • Chemical-resistant, steel-toe boots or shoes 	30	
Vessels	Work Boats	4	
	Tugs	4	
Manpower	IMO Level 1	20	20
	IMO Level 2	10	18
	IMO Level 3	4	7

Additional equipment and location

LIST OF RESOURCES AVAILABLE-ADANI PORTS and SEZ LIMITED, MUNDRA						
Tugs Available for Oil Spill Containment						
Name of Tug	Type	BHP	OSD	AFFF	Capacity (cum/Hr)	BP
Dolphin No. 4	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 7	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 10	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 11	ASD (DSV)	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 14	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 15	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 16	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Dolphin No. 17	ASD	3000 X 2	3000 ltr	-	-	70
Dolphin No. 18	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
Brahmini	ASD	2000 x 2	3000 ltr	2000 ltr	1200	65
Bitarni	ASD	2000 x 2	3000 ltr	2000 ltr	1200	65
Khushboo	Fixed screw	401 X 2	-	-	-	10

Dolphin No. 4, 7, 11, 14, 15, 16, 17, 18, Brahmini and Bitarni are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required. The tugs are also fitted with a fire curtain and remote-controlled fire monitors.

All above ten Tugs have class notation as Harbour Tugs and are certified to work within the Harbour limits only.


2. Reception Facility: 12" pipe line, connected to a slop tank at chemical tank farm.

Dolphin 11 has firefighting system of 1200 m3/hr along with 20 ton lifting "A" frame and diving support facility.

Location of Oil Spill Equipment: The Oil Spill Equipment stored in SPM Store.

APPENDIX-16: Vendor List


Sr No.	Equipment	Vendor List
1.	Boom complete with all accessories.	Lamor, Elastec / American Marine, ECOservice NEFTEGAZ, Markleen, Vikoma, Desmi, Spilcare, Al Maritim, Expandi, Aqua Guard
2.	Oil recovery free floating skimmer along with suitable pump and hydraulic Power Pack complete with all accessories.	Lamor, Elastec / American Marine, ECOservice NEFTEGAZ, Markleen, Vikoma, Desmi, Spilcare, Al Maritim, Expandi, Aqua Guard
3.	Oil recovery vacuum skimmer with suitable vacuum/suction pump coupled to a diesel engine complete with all accessories.	Lamor, Elastec / American Marine, ECOservice NEFTEGAZ, Markleen, Vikoma, Desmi, Spilcare, Al Maritim, Expandi, Aqua Guard
4.	Oil Spill Dispersant spray system and all required accessories.	Lamor, Elastec / American Marine, ECOservice NEFTEGAZ, Markleen, Vikoma, Desmi, Spilcare, Al Maritim, Expandi, Aqua Guard

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5.	Oil Spill Dispersant, Concentrate Type-3 combined	As per the Guidelines of Indian Coast Guard
6.	Absorbent (oil only) kit, for quick oil spill response	Lamor, ECOservice NEFTEGAZ, Markleen, Spilfyter, Spilcare, Al Maritim, Expandi, Spilltech, Aqua Guard
7.	Dedicated Oil Spill Response Vessel	Local with requisite Inland Vessels certifications and latest survey and insurance
8.	Work Boat	Local with requisite Inland Vessels certifications and latest survey and insurance

APPENDIX-17: List of HNS handled with their properties

Sl No	Chemical	Physical state	Color	Flash Point	Boiling Point	Melting Point	Solubility in water
1	Alkenes	Solid	White	183 °C	342 – 390 °C	35 °	Soluble in hydrocarbon
2	AWL-Crude palm Oil	Liquid	Reddish yellow	Above 200 °C	N/A	33 – 39 °C	Insoluble in water
3	AWL-Crude glycerin	Liquid	Brownish	187 °C	290 °C	180 °C	Soluble in water
4	AWL-Distilled topped palm kernel Fatty Acid	Liquid	White to yellowish	>100 °C	>240 °C @760 mm Hg	25 -28 °C	-
5	AWL-Fatty Acid	Solid	Yellowish white	>200 °C	-	50 – 58 °C	Non soluble in water, Soluble in alcohol, ether, chloroform, acetone
6	AWL-Lauric Acid	Solid	Light yellow	130 °C	undetermined	32 – 38 °C	-
7	AWL-palm Stearin	Solid oil	Yellowish white	Above 200 °C	N/A	44 °C Min	Insoluble
8	AWL-PKFAD	Liquid	Yellowish (crude) clear (distilled)	>100 °C	>260 °C at 760 mm Hg	-	Soluble
9	AWL-PSA	Solid	Yellowish	Not available	Not available	>48 °C	Not available
10	AL-S.CG	Liquid	Pale to dark brown	199 °C	Not available	18 °C	Water solubility is infinite
11	AWL-SPSFA	Solid	Yellowish	Not available	Not available	52 °C	Not available
12	Base Oil 2CST	Liquid	Light Amber	>140 °C	Not available	Not available	Insoluble in water
13	Bitumen	Solid	Black	220 °C	Not available	Not available	Soluble in water <0.1 g/l

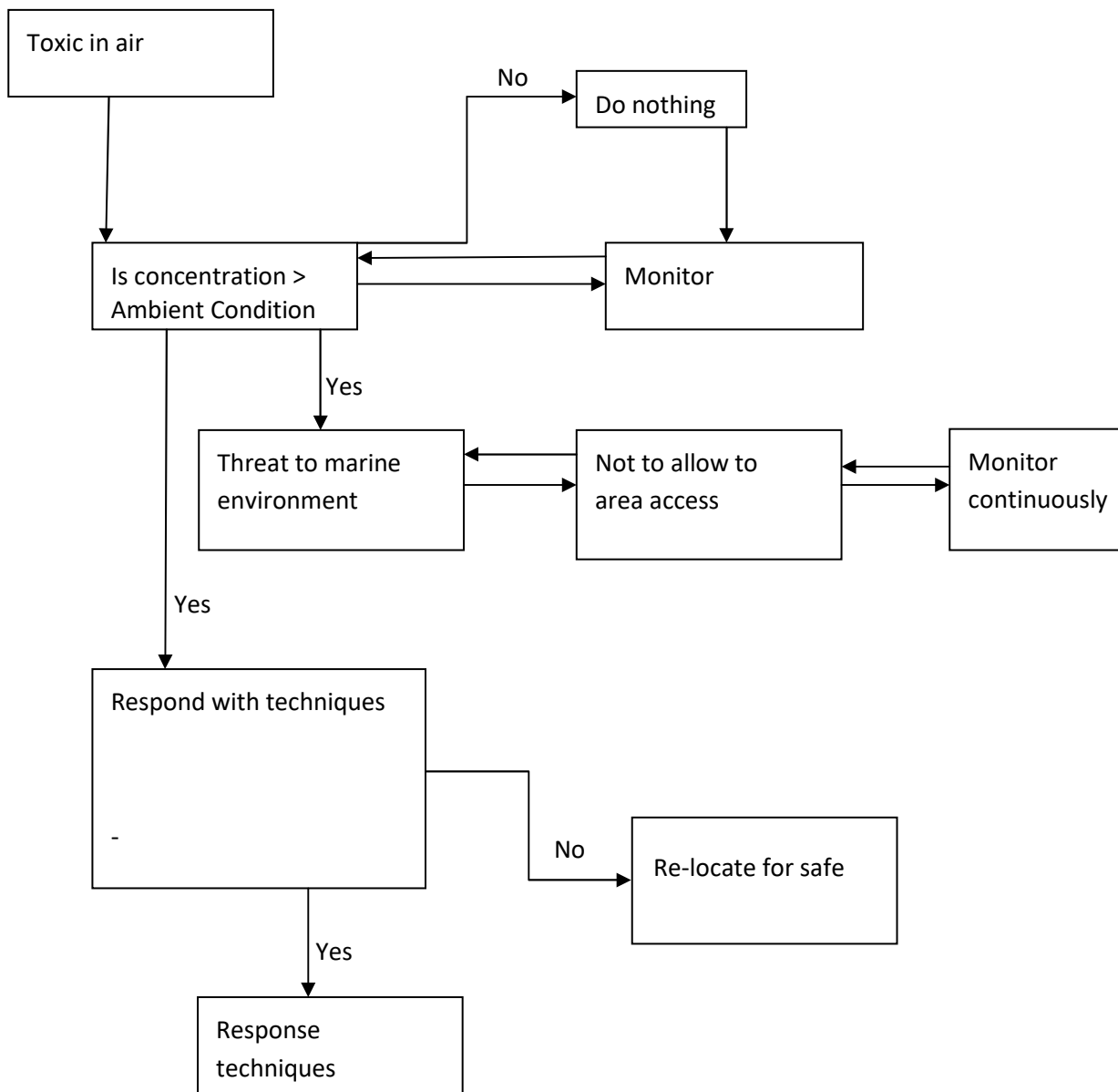
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					e		
14	CBFS_MS S	Viscous Liquid	Light to Dark Brown	77 – 110 °C	200 °C	Not available	Negligible at 20 °C
15	CDSBO – Crude Degummed Soya Bean Oil	Liquid	Pale yellow to brownish yellow	282.22 °C	Not available	-20 °C	Insoluble in cold water
16	CPKO	Solid	White Flake	>287.8 °C	Not available	Not available	Not available
17	Crude Sunflower seed oil	Liquid	-	Not available	Not available	Not available	Insoluble in water
18	Csfo	Liquid	-	>200 °C	Not available	Not available	Insoluble in water
19	DNA	Liquid	Colorless	12 °C	80 °C	Not available	Soluble in water
20	FATACU Fatty Acid	Liquid	Green yellow	170 °C	Not available	Not available	Not available
21	FO-CAPL	Liquid	Dark brown to black	>66 °C	Not available	Not available	Not available
22	GTL Fluid G80 SDS	Liquid	Colorless	>80 °C	202 – 275 °C	Not available	Negligible
23	Heavy Aromatic	Liquid	Clear, yellow	45 – 55 °C	155 – 210 °C	Not available	130 mg/L
24	HSD	Liquid	Straw or dark yellow	Not available	110 – 375 °C	Not available	Insoluble
25	Petrelab	Liquid	Colorless	Not available	275 – 307 °C	< -50 °C	Insoluble
26	Linolenic acid	Liquid	Not available	113 °C	Not available	Not available	Not available
27	Methanol	Liquid	Transparent	12 °C	64.7 °C	-97.8 °C	Miscible with water
28	MSDS PYGAS	Liquid	Colorless	Not Available	45 – 240 °C	-20 °C	Negligible
29	Philips Kerosene	Liquid	Light yellow or light green	38 – 66 °C	149 – 300 °C	-40 °C	0.1 %

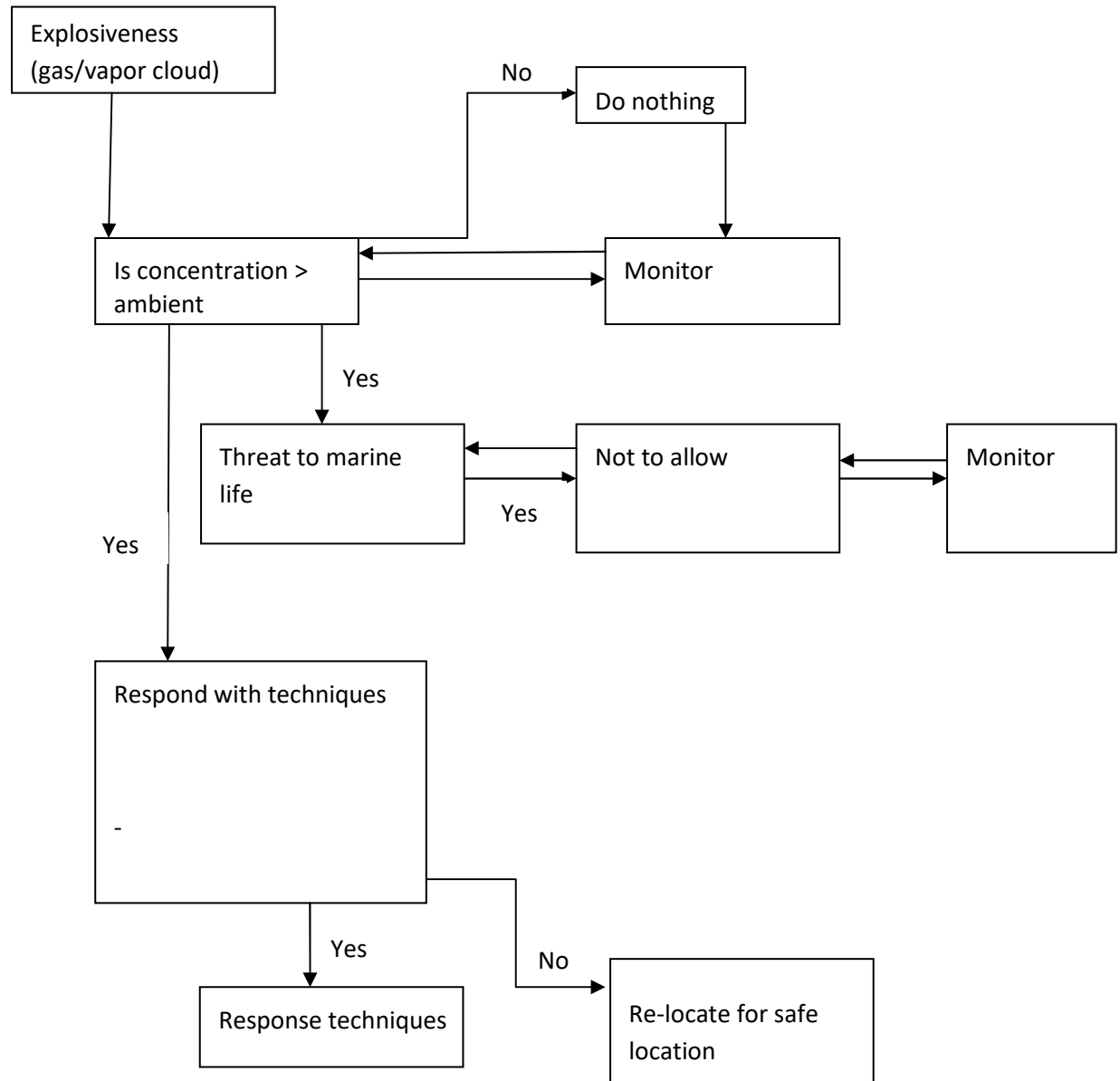
APPENDIX-18: Response techniques for HNS spill

Response to Gas or Volatile liquids

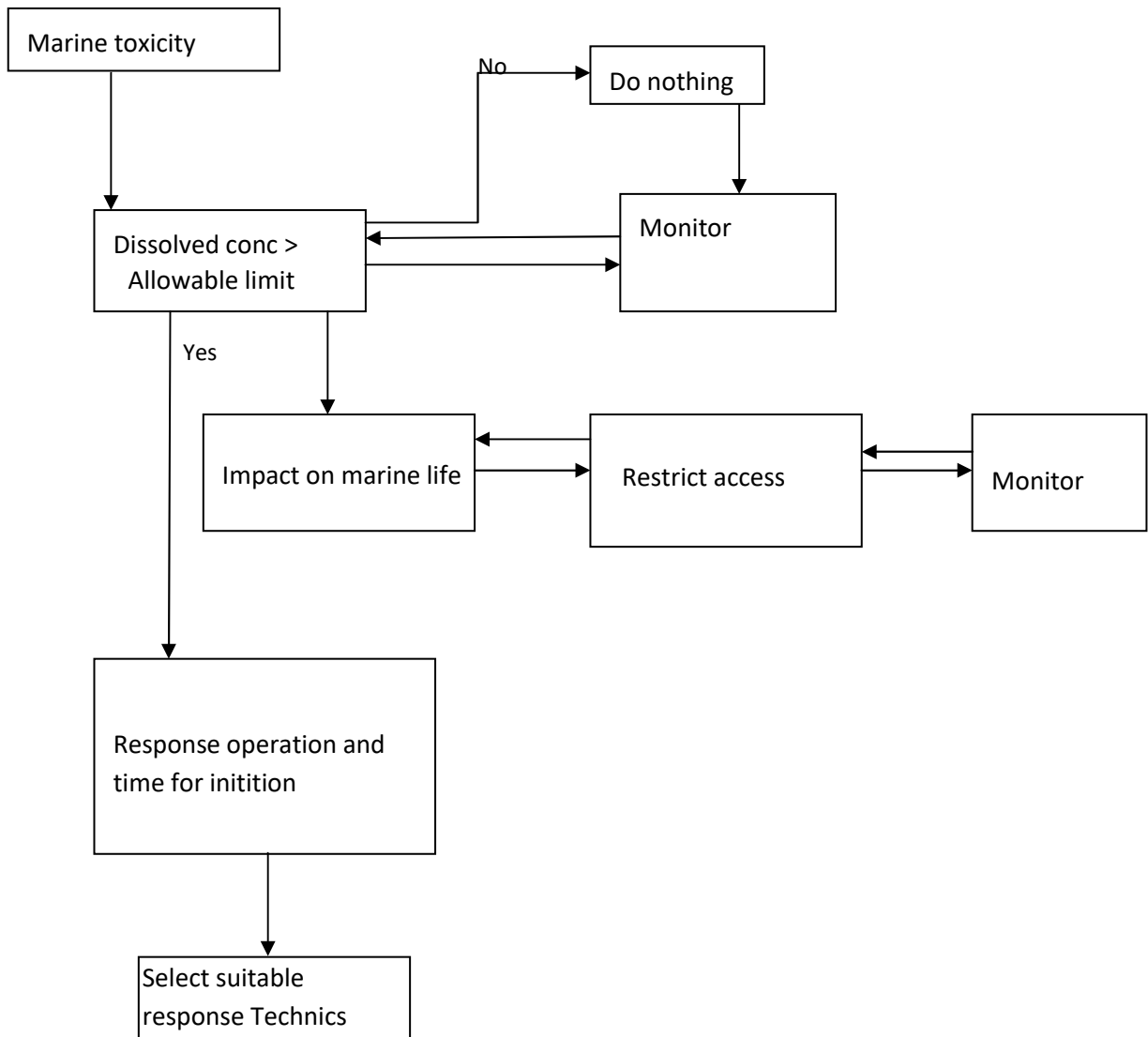
Flow Diagram responding to substances that is toxic in air



Flow Diagram for responding to substances that form explosive gaseous/vapor clouds



Flow Diagram for responding to water soluble toxic substances



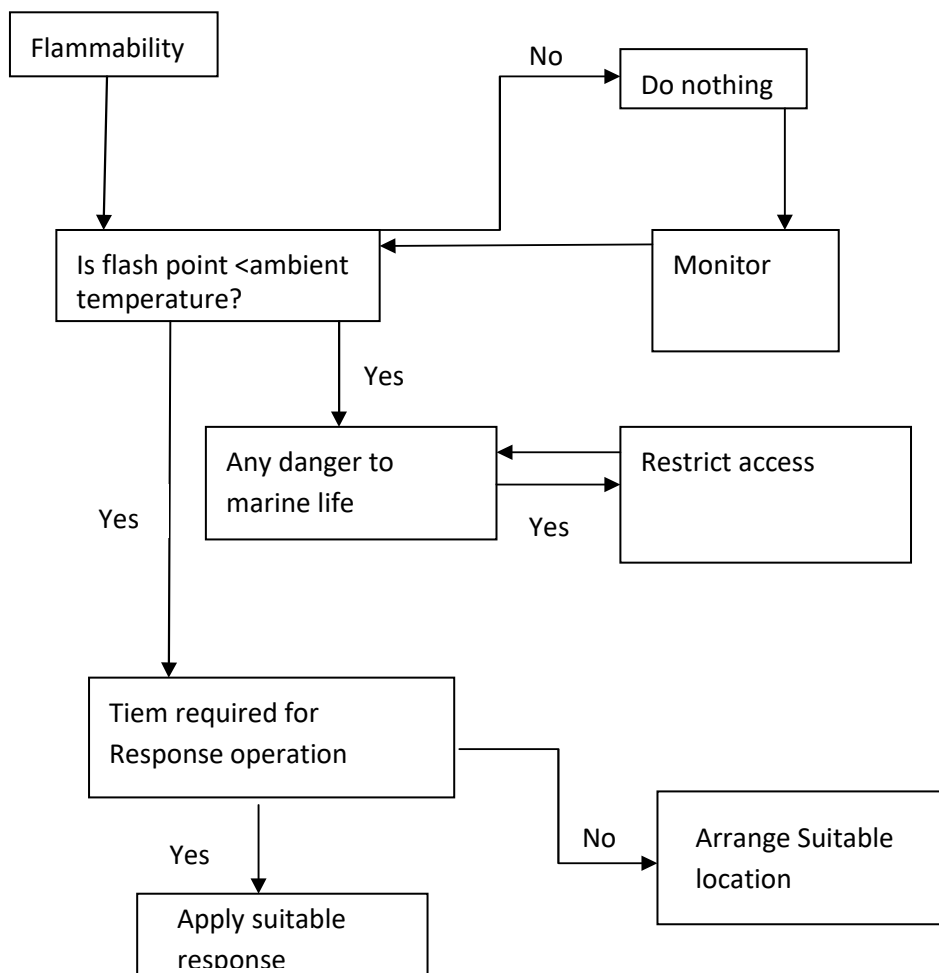
Response techniques for toxic substances

Controlled burning

If the gas is inflammable, controlled ignition and subsequent burning may be considered. Gases vapor clouds can be cleared by water spraying to reduce the fire and explosion of inflammable gases. This response operation is possible only during no wind condition.

Response to Floaters

Flow Diagram for responding to floating flammable substances



Flow Diagram for responding to floating substances which persist on the water surface



Response Techniques for Floaters

Use of fire-fighting foam


Fire-fighting foam can be sprayed onto a Floater to reduce the risk of fire and explosion if it is flammable, or to suppress vapors if it is toxic.

Use of sorbents

Sorbents (as sheets, pillows or booms or as powder or granulated material) could be applied to the slick for subsequent collection and recovery of the HNS from the sorbent. Polypropylene sorbents used for the recovery of spilled oil would be suitable for the recovery of hydrocarbons, but other liquid HNS may not be amenable to this technique.

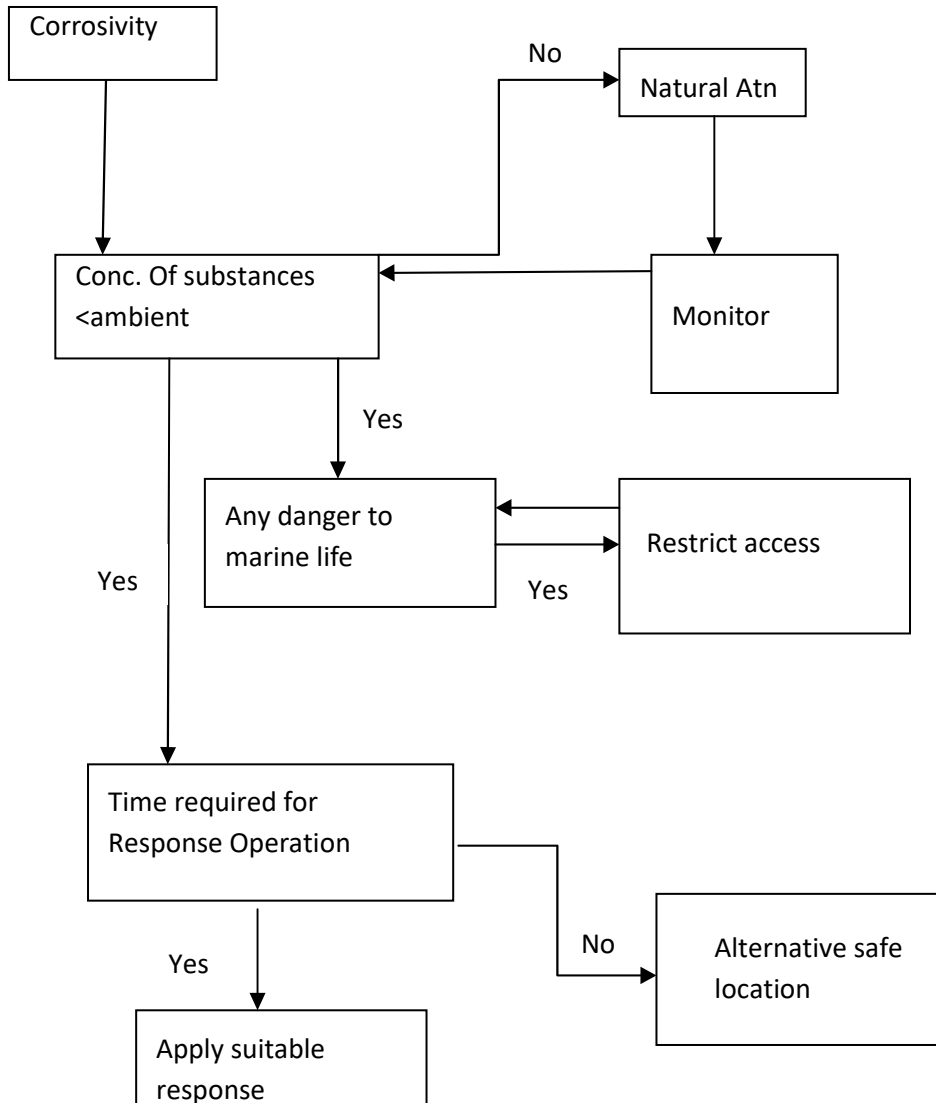
Contain and recover

Booms could be used to contain the slick, unless it has already spread too thinly due to low viscosity. The slick could be recovered by using some types of skimmers. Belt skimmers and sorbent rope skimmers are used for the recovery of some chemicals, e.g. octanol and dioctyl phthalate. Skimmers constructed from stainless steel, aluminum alloy or coated with Teflon (interior) are resistant to aggressive chemicals.

 <i>Adani Ports and Special Economic Zone Ltd, Mundra</i>	<i>Appendix</i>	<i>Rev.No: 04 Dt: 12th July 2022</i> <i>Doc No: ENVR 2022-003-R4</i>
		<i>Page No: 154</i>

Response to Techniques for Dissolvers

Flow Diagram for responding to soluble corrosive substances




Response technique for Dissolvers

HNS spills that dissolve in water can be treated with various response agents in order to reduce or “neutralize” their harmful effects. Examples of chemical treating agents are:

- Neutralizing agents;
- Flocculation agents;
- Oxidizing agents;
- Reduction agents;
- Gelling agents;
- Activated carbon;
- Complexing agents; and
- Ion exchangers.

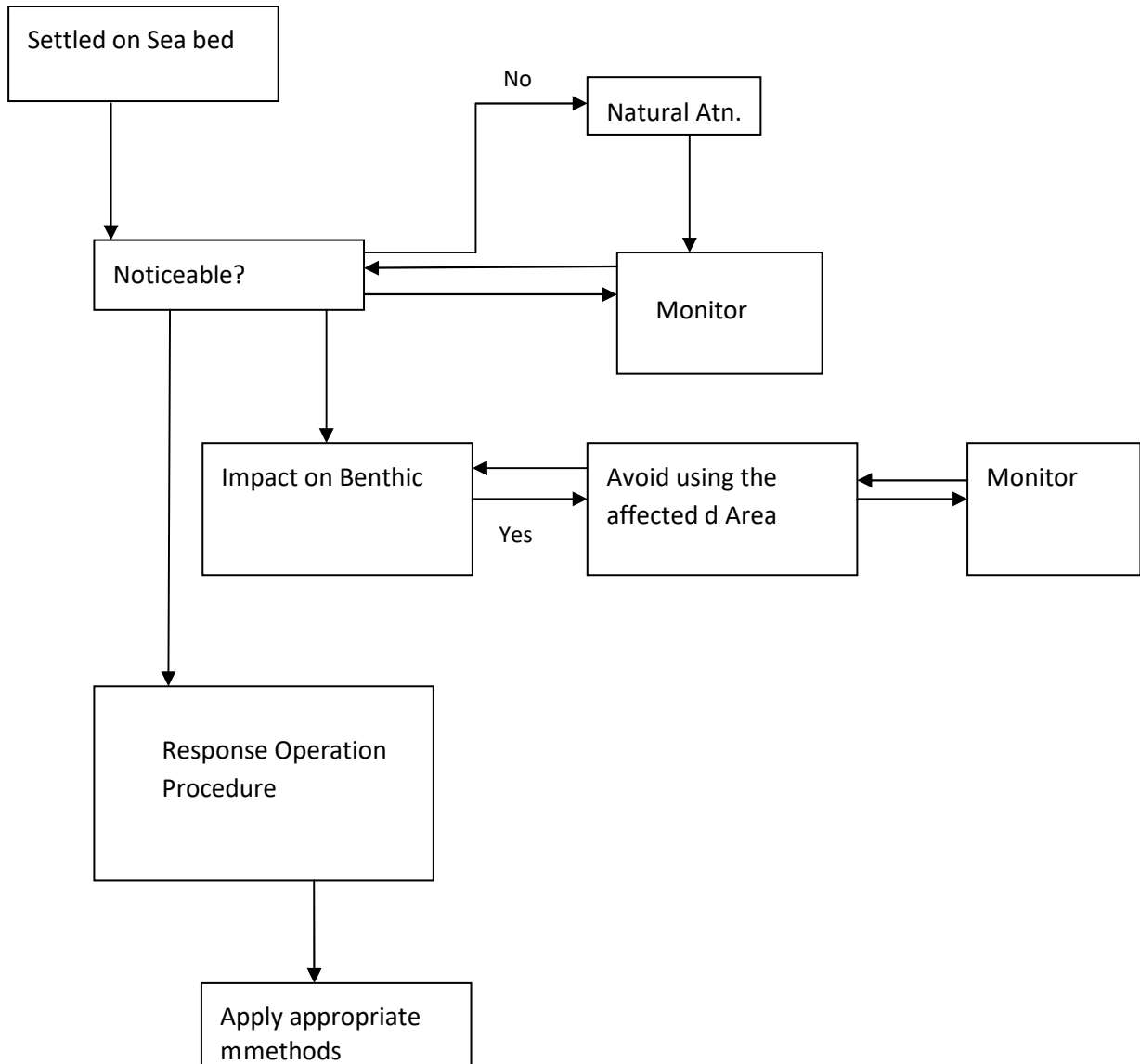
Neutralization

Acid Spills can be neutralized with sodium bicarbonate (NaHCO_3) and monosodium phosphate (NaH_2PO_4) to neutralize spills of alkalis.

 <i>Adani Ports and Special Economic Zone Ltd, Mundra</i>	<i>Appendix</i>	<i>Rev.No: 04 Dt: 12th July 2022</i> <i>Doc No: ENVR 2022-003-R4</i>
		<i>Page No: 156</i>

Response to Sinkers

Flow Diagram for responding to substances which have impact on benthic biota (sinkers)




Recovery of HNS from sea bed








If a Sinker HNS has sunk to the sea bed and is considered to threat to the marine environment and response to be carried out.












The dissolved oils are mixed with sedimentation and forms tar balls, sinks to the sea bed. The material can be pick-up or cleaned using Mechanical, hydraulic and Pneumatic dredgers

APPENDIX-19: Inventory of Oil spill equipment

 Adani Ports and Special Economic Zone Ltd, Mundra	Appendix	Rev.No: 04 Dt:12 th July 2022 Doc No: ENVR 2022-003-R4
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INVENTORY OF OIL SPILL RESPONSE RESOURCES

Sr No.	Equipment	Make Type/Model	Qnt Ops	Ops	Non-ops	Total	Equipment photos	Remark
1	Oil Containment Equipments:							
A	Inflatable Bulkhead boom	Make: Vikoma International Limited Model: BULKHEAD 1500	2000 mtr.	2000 mtr.	0	2000 mtr.	 	
a)	Inflator, Back Pack type	Make : Vikoma International Limited Model: PB 580 Type: Backpack Inflator	4	4	0	4	 	
b)	Inflator, Electric	Make: Vikoma International Limited Serial no.: AP/0080-0174 Model no.: AP/0080-E	2	2	0	2	 	
c)	Power Pack (GP 10)	Make: Vikoma International Limited Type: Hydraulic Model: GP10	6	6	0	6	 	
B	Canadyne Fence boom	Make: Canadyne Technologies INC. Model: Boom Reel 7296 HE	235 Mtr.	235 Mtr.	0	235 Mtr.	 	
2	Oil Recovery equipments:							
a)	Skimmer (Brush/Disc)	Make : Vikoma International Model: Komara 15 Type : Komara Duplex Skimming Capacity: 15 m3/hr	4	4	0	4	 	
B	Intigrated Containment cum Recovery System (Current Buster Boom)	Make: Vikoma International Limited Type: Current Buster Boom Model: FASFLO 75	2	2	0	2	 	

	a)	Power pack (GP 70) for Fasflo Skimmer	Make: Vikoma International Limited Type: Hydraulic Model : GP70	2	2	0	2			
3	Temporary Storage Facility:									
	a)	Flex Floating Barge	Make: Vikoma International Limited Model: FT/0030 Capacity : 12.5 T	3	3	0	3			
	b)	Flex Floating Barge	Make: Vikoma International Limited Capacity : 25 T	1	1	0	1			
4	OSD Spraying System:									
	a)	Fiited on Tugs	All Tugs are fitted with Oil Spill Dispersent boom and proportionate pumps for mixture of OSD with Sea Water as required.	9	9	0	9			
5	Oil Spill Dispersant:									
	a)	Chemical OSD	Make: Nova Chemicals Type: NOVA 4G Type II and III Expiry : May 2026	3400 Ltr.	3400 Ltr.	0	3400 Ltr.			
	b)	Bio Remediation	Make: Sunchem Industries Purchase year: Oct 2022 Expiry: Oct 2027	2000 Ltr.	2000 Ltr.	0	2000 Ltr.			
6	Shoreline Response Equipments:									
	a)	Mini Vaccum Pump	Make: Vikoma International LTD Model:V190 Type: Lobe Pump Max flow: 25 m3/hr	5	5	0	5			

b)	Portable Tank - Temporary Oil Storage	Make: Vikoma International Limited Capacity: 10 T	5	5	0	5	
c)	Pump, Oil Transfer	Make: Vikoma International Serial No.: V190 Capacity: 15 m3/hr	2	2	0	2	
d)	OSD Applicator with Spray arms	Make : Vikoma International Type: Back Pack Capacity: 20 Ltr.	5	5	0	5	
e)	Sorbent Boom	Make : Vikoma International Limited Size: 12.5 CM X 4 M	500	500	0	500	
f)	Sorbent pad	Make: Vikoma International Limited Size: 40 CM x 52 CM	2000	2000	0	2000	
g)	VOC Portable Monitor (MultiGas Detector)	Make: Honeywell Technologies Model: BW Flex 4 Type: Portable Multigas detector	4	4	0	4	



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Annexure – 4

AREA LEVEL POLLUTION RESPONSE TRAINING/EXERCISE- 2025 REPORT
21 Apr 2025

Date: 21 Apr 2025	Exercise: Area Level PR Exercise
Name: Mr. Saket Kumar	Position: Radio Officer
Contact Number: 7874604321	Location: APSEZL, Mundra

Date: 21 Apr 2025 : Final Planning and Tabletop Exercise

0930-1230 hrs: Tabletop Exercise carried out at Adani house, APSEZ Mundra. Participants- ICGS, Mundra, Deendayal Port Kandla, APSEZ Mundra and HMEL.

Date: 21 Apr 2025 : Mock OSR Drill

Location- Near IOCL SPM (22^o 41' N 069^o 39.2' E)/APSEZL, Mundra

Drill Activity Timeline:

1430 hrs.: Tug Ocean Citrine reported to Marine Control that two in nos 6 inches hole observed in Port fuel tank and oil spillage observed into sea. There is no casualties. Maneuvering capability is intact. There are 33 crew on board, head count taken and all present.

1431 hrs.: Marine Control informed Marine HOD/HOS and all concerned departments.

1431 hrs.: Marine Control informed all vessels at anchor regarding oil spill near IOCL SPM area. The control room requested all underway vessels to pass 5 miles from IOCL SPM.

1435 hrs.: Ocean Citrine team was asked to take the sounding of damaged tanks, carry out cold repairs if possible by Divers and transfer fuel to another tank.

1435 hrs : Dol 11 and KB 48 with PR team proceeded to sight.

1440 hrs.: Dol 11 reached on sight and commenced boom deployment.

1440 hrs.: Capt. Hemant Dhruv, Marine HOS informed ICGS Mundra, Deendayal Port Kandla, Reliance Sikka and ICGS Vadinar about the incident through phone.

1445 hrs : Marine control informed all tugs to be stand by with OSD and Firefighting at short notice.

1446 hrs.: Marine Control informed Tug Dol 17 to stand by with OSD for Spraying nearby area.

1447 hrs.: Informed commercial team, environment cell and Liquid Control Room about the drill/incident to be in immediate readiness.

1448 hrs.: Security department were informed to allow entry of authorized persons, emergency vehicles without any delay and OHS/Adani hospital to be on alert.

1448 hrs : Marine control informed both boats to be stand by.

1450 hrs : Marine Control informed jetty team to deploy one hydra for loading/unloading of OSR equipment at SPM Store and jetty.

1450 hrs : Ocean Citrine informed that spill is spread in an area of around 150-200 m².

1455 hrs.: Ocean Citrine commenced internal fuel transferring from damaged tank. DoI 11 both OSD Boom ready and obtain permission from Authority for OSD spraying.

1500 hrs : OSD spraying permission granted.

1500 hrs.: Ocean Citrine informed damaged hole is blanked by divers. The Approx 600-700 ltrs fuel spilled into sea.

1510 hrs : DoI 11 reported Boom paid out now commenced forming U-formation to contain spilled oil.

1515 hrs : U-formation completed, OSD spraying commenced.

1530 hrs : Oil recovery commenced by skimmer.

1540 hrs : Contained oil approx. 600 ltrs recovered and stored in tank.

1545 hrs : Boom recovery commenced.

1618 hrs : Boom recovered and drill called off.

1630 hrs.: Area assessed by diving team and confirmed all clear.

1635 hrs.: Informed environment team for water sampling of spillage area.

1700 hrs.: Environment team informed that area is clear of oil and no environment impact observed.

1715 hrs.: De-briefing carried out onboard DoI-11 and shared learnings.

1800 hrs.: Recovered oil handed over for disposal at Oil Water Separator unit.

1900 hrs.: Environment team informed that GPCB approved recycler has collected the disposed oil.

Personnel & Boats Participated in Drill

Off Shore team:

1. Capt. Prasoon Roy-APSEZL
2. Capt. Sandeep Bisht – Deendayal Port Kandla
3. Dy Comdt GS Rathore – ICGS Mundra
4. Mr Yogesh Nandaniya-APSEZL
5. Mr, Saket Kumar-APSEZL
6. Mr. Ramdas Pavale-APSEZL
7. Mr. Ashok Tiwari - HMEL
8. Mr. Khagendra Kumar - HMEL
9. Mr. Santosh Rasam-APSEZL
10. Mr. Ayush Jha, APSEZL
11. Mr. Harsh Parmar -APSEZL
12. Mr. Jayesh Parmar-APSEZL
13. Mr. Shashikant Padave-APSEZL
14. Mr. Abhishek Pathak-APSEZL
15. Mr. Viral Bamaniya-APSEZL
16. M/s Sea Care – 5 Persons
17. ICGS Mundra – 5 Persons
18. Virag CSE - 6 Persons
19. Tug Dol 11, Dol 17, KB 47 & KB 48

Onshore team:

1. Capt. Hemant Dhruv
2. Mr. Vikram P Singh
3. Mr. Sunny Jai
4. Mr. Shubham Agre
5. Mr. Anish Kumar

Drill Performance Monitoring:

Sl. No	Activity	Time Taken
1.	Time taken to shift OSR equipment from SPM Store to load on DSV tugs	NA / 200-meter Fence boom and 1- skimmer is kept 24 x 7 on Tug Dol-11.
2.	Time taken for Tug cast off from time information given.	NA
3.	Time taken from tug cast off to Reach at Location.	05 min.
4.	Time taken for deploying 250-meter boom and skimmer after reaching at site.	30 min.
5	Time taken for U formation and deployment of skimmer.	10 min.

Observations:

SR. NO	POINTS	ACTION TAKEN	TARGET DATE	RESPONSIBILITY	REMARKS
1	Capt. Prasoon suggested that during boom laying and recovery operations, PR team on tug Dolphin 11 to be divided into two teams standing by on either side of boom so that no person is required to cross the boom during operations.	Point discussed during de-brief	10.06.2025	PR Team /Dol-11	

Initial Planning Conference, Tabletop Exercise and Mock Drill

Initial Planning Conference at ICGS Mundra



Tabletop Discussion and planning with the participants



Tabletop & Final Planning Conference at Adani house



PR Drill snap – 21 Apr 2025

Area Level Pollution Response Exercise at IOCL SPM

Boom Laying from Tug Dol-11



U-Formtion

J-Formation & Skimmer Operations



OSD Boom operations



De-briefing onboard Dol-11



Annexure – 5



“Half Yearly Environmental Monitoring Reports “



M/S.ADANI PORTS & SPECIAL ECONOMIC ZONE LTD.

PLOT NO. 169/P, AT - NAVINAL ISLAND, TAL. - MUNDRA, DIST. - KUTCH - 370421.

Monitoring Period: April - 2025 to September - 2025

Submitted By



UniStar Environment & Research Labs Pvt. Ltd.

Plot No. 51 Vibrant Business Park Vapi, Dist. Valsad 396191 | Gujarat | India



MARINE WATER MONITORING SUMMARY REPORT

RESULTS OF MARINE WATER [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.09	7.88	8.18	8.02	8.14	7.92	8.11	7.94	8.14	8.02	8.06	7.98	IS 3025(Part 11):2022
2.	Temperature	°C	29.8	29.7	29.9	29.8	29.8	29.7	29.7	29.6	29.6	29.5	29.5	29.4	IS 3025 (Part 9):2023
3.	Total Suspended Solids	mg/L	116	88	122	94	118	86	134	110	142	116	148	122	APHA 24th Ed., 2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	3	BDL(MDL :1.0)	2.4	BDL(MDL :1.0)	2.8	BDL(MDL :1.0)	2.9	BDL(MDL :1.0)	2.6	BDL(MDL :1.0)	2.7	BDL(MDL :1.0)	IS 3025 (Part 44):2023
5.	Dissolved Oxygen	mg/L	6.83	6.73	6.65	6.55	6.83	6.73	6.65	6.55	6.71	6.6	6.57	6.47	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	36.54	37.15	36.68	37.28	36.52	37.15	36.4	36.98	36.32	36.84	36.12	36.71	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	IS 3025 (Part 39):2021
8.	Nitrate as NO ₃	µmol/L	2.1	1.77	2.74	2.58	3.06	2.74	3.55	3.23	3.06	2.9	2.74	2.58	APHA 24th Ed. 2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	0.283	0.261	0.304	0.283	0.37	0.326	0.283	0.261	0.304	0.283	0.261	0.239	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	4.11	4.06	4.32	4.27	4.85	4.79	3.59	3.48	3.42	3.39	3.59	3.48	APHA 24th Ed. 2023,4500- NH3 B
11.	Phosphates as PO ₄	µmol/L	1.26	1.16	1.37	1.26	1.26	BDL(MDL :0.4)	1.58	1.37	1.47	1.37	BDL(MDL :0.4)	1.16	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	6.493	6.091	7.364	7.133	8.28	7.856	7.423	6.971	6.784	6.573	6.591	6.299	APHA 24th Ed. 2023,4500 NH3 - B
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	35324	36140	35604	36320	35426	36124	35140	36350	35174	36290	35210	36118	IS 3025(Part 16):2023
15.	COD	mg/L	32.7	20.4	27.9	16	29.1	16.6	24.4	12.2	28.1	16.1	32.2	20.1	IS 3025(Part 58):2023

Continue...

RESULTS OF MARINE WATER [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
A			Phytoplankton												
1.	Chlorophyll	mg/m ³	3.06	3.26	3.07	3.27	3.06	3.26	3.07	3.25	3.06	3.26	3.07	3.25	APHA (24th Ed. 2023)10200A-G
2.	Phaeophytin	mg/m ³	7	1.54	6	1.55	7	1.54	8	1.55	7	1.54	6	1.56	APHA (24th Ed. 2023)10200A-G
3.	Cell Count	No. x 10 ³ /L	113	92	112	91	113	92	112	91	113	93	112	92	APHA (24th Ed. 2023)10200A-G
4	Name of Group Number and name of group species of each group	--	<i>Coscinodiscus</i>	<i>Odontella</i>	<i>Nitzschia</i>	<i>Biddulphia</i>	<i>Nitzschia</i>	<i>Biddulphia</i>	<i>Thalassiothrix</i>	<i>Dinophysis</i>	<i>Thalassiothrix</i>	<i>Dinophysis</i>	<i>Thalassiothrix</i>	<i>Dinophysis</i>	APHA (24th Ed. 2023)10200A-G
			<i>Diploneis</i>	<i>Rhizosolenia</i>	<i>Diploneis</i>	<i>Rhizosolenia</i>	<i>Pinnularia</i>	<i>Rhizosolenia</i>	<i>Surirella</i>	<i>Pinnularia</i>	<i>Surirella</i>	<i>Pinnularia</i>	<i>Biddulphia</i>	<i>Pinnularia</i>	
			<i>Rhizosolenia</i>	<i>Coscinodiscus</i>	<i>Rhizosolenia</i>	<i>Coscinodiscus</i>	<i>Rhizosolenia</i>	<i>Coscinodiscus</i>	<i>Navicula</i>	<i>Thalassiothrix</i>	<i>Navicula</i>	<i>Thalassiothrix</i>	<i>Navicula</i>	<i>Thalassiothrix</i>	
			<i>Dinophysis</i>	<i>Grammatophora</i>	<i>Dinophysis</i>	<i>Grammatophora</i>	<i>Dinophysis</i>	<i>Grammatophora</i>	<i>Thalassiosira</i>	<i>Grammatophora</i>	<i>Nitzschia</i>	<i>Grammatophora</i>	<i>Nitzschia</i>	<i>Grammatophora</i>	
			<i>Thalassionema</i>	<i>Thalassiosira</i>	<i>Biddulphia</i>	<i>Navicula</i>	<i>Biddulphia</i>	<i>Navicula</i>	<i>Skeletonema</i>	<i>Ceratium</i>	<i>Skeletonema</i>	<i>Ceratium</i>	<i>Skeletonema</i>	<i>Ceratium</i>	
B			Zooplankton												
1	Abundance(Population)	noX10 ³ /100 m ³	66		67		66		67		66		66		APHA (24rd Ed. 2023)10200 G
2	Name of Group Number and name of group species of each group		<i>Crustacean Larvae</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		
			<i>Egg(Fish and Shrimps)</i>		<i>Pinnularia</i>		<i>Pinnularia</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		
			<i>Copepods</i>		<i>Copepods</i>		<i>Copepods</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		
			<i>Crustacean</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Crustacean</i>		
			<i>Bivalve Larvae</i>		<i>Thalassionema</i>		<i>Thalassionema</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		
3	Total Biomass	ml/100 m ³	13.66		13.67		13.66		13.67		13.66		13.66		

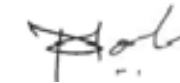
Continue...

RESULTS OF MARINE WATER [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
			E	M	E	M	E	M	E	M	E	M	E	M	
C			Microbiological												
1	Total Bacterial Count	CFU/ml	112		113		112		114		112		112		APHA 24 th Ed.2023,9215-C
2	Total Coliform	/100ml	12		13		12		13		14		14		APHA 24 th Ed.2023,9222-B
3	Ecoli	/100ml	87		88		87		88		89		89		IS :15185:2016
4	Enterococcus	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15186:2002
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:2016
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023,9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976



Mr. Nilesh Patel
Sr. Chemist

Mr. Nitin Tandel
Technical Manager

RESULTS OF SEDIMENT ANALYSIS [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1.	Organic Matter	%	0.46	0.51	0.48	0.44	0.48	0.52	IS: 2720 (Part 22):1972
2.	Phosphorus as P	µg/g	554.3	564.8	546	522	534	542	IS: 10158 :1982, Method B
3.	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Lab SOP No. UERL/CHM/LTM/108
4.	Petroleum Hydrocarbon	µg/g	N.D.	ND	ND	ND	ND	ND	APHA 24th Ed.2023,5520 F
5.0	Heavy Metals								
5.1	Aluminum as Al	%	4.03	4.08	3.58	3.62	3.59	3.44	IS3025(Part 55):2003
5.2	Total Chromium as Cr+3	µg/g	154.6	162.5	148.6	132.5	124.6	111.5	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.3	Manganese as Mn	µg/g	674.2	710.5	684.2	642.8	623.5	615.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.4	Iron as Fe	%	3.94	3.99	3.85	3.75	3.77	3.74	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.5	Nickel as Ni	µg/g	44.8	46.2	44.2	49.5	48.2	44.6	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.6	Copper as Cu	µg/g	58.2	62.8	58.6	51.2	46.4	42.8	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.7	Zinc as Zn	µg/g	115.6	121.5	125.6	112.4	115.2	120.4	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.8	Lead as Pb	µg/g	2.02	2.11	2.18	1.95	1.82	1.68	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.9	Mercury as Hg	µg/g	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	EPA 7471B (Extraction &Analytical Method) :2007

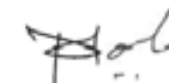
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RESULTS OF SEDIMENT ANALYSIS [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
Benthic Organisms									
1	Macrobenthos	--	<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	APHA (24th Ed. 2023)10500
			<i>Polychates</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Decapods Larvae</i>	<i>Decapods Larvae</i>	<i>Decapods Larvae</i>	
			<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Amphipods</i>	<i>Gastropods</i>	<i>Gastropods</i>	
			<i>Amphipods</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Polychates</i>	
2	MeioBenthos	--	<i>Herpectacoids</i>	<i>Gastropods</i>	<i>Herpectacoids</i>	<i>Turbellarians</i>	<i>Turbellarians</i>	<i>Turbellarians</i>	
			<i>Decapods Larvae</i>	<i>Decapods Larvae</i>	<i>Decapods Larvae</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	
3	Population	no/m ²	366	367	366	367	366	366	



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RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.12	7.96	8.19	8.4	8.24	8.04	8.18	7.95	8.22	7.98	8.12	7.94	IS 3025(Part 11):2022
2.	Temperature	°C	29.9	29.8	30	29.9	29.9	29.8	29.7	26.6	29.6	28.5	29.5	29.4	IS 3025(Part 9):2023
3.	Total Suspended Solids	mg/L	136	112	142	118	132	110	146	118	152	124	156	132	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	3.1	BDL(MDL :1.0)	2.8	BDL(MDL :1.0)	2.9	BDL(MDL :1.0)	3.1	BDL(MDL :1.0)	2.5	BDL(MDL :1.0)	2.6	BDL(MDL :1.0)	IS 3025(Part 44):2023
5.	Dissolved Oxygen	mg/L	6.73	6.53	6.55	6.35	6.73	6.53	6.55	6.35	6.6	6.4	6.47	6.27	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	36.08	37.12	36.18	37.19	36.22	37.02	36.05	36.87	35.98	36.74	35.86	36.62	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	IS 3025(Part 39):2021
8.	Nitrate as NO ₃	µmol/L	2.58	2.42	2.42	2.26	2.74	2.58	3.06	2.74	3.39	3.23	3.06	2.9	APHA 24th Ed.2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	0.37	0.348	0.261	0.239	0.304	0.283	0.326	0.304	0.283	0.261	0.304	0.283	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	4.01	3.95	4.22	4.16	4.74	4.69	3.64	3.59	3.53	3.48	3.48	3.42	APHA 24th Ed.2023,4500-NH ₃ B
11.	Phosphates as PO ₄	µmol/L	1.05	BDL(MDL :0.4)	1.16	BDL(MDL :0.4)	1.26	1.05	1.16	BDL(MDL :0.4)	BDL(MDL :0.4)	BDL(MDL :0.4)	1.16	1.05	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	6.96	6.718	6.901	6.659	7.784	7.553	7.026	6.634	7.203	6.971	6.844	6.603	APHA 24th Ed.2023,4500 NH ₃ - B
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	36120	36880	36244	37010	35966	36848	35744	36820	35712	36540	35644	36380	IS 3025(Part 16):2023
15.	COD	mg/L	36.8	24.5	31.9	20	33.3	20.8	28.5	16.3	32.1	20.1	36.3	24.2	IS 3025(Part 58):2023

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RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
A															
Phytoplankton															
1.	Chlorophyll	mg/m ³	2.95	2.65	2.96	2.66	2.97	2.67	2.96	2.66	2.97	2.67	2.98	2.66	APHA (24th Ed. 2023)10200A-G
2.	Phaeophytin	mg/m ³	2.05	2.02	2.04	2.01	2.03	2.02	2.02	2.01	2.01	2.02	2.02	2.04	APHA (24th Ed. 2023)10200A-G
3.	Cell Count	No. x 10 ³ /L	91	143	92	142	91	141	92	142	93	143	92	142	APHA (24th Ed. 2023)10200A-G
4	Name of Group Number and name of group species of each group	--	<i>Thalassiothrix</i>	<i>Pinnularia</i>	<i>Thalassiothrix</i>	<i>Pinnularia</i>	<i>Dinophysis</i>	<i>Pinnularia</i>	<i>Navicula</i>	<i>Thalassiothrix</i>	<i>Surirella</i>	<i>Thalassiothrix</i>	<i>Surirella</i>	<i>Thalassiothrix</i>	APHA (24th Ed. 2023)10200A-G
			<i>Surirella</i>	<i>Biddulphia</i>	<i>Surirella</i>	<i>Biddulphia</i>	<i>Surirella</i>	<i>Biddulphia</i>	<i>Skeletonema</i>	<i>Surirella</i>	<i>Pinnularia</i>	<i>Surirella</i>	<i>Pinnularia</i>	<i>Surirella</i>	
			<i>Navicula</i>	<i>Navicula</i>	<i>Navicula</i>	<i>Navicula</i>	<i>Nitzschia</i>	<i>Navicula</i>	<i>Rhizosolenia</i>	<i>Navicula</i>	<i>Rhizosolenia</i>	<i>Navicula</i>	<i>Melosira</i>	<i>Navicula</i>	
			<i>Thalassiosira</i>	<i>Rhizosolenia</i>	<i>Cyclotella</i>	<i>Rhizosolenia</i>	<i>Cyclotella</i>	<i>Rhizosolenia</i>	<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Dinophysis</i>	<i>Thalassiosira</i>	
			<i>Skeletonema</i>	<i>Skeletonema</i>	<i>Skeletonema</i>	<i>Thalassiosira</i>	<i>Skeletonema</i>	<i>Thalassiosira</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	
B															
Zooplankton															
1	Abundance (Population)	noX10 ³ / 100 m ³	42		43		42		41		43		43		APHA (24rd Ed. 2023)10200 G
2	Name of Group Number and name of group species of each group		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		
			<i>Copepods</i>		<i>Oikoplura</i>		<i>Nitzschia</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		
			<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		<i>Copepods</i>		<i>Copepods</i>		<i>Copepods</i>		
			<i>Crustacean</i>		<i>Crustacean</i>		<i>Pinnularia</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Copepods nauplii</i>		
3	Total Biomass	ml/100 m ³	15.1		15.2		15.1		15.2		15.1		15.1		

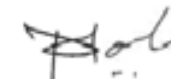
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RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO	TEST PARAMETER	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
Microbiological															
1	Total Bacterial Count	CFU/ml	134		135		134		132		134		134		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	34		36		37		36		35		35		APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	12		13		12		11		11		11		IS :15185:2016
4	Enterococcus	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15186:2002
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:2016
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976



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RESULTS OF SEDIMENT ANALYSIS [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1.	Organic Matter	%	0.52	0.56	0.52	0.49	0.52	0.51	IS: 2720 (Part 22):1972
2.	Phosphorus as P	µg/g	604.2	614.1	596.6	612.5	586	592	IS: 10158 :1982, Method B
3.	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Lab SOP No. UERL/CHM/LTM/108
4.	Petroleum Hydrocarbon	µg/g	ND	ND	ND	ND	ND	ND	APHA 24th Ed.2023,5520 F
5.0	Heavy Metals								
5.1	Aluminum as Al	%	3.98	4.05	3.82	3.74	3.66	3.56	IS3025(Part 55):2003
5.2	Total Chromium as Cr+3	µg/g	152.3	164.8	146.2	138.4	142.5	132.4	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.3	Manganese as Mn	µg/g	704	723	688	702	685	644.5	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.4	Iron as Fe	%	4.12	4.11	3.95	3.88	3.76	3.68	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.5	Nickel as Ni	µg/g	38.9	40.5	42.2	38.6	40.2	42.8	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.6	Copper as Cu	µg/g	49.5	51.6	52.4	46.2	44.6	41.3	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.7	Zinc as Zn	µg/g	112.4	115.5	120.2	114.6	111	130.4	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.8	Lead as Pb	µg/g	2.08	2.16	1.95	2.02	1.96	1.74	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.9	Mercury as Hg	µg/g	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	EPA 7471B (Extraction &Analytical Method) :2007

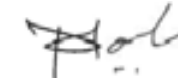
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RESULTS OF SEDIMENT ANALYSIS [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
D			Benthic Organisms						
1	Macrobenthos	--	<i>Decapods Larvae</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	APHA (24th Ed. 2023)10500
			<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Gastropods</i>	<i>Gastropods</i>	<i>Gastropods</i>	
			<i>Amphipods</i>	<i>Amphipods</i>	<i>Gastropods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	
			<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Amphipods</i>	<i>Amphipods</i>	
2	MeioBenthos	--	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Decapods Larvae</i>	<i>Herpectacoids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	
			<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Polychates</i>	
3	Population	no/m ²	301	302	301	302	301	301	



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RESULTS OF MARINE WATER [M3 EAST OF BOCHAISLANOT DETECTED - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.17	8.04	8.28	8.11	8.22	8.09	8.17	8.02	8.25	8.08	8.16	8.02	IS 3025(Part 11):2022
2.	Temperature	°C	29.8	29.7	29.8	29.6	29.7	29.6	29.6	29.5	29.5	29.4	29.4	29.3	IS 3025(Part 9):2023
3.	Total Suspended Solids	mg/L	124	108	134	118	142	124	156	122	144	108	146	118	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	3.2	BDL(MDL: 1.0)	3.4	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	3.3	BDL(MDL: 1.0)	2.8	BDL(MDL: 1.0)	2.7	BDL(MDL: 1.0)	IS 3025(Part 44):2023
5.	Dissolved Oxygen	mg/L	6.73	6.63	6.55	6.45	6.73	6.63	6.55	6.45	6.6	6.5	6.47	6.37	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	35.98	37.24	36.21	37.35	36.18	37.16	36.12	36.98	35.88	36.74	35.72	36.68	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	IS 3025(Part 39):2021
8.	Nitrate as NO ₃	µmol/L	2.9	2.74	2.58	2.26	2.9	2.74	3.39	3.06	3.55	3.39	3.23	3.06	APHA 24th Ed.2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	0.413	0.391	0.348	0.326	0.304	0.283	0.348	0.304	0.261	0.239	0.261	0.239	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	4.11	4.06	4.11	4.01	4.64	4.58	3.74	3.69	3.59	3.48	3.39	3.32	APHA 24th Ed.2023,4500-NH3 B
11.	Phosphates as PO ₄	µmol/L	1.16	1.05	1.05	BDL(MDL: 0.4)	1.16	1.05	1.47	1.37	1.58	1.47	1.37	1.26	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	7.423	7.191	7.038	6.596	7.844	7.603	7.478	7.054	7.401	7.109	6.881	6.619	APHA 24th Ed.2023,4500 NH3
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	35520	36260	35760	36554	35500	36110	35380	36288	35464	36350	35320	36110	IS 3025(Part 16):2023
15.	COD	mg/L	28.6	16.3	24	12	25	12.5	20.4	8.1	24.1	12	28.2	16.1	IS 3025(Part 58):2023

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RESULTS OF MARINE WATER [M3 EAST OF BOCHASLANOT DETECTED - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD		
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM			
A			Phytoplankton														
1.	Chlorophyll	mg/m ³	2.41	2.46	2.42	2.47	2.41	2.46	2.42	2.47	2.41	2.46	2.45	2.44	APHA (24th Ed. 2023)10200A-G		
2.	Phaeophytin	mg/m ³	1.65	1.41	1.66	1.42	1.67	1.43	1.66	1.42	1.65	1.41	1.55	1.42	APHA (24th Ed. 2023)10200A-G		
3.	Cell Count	No. x 10 ³ /L	154	96	155	97	154	96	153	97	152	96	150	94	APHA (24th Ed. 2023)10200A-G		
4	Name of Group Number and name of group species of each group	--	<i>Pinnularia</i>	<i>Coscino discus</i>	<i>Pinnularia</i>	<i>Coscino discus</i>	<i>Pinnularia</i>	<i>Coscino discus</i>	<i>Melosira</i>	<i>Cyclotella</i>	<i>Melosira</i>	<i>Cyclotella</i>	<i>Melosira</i>	<i>Cyclotella</i>	APHA (24th Ed. 2023)10200A-G		
			<i>Biddulphia</i>	<i>Pinnularia</i>	<i>Biddulphia</i>	<i>Pinnularia</i>	<i>Biddulphia</i>	<i>Pinnularia</i>	<i>Pinnularia</i>	<i>Pinnularia</i>	<i>Pinnularia</i>	<i>Pinnularia</i>	<i>Pinnularia</i>	<i>Pinnularia</i>			
			<i>Navicula</i>	<i>Rhizosolenia</i>	<i>Navicula</i>	<i>Rhizosolenia</i>	<i>Navicula</i>	<i>Rhizosolenia</i>	<i>Skeletonema</i>	<i>Skeletonema</i>	<i>Rhizosolenia</i>	<i>Skeletonema</i>	<i>Rhizosolenia</i>	<i>Skeletonema</i>		<i>Rhizosolenia</i>	<i>Skeletonema</i>
			<i>Thalassiosira</i>	<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Thalassiosira</i>	<i>Thalassiosira</i>	<i>Thalassiosira</i>	<i>Thalassiosira</i>	<i>Thalassiosira</i>		<i>Thalassiosira</i>	<i>Thalassiosira</i>
			<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Thalassionema</i>	<i>Thalassionema</i>	<i>Thalassionema</i>	<i>Thalassionema</i>	<i>Thalassionema</i>	<i>Thalassionema</i>		<i>Thalassionema</i>	<i>Thalassionema</i>
B			Zooplankton														
1	Abundance (Population)	noX10 ³ / 100 m ³	41	42	41	43	41	41	41	41	41	41	41	41	APHA (24rd Ed. 2023)10200 G		
2	Name of Group Number and name of group species of each group		<i>Copepods</i>	<i>Copepods</i>	<i>Rhizosolenia</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>			
			<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Crustacean Larvae</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>			
			<i>Egg(Fish and Shrimps)</i>	<i>Egg(Fish and Shrimps)</i>	<i>Egg(Fish and Shrimps)</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>			
			<i>Crustacean</i>	<i>Pinnularia</i>	<i>Oikoplura</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>		<i>Egg(Fish and Shrimps)</i>	
			<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Thalassionema</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>				
3	Total Biomass	ml/100 m ³	15.3	15.2	15.3	15.2	15.3	15.2	15.3	15.2	15.3	15.3	15.3				

Continue...

RESULTS OF MARINE WATER [M3 EAST OF BOCHAISLANOT DETECTED - N 22°46'530" E 069°41'690"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
C			Microbiological												
1	Total Bacterial Count	CFU/ml	142		143		144		143		144		144		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	32		31		30		31		33		33		APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	21		22		21		20		22		22		IS :15185:2016
4	Enterococcus	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15186:2002
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:2016
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976

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RESULTS OF SEDIMENT ANALYSIS [M3 EAST OF BOCHAI LANOT DETECTED - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1.	Organic Matter	%	0.62	0.45	0.52	0.46	0.49	0.46	IS: 2720 (Part 22):1972
2.	Phosphorus as P	µg/g	624.3	596.5	602	582	566	552	IS: 10158 :1982, Method B
3.	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Lab SOP No. UERL/CHM/LTM/108
4.	Petroleum Hydrocarbon	µg/g	ND	ND	ND	ND	ND	ND	APHA 24th Ed.2023,5520 F
5.0	Heavy Metals								
5.1	Aluminum as Al	%	4.12	4.03	4.12	3.92	3.74	3.62	IS3025(Part 55):2003
5.2	Total Chromium as Cr+3	µg/g	130.2	136.4	114	121	116	118	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.3	Manganese as Mn	µg/g	524.6	550.8	546.2	564.2	554	582.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.4	Iron as Fe	%	3.94	3.88	3.67	3.71	3.54	3.62	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.5	Nickel as Ni	µg/g	44.3	49.4	48.6	51.2	48.6	43.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.6	Copper as Cu	µg/g	38.24	42.2	41.3	44.5	42.3	39.5	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.7	Zinc as Zn	µg/g	124.6	111.5	115.2	104.5	111.2	125	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.8	Lead as Pb	µg/g	2.03	1.95	1.84	1.76	1.55	1.62	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.9	Mercury as Hg	µg/g	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	EPA 7471B (Extraction &Analytical Method) :2007

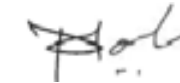
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RESULTS OF SEDIMENT ANALYSIS [M3 EAST OF BOCHASLANOT DETECTED - N 22°46'530" E 069°41'690"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
Benthic Organisms									
1	Macrobenthos	--	Polychates	<i>Polychates</i>	<i>Amphipods</i>	<i>Gastropods</i>	<i>Gastropods</i>	<i>Decapods Larvae</i>	APHA (24th Ed. 2023)10500
			<i>Gastropods</i>	<i>Gastropods</i>	<i>Gastropods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	
			<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Amphipods</i>	<i>Amphipods</i>	<i>Amphipods</i>	
			<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	
2	MeioBenthos	--	<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Foraminiferan</i>	
			<i>Polychates</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Herpectacoids</i>	
3	Population	no/m ²	297	298	297	296	297	297	



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RESULTS OF MARINE WATER [M4 JUNA BANOT DETECTEDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.15	8.01	8.24	8.09	8.21	8.11	8.24	8.06	8.22	8.09	8.14	7.91	IS 3025(Part 11):2022
2.	Temperature	°C	29.7	29.6	29.8	29.7	29.7	29.6	29.5	29.4	29.4	29.3	29.3	29.2	IS 3025(Part 9):2023
3.	Total Suspended Solids	mg/L	124	106	112	94	134	108	162	114	132	110	142	124	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	3.1	BDL(MDL: 1.0)	2.7	BDL(MDL: 1.0)	2.9	BDL(MDL: 1.0)	2.6	BDL(MDL: 1.0)	2.7	BDL(MDL: 1.0)	2.9	BDL(MDL: 1.0)	IS 3025(Part 44):2023
5.	Dissolved Oxygen	mg/L	6.93	6.73	6.75	6.55	6.94	6.73	6.75	6.55	6.81	6.6	6.67	6.47	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	36.42	37.32	36.58	37.44	36.27	37.28	36.32	37.14	36.17	36.94	36.02	36.88	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	IS 3025(Part 39):2021
8.	Nitrate as NO ₃	µmol/L	2.74	2.58	2.9	2.58	3.23	3.06	3.06	2.9	3.71	3.55	3.39	3.23	APHA 24th Ed.2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	0.413	0.391	0.304	0.283	0.239	0.217	0.283	0.261	0.326	0.304	0.283	0.261	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	4.16	4.06	3.95	3.9	4.53	4.48	3.8	3.74	3.69	3.64	3.64	3.59	APHA 24th Ed.2023,4500-NH ₃ B
11.	Phosphates as PO ₄	µmol/L	1.16	BDL(MDL: 0.4)	1.05	BDL(MDL: 0.4)	1.16	BDL(MDL: 0.4)	1.05	BDL(MDL: 0.4)	1.16	BDL(MDL: 0.4)	BDL(MDL: 0.4)	BDL(MDL: 0.4)	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	7.313	7.031	7.154	6.763	7.999	7.757	7.143	6.901	7.726	7.494	7.313	7.081	APHA 24th Ed.2023,4500 NH ₃ - B
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	36380	37090	36640	37250	36580	37138	36234	36940	35860	36520	35486	36322	IS 3025(Part 16):2023
15.	COD	mg/L	32.7	20.4	27.9	16	29.1	16.6	28.5	12.2	32.1	16.1	28.2	20.1	IS 3025(Part 58):2023

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RESULTS OF MARINE WATER [M4 JUNA BANOT DETECTEDAR N 22°47'57" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD	
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM		
A			Phytoplankton													
1.	Chlorophyll	mg/m ³	2.36	3.1	2.37	3.2	2.36	3.1	2.37	3.2	2.36	3.1	2.35	3	APHA (24th Ed. 2023)10200A-G	
2.	Phaeophytin	mg/m ³	2.2	9	2.1	8	2.2	7	2.1	6	2.2	7	2.1	8	APHA (24th Ed. 2023)10200A-G	
3.	Cell Count	No. x 10 ³ /L	155	87	154	88	155	87	154	88	155	89	154	88	APHA (24th Ed. 2023)10200A-G	
4	Name of Group Number and name of group species of each group	--	<i>Coscino discus</i>	<i>Surirella</i>	<i>Surirella</i>	<i>Surirella</i>	<i>Coscino discus</i>	<i>Surirella</i>	<i>Thalassiosira</i>	<i>Coscino discus</i>	<i>Thalassiosira</i>	<i>Coscino discus</i>	<i>Thalassiosira</i>	<i>Coscino discus</i>	APHA (24th Ed. 2023)10200A-G	
			<i>Diploneis</i>	<i>Biddulphia</i>	<i>Diploneis</i>	<i>Biddulphia</i>	<i>Diploneis</i>	<i>Biddulphia</i>	<i>Melosira</i>	<i>Diploneis</i>	<i>Melosira</i>	<i>Diploneis</i>	<i>Melosira</i>	<i>Diploneis</i>		
			<i>Rhizosolenia</i>	<i>Navicula</i>	<i>Thalassiothrix</i>	<i>Coscino discus</i>	<i>Skeletonema</i>	<i>Coscino discus</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>		
			<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Navicula</i>	<i>Thalassiosira</i>	<i>Navicula</i>	<i>Thalassiosira</i>	<i>Rhizosolenia</i>	<i>Dinophysis</i>	<i>Rhizosolenia</i>	<i>Dinophysis</i>	<i>Rhizosolenia</i>	<i>Dinophysis</i>		
			<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Thalassionema</i>	<i>Skeletonema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>		
B			Zooplankton													
1	Abundance (Population)	noX10 ³ / 100 m ³	35	36	35	37	36	36							APHA (24rd Ed. 2023)10200 G	
2	Name of Group Number and name of group species of each group		<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>		
			<i>Copepods nauplii</i>	<i>Rhizosolenia</i>	<i>Rhizosolenia</i>	<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Egg(Fish and Shrimps)</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>		
			<i>Crustacean Larvae</i>	<i>Crustacean Larvae</i>	<i>Egg(Fish and Shrimps)</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>	<i>Oikoplura</i>		<i>Oikoplura</i>
			<i>Crustacean</i>	<i>Crustacean</i>	<i>Crustacean</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Bivalve Larvae</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>	<i>Copepods nauplii</i>		<i>Copepods nauplii</i>
3	Total Biomass	ml/100 m ³	14.28	14.27	14.26	14.27	14.26	14.26	14.26	14.26	14.26	14.26	14.26			

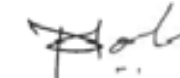
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RESULTS OF MARINE WATER [M4 JUNA BANOT DETECTEDAR N 22°47'57" E 069°43'620"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
C			Microbiological												
1	Total Bacterial Count	CFU/ml	106	107	106	108	110	110	110	110	110	110	110	110	APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	42	43	42	41	41	41	41	41	41	41	41	41	APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	10	11	10	12	12	12	12	12	12	12	12	12	IS :15185:2016
4	Enterococcus	/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:15186:200 2
5	Salmonella	/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:15187:201 6
6	Shigella	/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS: 5887 (Part V):1976



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RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANOT DETECTEDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1.	Organic Matter	%	0.48	0.54	0.52	0.47	0.44	0.48	IS: 2720 (Part 22):1972
2.	Phosphorus as P	µg/g	552.4	562.4	649.4	624.2	611.2	614	IS: 10158 :1982, Method B
3.	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Lab SOP No. UERL/CHM/LTM/108
4.	Petroleum Hydrocarbon	µg/g	ND	ND	ND	ND	ND	ND	APHA 24th Ed.2023,5520 F
5.0	Heavy Metals								
5.1	Aluminum as Al	%	4.11	4.15	3.82	3.76	3.64	3.58	IS3025(Part 55):2003
5.2	Total Chromium as Cr+3	µg/g	132.4	142.3	135.4	123.4	120	112.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.3	Manganese as Mn	µg/g	522.4	534.4	510.2	498.6	485	490.5	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.4	Iron as Fe	%	3.95	4.01	3.85	3.72	3.64	3.72	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.5	Nickel as Ni	µg/g	41.3	42.4	44.2	48.6	46.5	41.6	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.6	Copper as Cu	µg/g	58.6	64.5	62.1	66.7	65.2	55.8	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.7	Zinc as Zn	µg/g	440.6	466.5	456.2	172.5	180.5	164.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.8	Lead as Pb	µg/g	2.05	2.15	1.86	1.71	1.66	1.48	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.9	Mercury as Hg	µg/g	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	EPA 7471B (Extraction &Analytical Method) :2007

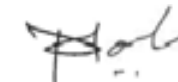
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RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANOT DETECTEDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
D			Benthic Organisms						
1	Macrobenthos	--	Foraminiferan	Amphipods	Amphipods	Sipunculids	Sipunculids	Sipunculids	APHA (24th Ed. 2023)10500
			Gastropods	Gastropods	Gastropods	Decapods Larvae	Decapods Larvae	Decapods Larvae	
			Isopods	Isopods	Isopods	Polychates	Polychates	Polychates	
			Sipunculids	Sipunculids	Turbellarians	Isopods	Isopods	Foraminiferan	
2	MeioBenthos	--	Herpectacoids	Herpectacoids	Herpectacoids	Turbellarians	Gastropods	Gastropods	
			Polychates	Turbellarians	Decapods Larvae	Herpectacoids	Herpectacoids	Herpectacoids	
3	Population	no/m ²	301	302	303	301	302	302	



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RESULTS OF MARINE WATER [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.21	7.97	8.14	7.99	8.16	8.04	8.19	8.01	8.23	8.05	8.13	8.02	IS 3025(Part 11):2022
2.	Temperature	°C	29.7	29.6	29.8	29.7	29.7	29.6	29.5	29.4	29.4	29.3	29.3	29.2	IS 3025(Part 9):2023
3.	Total Suspended Solids	mg/L	138	114	130	108	146	122	138	106	142	114	152	118	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27oC)	mg/L	2.8	BDL(MDL: 1.0)	2.4	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	3.4	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	3	BDL(MDL: 1.0)	IS 3025(Part 44):2023
5.	Dissolved Oxygen	mg/L	6.63	6.53	6.45	6.35	6.63	6.53	6.45	6.35	6.5	6.4	6.37	6.27	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	35.74	37.11	35.86	37.24	35.88	37.11	35.74	36.82	35.71	36.74	35.74	36.66	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	IS 3025(Part 39):2021
8.	Nitrate as NO3	µmol/L	3.23	3.06	3.06	2.74	2.74	2.58	3.23	2.9	3.06	2.9	2.9	2.74	APHA 24th Ed.2023,4500 NO3-B
9.	Nitrite as NO2	µmol/L	0.348	0.326	0.348	0.326	0.304	0.283	0.239	0.217	0.348	0.326	0.239	0.217	APHA 24th Ed.2023,4500NO2 B
10.	Ammonical Nitrogen as NH3	µmol/L	3.95	3.9	4.01	3.9	4.37	4.32	3.9	3.85	3.74	3.69	3.69	3.64	APHA 24th Ed.2023,4500-NH3 B
11.	Phosphates as PO4	µmol/L	1.26	1.16	1.16	1.05	1.16	BDL(MDL: 0.4)	1.37	1.26	1.05	1.16	1.16	BDL(MDL: 0.4)	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	7.528	7.286	7.418	6.966	7.414	7.183	7.369	6.967	7.148	6.916	6.829	6.597	APHA 24th Ed.2023,4500 NH3 - B
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	35230	36110	35610	36380	35434	36108	35390	36180	35410	36240	35380	36160	IS 3025(Part 16):2023
15.	COD	mg/L	20.4	16.3	16	12	16.6	12.5	12.2	8.1	16.1	12	20.1	16.1	IS 3025(Part 58):2023

Continue...

RESULTS OF MARINE WATER [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD		
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM			
A			Phytoplankton														
1.	Chlorophyll	mg/m ³	3.11	3.12	3.12	3.11	3.11	3.12	3.12	3.13	3.11	3.12	3.12	3.11	APHA (24th Ed. 2023)10200A-G		
2.	Phaeophytin	mg/m ³	2.2	1.22	2.1	1.23	2.2	1.22	2.1	1.21	2.2	1.22	2.4	1.25	APHA (24th Ed. 2023)10200A-G		
3.	Cell Count	No. x 10 ³ /L	122	112	123	113	122	112	124	113	126	112	125	114	APHA (24th Ed. 2023)10200A-G		
4	Name of Group Number and name of group species of each group	--	<i>Diploneis</i>	<i>Navicula</i>	<i>Diploneis</i>	<i>Navicula</i>	<i>Navicula</i>	<i>Navicula</i>	<i>Navicula</i>	<i>Pinnularia</i>	<i>Navicula</i>	<i>Pinnularia</i>	<i>Navicula</i>	<i>Pinnularia</i>	APHA (24th Ed. 2023)10200A-G		
			<i>Rhizosolenia</i>	<i>Skeletonema</i>	<i>Rhizosolenia</i>	<i>Skeletonema</i>	<i>Biddulphia</i>	<i>Skeletonema</i>	<i>Biddulphia</i>	<i>Biddulphia</i>	<i>Biddulphia</i>	<i>Biddulphia</i>	<i>Biddulphia</i>	<i>Rhizosolenia</i>			
			<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Navicula</i>	<i>Nitzschia</i>	<i>Navicula</i>	<i>Nitzschia</i>	<i>Navicula</i>		<i>Odentella</i>	<i>Dinophysis</i>
			<i>Cyclotella</i>	<i>Dinophysis</i>	<i>Cyclotella</i>	<i>Biddulphia</i>	<i>Cyclotella</i>	<i>Biddulphia</i>	<i>Cyclotella</i>	<i>Thalassiosira</i>	<i>Cyclotella</i>	<i>Thalassiosira</i>	<i>Cyclotella</i>	<i>Thalassiosira</i>		<i>Cyclotella</i>	<i>Coscinodiscus</i>
			<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Skeletonema</i>	<i>Pleurosigma</i>	<i>Skeletonema</i>		<i>Pleurosigma</i>	<i>Skeletonema</i>
B			Zooplankton														
1	Abundance (Population)	noX10 ³ / 100 m ³	52		51		50		52		51		52		APHA (24rd Ed. 2023)10200 G		
2	Name of Group Number and name of group species of each group		<i>Copepods nauplii</i>		<i>Nitzschia</i>		<i>Nitzschia</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>				
			<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>				
			<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Copepods</i>		<i>Copepods</i>		<i>Copepods nauplii</i>				
			<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Crustacean</i>				
3	Total Biomass	ml/100 m ³	14.13		14.12		14.11		14.12		14.11		14.12				
			<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>				

Continue...

RESULTS OF MARINE WATER [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
Microbiological															
1	Total Bacterial Count	CFU/ml	148		147		146		144		146		145		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	32		31		32		31		32		30		APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	16		15		14		13		11		12		IS :15185:2016
4	Enterococcus	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15186:2002
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:2016
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976

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RESULTS OF SEDIMENT ANALYSIS [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1.	Organic Matter	%	0.58	0.62	0.58	0.54	0.49	0.47	IS: 2720 (Part 22):1972
2.	Phosphorus as P	µg/g	634.5	644	610	612	620	608	IS: 10158 :1982, Method B
3.	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Lab SOP No. UERL/CHM/LTM/108
4.	Petroleum Hydrocarbon	µg/g	N.D.	ND	ND	ND	ND	ND	APHA 24th Ed.2023,5520 F
5.0	Heavy Metals								
5.1	Aluminum as Al	%	4.12	4.18	3.86	3.74	3.65	3.46	IS3025(Part 55):2003
5.2	Total Chromium as Cr+3	µg/g	154.6	162.5	152.4	148.5	144.2	131.1	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.3	Manganese as Mn	µg/g	605.4	610.4	596.2	604.2	582.5	490.1	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.4	Iron as Fe	%	4.21	4.33	4.11	3.84	3.75	3.65	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.5	Nickel as Ni	µg/g	48.6	52.4	55.4	51.6	52.2	55.4	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.6	Copper as Cu	µg/g	52.6	62.5	60.3	49.8	44.2	38.6	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.7	Zinc as Zn	µg/g	112.4	118.5	121.4	110.6	102.3	110.8	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.8	Lead as Pb	µg/g	2.03	2.11	1.96	2.02	1.92	1.86	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.9	Mercury as Hg	µg/g	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	EPA 7471B (Extraction &Analytical Method) :2007

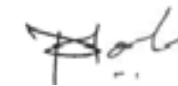
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RESULTS OF SEDIMENT ANALYSIS [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
D			Benthic Organisms						
1	Macrobenthos	--	<i>Amphipods</i>	<i>Amphipods</i>	<i>Amphipods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	APHA (24th Ed. 2023)10500
			<i>Polychates</i>	<i>Sipunculids</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Gastropods</i>	
			<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	
			<i>Gastropods</i>	<i>Gastropods</i>	<i>Gastropods</i>	<i>Amphipods</i>	<i>Amphipods</i>	<i>Amphipods</i>	
2	MeioBenthos	--	Decapods Larvae	Decapods Larvae	Foraminiferan	Polychates	Herpectacoids	<i>Herpectacoids</i>	
			<i>Herpectacoids</i>	<i>Gastropods</i>	<i>Herpectacoids</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Polychates</i>	
3	Population	no/m ²	306	305	306	307	306	305	



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RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	29.7	8.02	8.25	8.05	8.26	8.11	7.96	7.84	8.12	7.95	8.09	7.92	IS 3025(Part 11):2022
2.	Temperature	°C	142	29.6	29.8	29.7	29.7	29.6	29.6	29.5	29.5	29.4	29.4	29.3	IS 3025(Part 9):2023
3.	Total Suspended Solids	mg/L	2.9	118	136	108	128	112	144	118	130	122	154	126	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	6.83	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	2.8	BDL(MDL: 1.0)	2.9	BDL(MDL: 1.0)	3.2	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	IS 3025(Part 44):2023
5.	Dissolved Oxygen	mg/L	35.82	6.73	6.65	6.55	6.83	6.73	6.65	6.55	6.71	6.6	6.57	6.47	APHA 24th Ed.,2023,4500-O, B
6.	Salinity	ppt	BDL(MDL: 2.0)	37.09	36.02	37.26	36.14	37.12	35.92	36.94	35.88	36.74	35.96	36.71	By Calculation
7.	Oil & Grease	mg/L	2.9	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	IS 3025(Part 39):2021
8.	Nitrate as NO ₃	µmol/L	0.413	2.58	3.23	3.06	2.9	2.74	2.58	2.42	3.39	3.23	3.23	2.9	APHA 24th Ed.,2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	3.8	0.391	0.37	0.348	0.326	0.304	0.283	0.261	0.261	0.239	0.283	0.261	APHA 24th Ed.,2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	1.16	3.74	4.01	3.95	4.22	4.11	3.95	3.9	3.8	3.69	3.69	3.64	APHA 24th Ed.,2023,4500-NH3 B
11.	Phosphates as PO ₄	µmol/L	7.113	BDL(MDL: 0.4)	1.26	1.16	1.05	BDL(MDL: 0.4)	1.16	BDL(MDL: 0.4)	BDL(MDL: 0.4)	BDL(MDL: 0.4)	1.16	1.05	APHA 24th Ed.,2023,4500-P, D
12.	Total Nitrogen	µmol/L	ND	6.711	7.61	7.358	7.446	7.154	6.813	6.581	7.451	7.159	7.203	6.801	APHA 24th Ed.,2023,4500 NH3
13.	Petroleum Hydrocarbon	µg/L	36150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.,2023,5520 F
14.	Total Dissolved Solids	mg/L	24.5	36930	36440	37124	36090	36920	36260	37050	36324	36990	36310	36780	IS 3025(Part 16):2023
15.	COD	mg/L			20	16	20.8	16.6	24.4	20.4	28.1	24.1	24.2	20.1	IS 3025(Part 58):2023

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RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFAC E	BOTTO M	SURFAC E	BOTTO M	SURFAC E	BOTTO M	SURFAC E	BOTTO M	SURFAC E	BOTTO M	SURFAC E	BOTTO M	
A			Phytoplankton												
1.	Chlorophyll	mg/m ³	3.06	2.5	3.07	2.6	3.06	2.7	3.07	2.6	3.06	2.7	3.07	2.8	APHA (24th Ed. 2023)10200A-G
2.	Phaeophytin	mg/m ³	2.5	1.77	2.6	1.78	2.7	1.77	2.6	1.77	2.7	1.78	2.8	1.74	APHA (24th Ed. 2023)10200A-G
3.	Cell Count	No. x 10 ³ /L	91	123	92	122	91	123	92	122	91	121	90	122	APHA (24th Ed. 2023)10200A-G
4	Name of Group Number and name of group species of each group	--	<i>Nitzschia</i>	<i>Thalassiothrix</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Diploneis</i>	<i>Coscinodiscus</i>	<i>Diploneis</i>	<i>Coscinodiscus</i>	<i>Diploneis</i>	<i>Coscinodiscus</i>	APHA (24th Ed. 2023)10200A-G
			<i>Pinnularia</i>	<i>Surirella</i>	<i>Pinnularia</i>	<i>Surirella</i>	<i>Odontella</i>	<i>Surirella</i>	<i>Rhizosolenia</i>	<i>Diploneis</i>	<i>Rhizosolenia</i>	<i>Diploneis</i>	<i>Rhizosolenia</i>	<i>Diploneis</i>	
			<i>Odontella</i>	<i>Navicula</i>	<i>Dinophysis</i>	<i>Navicula</i>	<i>Dinophysis</i>	<i>Navicula</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	<i>Nitzschia</i>	<i>Rhizosolenia</i>	
			<i>Dinophysis</i>	<i>Thalassiosira</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Thalassiothrix</i>	<i>Dinophysis</i>	<i>Thalassiothrix</i>	<i>Dinophysis</i>	<i>Thalassiothrix</i>	<i>Dinophysis</i>	
			<i>Surirella</i>	<i>Skeletonema</i>	<i>Surirella</i>	<i>Skeletonema</i>	<i>Cyclotella</i>	<i>Skeletonema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Thalassionema</i>	<i>Cyclotella</i>	<i>Thalassionema</i>	
B			Zooplankton												
1	Abundance (Population)	noX10 ³ / 100 m ³	41		40		42		41		40		42		APHA (24rd Ed. 2023)10200 G
2	Name of Group Number and name of group species of each group		<i>Nitzschia</i>		<i>Nitzschia</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		
			<i>Pinnularia</i>		<i>Pinnularia</i>		<i>Coscinodiscus</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		
			<i>Odontella</i>		<i>Odontella</i>		<i>Odontella</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		
			<i>Dinophysis</i>		<i>Dinophysis</i>		<i>Dinophysis</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Crustacean</i>		
<i>Surirella</i>		<i>Surirella</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>			
3	Total Biomass	ml/100 m ³	16.58		16.57		16.56		16.55		16.54		16.52		

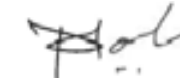
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RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
Microbiological															
1	Total Bacterial Count	CFU/ml	92		93		92		91		92		94		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	27		26		27		26		25		26		APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	10		11		10		11		10		16		IS :15185:2016
4	Enterococcus	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15186:200 2
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:201 6
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976



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RESULTS OF MARINE WATER [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	29.8	7.99	8.27	8.03	8.24	8.12	8.22	7.95	8.18	7.99	8.11	7.97	IS 3025(Part 11):2022
2.	Temperature	°C	122	29.7	29.9	29.8	29.8	29.7	29.6	29.5	29.5	29.4	29.4	29.3	IS 3025(Part 9):2023
3.	Total Suspended Solids	mg/L	3.2	104	134	124	142	118	164	128	152	114	154	120	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	6.93	BDL(MDL: 1.0)	3.5	BDL(MDL: 1.0)	2.9	BDL(MDL: 1.0)	3.3	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	3.2	BDL(MDL: 1.0)	IS 3025(Part 44):2023
5.	Dissolved Oxygen	mg/L	36.15	6.73	6.84	6.65	7.04	6.83	6.85	6.65	6.91	6.71	6.77	6.57	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	BDL(MDL: 2.0)	37.18	36.35	37.29	36.34	37.31	36.02	37.04	36.11	36.84	35.96	36.81	By Calculation
7.	Oil & Grease	mg/L	2.9	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	IS 3025(Part 39):2021
8.	Nitrate as NO ₃	µmol/L	0.435	2.74	3.39	3.23	3.06	2.9	2.74	2.58	3.06	2.9	3.23	2.9	APHA 24th Ed.2023,4500 NO3-
9.	Nitrite as NO ₂	µmol/L	3.9	0.413	0.391	0.37	0.348	0.326	0.217	0.196	0.261	0.239	0.304	0.283	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	1.16	3.85	4.11	4.01	4.06	3.95	4.06	3.9	3.8	3.74	3.8	3.69	APHA 24th Ed.2023,4500-NH ₃
11.	Phosphates as PO ₄	µmol/L	7.235	1.05	1.05	BDL(MDL: 0.4)	1.37	1.16	1.05	BDL(MDL: 0.4)	1.16	BDL(MDL: 0.4)	BDL(MDL: 0.4)	BDL(MDL: 0.4)	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	ND	7.003	7.891	7.61	7.468	7.176	7.017	6.676	7.121	6.879	7.334	6.873	APHA 24th Ed.2023,4500 NH ₃
13.	Petroleum Hydrocarbon	µg/L	35430	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	24.5	36120	35860	36380	35460	36060	35284	36192	35350	36210	35410	36164	IS 3025(Part 16):2023
15.	COD	mg/L		16.3	20	12	20.8	12.5	28.5	20.4	32.1	24.1	28.2	20.1	IS 3025(Part 58):2023

Continue...

RESULTS OF MARINE WATER [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
Phytoplankton															
1.	Chlorophyll	mg/m ³	3.1	3.12	3.2	3.11	3.1	3.12	3.2	3.11	3.1	3.12	3.2	3.2	APHA (24th Ed. 2023)10200A-G
2.	Phaeophytin	mg/m ³	1.5	1.6	1.4	1.5	1.3	1.4	1.2	1.3	1.3	1.2	1.2	1.1	APHA (24th Ed. 2023)10200A-G
3.	Cell Count	No. x 10 ³ /L	112	107	111	108	112	107	113	106	112	107	114	104	APHA (24th Ed. 2023)10200A-G
4	Name of Group Number and name of group species of each group	--	<i>Odontella</i>	<i>Cyclotella</i>	<i>Odontella</i>	<i>Cyclotella</i>	<i>Odontella</i>	<i>Cyclotella</i>	<i>Nitzschia</i>	<i>Diploneis</i>	<i>Nitzschia</i>	<i>Diploneis</i>	<i>Nitzschia</i>	<i>Diploneis</i>	APHA (24th Ed. 2023)10200A-G
			<i>Rhizosolenia</i>	<i>Pinnularia</i>	<i>Rhizosolenia</i>	<i>Pinnularia</i>	<i>Rhizosolenia</i>	<i>Pinnularia</i>	<i>Grammatophora</i>	<i>Rhizosolenia</i>	<i>Grammatophora</i>	<i>Rhizosolenia</i>	<i>Grammatophora</i>	<i>Rhizosolenia</i>	
			<i>Coscinodiscus</i>	<i>Skeletonema</i>	<i>Coscinodiscus</i>	<i>Skeletonema</i>	<i>Coscinodiscus</i>	<i>Skeletonema</i>	<i>Diploneis</i>	<i>Nitzschia</i>	<i>Diploneis</i>	<i>Nitzschia</i>	<i>Diploneis</i>	<i>Nitzschia</i>	
			<i>Grammatophora</i>	<i>Thalassiosira</i>	<i>Grammatophora</i>	<i>Thalassiosira</i>	<i>Grammatophora</i>	<i>Thalassiosira</i>	<i>Thalassiosira</i>	<i>Cyclotella</i>	<i>Thalassiosira</i>	<i>Cyclotella</i>	<i>Thalassiosira</i>	<i>Grammatophora</i>	
			<i>Thalassiosira</i>	<i>Thalassionema</i>	<i>Thalassiosira</i>	<i>Thalassionema</i>	<i>Thalassiosira</i>	<i>Thalassionema</i>	<i>Thalassiosira</i>	<i>Thalassionema</i>	<i>Pleurosigma</i>	<i>Pleurosigma</i>	<i>Pleurosigma</i>	<i>Pleurosigma</i>	
Zooplankton															
1	Abundance(Population)	noX10 ³ / 100 m ³	32		33		32		33		34		32		APHA (24rd Ed. 2023)10200 G
2	Name of Group Number and name of group species of each group		<i>Coscinodiscus</i>		<i>Coscinodiscus</i>		<i>Odontella</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		
			<i>Diploneis</i>		<i>Egg(Fish and Shrimps)</i>		<i>Egg(Fish and Shrimps)</i>		<i>Copepods nauplii</i>		<i>Copepods nauplii</i>		<i>Egg(Fish and Shrimps)</i>		
			<i>Rhizosolenia</i>		<i>Rhizosolenia</i>		<i>Rhizosolenia</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		
			<i>Dinophysis</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Crustacean</i>		
		<i>Thalassionema</i>		<i>Thalassionema</i>		<i>Thalassionema</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>		<i>Bivalve Larvae</i>			
3	Total Biomass	ml/100 m ³	14.77		14.78		14.77		14.76		14.77		14.78		

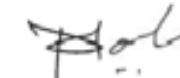
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RESULTS OF MARINE WATER [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
C			Microbiological												
1	Total Bacterial Count	CFU/ml	14		13		12		14		13		10		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	11		12		11		10		11		18		APHA 24thEd.2023, 9222-B
3	E.coli	/100ml	10		13		12		11		9		10		IS :15185:2016
4	Enterococcus	/100ml	6		7		6		7		6		8		IS:15186:2002
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:2016
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24thEd.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976



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RESULTS OF SEDIMENT ANALYSIS [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1.	Organic Matter	%	0.58	0.62	0.58	0.52	0.58	0.61	IS: 2720 (Part 22):1972
2.	Phosphorus as P	µg/g	611.4	615.4	620.2	586.5	602	611	IS: 10158 :1982, Method B
3.	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	Lab SOP No. UERL/CHM/LTM/108
4.	Petroleum Hydrocarbon	µg/g	N.D.	ND	ND	ND	ND	ND	APHA 24th Ed.2023,5520 F
5.0	Heavy Metals								
5.1	Aluminum as Al	%	4.06	4.11	3.96	3.82	3.76	3.68	IS3025(Part 55):2003
5.2	Total Chromium as Cr+3	µg/g	148.6	152.6	148.4	139.8	144.2	128.6	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.3	Manganese as Mn	µg/g	594.5	602.4	592	568.5	554.6	560.7	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.4	Iron as Fe	%	4.11	4.16	3.96	3.79	3.66	3.59	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.5	Nickel as Ni	µg/g	46.5	48.2	44.7	48.2	44.3	49.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.6	Copper as Cu	µg/g	52.2	56.4	52.5	55.2	52.3	55.4	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.7	Zinc as Zn	µg/g	124.3	128.5	130.4	124.1	124.9	116.2	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.8	Lead as Pb	µg/g	2.03	2.11	1.96	1.82	1.75	1.68	EPA 3050B/7000B (Extraction &Analytical Method):2007
5.9	Mercury as Hg	µg/g	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	EPA 7471B (Extraction &Analytical Method) :2007

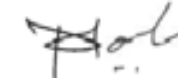
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RESULTS OF SEDIMENT ANALYSIS [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	TEST METHOD	
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT		
D			Benthic Organisms							
1	Macrobenthos	--	<i>Polychates</i>	<i>Gastropods</i>	<i>Gastropods</i>	<i>Polychates</i>	<i>Polychates</i>	<i>Polychates</i>	APHA (24th Ed. 2023)10500	
			<i>Decapods Larvae</i>	<i>Decapods Larvae</i>	<i>Decapods Larvae</i>	<i>Amphipods</i>	<i>Amphipods</i>	<i>Amphipods</i>		
			<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Isopods</i>	<i>Sipunculids</i>		
			<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Sipunculids</i>	<i>Herpectacoids</i>	<i>Herpectacoids</i>		
2	MeioBenthos	--	<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Herpectacoids</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>	<i>Foraminiferan</i>		
			<i>Turbellarians</i>	<i>Turbellarians</i>	<i>Turbellarians</i>	<i>Turbellarians</i>	<i>Turbellarians</i>	<i>Turbellarians</i>		
3	Population	no/m ²	368	367	368	367	368	366		



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RESULTS OF MARINE WATER [M11 MPT T1 JETTY N 22°42'278" E 069°43'450"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.23	8.06	8.21	8.04	8.25	8.14	7.98	7.82	8.24	8.09	8.1	7.93	IS 3025 (Part 11):2022
2.	Temperature	°C	29.9	29.8	30	29.9	29.9	29.8	29.6	29.5	29.5	29.4	29.4	29.3	IS 3025 (Part 9):2023
3.	Total Suspended Solids	mg/L	132	110	140	118	134	110	142	118	136	122	144	128	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	3.1	BDL(MDL: 1.0)	2.9	BDL(MDL: 1.0)	3.2	BDL(MDL: 1.0)	3.1	BDL(MDL: 1.0)	2.9	BDL(MDL: 1.0)	3.2	BDL(MDL: 1.0)	IS 3025 (Part 44):2023
5.	Dissolved Oxygen	mg/L	6.63	6.53	6.55	6.45	6.73	6.63	6.55	6.45	6.6	6.5	6.47	6.37	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	36.52	37.33	36.71	37.45	36.52	37.31	36.18	37.01	36.22	36.86	36.09	36.94	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)	IS 3025 (Part 39):2021
8.	Nitrate as NO ₃	µmol/L	3.23	3.06	3.55	3.39	3.39	3.23	3.23	2.9	3.55	3.39	3.39	3.06	APHA 24th Ed. 2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	0.391	0.37	0.391	0.37	0.37	0.348	0.304	0.283	0.283	0.261	0.261	0.239	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	4.06	4.01	3.9	3.85	4.06	3.95	4.11	4.01	3.85	3.8	3.95	3.85	APHA 24th Ed. 2023,4500- NH3 B
11.	Phosphates as PO ₄	µmol/L	1.05	BDL(MDL: 0.4)	1.26	1.16	1.37	1.26	1.58	1.47	1.26	1.37	1.37	1.26	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	7.681	7.44	7.841	7.61	7.82	7.528	7.644	7.193	7.683	7.451	7.601	7.149	APHA 24th Ed. 2023,4500 NH3 - B
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	35510	36420	35740	36840	35322	35996	35190	36088	35220	36120	35314	36142	IS 3025(Part 16):2023
15.	COD	mg/L	24.5	20.4	20	16	20.8	16.6	28.5	24.4	32.1	28.1	28.2	24.2	IS 3025(Part 58):2023

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RESULTS OF MARINE WATER [M11 MPT T1 JETTY N 22°42'278" E 069°43'450"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTO M	SURFACE	BOTTO M	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTO M	
A			Phytoplankton												
1.	Chlorophyll	mg/m ³	2.6	2.7	2.7	2.6	2.6	2.7	2.7	2.6	2.6	2.7	2.4	2.8	APHA (24th Ed. 2023)10200A-G
2.	Phaeophytin	mg/m ³	2.3	1.3	2.4	1.2	2.3	1.1	2.2	1.2	2.1	1.3	2	1.4	APHA (24th Ed. 2023)10200A-G
3.	Cell Count	No. x 10 ³ /L	133	122	134	123	133	122	131	121	132	122	131	120	APHA (24th Ed. 2023)10200A-G
4	Name of Group Number and name of group species of each group	--	<i>Dinophy sis</i>	<i>Navicula</i>	<i>Odentell a</i>	<i>Cyclotell a</i>	<i>Cyclotell a</i>	<i>Surirella</i>	<i>Odentell a</i>	<i>Nitzschia</i>	<i>Odentell a</i>	<i>Nitzschia</i>	<i>Odentell a</i>	<i>Nitzschia</i>	APHA (24th Ed. 2023)10200A-G
			<i>Pinnulari a</i>	<i>Skeleton ema</i>	<i>Rhizosol enia</i>	<i>Pinnulari a</i>	<i>Pinnulari a</i>	<i>Skeleton ema</i>	<i>Rhizosol enia</i>	<i>Pinnulari a</i>	<i>Rhizosol enia</i>	<i>Pinnulari a</i>	<i>Rhizosol enia</i>	<i>Pinnulari a</i>	
			<i>Thalassi othrix</i>	<i>Rhizosol enia</i>	<i>Coscinod iscus</i>	<i>Skeleton ema</i>	<i>Thalassi othrix</i>	<i>Rhizosol enia</i>	<i>Coscinod iscus</i>	<i>Odontell a</i>	<i>Coscinod iscus</i>	<i>Odontell a</i>	<i>Coscinod iscus</i>	<i>Odontell a</i>	
			<i>Gramma tophora</i>	<i>Dinophy sis</i>	<i>Gramma tophora</i>	<i>Thallassi osira</i>	<i>Rhizosol enia</i>	<i>Cyclotell a</i>	<i>Gramma tophora</i>	<i>Dinophy sis</i>	<i>Gramma tophora</i>	<i>Dinophy sis</i>	<i>Pleurosi gma</i>	<i>Dinophy sis</i>	
			<i>Ceratiu m</i>	<i>Thallassi onema</i>	<i>Thallassi osira</i>	<i>Thallassi onema</i>	<i>Ceratiu m</i>	<i>Thallassi onema</i>	<i>Thallassi osira</i>	<i>Surirella</i>	<i>Thallassi osira</i>	<i>Surirella</i>	<i>Thallassi osira</i>	<i>Surirella</i>	

B			Zooplankton												
1	Abudance(Populat ion)	noX103/ 100 m3	32		30		31		34		36		34		APHA (24rd Ed. 2023)10200 G
2	Name of Group Number and name of group species of each group		<i>Diploneis</i>		<i>Diploneis</i>		<i>Diploneis</i>		<i>Decapoda</i>		<i>Decapoda</i>		<i>Decapoda</i>		
			<i>Rhizosolenia</i>		<i>Rhizosolenia</i>		<i>Rhizosolenia</i>		<i>Copepods</i>		<i>Copepods</i>		<i>Oikoplura</i>		
			<i>Nitzschia</i>		<i>Nitzschia</i>		<i>Nitzschia</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		
			<i>Thalassiothrix</i>		<i>Coscinodiscus</i>		<i>Coscinodiscus</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Bivalve Larvae</i>		
			<i>Pleurosigma</i>		<i>Pleurosigma</i>		<i>Pleurosigma</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		
3	Total Biomass	ml/100 m ³	15.22		15.21		15.22		15.22		15.21		15.2		

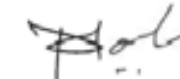
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RESULTS OF MARINE WATER [M11 MPT T1 JETTY N 22°42'278" E 069°43'450"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
C			Microbiological												
1	Total Bacterial Count	CFU/ml	236		237		236		234		236		234		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	42		41		40		42		40		42		APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	30		32		31		30		32		30		IS :15185:2016
4	Enterococcus	/100ml	13		12		11		12		10		11		IS:15186:200 2
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:201 6
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976



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Sr. Chemist

Mr. Nitin Tandel
Technical Manager

RESULTS OF MARINE WATER [M12 SPM N 22°40'938" E 069°39'191"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1.	pH	--	8.17	8.06	8.22	8.01	8.27	8.16	8.04	7.81	8.14	8.03	8.09	7.89	IS 3025 (Part 11):2022
2.	Temperature	°C	29.9	29.8	30	29.9	29.8	29.7	29.6	29.5	29.5	29.4	29.4	29.3	IS 3025 (Part 9):2023
3.	Total Suspended Solids	mg/L	130	110	142	118	122	96	138	102	124	110	132	114	APHA 24th Ed.,2023,2540- D
4.	BOD (3 Days @ 27°C)	mg/L	3	BDL(MDL :1.0)	2.8	BDL(MDL :1.0)	3.4	BDL(MDL :1.0)	2.8	BDL(MDL :1.0)	2.5	BDL(MDL :1.0)	3.1	BDL(MDL :1.0)	IS 3025 (Part 44):2023
5.	Dissolved Oxygen	mg/L	6.83	6.73	6.75	6.65	6.94	6.83	6.75	6.65	6.81	6.71	6.67	6.57	APHA 24th Ed.2023,4500-O, B
6.	Salinity	ppt	36.56	37.28	36.52	37.38	36.29	37.11	36.44	37.19	36.25	37.03	36.22	36.94	By Calculation
7.	Oil & Grease	mg/L	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	BDL(MDL :2.0)	IS 3025 (Part 39):2021
8.	Nitrate as NO ₃	µmol/L	3.39	3.23	3.23	3.06	2.9	2.74	3.39	3.23	3.23	3.06	3.55	3.39	APHA 24th Ed. 2023,4500 NO3-B
9.	Nitrite as NO ₂	µmol/L	0.435	0.391	0.413	0.391	0.37	0.348	0.326	0.304	0.239	0.217	0.283	0.261	APHA 24th Ed.2023,4500NO ₂ B
10.	Ammonical Nitrogen as NH ₃	µmol/L	4.11	4.01	4.27	4.22	4.16	4.06	4.11	4.01	3.74	3.69	4.01	3.95	APHA 24th Ed. 2023,4500- NH3 B
11.	Phosphates as PO ₄	µmol/L	1.26	1.16	1.37	1.26	1.47	1.37	1.37	1.26	1.26	1.16	1.47	1.37	APHA 24th Ed.2023,4500-P, D
12.	Total Nitrogen	µmol/L	7.935	7.631	7.913	7.671	7.43	7.148	7.826	7.544	7.209	6.967	7.843	7.601	APHA 24th Ed. 2023,4500 NH3 - B
13.	Petroleum Hydrocarbon	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	APHA 24th ED.2023,5520 F
14.	Total Dissolved Solids	mg/L	35790	36610	35940	36840	36120	36880	36340	37116	36300	37060	36146	36944	IS 3025(Part 16):2023
15.	COD	mg/L	28.6	24.5	24	20	25	20.8	28.5	24.4	32.1	28.1	36.3	32.2	IS 3025(Part 58):2023

Continue...

RESULTS OF MARINE WATER [M12 SPM N 22°40'938" E 069°39'191"]

SR. NO.	TEST PARAMETERS	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
A			Phytoplankton												
1.	Chlorophyll	mg/m ³	2.2	2.3	2.1	2.2	2.2	2.1	2.1	2.2	2.2	2.1	2.1	2	APHA (24th Ed. 2023)10200A-G
2.	Phaeophytin	mg/m ³	1.18	1.48	1.17	1.47	1.16	1.46	1.17	1.47	1.16	1.46	1.14	1.44	APHA (24th Ed. 2023)10200A-G
3.	Cell Count	No. x 10 ³ /L	78	133	76	132	77	133	76	132	77	133	78	135	APHA (24th Ed. 2023)10200A-G
4	Name of Group Number and name of group species of each group	--	<i>Ceratium</i>	<i>Melosira</i>	<i>Ceratium</i>	<i>Rhizosolenia</i>	<i>Surirella</i>	<i>Rhizosolenia</i>	<i>Skeletonema</i>	<i>Odontella</i>	<i>Skeletonema</i>	<i>Odontella</i>	<i>Skeletonema</i>	<i>Odontella</i>	APHA (24th Ed. 2023)10200A-G
			<i>Pinnularia</i>	<i>Dinophysis</i>	<i>Pinnularia</i>	<i>Dinophysis</i>	<i>Pinnularia</i>	<i>Dinophysis</i>	<i>Grammatophora</i>	<i>Rhizosolenia</i>	<i>Grammatophora</i>	<i>Rhizosolenia</i>	<i>Grammatophora</i>	<i>Rhizosolenia</i>	
			<i>Odontella</i>	<i>Skeletonema</i>	<i>Odontella</i>	<i>Skeletonema</i>	<i>Grammatophora</i>	<i>Skeletonema</i>	<i>Nitzschia</i>	<i>Coscinodiscus</i>	<i>Nitzschia</i>	<i>Coscinodiscus</i>	<i>Nitzschia</i>	<i>Coscinodiscus</i>	
			<i>Thalassiothrix</i>	<i>Thalassiosira</i>	<i>Thalassiothrix</i>	<i>Thalassiosira</i>	<i>Thalassiothrix</i>	<i>Thalassiosira</i>	<i>Thalassiothrix</i>	<i>Grammatophora</i>	<i>Thalassiothrix</i>	<i>Grammatophora</i>	<i>Coscinodiscus</i>	<i>Pinnularia</i>	
			<i>Thalassiosira</i>	<i>Thalassionema</i>	<i>Thalassiosira</i>	<i>Melosira</i>	<i>Rhizosolenia</i>	<i>Melosira</i>	<i>Pleurosigma</i>	<i>Thalassiosira</i>	<i>Pleurosigma</i>	<i>Thalassiosira</i>	<i>Pleurosigma</i>	<i>Thalassiosira</i>	
B			Zooplankton												
1	Abundance (Population)	noX10 ³ /100 m ³	72		70		71		70		71		70		APHA (24rd Ed. 2023)10200 G
2	Name of Group Number and name of group species of each group		<i>Nitzschia</i>		<i>Nitzschia</i>		<i>Nitzschia</i>		<i>Copepods</i>		<i>Copepods</i>		<i>Copepods</i>		
			<i>Grammatophora</i>		<i>Grammatophora</i>		<i>Grammatophora</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		<i>Oikoplura</i>		
			<i>Diploneis</i>		<i>Diploneis</i>		Egg(Fish and Shrimps)		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		<i>Crustacean Larvae</i>		
			<i>Thalassiothrix</i>		<i>Thalassiothrix</i>		<i>Thalassiothrix</i>		<i>Crustacean</i>		<i>Crustacean</i>		<i>Crustacean</i>		
3	Total Biomass	ml/100 m ³	14.56		14.56		14.57		14.56		14.55		14.52		

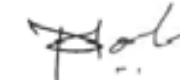
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RESULTS OF MARINE WATER [M12 SPM N 22°40'938" E 069°39'191"]

SR. NO	TEST PARAMETER S	UNIT	Apr-25		May-25		Jun-25		Jul-25		Aug-25		Sep-25		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
C			Microbiological												
1	Total Bacterial Count	CFU/ml	262		262		264		266		264		266		APHA 24 th Ed.2023,9215 -C
2	Total Coliform	/100ml	51		51		52		50		52		50		APHA 24 th Ed.2023, 9222-B
3	E.coli	/100ml	42		42		41		40		41		40		IS :15185:2016
4	Enterococcus	/100ml	34		34		31		32		31		30		IS:15186:2002
5	Salmonella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:15187:2016
6	Shigella	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		APHA 24 th Ed.2023, 9260-E
7	Vibrio	/100ml	Absent		Absent		Absent		Absent		Absent		Absent		IS: 5887 (Part V):1976



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RESULTS OF ETP OUTLET WATER

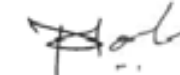
SR.NO.	TEST PARAMETERS	UNIT	LIQUID TERMINAL						GPCB Limit	TEST METHOD
			Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25		
			27-04-2024	12-05-2025	05-06-2025	14-07-2025	18-08-2025	02-09-2025		
1	pH @ 27 ° C	--	7.45	6.91	7.35	7.68	7.74	7.47	6.5 to 8.5	IS 3025(Part 11):2022
2	Temperature	°C	31	31	30.5	30	30	30	40	IS 3025(Part 9):2023
3	Colour	Pt. Co. Scale	40	40	50	60	50	50	100	IS 3025(Part 4):2021
4	Total Suspended Solids	mg/L	24	22	28	26	28	74	100	APHA 24th Ed.2023,2540 –D
5	Oil & Grease	mg/L	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)	BDL(MDL:4.0)	10	IS 3025(Part 39):2021
6	Ammonical Nitrogen	mg/L	24.5	28.6	32.2	25.2	22.6	35.4	50	IS 3025(Part 34):1988,
7	BOD (3 days at 27 °C)	mg/L	21	24.5	26	23	24	23	30	IS 3025(Part 44):2023
8	COD	mg/L	72.4	88.4	87.8	76.4	85.2	86.2	100	IS 3025(Part 58):2023
9	Chloride (as Cl) ⁻	mg/L	262.5	240	349.9	402.4	333.6	441.5	600	IS 3025(Part 32):1988
10	Sulphate (as SO ₄)	mg/L	36	32	36.4	42	48	66	1000	IS 3025(Part 24):2022
11	Total Dissolved Solids	mg/L	710	744	760	1010	1000	1120	2100	APHA 24th Ed.2023,2540- C
12	Percent Sodium	%	47.13	46.3	47.44	47.65	46.47	46.55	60	By Calculation
13	Phenolic Compound	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	1	IS 3025(Part 43):2022

Continue...

SR. NO.	TEST PARAMETERS	UNIT	LIQUID TERMINAL						GPCB Limit	TEST METHOD
			Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25		
			27-04-2024	12-05-2025	05-06-2025	14-07-2025	18-08-2025	02-09-2025		
14	Sulphide as S	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.1)	BDL(MDL:0.05)	BDL(MDL:0.05)	2	APHA 24th Ed.2023,4500 S ² F
15	Sodium Absorption ratio	--	2.90	3.1	3.3	3	3.1	3.2	26	By Calculation
16	Copper as Cu	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	3	IS 3025(Part 42):1992
17	Lead as Pb	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	0.1	APHA 24th Ed.2023,3111-B
18	Cadmium as Cd	mg/L	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	2	APHA 24th Ed.2023,3111-B
19	Fluoride as F	mg/L	0.62	0.59	0.44	0.51	0.48	0.68	2	APHA 24th Ed.2023,4500 F, D
20	Residual Chlorine	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	0.62	BDL(MDL:0.1)	BDL(MDL:0.1)	0.5 Min.	APHA 24th Ed.2023,4500-CI- G



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Results of Ambient Air Quality Monitoring

Name of Location		CT3 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
1.	03-04-2025	84.37	37.84	34.15	38.82	1.18	--	NOT DETECTED
2.	07-04-2025	80.53	35.38	33.74	36.92	1.14	4.8	NOT DETECTED
3.	10-04-2025	77.19	32.15	28.47	32.58	1.10	4.72	NOT DETECTED
4.	14-04-2025	79.53	33.68	30.82	34.97	1.13	4.78	NOT DETECTED
5.	17-04-2025	83.26	36.11	32.41	37.26	1.17	4.85	NOT DETECTED
6.	21-04-2025	86.15	39.74	35.89	39.61	1.18	4.98	NOT DETECTED
7.	24-04-2025	81.64	37.62	32.16	36.49	1.14	4.81	NOT DETECTED
8.	28-04-2025	84.59	38.41	33.56	37.82	1.16	4.88	NOT DETECTED
9.	01-05-2025	82.32	35.43	32.12	35.67	1.21	4.56	NOT DETECTED
10.	05-05-2025	75.67	33.12	30.12	34.54	1.18	4.78	NOT DETECTED
11.	08-05-2025	73.21	31.12	27.34	31.23	1.14	4.7	NOT DETECTED
12.	12-05-2025	78.23	32.56	29.56	33.23	1.18	4.65	NOT DETECTED
13.	15-05-2025	80.12	34.23	30.34	34.42	1.21	4.96	NOT DETECTED
14.	19-05-2025	82.34	38.54	34.12	37.65	1.20	4.67	NOT DETECTED
15.	22-05-2025	79.89	36.17	30.98	35.23	1.18	4.88	NOT DETECTED

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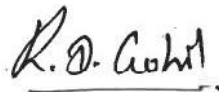
Name of Location		CT3 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
16.	26-05-2025	81.23	37.23	31.24	34.43	1.23	4.32	NOT DETECTED
17.	29-05-2025	76.54	34.23	29.67	33.12	1.20	4.14	NOT DETECTED
18.	02-06-2025	80.13	33.57	28.23	33.62	1.13	4.26	NOT DETECTED
19.	05-06-2025	77.96	31.13	25.84	30.65	1.06	4.38	NOT DETECTED
20.	09-06-2025	75.36	28.48	24.76	28.34	1.02	4.3	NOT DETECTED
21.	12-06-2025	78.11	30.37	26.21	31.23	1.08	4.43	NOT DETECTED
22.	16-06-2025	72.16	28.43	23.65	27.58	1.00	4.32	NOT DETECTED
23.	19-06-2025	66.91	25.46	21.78	25.87	0.91	4.25	NOT DETECTED
24.	23-06-2025	70.86	27.37	26.54	31.36	0.97	4.36	NOT DETECTED
25.	26-06-2025	68.43	26.58	24.35	29.13	0.88	4.21	NOT DETECTED
26.	30-06-2025	73.32	29.21	27.56	32.29	1.05	4.28	NOT DETECTED
27.	03-07-2025	71.25	27.14	25.47	29.64	1.00	--	NOT DETECTED
28.	07-07-2025	73.46	30.72	27.81	31.1	1.07	4.37	NOT DETECTED
29.	10-07-2025	67.21	25.62	24.35	27.79	0.97	4.32	NOT DETECTED
30.	14-07-2025	64.38	22.29	21.28	25.63	0.86	4.25	NOT DETECTED
31.	17-07-2025	69.53	24.38	24.55	28.26	0.92	4.29	NOT DETECTED

Continue...

Name of Location		CT3 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
32.	21-07-2025	72.17	27.59	28.13	32.91	0.97	4.4	NOT DETECTED
33.	24-07-2025	66.43	22.15	26.73	30.17	0.9	4.34	NOT DETECTED
34.	28-07-2025	62.96	21.89	22.51	26.44	0.82	4.23	NOT DETECTED
35.	31-07-2025	64.83	24.37	24.92	28.38	0.87	4.26	NOT DETECTED
36.	04-08-2025	62.59	23.96	21.27	24.13	0.82	4.18	NOT DETECTED
37.	07-08-2025	65.49	24.16	23.48	27.31	0.87	4.26	NOT DETECTED
38.	11-08-2025	70.13	27.52	25.62	29.53	0.95	4.32	NOT DETECTED
39.	14-08-2025	68.75	25.67	23.13	26.86	0.84	4.25	NOT DETECTED
40.	18-08-2025	64.16	24.13	21.75	24.15	0.72	4.16	NOT DETECTED
41.	21-08-2025	59.62	21.08	18.59	23.37	0.68	4.23	NOT DETECTED
42.	25-08-2025	63.15	23.29	20.31	24.62	0.76	4.35	NOT DETECTED
43.	28-08-2025	67.49	26.63	23.47	27.42	0.82	4.46	NOT DETECTED
44.	01-09-2025	69.42	26.15	24.36	27.47	0.77	4.35	NOT DETECTED
45.	04-09-2025	73.04	29.53	26.12	30.43	0.72	4.47	NOT DETECTED
46.	08-09-2025	75.13	30.79	28.64	31.56	0.75	4.56	NOT DETECTED
47.	11-09-2025	68.43	28.64	24.22	27.58	0.67	4.31	NOT DETECTED

Continue...

Name of Location		CT3 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
48.	15-09-2025	65.49	25.47	23.85	26.39	0.62	4.22	NOT DETECTED
49.	18-09-2025	69.35	27.14	25.65	28.24	0.65	4.35	NOT DETECTED
50.	22-09-2025	64.59	23.48	23.16	26.43	0.56	4.14	NOT DETECTED
51.	25-09-2025	66.12	25.62	26.75	29.48	0.59	4.22	NOT DETECTED
52.	29-09-2025	68.53	26.36	24.47	27.13	0.63	4.30	NOT DETECTED
Permissible Value as per NAAQMS		100.0	60.0	80.0	80.0	2.0	---	5.0
Test Method		IS - 5182, Part- 23	UERL/AIR/ SOP/11	IS - 5182, Part - 2	IS - 5182, Part - 6	IS - 5182, Part - 10	Gas analyzer	IS – 5182, Part – 11



Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

Results of Ambient Air Quality Monitoring

Name of Location		Near Fire Station						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
1.	03-04-2025	74.27	25.36	24.17	28.81	0.77	--	NOT DETECTED
2.	07-04-2025	77.49	26.91	26.53	30.64	0.82	2.81	NOT DETECTED
3.	10-04-2025	70.63	24.42	22.13	26.89	0.74	2.73	NOT DETECTED
4.	14-04-2025	74.39	27.64	23.58	28.53	0.66	2.78	NOT DETECTED
5.	17-04-2025	79.81	29.15	26.73	30.71	0.70	2.85	NOT DETECTED
6.	21-04-2025	68.56	22.79	22.64	26.25	0.62	2.67	NOT DETECTED
7.	24-04-2025	75.19	25.97	25.47	29.68	0.73	2.72	NOT DETECTED
8.	28-04-2025	80.78	29.35	28.13	32.54	0.79	2.76	NOT DETECTED
9.	01-05-2025	73.45	23.12	22.34	25.76	0.65	2.31	NOT DETECTED
10.	05-05-2025	74.23	24.56	24.56	28.98	0.76	2.78	NOT DETECTED
11.	08-05-2025	68.78	23.11	21.12	24.34	0.65	2.56	NOT DETECTED
12.	12-05-2025	71.23	26.76	22.67	25.67	0.57	2.7	NOT DETECTED
13.	15-05-2025	75.34	28.34	24.54	28.76	0.65	2.81	NOT DETECTED
14.	19-05-2025	67.12	21.12	20.98	25.43	0.56	2.64	NOT DETECTED
15.	22-05-2025	74.23	24.32	23.23	27.76	0.7	2.70	NOT DETECTED

Continue...

Name of Location		Near Fire Station						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
16.	26-05-2025	76.12	27.65	26.76	29.87	0.73	2.68	NOT DETECTED
17.	29-05-2025	72.34	25.21	24.12	28.45	0.68	2.72	NOT DETECTED
18.	02-06-2025	66.13	21.76	23.19	28.64	0.56	2.61	NOT DETECTED
19.	05-06-2025	64.39	20.26	20.64	25.13	0.47	2.54	NOT DETECTED
20.	09-06-2025	68.53	24.39	24.47	28.86	0.54	2.57	NOT DETECTED
21.	12-06-2025	61.37	17.56	18.24	23.45	0.41	2.4	NOT DETECTED
22.	16-06-2025	57.67	15.46	14.39	19.47	0.37	2.35	NOT DETECTED
23.	19-06-2025	63.45	18.24	16.47	21.53	0.48	2.48	NOT DETECTED
24.	23-06-2025	60.82	17.97	15.47	20.91	0.57	2.39	NOT DETECTED
25.	26-06-2025	58.35	16.24	18.75	23.47	0.52	2.28	NOT DETECTED
26.	30-06-2025	65.11	20.57	20.26	25.99	0.45	2.42	NOT DETECTED
27.	03-07-2025	62.18	18.75	20.52	24.31	0.42	--	NOT DETECTED
28.	07-07-2025	60.98	17.34	18.73	21.46	0.35	2.34	NOT DETECTED
29.	10-07-2025	64.39	19.24	22.15	26.47	0.39	2.39	NOT DETECTED
30.	14-07-2025	58.64	15.92	17.47	21.99	0.5	2.25	NOT DETECTED
31.	17-07-2025	56.4	14.27	15.64	19.37	0.54	2.27	NOT DETECTED

Continue...

Name of Location		Near Fire Station						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
32.	21-07-2025	61.22	17.48	19.21	23.46	0.58	2.34	NOT DETECTED
33.	24-07-2025	64.38	18.89	22.36	27.68	0.56	2.4	NOT DETECTED
34.	28-07-2025	54.18	14.37	17.65	22.39	0.43	2.29	NOT DETECTED
35.	31-07-2025	57.49	16.28	19.85	23.11	0.47	2.33	NOT DETECTED
36.	04-08-2025	55.32	15.64	17.5	21.72	0.51	2.39	NOT DETECTED
37.	07-08-2025	58.16	17.62	18.26	23.51	0.56	2.46	NOT DETECTED
38.	11-08-2025	62.49	20.13	20.38	24.11	0.59	2.49	NOT DETECTED
39.	14-08-2025	66.49	23.56	21.93	25.79	0.63	2.55	NOT DETECTED
40.	18-08-2025	60.11	22.17	20.38	24.62	0.58	2.46	NOT DETECTED
41.	21-08-2025	57.96	19.63	18.64	23.48	0.54	2.38	NOT DETECTED
42.	25-08-2025	62.26	21.48	20.35	24.78	0.6	2.43	NOT DETECTED
43.	28-08-2025	64.56	23.87	21.32	25.81	0.68	2.51	NOT DETECTED
44.	01-09-2025	65.13	21.56	19.48	23.13	0.65	2.56	NOT DETECTED
45.	04-09-2025	67.58	24.39	20.53	23.64	0.72	2.47	NOT DETECTED
46.	08-09-2025	70.49	27.55	23.28	27.11	0.77	2.61	NOT DETECTED
47.	11-09-2025	65.35	23.94	21.46	25.29	0.69	2.56	NOT DETECTED

Continue...

Name of Location		Near Fire Station						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
48.	15-09-2025	69.59	26.47	25.34	29.64	0.72	2.58	NOT DETECTED
49.	18-09-2025	73.23	28.14	28.04	32.15	0.8	2.67	NOT DETECTED
50.	22-09-2025	64.38	22.76	21.27	24.87	0.61	2.53	NOT DETECTED
51.	25-09-2025	66.37	24.68	19.56	23.82	0.65	2.64	NOT DETECTED
52.	29-09-2025	69.13	26.51	23.69	26.53	0.68	2.59	NOT DETECTED
Permissible Value as per NAAQMS		100.0	60.0	80.0	80.0	2.0	---	5.0
Test Method		IS - 5182, Part- 23	UERL/AIR/ SOP/11	IS - 5182, Part - 2	IS - 5182, Part - 6	IS - 5182, Part - 10	Gas analyzer	IS – 5182, Part – 11



Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

Results of Ambient Air Quality Monitoring

Name of Location		ADANI PORT – TUG Berth 600 KL Pupm House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
1.	03-04-2025	81.48	36.18	29.73	33.97	0.81	--	NOT DETECTED
2.	07-04-2025	84.57	38.61	33.16	38.42	0.87	3.83	NOT DETECTED
3.	10-04-2025	79.13	34.11	28.56	33.56	0.75	3.74	NOT DETECTED
4.	14-04-2025	82.39	35.87	32.19	37.1	0.79	3.77	NOT DETECTED
5.	17-04-2025	85.47	37.25	35.47	39.84	0.85	3.81	NOT DETECTED
6.	21-04-2025	78.57	33.29	30.54	35.52	0.76	3.76	NOT DETECTED
7.	24-04-2025	74.19	31.69	27.17	33.83	0.70	3.68	NOT DETECTED
8.	28-04-2025	76.91	33.58	29.35	34.62	0.74	3.72	NOT DETECTED
9.	01-05-2025	79.76	34.12	28.23	31.2	0.78	3.51	NOT DETECTED
10.	05-05-2025	82.34	37.54	30.87	36.56	0.67	3.67	NOT DETECTED
11.	08-05-2025	78.45	33.12	29.67	32.78	0.82	3.61	NOT DETECTED
12.	12-05-2025	81.23	34.23	33.12	36.23	0.76	3.7	NOT DETECTED
13.	15-05-2025	84.12	36.23	32.21	38.56	0.82	3.78	NOT DETECTED
14.	19-05-2025	77.23	30.98	29.87	34.21	0.77	3.67	NOT DETECTED
15.	22-05-2025	72.12	29.87	26.23	32.12	0.43	3.75	NOT DETECTED

Continue...


Name of Location		ADANI PORT – TUG Berth 600 KL Pupm House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
16.	26-05-2025	74.34	31.21	28.23	33.78	0.78	3.7	NOT DETECTED
17.	29-05-2025	71.32	30.78	29.78	32.12	0.72	3.72	NOT DETECTED
18.	02-06-2025	74.57	28.13	30.52	34.86	0.69	3.46	NOT DETECTED
19.	05-06-2025	69.58	26.48	27.56	31.21	0.62	3.37	NOT DETECTED
20.	09-06-2025	66.13	24.86	26.43	29.64	0.56	3.29	NOT DETECTED
21.	12-06-2025	72.34	27.54	28.35	32.56	0.58	3.51	NOT DETECTED
22.	16-06-2025	75.48	31.12	31.46	36.82	0.65	3.6	NOT DETECTED
23.	19-06-2025	68.58	26.53	26.45	30.14	0.56	3.56	NOT DETECTED
24.	23-06-2025	64.35	23.19	24.82	28.67	0.47	3.42	NOT DETECTED
25.	26-06-2025	70.13	26.58	25.86	30.11	0.58	3.52	NOT DETECTED
26.	30-06-2025	67.54	25.36	24.75	28.46	0.53	3.4	NOT DETECTED
27.	03-07-2025	65.49	25.11	23.84	27.15	0.56	--	NOT DETECTED
28.	07-07-2025	62.57	23.46	20.61	24.83	0.5	3.3	NOT DETECTED
29.	10-07-2025	67.58	26.85	25.38	29.61	0.53	3.41	NOT DETECTED
30.	14-07-2025	70.23	29.18	29.91	34.39	0.6	3.54	NOT DETECTED
31.	17-07-2025	72.34	30.98	32.05	37.81	0.66	3.58	NOT DETECTED

Continue...

Name of Location		ADANI PORT – TUG Berth 600 KL Pupm House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
32.	21-07-2025	66.48	27.63	27.35	32.54	0.62	3.46	NOT DETECTED
33.	24-07-2025	64.32	24.14	23.52	26.88	0.57	3.42	NOT DETECTED
34.	28-07-2025	59.85	21.28	20.95	24.58	0.46	3.33	NOT DETECTED
35.	31-07-2025	66.41	26.74	23.45	27.21	0.53	3.28	NOT DETECTED
36.	04-08-2025	68.72	29.11	25.63	30.25	0.61	3.38	NOT DETECTED
37.	07-08-2025	73.15	31.26	26.89	31.21	0.65	3.49	NOT DETECTED
38.	11-08-2025	70.52	28.76	25.21	29.87	0.58	3.42	NOT DETECTED
39.	14-08-2025	74.54	33.18	28.74	33.27	0.69	3.56	NOT DETECTED
40.	18-08-2025	66.15	26.64	23.85	26.49	0.56	3.52	NOT DETECTED
41.	21-08-2025	69.13	28.91	26.24	31.28	0.58	3.45	NOT DETECTED
42.	25-08-2025	67.92	25.32	25.16	29.69	0.62	3.62	NOT DETECTED
43.	28-08-2025	72.42	31.46	29.84	33.66	0.68	3.58	NOT DETECTED
44.	01-09-2025	75.48	32.13	30.89	34.67	0.71	3.6	NOT DETECTED
45.	04-09-2025	71.3	29.67	27.14	31.36	0.76	3.53	NOT DETECTED
46.	08-09-2025	77.59	34.57	32.87	36.58	0.66	3.72	NOT DETECTED
47.	11-09-2025	74.39	32.53	31.16	35.42	0.58	3.65	NOT DETECTED

Continue...

Name of Location		ADANI PORT – TUG Berth 600 KL Pupm House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
48.	15-09-2025	70.58	29.32	27.92	31.78	0.53	3.58	NOT DETECTED
49.	18-09-2025	67.58	27.46	25.37	30.24	0.48	3.53	NOT DETECTED
50.	22-09-2025	65.37	25.94	24.36	28.41	0.54	3.45	NOT DETECTED
51.	25-09-2025	69.14	28.47	26.51	30.73	0.63	3.53	NOT DETECTED
52.	29-09-2025	66.58	26.45	24.87	28.14	0.58	3.59	NOT DETECTED
Permissible Value as per NAAQMS		100.0	60.0	80.0	80.0	2.0	---	5.0
Test Method		IS - 5182, Part- 23	UERL/AIR/ SOP/11	IS - 5182, Part - 2	IS - 5182, Part - 6	IS - 5182, Part - 10	Gas analyzer	IS – 5182, Part – 11



Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

Results of Ambient Air Quality Monitoring

Name of Location		PUB / Adani House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
1.	03-04-2025	74.21	25.48	16.14	20.23	0.70	--	NOT DETECTED
2.	07-04-2025	69.52	22.16	14.35	28.69	0.67	2.47	NOT DETECTED
3.	10-04-2025	64.47	19.64	13.75	27.53	0.63	2.35	NOT DETECTED
4.	14-04-2025	61.85	18.62	12.58	16.42	0.57	2.28	NOT DETECTED
5.	17-04-2025	63.47	19.79	13.36	17.88	0.61	2.37	NOT DETECTED
6.	21-04-2025	68.17	21.54	15.67	19.45	0.66	2.45	NOT DETECTED
7.	24-04-2025	73.26	25.75	18.31	22.72	0.71	2.53	NOT DETECTED
8.	28-04-2025	66.58	23.27	16.35	20.48	0.65	2.48	NOT DETECTED
9.	01-05-2025	72.34	23.24	15.34	18.80	0.67	2.75	NOT DETECTED
10.	05-05-2025	67.87	21.12	13.21	17.67	0.58	2.37	NOT DETECTED
11.	08-05-2025	63.21	18.78	14.65	18.98	0.61	2.28	NOT DETECTED
12.	12-05-2025	60.87	19.89	11.12	15.45	0.55	2.45	NOT DETECTED
13.	15-05-2025	62.23	18.23	12.12	16.34	0.64	2.41	NOT DETECTED
14.	19-05-2025	70.20	20.78	14.23	18.76	0.61	2.32	NOT DETECTED
15.	22-05-2025	67.34	24.32	17.54	21.12	0.74	2.45	NOT DETECTED

Continue...

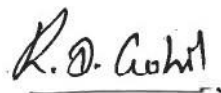
Name of Location		PUB / Adani House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
16.	26-05-2025	64.21	21.12	14.21	18.56	0.60	2.38	NOT DETECTED
17.	29-05-2025	61.21	18.78	13.21	17.34	0.58	2.12	NOT DETECTED
18.	02-06-2025	63.47	19.76	12.47	16.25	0.49	2.36	NOT DETECTED
19.	05-06-2025	57.59	18.23	11.64	14.97	0.44	2.42	NOT DETECTED
20.	09-06-2025	65.49	20.86	14.36	19.42	0.56	2.54	NOT DETECTED
21.	12-06-2025	68.13	23.45	15.74	19.83	0.62	2.64	NOT DETECTED
22.	16-06-2025	59.63	19.84	13.42	17.38	0.54	2.47	NOT DETECTED
23.	19-06-2025	56.37	16.54	10.85	14.18	0.51	2.35	NOT DETECTED
24.	23-06-2025	58.21	17.18	11.53	16.25	0.59	2.30	NOT DETECTED
25.	26-06-2025	63.25	20.98	13.25	17.24	0.67	2.41	NOT DETECTED
26.	30-06-2025	60.65	19.52	12.25	16.42	0.60	2.38	NOT DETECTED
27.	03-07-2025	55.47	18.24	13.65	17.43	0.56	--	NOT DETECTED
28.	07-07-2025	59.31	20.85	14.93	17.97	0.61	2.33	NOT DETECTED
29.	10-07-2025	57.59	18.87	13.26	16.78	0.54	2.24	NOT DETECTED
30.	14-07-2025	62.37	21.28	16.49	20.31	0.64	2.29	NOT DETECTED
31.	17-07-2025	65.48	23.64	19.11	23.46	0.67	2.37	NOT DETECTED

Continue...

Name of Location		PUB / Adani House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
32.	21-07-2025	60.32	20.97	17.15	21.78	0.52	2.34	NOT DETECTED
33.	24-07-2025	56.39	16.84	14.31	18.52	0.45	2.27	NOT DETECTED
34.	28-07-2025	51.66	13.82	12.94	16.85	0.39	2.19	NOT DETECTED
35.	31-07-2025	53.09	15.53	13.78	17.31	0.42	2.22	NOT DETECTED
36.	04-08-2025	58.25	17.36	14.08	17.59	0.46	2.24	NOT DETECTED
37.	07-08-2025	62.49	18.76	15.95	20.13	0.49	2.30	NOT DETECTED
38.	11-08-2025	64.13	20.15	17.11	21.54	0.56	2.36	NOT DETECTED
39.	14-08-2025	60.28	18.31	14.56	18.62	0.52	2.32	NOT DETECTED
40.	18-08-2025	54.13	15.64	12.43	16.29	0.41	2.25	NOT DETECTED
41.	21-08-2025	51.21	14.62	11.49	15.31	0.37	2.17	NOT DETECTED
42.	25-08-2025	56.79	16.05	13.42	17.48	0.46	2.20	NOT DETECTED
43.	28-08-2025	62.15	18.52	16.89	20.16	0.54	2.28	NOT DETECTED
44.	01-09-2025	64.38	20.42	15.75	19.31	0.56	2.31	NOT DETECTED
45.	04-09-2025	67.58	22.35	16.14	20.34	0.59	2.28	NOT DETECTED
46.	08-09-2025	61.82	17.46	14.29	19.45	0.45	2.15	NOT DETECTED
47.	11-09-2025	65.47	19.32	15.38	19.12	0.49	2.37	NOT DETECTED

Continue...

Name of Location		PUB / Adani House						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
48.	15-09-2025	69.78	22.35	18.67	22.45	0.60	2.49	NOT DETECTED
49.	18-09-2025	62.18	20.45	16.37	20.57	0.54	2.38	NOT DETECTED
50.	22-09-2025	56.49	15.93	12.35	15.42	0.31	2.24	NOT DETECTED
51.	25-09-2025	58.64	16.78	13.39	17.57	0.26	2.30	NOT DETECTED
52.	29-09-2025	60.13	19.24	14.67	18.42	0.40	2.35	NOT DETECTED
Permissible Value as per NAAQMS		100.0	60.0	80.0	80.0	2.0	---	5.0
Test Method		IS - 5182, Part- 23	UERL/AIR/ SOP/11	IS - 5182, Part - 2	IS - 5182, Part - 6	IS - 5182, Part - 10	Gas analyzer	IS – 5182, Part – 11



Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

Results of Ambient Air Quality Monitoring

Name of Location		CT-4 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
1.	03-04-2025	82.53	32.36	31.41	36.17	0.81	--	NOT DETECTED
2.	07-04-2025	79.81	30.64	29.43	33.69	0.77	4.16	NOT DETECTED
3.	10-04-2025	76.51	27.15	27.96	32.48	0.73	4.11	NOT DETECTED
4.	14-04-2025	80.13	32.19	30.42	35.16	0.80	4.21	NOT DETECTED
5.	17-04-2025	83.45	34.56	32.27	37.52	0.88	4.26	NOT DETECTED
6.	21-04-2025	76.81	29.28	27.15	32.19	0.79	4.15	NOT DETECTED
7.	24-04-2025	78.54	30.71	28.57	33.78	0.83	4.19	NOT DETECTED
8.	28-04-2025	82.43	34.65	31.43	36.55	0.91	4.23	NOT DETECTED
9.	01-05-2025	80.34	30.89	27.89	31.23	0.76	4.12	NOT DETECTED
10.	05-05-2025	78.45	28.78	31.21	35.34	0.65	4.28	NOT DETECTED
11.	08-05-2025	74.34	25.56	25.65	29.98	0.70	4.18	NOT DETECTED
12.	12-05-2025	79.45	30.98	29.89	33.23	0.78	4.22	NOT DETECTED
13.	15-05-2025	80.12	31.23	30.76	34.23	0.81	4.16	NOT DETECTED
14.	19-05-2025	74.34	28.78	26.56	29.98	0.75	4.22	NOT DETECTED
15.	22-05-2025	77.21	26.78	27.34	31.23	0.87	4.25	NOT DETECTED

Continue...

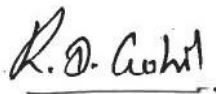
Name of Location		CT-4 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
16.	26-05-2025	80.78	30.98	29.98	32.43	0.76	4.15	NOT DETECTED
17.	29-05-2025	76.56	27.67	30.12	34.23	0.82	4.22	NOT DETECTED
18.	02-06-2025	74.38	26.77	28.15	32.64	0.74	4.10	NOT DETECTED
19.	05-06-2025	77.35	29.13	29.97	32.98	0.78	4.21	NOT DETECTED
20.	09-06-2025	80.81	32.64	32.13	36.47	0.84	4.37	NOT DETECTED
21.	12-06-2025	78.13	28.79	28.42	33.11	0.76	4.27	NOT DETECTED
22.	16-06-2025	70.18	24.26	25.31	29.84	0.61	4.00	NOT DETECTED
23.	19-06-2025	67.48	23.65	22.76	26.49	0.58	3.88	NOT DETECTED
24.	23-06-2025	72.35	26.82	24.36	28.12	0.65	4.11	NOT DETECTED
25.	26-06-2025	75.27	27.64	26.83	31.52	0.70	4.18	NOT DETECTED
26.	30-06-2025	70.63	25.11	24.77	28.61	0.67	4.06	NOT DETECTED
27.	03-07-2025	72.19	24.86	23.91	28.13	0.65	--	NOT DETECTED
28.	07-07-2025	66.59	21.28	19.75	23.59	0.59	4.00	NOT DETECTED
29.	10-07-2025	69.42	23.65	20.14	26.42	0.63	3.91	NOT DETECTED
30.	14-07-2025	64.38	19.86	17.64	22.90	0.55	3.85	NOT DETECTED
31.	17-07-2025	68.68	21.40	19.32	24.89	0.58	3.96	NOT DETECTED

Continue...

Name of Location		CT-4 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
32.	21-07-2025	70.13	26.57	21.38	26.57	0.65	4.13	NOT DETECTED
33.	24-07-2025	62.18	22.91	16.39	21.11	0.60	3.87	NOT DETECTED
34.	28-07-2025	60.49	18.73	15.34	19.69	0.51	3.83	NOT DETECTED
35.	31-07-2025	65.37	20.45	17.58	22.71	0.55	3.94	NOT DETECTED
36.	04-08-2025	67.58	22.16	20.47	25.64	0.59	4.12	NOT DETECTED
37.	07-08-2025	70.16	24.74	23.46	27.89	0.64	4.21	NOT DETECTED
38.	11-08-2025	73.15	27.38	26.73	30.16	0.71	4.35	NOT DETECTED
39.	14-08-2025	69.43	23.54	22.91	26.79	0.68	4.28	NOT DETECTED
40.	18-08-2025	62.13	20.19	16.42	21.42	0.60	4.15	NOT DETECTED
41.	21-08-2025	64.61	21.63	17.84	21.18	0.62	4.24	NOT DETECTED
42.	25-08-2025	68.46	24.98	21.76	26.39	0.72	4.30	NOT DETECTED
43.	28-08-2025	70.17	25.86	23.51	27.48	0.68	4.36	NOT DETECTED
44.	01-09-2025	73.18	29.74	26.46	31.87	0.65	4.43	NOT DETECTED
45.	04-09-2025	75.19	32.45	29.11	33.62	0.73	4.51	NOT DETECTED
46.	08-09-2025	69.58	25.47	23.56	26.89	0.61	4.37	NOT DETECTED
47.	11-09-2025	72.49	30.58	27.13	31.25	0.76	4.64	NOT DETECTED

Continue...

Name of Location		CT-4 RMU-2						
Sr. No.	Date of Monitoring	Parameter with Results						
		PM ₁₀ µg/m ³	PM _{2.5} µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO mg/m ³	HC µg/m ³	Benzene µg/m ³
48.	15-09-2025	77.38	33.46	30.68	36.14	0.83	4.71	NOT DETECTED
49.	18-09-2025	71.22	27.56	25.31	29.45	0.77	4.62	NOT DETECTED
50.	22-09-2025	64.29	24.31	21.35	24.22	0.59	4.41	NOT DETECTED
51.	25-09-2025	67.58	26.40	24.48	27.87	0.62	4.47	NOT DETECTED
52.	29-09-2025	69.32	29.84	25.10	29.23	0.70	4.33	NOT DETECTED
Permissible Value as per NAAQMS		100.0	60.0	80.0	80.0	2.0	---	5.0
Test Method		IS - 5182, Part- 23	UERL/AIR/ SOP/11	IS - 5182, Part - 2	IS - 5182, Part - 6	IS - 5182, Part - 10	Gas analyzer	IS – 5182, Part – 11


Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

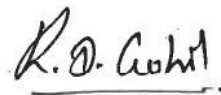
Results of Noise Level Monitoring

Location Name		CT3 RMU-2					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Day Time					
		14-04-2025	12-05-2025	12-06-2025	14-07-2025	14-08-2025	11-09-2025
1	06:00 to 07:00	60.5	64.5	64.8	64.5	64.3	64.1
2	07:00 to 08:00	63.4	69.2	68.7	66.3	65.8	64.8
3	08:00 to 09:00	64.5	67.8	67.3	66.8	66.8	65.7
4	09:00 to 10:00	65.8	69.5	68.6	65.8	65.8	66.3
5	10:00 to 11:00	67.1	65.3	68.1	67.5	67.3	66.2
6	11:00 to 12:00	66.8	60.6	69.5	68.8	67.7	67.5
7	12:00 to 13:00	66.5	65.5	68.5	67.5	67.2	64.5
8	13:00 to 14:00	67.1	67.2	67.3	66.7	64.3	67.7
9	14:00 to 15:00	66.4	68.5	65.2	64.3	64.9	64.2
10	15:00 to 16:00	64.3	66.5	67.5	63.2	65.2	64.3
11	16:00 to 17:00	64.5	65.5	64.8	65.3	64.7	61.3
12	17:00 to 18:00	65.4	68.9	66.2	66.7	64.5	63.5
13	18:00 to 19:00	66.3	67.2	65.9	65.5	65.1	64.8
14	19:00 to 20:00	64.8	66.7	66.3	66.1	63.8	64.2
15	20:00 to 21:00	63.1	65.4	64.5	63.4	64.6	63.5
16	21:00 to 22:00	61.9	63.9	62.8	62.4	62.6	61.9
Day Time		<75 dB (A)					

Continue...

Location Name		CT3 RMU-2					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) – Night Time					
		14-04-2025	12-05-2025	12-06-2025	14-07-2025	14-08-2025	11-09-2025
1	22:00 to 23:00	60.3	62.5	62.8	64.1	64.5	62.8
2	23:00 to 24:00	61.8	61.7	61.5	63.9	64.6	63.6
3	24:00 to 01:00	62.7	64.5	63.2	62.4	63.8	62.9
4	01:00 to 02:00	62.3	60.5	62.3	62.8	64.7	64.1
5	02:00 to 03:00	63.5	63.2	60.8	63.9	62.1	63.5
6	03:00 to 04:00	62.8	61.8	61.3	61.8	60.3	61.3
7	04:00 to 05:00	62.3	64.5	63.2	59.2	58.7	59.7
8	05:00 to 06:00	59.7	63.6	63.7	58.3	59.6	60.3
Night Time		<70 dB (A)					

Test Method	IS: 9989 : 1981
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Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

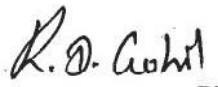
Results of Noise Level Monitoring

Location Name		Near Fire Station					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Day Time					
		07-04-2025	05-05-2025	05-06-2025	07-07-2025	07-08-2025	04-09-2025
1	06:00 to 07:00	62.5	65.8	63.7	62.8	64.1	62.3
2	07:00 to 08:00	63.2	67.9	65.4	65.1	64.4	64.5
3	08:00 to 09:00	64.5	69.3	68.7	66.4	65.8	64.8
4	09:00 to 10:00	63.6	68.6	68.2	67.9	67.6	66.2
5	10:00 to 11:00	66.4	68.3	67.4	66.4	65.4	64.3
6	11:00 to 12:00	65.6	67.3	68.4	67.2	66.8	65.7
7	12:00 to 13:00	65.1	66.2	65.3	67.5	67.1	66.2
8	13:00 to 14:00	65.8	68.2	66.9	66.9	66.9	65.7
9	14:00 to 15:00	66.2	67.5	64.3	65.1	65.5	63.2
10	15:00 to 16:00	64.8	62.9	66.4	66.4	66.4	64.3
11	16:00 to 17:00	64.3	66.4	65.4	64.8	64.3	65.1
12	17:00 to 18:00	64.3	62.6	65.9	65.4	64.2	63.9
13	18:00 to 19:00	63.2	65.5	64.3	64.1	62.8	63.4
14	19:00 to 20:00	63.5	68.5	66.8	65.7	63.7	64.2
15	20:00 to 21:00	64.2	66.7	64.3	64.3	63.4	61.9
16	21:00 to 22:00	60.1	62.8	62.2	62.6	61.2	61.5
Day Time		<75 dB (A)					

Continue...

Location Name		Near Fire Station					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Night Time					
		07-04-2025	05-05-2025	05-06-2025	07-07-2025	07-08-2025	04-09-2025
1	22:00 to 23:00	61.3	63.5	62.7	60.2	62.3	61.7
2	23:00 to 24:00	62.8	62.5	63.5	63.8	61.5	60.5
3	24:00 to 01:00	64.7	61.9	61.8	64.6	63.7	64.3
4	01:00 to 02:00	62.7	62.8	61.4	62.3	64.3	63.2
5	02:00 to 03:00	62.9	60.5	60.5	61.3	62.3	63.7
6	03:00 to 04:00	63.1	59.6	60.8	59.1	60.7	61.4
7	04:00 to 05:00	61.4	58.5	59.5	58.5	60.2	59.7
8	05:00 to 06:00	60.1	59.7	60.6	58.1	58.4	58.6
Night Time		<70 dB (A)					

Test Method	IS: 9989 : 1981
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Rajnish D. Gohil
(Chemist)




Jaivik S. Tandell
(Manager - Operations)


Results of Noise Level Monitoring

Location Name		ADANI PORT – TUG Berth 600 KL Pump House					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Day Time					
		10-04-2025	08-05-2025	09-06-2025	10-07-2025	11-08-2025	08-09-2025
1	06:00 to 07:00	57	63.4	63.4	63.3	62.7	60.5
2	07:00 to 08:00	59.6	66.9	66.2	64.8	63.8	61.2
3	08:00 to 09:00	61.3	65.5	64.5	65.7	65.7	63.4
4	09:00 to 10:00	65.4	69.6	68.7	66.6	66.6	63.9
5	10:00 to 11:00	65.8	65.2	69.3	68.6	68.3	67.5
6	11:00 to 12:00	64.3	66.5	68.3	68.2	67.5	65.4
7	12:00 to 13:00	65.3	69.5	67.8	66.3	66.4	67.2
8	13:00 to 14:00	64.3	67.5	66.4	65.8	65.5	66.9
9	14:00 to 15:00	64.3	68.2	67.6	68.3	66.3	65.4
10	15:00 to 16:00	64.2	69.5	68.1	67.3	67.7	65.1
11	16:00 to 17:00	65.8	68.5	66.2	65.9	65.8	64.3
12	17:00 to 18:00	63.4	68.2	67.4	67.2	65.4	64.8
13	18:00 to 19:00	65.1	69.5	68.7	68.4	67.3	66.9
14	19:00 to 20:00	64.3	65.5	64.3	65.8	65.6	66.5
15	20:00 to 21:00	60.5	61.5	63.2	64.8	65.6	64.3
16	21:00 to 22:00	58.8	64.5	63.5	63.1	63.5	62.4
Day Time		<75 dB (A)					

Continue...

Location Name		ADANI PORT – TUG Berth 600 KL Pump House					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Night Time					
		10-04-2025	08-05-2025	09-06-2025	10-07-2025	11-08-2025	08-09-2025
1	22:00 to 23:00	58.1	61.5	63.1	62.3	60.8	59.4
2	23:00 to 24:00	59.7	62.5	62.8	60.5	58.6	59.8
3	24:00 to 01:00	61.8	62.3	62.7	62.3	61.5	60.5
4	01:00 to 02:00	63.1	62.3	60.5	64.6	62.3	61.3
5	02:00 to 03:00	64.1	61.6	61.3	63.2	63.9	61.4
6	03:00 to 04:00	61.7	60.3	62.6	61.7	62.2	60.5
7	04:00 to 05:00	61.8	64.4	62.3	60.3	61.4	61.1
8	05:00 to 06:00	58.4	61.8	63.4	57.4	60.3	59.4
Day Time		<70 dB (A)					

Test Method	IS: 9989 : 1981
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Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)

Results of Noise Level Monitoring

Location Name		PUB/Adani House					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Day Time					
		03-04-2025	01-05-2025	02-06-2025	03-07-2025	04-08-2025	01-09-2025
1	06:00 to 07:00	61.8	62.6	60.2	60.5	61.4	58.4
2	07:00 to 08:00	64.3	65.6	64.7	62.8	63.7	61.3
3	08:00 to 09:00	63.2	68.6	66.9	65.7	64.5	62.8
4	09:00 to 10:00	65.1	65.5	67.3	65.5	65.5	64.5
5	10:00 to 11:00	64.3	68.3	68.5	67.2	66.2	66.7
6	11:00 to 12:00	65.4	68.9	67.4	68.8	67.9	66.4
7	12:00 to 13:00	66.5	65.4	66.3	66.3	65.8	65.3
8	13:00 to 14:00	65.8	66.3	65.4	62.3	64.5	65.8
9	14:00 to 15:00	63.2	68.5	67.8	64.7	65.3	66.2
10	15:00 to 16:00	65.8	64.5	65.3	65.3	66.2	65.4
11	16:00 to 17:00	66.5	68.3	67.5	67.5	67.1	66.2
12	17:00 to 18:00	62.3	65.6	64.1	64.5	65.7	67.6
13	18:00 to 19:00	64.7	67.2	65.7	66.1	65.5	66.1
14	19:00 to 20:00	64.8	63.5	64.2	64.2	64.2	65.3
15	20:00 to 21:00	63.1	60.5	62.7	62.7	63.6	61.4
16	21:00 to 22:00	58.4	62.8	60.4	60.3	59.8	60.1
Day Time		<75 dB (A)					

Continue...

Location Name		PUB/Adani House					
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Night Time					
		03-04-2025	01-05-2025	02-06-2025	03-07-2025	04-08-2025	01-09-2025
1	22:00 to 23:00	59.3	61.6	61.8	59.7	57.3	58.3
2	23:00 to 24:00	61.3	60.5	61.2	61.3	60.1	59.7
3	24:00 to 01:00	62.4	59.5	60.4	62.3	61.5	62.3
4	01:00 to 02:00	64.2	60.5	59.8	61.9	62.3	61.7
5	02:00 to 03:00	63.2	58.1	59.5	59.7	60.8	61.3
6	03:00 to 04:00	61.3	60.5	60.3	57.6	59.6	57.6
7	04:00 to 05:00	58.5	62.3	62.4	56.3	56.4	55.4
8	05:00 to 06:00	58.2	61.5	62.8	57.5	56.7	56.8
Day Time		<70 dB (A)					

Test Method	IS: 9989 : 1981
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Rajnish D. Gohil
(Chemist)




Jaivik S. Tandel
(Manager - Operations)


Results of Noise Level Monitoring

Location Name		CT-4 RMU-2				
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Day Time				
		23-04-2025	20-05-2025	21-06-2025	15-07-2025	20-08-2025
1	06:00 to 07:00	63.7	62.4	64.3	62.6	60.7
2	07:00 to 08:00	64.5	63.9	66.8	64.5	63.4
3	08:00 to 09:00	65.7	65.7	65.4	65.2	63.1
4	09:00 to 10:00	66.2	66.2	68.2	67.7	64.6
5	10:00 to 11:00	66.2	65.4	68.5	68.3	66.3
6	11:00 to 12:00	66.9	67.8	69.4	68.5	65.5
7	12:00 to 13:00	67.4	67.4	68.6	67.8	65.4
8	13:00 to 14:00	66.2	66.2	65.8	64.5	65.7
9	14:00 to 15:00	65.3	64.3	67.2	66.9	64.3
10	15:00 to 16:00	65.7	65.7	66.4	64.3	66.8
11	16:00 to 17:00	67.1	67.1	67.9	65.7	65.3
12	17:00 to 18:00	65.4	63.2	65.4	66.4	66.1
13	18:00 to 19:00	65.2	65.2	64.1	65.6	66.8
14	19:00 to 20:00	63.4	63.4	65.8	66.8	66.3
15	20:00 to 21:00	63.8	62.8	65.4	64.3	64.3
16	21:00 to 22:00	61.3	62.2	62.3	63.7	61.5
Day Time		<75 dB (A)				


Continue...

Location Name		CT-4 RMU-2				
Sr. No.	Sampling Date and Time	Noise Level Leq. dB(A) - Night Time				
		23-04-2025	20-05-2025	21-06-2025	15-07-2025	20-08-2025
1	22:00 to 23:00	61.3	60.8	61.7	62.8	61.3
2	23:00 to 24:00	63.2	62.4	63.3	60.5	61.8
3	24:00 to 01:00	63.5	63.5	62.7	64.3	62.3
4	01:00 to 02:00	64.3	63.8	60.4	61.6	62.5
5	02:00 to 03:00	64.6	64.2	59.9	62.4	63.7
6	03:00 to 04:00	62.4	62.4	60.4	64.1	62.5
7	04:00 to 05:00	61.2	61.2	60.7	62.6	61.3
8	05:00 to 06:00	60.8	60.3	61.4	60.1	58.6
Day Time		<70 dB (A)				

Test Method	IS: 9989 : 1981
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Rajnish D. Gohil
(Chemist)

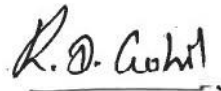



Jaivik S. Tandel
(Manager - Operations)

Results of Stack Monitoring								
Sr. No.	Parameter	Unit	Hot Water System-1 (Liquid Terminal)	Hot Water System-2 (Liquid Terminal)	Thermic Fluid Heater (Bitumin-1)	Thermic Fluid Heater (Bitumin-2)	GPCB LIMIT	Method of Test
Apr-25								
1	Particulate Matter	mg/Nm ³	22.81	20.51	21.47	20.27	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	7.64	6.64	8.41	7.97	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	21.27	21.36	20.19	20.72	50	IS 11255 (Part - 7)
May-25								
1	Particulate Matter	mg/Nm ³	21.78	20.16	20.83	20.95	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	7.42	6.51	8.17	7.81	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	20.98	22.16	19.79	21.11	50	IS 11255 (Part - 7)
Jun-25								
1	Particulate Matter	mg/Nm ³	20.92	19.67	18.36	19.81	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	7.11	6.39	8.28	7.60	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	19.85	21.15	19.31	20.54	50	IS 11255 (Part - 7)
Jul-25								
1	Particulate Matter	mg/Nm ³	20.36	20.05	19.12	19.13	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	6.89	6.18	8.41	7.35	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	20.12	20.84	20.03	19.85	50	IS 11255 (Part - 7)

Continue...

Sr. No.	Parameter	Unit	Hot Water System-1 (Liquid Terminal)	Hot Water System-2 (Liquid Terminal)	Thermic Fluid Heater (Bitumin-1)	Thermic Fluid Heater (Bitumin-2)	GPCB LIMIT	Method of Test
Aug-25								
1	Particulate Matter	mg/Nm ³	19.92	19.86	18.81	19.22	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	6.65	6.04	7.98	7.47	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	19.71	20.41	19.73	20.14	50	IS 11255 (Part - 7)
Sep-25								
1	Particulate Matter	mg/Nm ³	17.73	19.41	16.95	18.69	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	6.32	6.36	6.82	7.24	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	19.25	20.85	17.46	19.51	50	IS 11255 (Part - 7)


Rajnish D. Gohil
(Chemist)

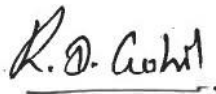



Jaivik S. Tandel
(Manager - Operations)

Results of Stack Monitoring								
Sr. No	Parameter	Unit	D.G. Set-6, 7 & 8 (1250 KVA - CT2) Common Stack	D.G. Set-9 (1500 KVA - CT3)	D.G. Set-10 (1500 KVA - CT3)	D.G. Set-11 (1500 KVA - CT3)	GPC B LIMI T	Method of Test
			Sep-25					
			24-09-2025	26-09-2025	26-09-2025	26-09-2025		
1	Particulate Matter	mg/Nm ³	25.61	18.41	19.75	17.72	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	9.17	14.26	14.19	14.11	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	20.55	15.38	28.53	21.35	50	IS 11255 (Part - 7)
4	Carbon Monoxide	mg/Nm ³	3.92	3.5	3.2	2.8	--	UERL/AIR/SOP/18
5	Non Methyl Hydro Carbon	ppm	Not Detected	Not Detected	Not Detected	Not Detected	--	UERL/AIR/SOP/27
Sr. No	Parameter	Unit	D.G. Set-12 (1500 KVA) - CT4	D.G. Set-13 (1500 KVA) - CT4	D.G. Set-14 (1500 KVA) - CT4	D.G. Set-1 (500 KVA) - DG House - MPT	GPC B LIMI T	Method of Test
			Sep-25					
			22-09-2025	22-09-2025	22-09-2025	04-09-2025		
1	Particulate Matter	mg/Nm ³	21.64	27.59	20.17	23.41	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	8.81	10.18	9.33	9.2	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	20.15	23.46	19.03	29.57	50	IS 11255 (Part - 7)
4	Carbon Monoxide	mg/Nm ³	3.4	4.52	4	3.18	--	UERL/AIR/SOP/18
5	Non Methyl Hydro Carbon	ppm	Not Detected	Not Detected	Not Detected	Not Detected	--	UERL/AIR/SOP/27

Continue...

Sr. No	Parameter	Unit	D.G. Set-2 (500 KVA) - DG House - MPT	D.G. Set-3 (500 KVA) - DG House - MPT	D.G. Set-4 (500 KVA) - DG House - MPT	D.G. Set-5 (500 KVA) - DG House - MPT	GPC B LIMIT	Method of Test
			Sep-25					
			04-09-2025	09-09-2025	09-09-2025	09-09-2025		
1	Particulate Matter	mg/Nm ³	26.79	20.91	27.29	20.36	150	IS 11255 (Part - 1)
2	Sulphur Dioxide as SO ₂	ppm	7.83	9.66	8.58	8.84	100	IS 11255 (Part - 2)
3	Oxides of Nitrogen as NO _x	ppm	31.27	26.83	30.41	27.53	50	IS 11255 (Part - 7)
4	Carbon Monoxide	mg/Nm ³	3.44	4.46	4.24	3.27	--	UERL/AIR/SOP/18
5	Non Methyl Hydro Carbon	ppm	Not Detected	Not Detected	Not Detected	Not Detected	--	UERL/AIR/SOP/27



Rajnish D. Gohil
(Chemist)



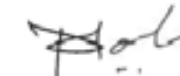

Jaivik S. Tandel
(Manager - Operations)

RESULTS OF BORE HOLE WATER

SR.NO.	TEST PARAMETERS	UNIT	Pump House-1	Pump House-2	Pump House-3	Near Unloading bays	Near ETP	TEST METHOD
			26-09-2025	26-09-2025	26-09-2025	26-09-2025	26-09-2025	
1.	pH @ 25 ° C	--	8.11	7.44	7.86	7.52	8.05	IS 3025(Part 11):2022
2.	Salinity	ppt	3.1	1.6	1.4	1.8	2.1	APHA 24th Ed.,2023,2520 B
3.	Oil & Grease	mg/L	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	IS 3025(Part 39):2021
4.	Hydrocarbon	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	GC/GCMS
5.	Lead as Pb	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	IS 3025 (PART 47) 1994
6.	Arsenic as As	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	APHA 24th Ed.,2023,3114-C
7.	Nickel as Ni	mg/L	BDL(MDL:0.02)	BDL(MDL:0.02)	0.068	BDL(MDL:0.02)	0.084	IS 3025 (PART 54) 2003
8.	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	IS 3025 (PART 52) 2003
9.	Cadmium as Cd	mg/L	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	BDL(MDL:0.003)	IS 3025(PART 41) 1992
10.	Mercury as Hg	mg/L	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	APHA 24th Ed.,2023, 3112-B
11.	Zinc as Zn	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	IS 3025(PART 49) 1994
12.	Copper as Cu	mg/L	0.059	0.066	0.074	0.062	0.094	IS 3025 (PART 42) 1992
13.	Iron as Fe	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	IS 3025(PART 53) 2003
14.	Insecticides/Pesticides	µg/L	Absent	Absent	Absent	Absent	Absent	USEPA 8081 B
15.	Depth of Water Level from Ground Level	meter	2	2	2	2.1	2	--



Mr. Nilesh Patel
Sr. Chemist

Mr. Nitin Tandel
Technical Manager

Minimum Detection Limit

Ambient Air Quality Monitoring

Sr. No.	Test Parameter	Unit	MDL
1	Particulate Matter (PM10)	µg/m ³	5 µg/m ³
2	Particulate Matter (PM2.5)	µg/m ³	5 µg/m ³
3	Sulphur Dioxide (SO ₂)	µg/m ³	4 µg/m ³
4	Nitrogen Dioxide (NO ₂)	µg/m ³	5 µg/m ³
5	Carbon Monoxide (CO)	mg/m ³	0.01 mg/m ³
6	Ammonia (NH ₃)	µg/m ³	5 µg/m ³
7	Ozone (O ₃)	µg/m ³	5 µg/m ³
8	Lead (Pb)	µg/m ³	0.5 µg/m ³
9	Nickle (Ni)	ng/m ³	1 ng/m ³
10	Arsenic (As)	ng/m ³	1 ng/m ³
11	Benzene	µg/m ³	1µg/m ³
12	Benzo(o)Pyrene	ng/m ³	0.1 ng/m ³
14	Hydro Carbon	µg/m ³	1 µg/m ³

Stack Emission Monitoring

Sr. No.	Test Parameter	Unit	MDL
1	Suspended particulate matter	mg/Nm ³	2 mg/Nm ³
2	Sulphur Dioxide SO _X	mg/Nm ³	4 mg/Nm ³
3	Oxides of Nitrogen NO _X	mg/Nm ³	5 mg/Nm ³

ETP Water

Sr. No.	Test Parameter	Unit	MDL
1	Colour	Pt. Co. Scale	5
2	pH @ 27 ° C	--	2
3	Temperature	OC	5
4	Total Suspended Solids	mg/L	4
5	Total Dissolved Solids	mg/L	4
6	COD	mg/L	2
7	BOD (3 days at 27 OC)	mg/L	1
8	Chloride (as Cl) -	mg/L	1
9	Oil & Grease	mg/L	4
10	Sulphate (as SO4)	mg/L	1
11	Ammonical Nitrogen	mg/L	5
12	Phenolic Compound	mg/L	0.1
13	Copper as Cu	mg/L	0.05
14	Lead as Pb	mg/L	0.01
15	Sulphide as S	mg/L	0.1
16	Cadmium as Cd	mg/L	0.003
17	Fluoride as F	mg/L	0.2
18	Residual Chlorine	mg/L	0.1
19	Percent Sodium	%	--
20	Sodium Absorption ratio	--	--

MARINE WATER			
Sr. No.	Test Parameter	Unit	MDL
1	pH	--	5
2	Temperature	oC	5
3	Total Suspended Solids	mg/L	4
4	BOD (3 Days @ 27oC)	mg/L	1
5	Dissolved Oxygen	mg/L	0.2
6	Salinity	ppt	0.01
7	Oil & Grease	mg/L	2
8	Nitrate as NO ₃	µmol/L	0.4
9	Nitrite as NO ₂	µmol/L	0.04
10	Ammonical Nitrogen as NH ₃	µmol/L	0.8
11	Phosphates as PO ₄	µmol/L	0.4
12	Total Nitrogen	µmol/L	2.2
13	Petroleum Hydrocarbon	µg/L	0.1
14	Total Dissolved Solids	mg/L	4
15	COD	mg/L	2

Sea SEDIMENT			
Sr. No.	Test Parameter	Unit	MDL
1	Organic Matter	%	0.5
2	Phosphorus as P	µg/g	1
3	Texture	--	--
4	Petroleum Hydrocarbon	µg/g	0.1
5	Aluminum as Al	%	0.1
6	Total Chromium as Cr+3	µg/g	2
7	Manganese as Mn	µg/g	1
8	Iron as Fe	%	0.1
9	Nickel as Ni	µg/g	1
10	Copper as Cu	µg/g	1
11	Zinc as Zn	µg/g	1
12	Lead as Pb	µg/g	1
13	Mercury as Hg	µg/g	0.05

BORE HOLE WATER

Sr. No.	Test Parameter	Unit	MDL
1	pH @ 25 ° C	--	5
2	Salinity	ppt	--
3	Oil & Grease	mg/L	2
4	Hydrocarbon	mg/L	0.1
5	Lead as Pb	mg/L	0.01
6	Arsenic as As	mg/L	0.01
7	Nickel as Ni	mg/L	0.02
8	Total Chromium as Cr	mg/L	0.05
9	Cadmium as Cd	mg/L	0.003
10	Mercury as Hg	mg/L	0.001
11	Zinc as Zn	mg/L	0.05
12	Copper as Cu	mg/L	0.05
13	Iron as Fe	mg/L	0.1
14	Insecticides/Pesticides	µg/L	0.1
15	Depth of Water Level from Ground Level	meter	--

Annexure – 6



ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED



PIPE - TO - SOIL MONITORING REPORT

MAINTENANCE BASE : MUNDRA
 PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA
 CP STATION LOCATION : TP2
 CP SYSTEM PARAMETERS : DC Voltage = 4.01 VOLTS; DC Current = 2.60 AMP

DATE : 29.04.2025
 REPORT NO : APRIL25/36
 DATE OF MONITORING : 29.04.2025

TLP NO.	Type	Chainage KM	ON PSP (-volt)	OFF PSP (-volt)	AC VOLTAGE	Casing (-V w.r.t CSE)				Polarization coupon (-V w.r.t CSE)		HT Crossing		Foreign pipeline PSP (V w.r.t CSE)	Isolating Joint (-V w.r.t CSE)		Remarks
						Carrier PSP	Casing PSP	Casing Anode Potential (-V)	Casing Anode Current (mA)	ON PSP	OFF PSP	ZN Anode Potential (-V)	ZN Anode Resistance		Protected side PSP	Unprotected side PSP	
1	E	0.000	1.290	-	0.020	-	-	-	-	-	-	-	-	1.290	1.086		
2	D	0.425	1.309	-	0.023	1.309	0.690	NA	NA	-	-	-	-	-	-		
3	A	1.400	1.301	-	0.018	-	-	-	-	-	-	-	-	-	-		
4	A	2.400	1.357	-	0.011	-	-	-	-	-	-	-	-	-	-		
5	A	3.000	1.261	-	0.001	-	-	-	-	-	-	-	-	-	-		
6	D	3.440	1.244	-	0.002	1.244	0.552	NA	NA	-	-	-	-	-	-		
7	A	4.300	1.191	-	0.011	-	-	-	-	-	-	-	-	-	-		
8	A	5.200	1.199	-	0.013	-	-	-	-	-	-	-	-	-	-		
9	A	5.900	1.236	-	0.021	-	-	-	-	-	-	-	-	-	-		
10	E	6.200	1.087	-	0.042	-	-	-	-	-	-	-	-	1.087	0.772		

Remarks:

Monitored by : SAP ENPROCON PVT LTD

Signature:

Name :

Designation : CP Engineer



Reviewed by :

Signature

Name :

Disignation :

Graphical Representation of ON Measured PSP

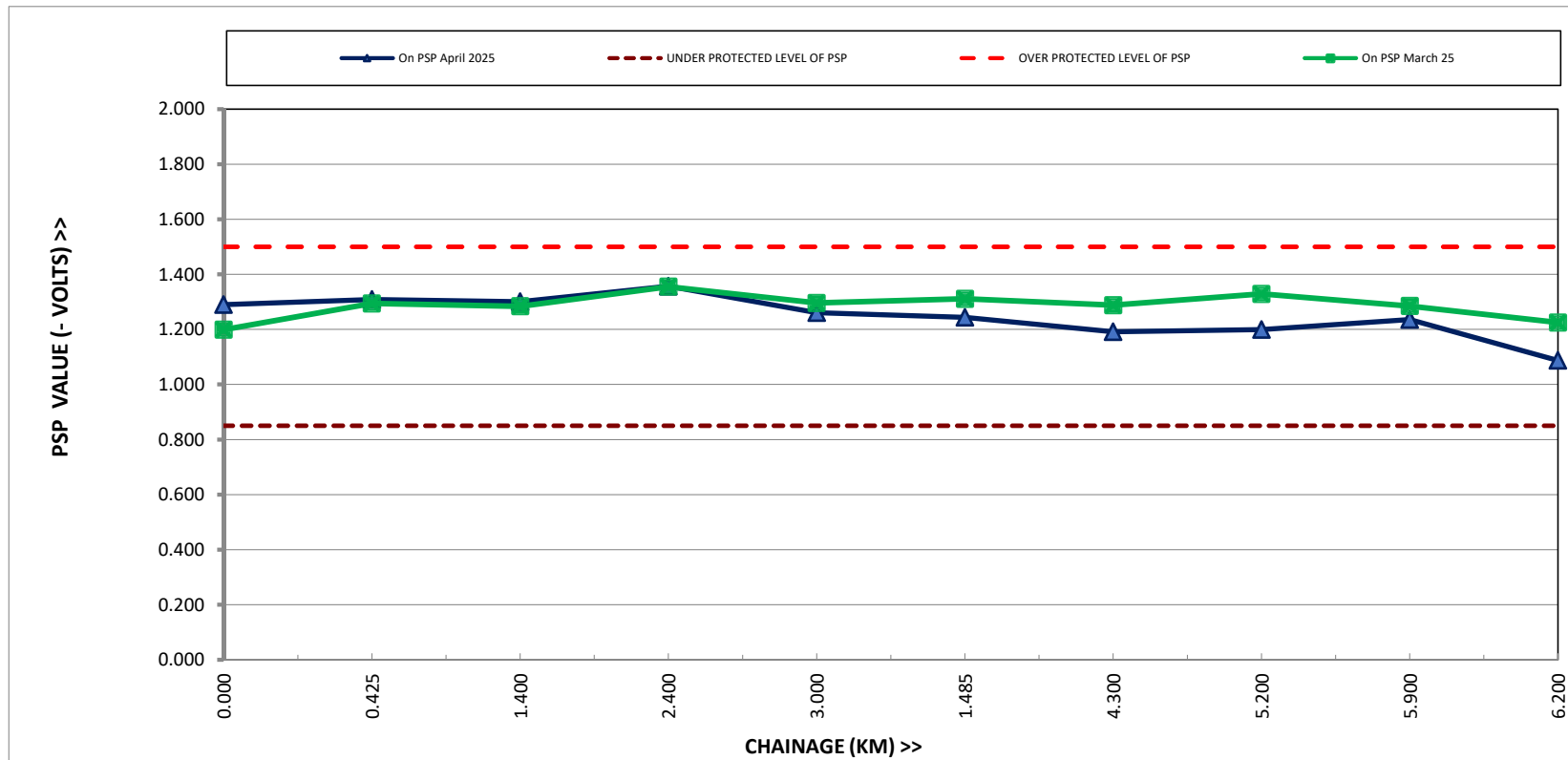
MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage (V) = 4.01 DC Current (A) = 2.60

CP CONTRACTOR: SAP ENPROCON PVT LTD



LEGENDS

APRIL 2025 ON PSP (VOLT)	(Blue Solid)
MARCH 2025 ON PSP (VOLT)	(Green Solid)
UNDER PROTECTED LEVEL OF PSP	(Brown Broken)
OVER PROTECTED LEVEL OF PSP	(Red Dashed)

Note : PSP value measured wrt Cu-CuSO4 portable reference Cell.





ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED



PIPE - TO - SOIL MONITORING REPORT

MAINTENANCE BASE : MUNDRA
PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA
CP STATION LOCATION : TP2
CP SYSTEM PARAMETERS : DC Voltage = 3.30 VOLTS; DC Current = 2.35 AMP

DATE : 28-05-2025
REPORT NO : MAY25/37
DATE OF MONITORING : 28-05-2025

TLP NO.	Type	Chainage KM	ON PSP (-volt)	OFF PSP (-volt)	AC VOLTAGE	Casing (-V w.r.t CSE)				Polarization coupon (-V w.r.t CSE)		HT Crossing		Foreign pipeline PSP (V w.r.t CSE)	Isolating Joint (-V w.r.t CSE)		Remarks
						Carrier PSP	Casing PSP	Casing Anode Potential (-V)	Casing Anode Current (mA)	ON PSP	OFF PSP	ZN Anode Potential (-V)	ZN Anode Resistance		Protected side PSP	Unprotected side PSP	
1	E	0.000	1.343	1.021	0.082	-	-	-	-	-	-	-	-	1.343	1.040		
2	D	0.425	1.188	0.91	0.040	1.188	0.747	NA	NA	-	-	-	-	-	-		
3	A	1.400	1.306	1.079	0.037	-	-	-	-	-	-	-	-	-	-		
4	A	2.400	1.352	1.039	0.021	-	-	-	-	-	-	-	-	-	-		
5	A	3.000	1.323	1.012	0.037	-	-	-	-	-	-	-	-	-	-		
6	D	3.440	1.310	1.008	0.080	1.310	0.552	NA	NA	-	-	-	-	-	-		
7	A	4.300	1.278	1.030	0.090	-	-	-	-	-	-	-	-	-	-		
8	A	5.200	1.289	1.04	0.085	-	-	-	-	-	-	-	-	-	-		
9	A	5.900	1.277	1.027	0.037	-	-	-	-	-	-	-	-	-	-		
10	E	6.200	1.316	1.081	0.015	-	-	-	-	-	-	-	-	1.316	0.820		

Remarks:

Monitored by : SAP ENPROCON PVT LTD

Signature:

Name :

Designation : CP Engineer



Reviewed by :

Signature

Name :

Disignation :

Graphical Representation of ON-OFF Measured PSP

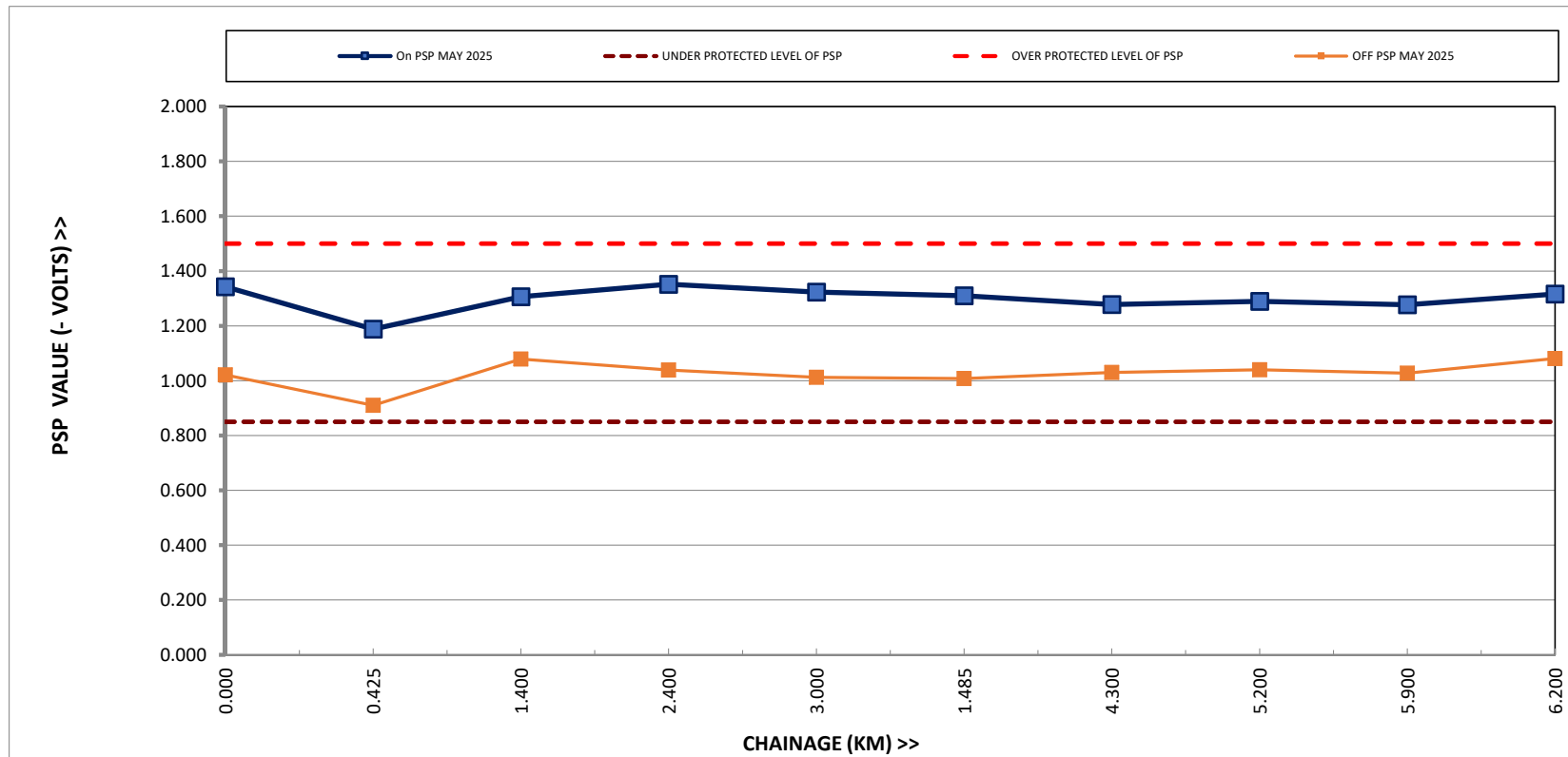
MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage (V) = 3.30 V DC Current (A) = 2.35 A

CP CONTRACTOR: SAP ENPROCON PVT LTD



LEGENDS

MAY 2025 ON PSP (VOLT)	—■—	(Blue Solid)
MAY 2025 OFF PSP (VOLT)	—■—	(Orange Solid)
UNDER PROTECTED LEVEL OF PSP	- - -	(Brown Broken)
OVER PROTECTED LEVEL OF PSP	- - -	(Red Dashed)

Note : PSP value measured wrt Cu-CuSO4 portable reference Cell.





ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED



PIPE - TO - SOIL MONITORING REPORT

MAINTENANCE BASE : MUNDRA
 PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA
 CP STATION LOCATION : TP2
 CP SYSTEM PARAMETERS : DC Voltage = 3.24 VOLTS; DC Current = 2.30 AMP

DATE : 30.06.2025
 REPORT NO : JUNE 25/38
 DATE OF MONITORING : 30.06.2025

TLP NO.	Type	Chainage KM	ON PSP (-volt)	OFF PSP (-volt)	AC VOLTAGE	Casing (-V w.r.t CSE)				Polarization coupon (-V w.r.t CSE)		HT Crossing		Foreign pipeline PSP (V w.r.t CSE)	Isolating Joint (-V w.r.t CSE)		Remarks
						Carrier PSP	Casing PSP	Casing Anode Potential (-V)	Casing Anode Current (mA)	ON PSP	OFF PSP	ZN Anode Potential (-V)	ZN Anode Resistance		Protected side PSP	Unprotected side PSP	
1	E	0.000	1.359	-	0.031	-	-	-	-	-	-	-	-	1.359	1.054		
2	D	0.425	1.383	-	0.030	1.383	0.715	NA	NA	-	-	-	-	-	-		
3	A	1.400	1.409	-	0.023	-	-	-	-	-	-	-	-	-	-		
4	A	2.400	1.410	-	0.013	-	-	-	-	-	-	-	-	-	-		
5	A	3.000	1.373	-	0.002	-	-	-	-	-	-	-	-	-	-		
6	D	3.440	1.372	-	0.001	1.372	0.509	NA	NA	-	-	-	-	-	-		
7	A	4.300	1.310	-	0.007	-	-	-	-	-	-	-	-	-	-		
8	A	5.200	1.301	-	0.010	-	-	-	-	-	-	-	-	-	-		
9	A	5.900	1.357	-	0.016	-	-	-	-	-	-	-	-	-	-		
10	E	6.200	1.363	-	0.041	-	-	-	-	-	-	-	-	1.363	0.993		

Remarks:

Monitored by : SAP ENPROCON PVT LTD

Signature:

Name : Sanjay Panchal

Designation : CP Engineer



Reviewed by :

Signature

Name :

Disignation :

Graphical Representation of ON Mesured PSP

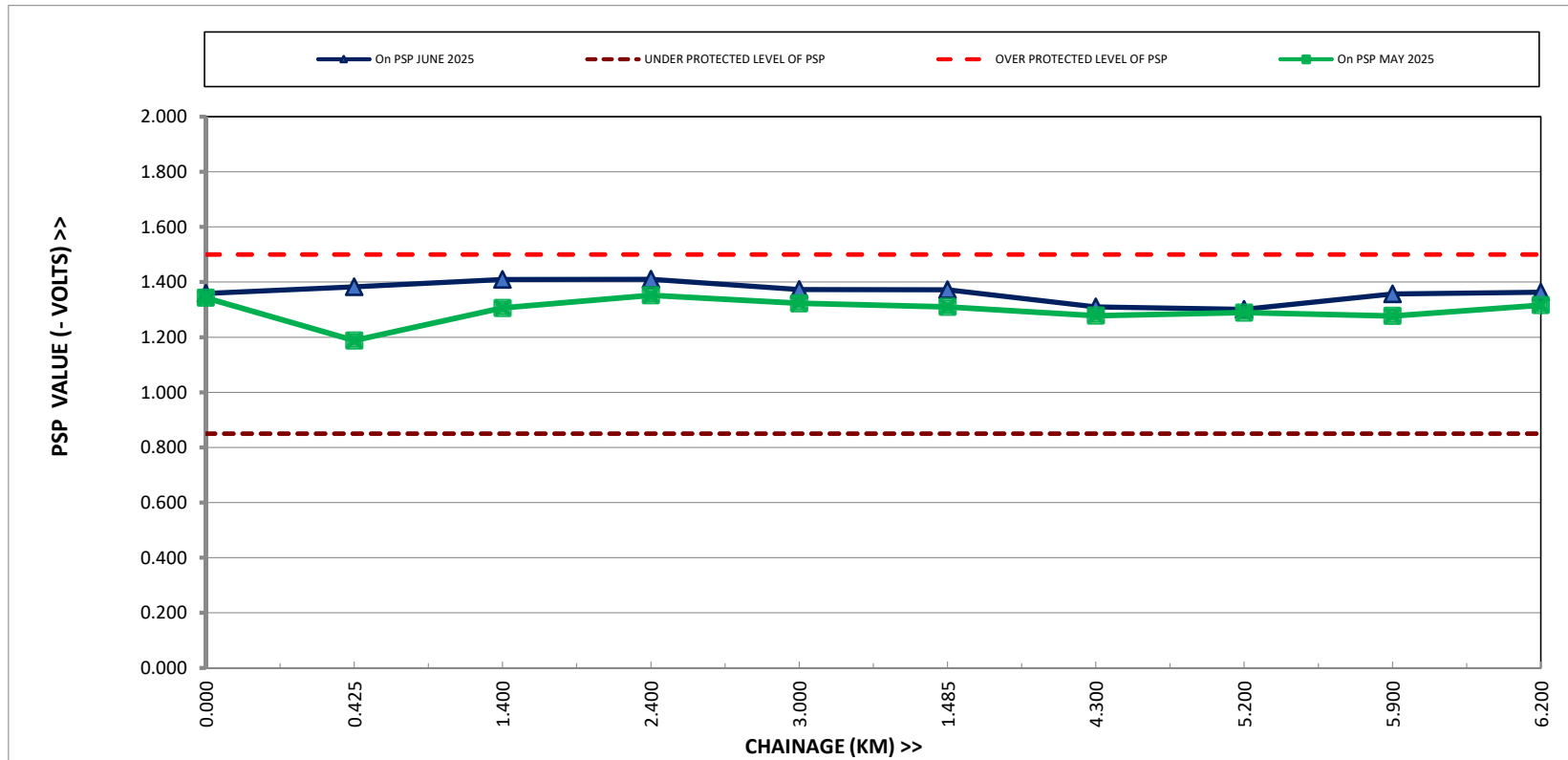
MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage (V) = 3.24 V DC Current (A) = 2.30 A

CP CONTRACTOR: SAP ENPROCON PVT LTD



LEGENDS

JUNE 2025 ON PSP (VOLT)		(Blue Solid)
MAY 2025 ON PSP (VOLT)		(Green Solid)
UNDER PROTECTED LEVEL OF PSP		(Brown Broken)
OVER PROTECTED LEVEL OF PSP		(Red Dashed)

Note : PSP value measured wrt Cu-CuSO4 portable reference Cell.





ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED



PIPE - TO - SOIL MONITORING REPORT

MAINTENANCE BASE : MUNDRA
 PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA
 CP STATION LOCATION : TP2
 CP SYSTEM PARAMETERS : DC Voltage = 4.900 VOLTS; DC Current = 2.70 AMP

DATE : 29.07.2025
 REPORT NO : JULY 25/39
 DATE OF MONITORING : 29.07.2025

TLP NO.	Type	Chainage KM	ON PSP (-volt)	OFF PSP (-volt)	AC VOLTAGE	Casing (-V w.r.t CSE)				Polarization coupon (-V w.r.t CSE)		HT Crossing		Foreign pipeline PSP (V w.r.t CSE)	Isolating Joint (-V w.r.t CSE)		Remarks
						Carrier PSP	Casing PSP	Casing Anode Potential (-V)	Casing Anode Current (mA)	ON PSP	OFF PSP	ZN Anode Potential (-V)	ZN Anode Resistance		Protected side PSP	Unprotected side PSP	
1	E	0.000	1.368	-	0.022	-	-	-	-	-	-	-	-	1.368	1.059		
2	D	0.425	1.402	-	0.027	1.402	0.689	NA	NA	-	-	-	-	-	-		
3	A	1.400	1.386	-	0.017	-	-	-	-	-	-	-	-	-	-		
4	A	2.400	1.327	-	0.010	-	-	-	-	-	-	-	-	-	-		
5	A	3.000	1.318	-	0.068	-	-	-	-	-	-	-	-	-	-		
6	D	3.440	1.314	-	0.012	1.314	0.565	NA	NA	-	-	-	-	-	-		
7	A	4.300	1.298	-	0.007	-	-	-	-	-	-	-	-	-	-		
8	A	5.200	1.300	-	0.019	-	-	-	-	-	-	-	-	-	-		
9	A	5.900	1.298	-	0.012	-	-	-	-	-	-	-	-	-	-		
10	E	6.200	1.388	-	0.066	-	-	-	-	-	-	-	-	1.388	1.047		

Remarks:

Monitored by : SAP ENPROCON PVT LTD

Signature:

Name : Sanjay Panchal

Designation : CP Engineer



Reviewed by :

Signature

Name :

Disignation :

Graphical Representation of ON Mesured PSP

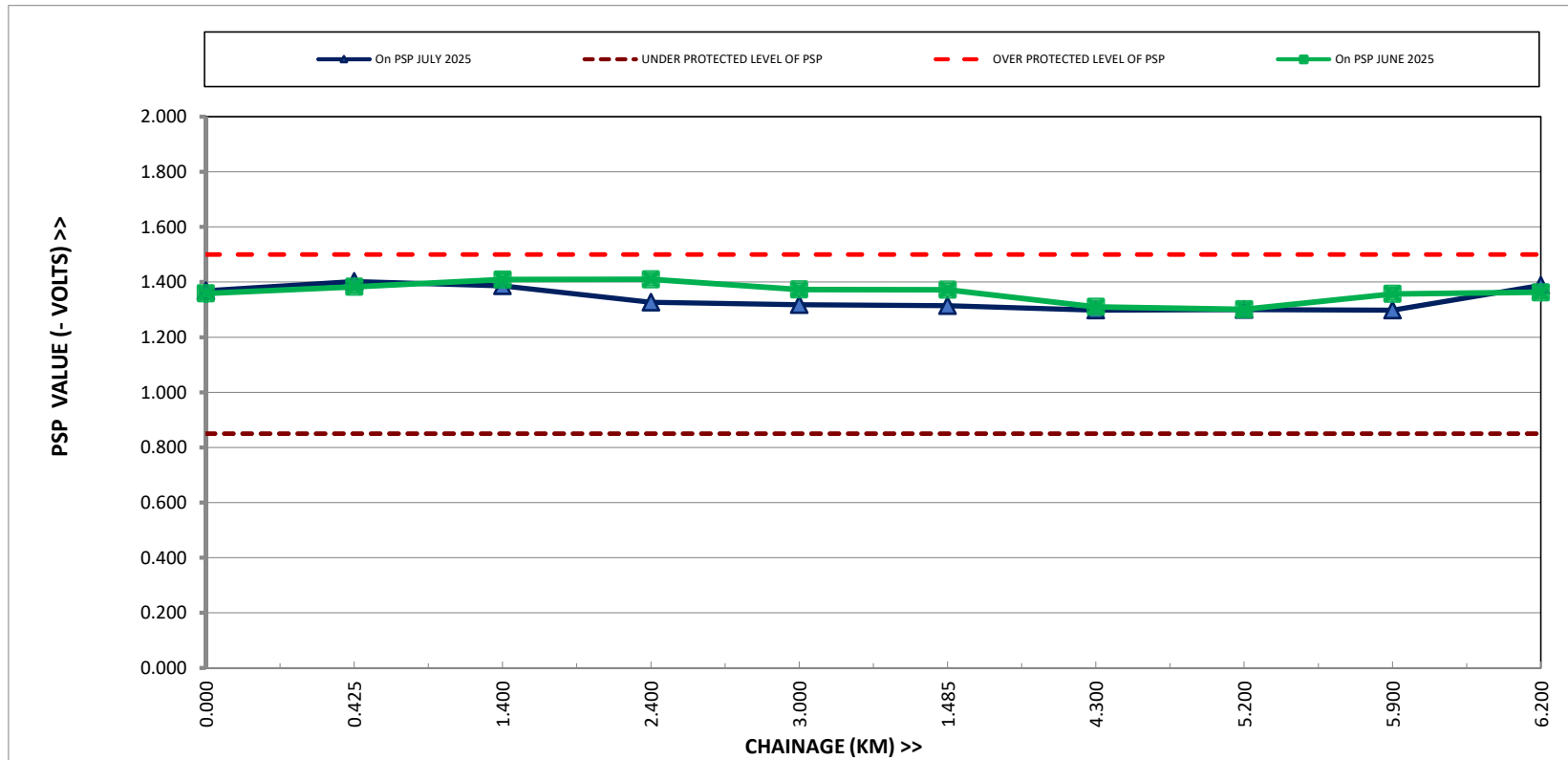
MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage (V) = 4.90 V DC Current (A) = 2.70 A

CP CONTRACTOR: SAP ENPROCON PVT LTD



LEGENDS		
JULY 2025 ON PSP (VOLT)	—	(Blue Solid)
JUNE 2025 ON PSP (VOLT)	—	(Green Solid)
UNDER PROTECTED LEVEL OF PSP	- - -	(Brown Broken)
OVER PROTECTED LEVEL OF PSP	- - -	(Red Dashed)

Note : PSP value measured wrt Cu-CuSO4 portable reference Cell.



PIPE - TO - SOIL MONITORING REPORT

MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage = 3.87 VOLTS; DC Current = 2.80 AMP

DATE : 29.08.2025

REPORT NO : AUGUST 25/40

DATE OF MONITORING : 29.08.2025

TLP NO.	Type	Chainage KM	ON PSP (-volt)	OFF PSP (-volt)	AC VOLTAGE	Casing (-V w.r.t CSE)				Polarization coupon (-V w.r.t CSE)		HT Crossing		Foreign pipeline PSP (V w.r.t CSE)	Isolating Joint (-V w.r.t CSE)		Remarks
						Carrier PSP	Casing PSP	Casing Anode Potential (-V)	Casing Anode Current (mA)	ON PSP	OFF PSP	ZN Anode Potential (-V)	ZN Anode Resistance		Protected side PSP	Unprotected side PSP	
1	E	0.000	1.313	-	0.024	-	-	-	-	-	-	-	-	-	1.313	1.081	
2	D	0.425	1.324	-	0.024	1.324	0.712	NA	NA	-	-	-	-	-	-	-	
3	A	1.400	1.319	-	0.018	-	-	-	-	-	-	-	-	-	-	-	
4	A	2.400	1.330	-	0.012	-	-	-	-	-	-	-	-	-	-	-	
5	A	3.000	1.336	-	0.008	-	-	-	-	-	-	-	-	-	-	-	
6	D	3.440	1.319	-	0.025	1.319	0.518	NA	NA	-	-	-	-	-	-	-	
7	A	4.300	1.316	-	0.014	-	-	-	-	-	-	-	-	-	-	-	
8	A	5.200		-		-	-	-	-	-	-	-	-	-	-	-	CABLE CUT
9	A	5.900	1.284	-	0.017	-	-	-	-	-	-	-	-	-	-	-	
10	E	6.200	1.291	-	0.066	-	-	-	-	-	-	-	-	-	1.291	1.002	

Remarks:

Monitored by : SAP ENPROCON PVT LTD

Signature:

Name : Sanjay Panchal

Designation : CP Engineer



Reviewed by :

Signature

Name :

Disignation :

Graphical Representation of ON Measured PSP

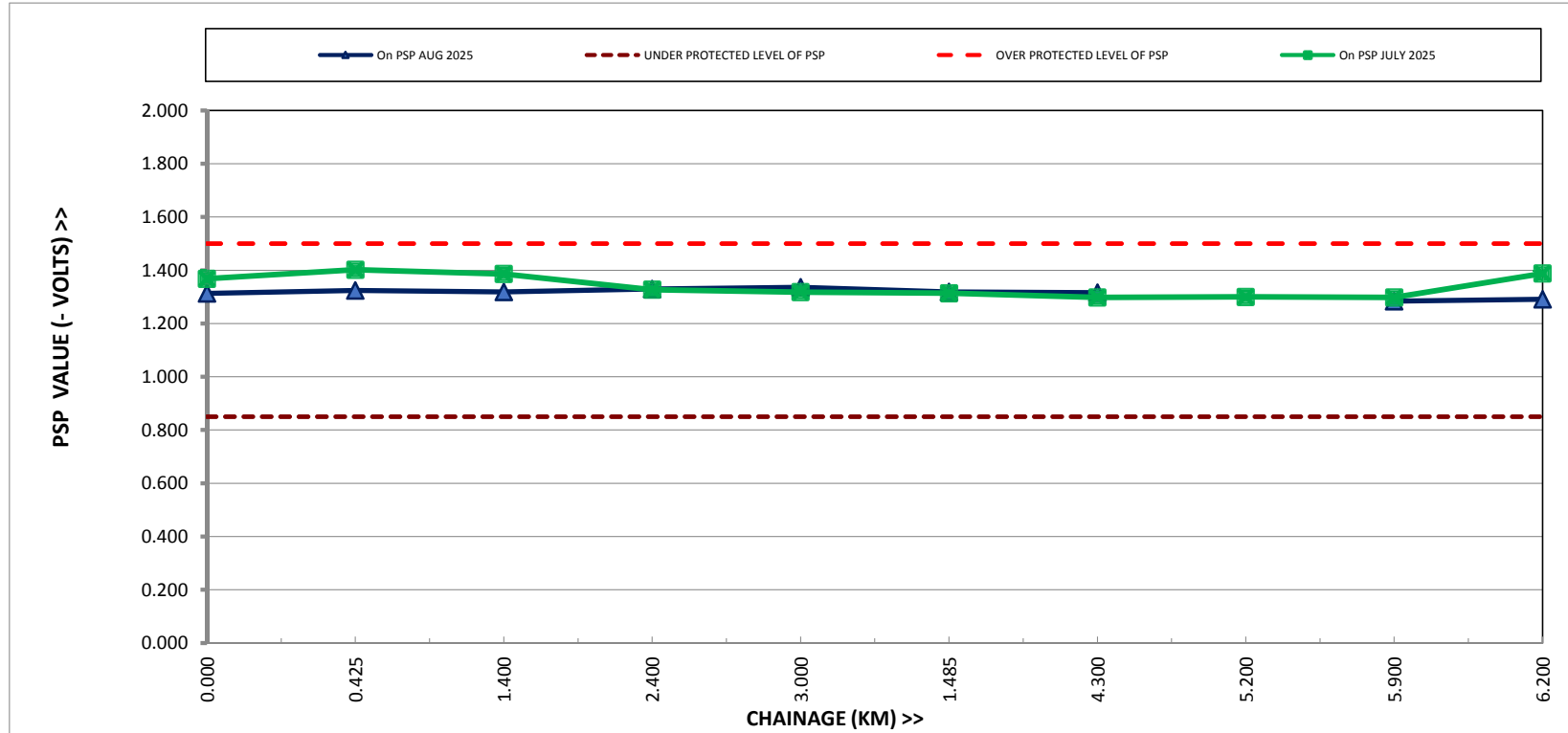
MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage (V) = 3.87 V DC Current (A) = 2.80 A

CP CONTRACTOR: SAP ENPROCON PVT LTD



LEGENDS

AUGUST 2025 ON PSP (VOLT)		(Blue Solid)
JULY 2025 ON PSP (VOLT)		(Green Solid)
UNDER PROTECTED LEVEL OF PSP		(Brown Broken)
OVER PROTECTED LEVEL OF PSP		(Red Dashed)

Note : PSP value measured wrt Cu-CuSO4 portable reference Cell.



PIPE - TO - SOIL MONITORING REPORT

MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage = 4.50 VOLTS; DC Current = 3.00 AMP

DATE : 29.09.2025

REPORT NO : SEPTEMBER 25/41

DATE OF MONITORING : 29.09.2025

TLP NO.	Type	Chainage KM	ON PSP (-volt)	OFF PSP (-volt)	AC VOLTAGE	Casing (-V w.r.t CSE)				Polarization coupon (-V w.r.t CSE)		HT Crossing		Foreign pipeline PSP (V w.r.t CSE)	Isolating Joint (-V w.r.t CSE)		Remarks
						Carrier PSP	Casing PSP	Casing Anode Potential (-V)	Casing Anode Current (mA)	ON PSP	OFF PSP	ZN Anode Potential (-V)	ZN Anode Resistance		Protected side PSP	Unprotected side PSP	
1	E	0.000	1.280	-	0.022	-	-	-	-	-	-	-	-	-	1.280	1.084	
2	D	0.425	1.310	-	0.024	1.310	0.713	NA	NA	-	-	-	-	-	-	-	
3	A	1.400	1.306	-	0.027	-	-	-	-	-	-	-	-	-	-	-	
4	A	2.400	1.274	-	0.026	-	-	-	-	-	-	-	-	-	-	-	
5	A	3.000	1.284	-	0.028	-	-	-	-	-	-	-	-	-	-	-	
6	D	3.440	1.289	-	0.025	1.289	0.574	NA	NA	-	-	-	-	-	-	-	
7	A	4.300	1.274	-	0.016	-	-	-	-	-	-	-	-	-	-	-	
8	A	5.200		-		-	-	-	-	-	-	-	-	-	-	-	CABLE CUT
9	A	5.900	1.280	-	0.022	-	-	-	-	-	-	-	-	-	-	-	
10	E	6.200	1.301	-	0.044	-	-	-	-	-	-	-	-	-	1.301	0.958	

Remarks:

Monitored by : SAP ENPROCON PVT LTD

Signature:

Name : Sanjay Panchal

Designation : CP Engineer



Reviewed by :

Signature

Name :

Disignation :

Graphical Representation of ON Measured PSP

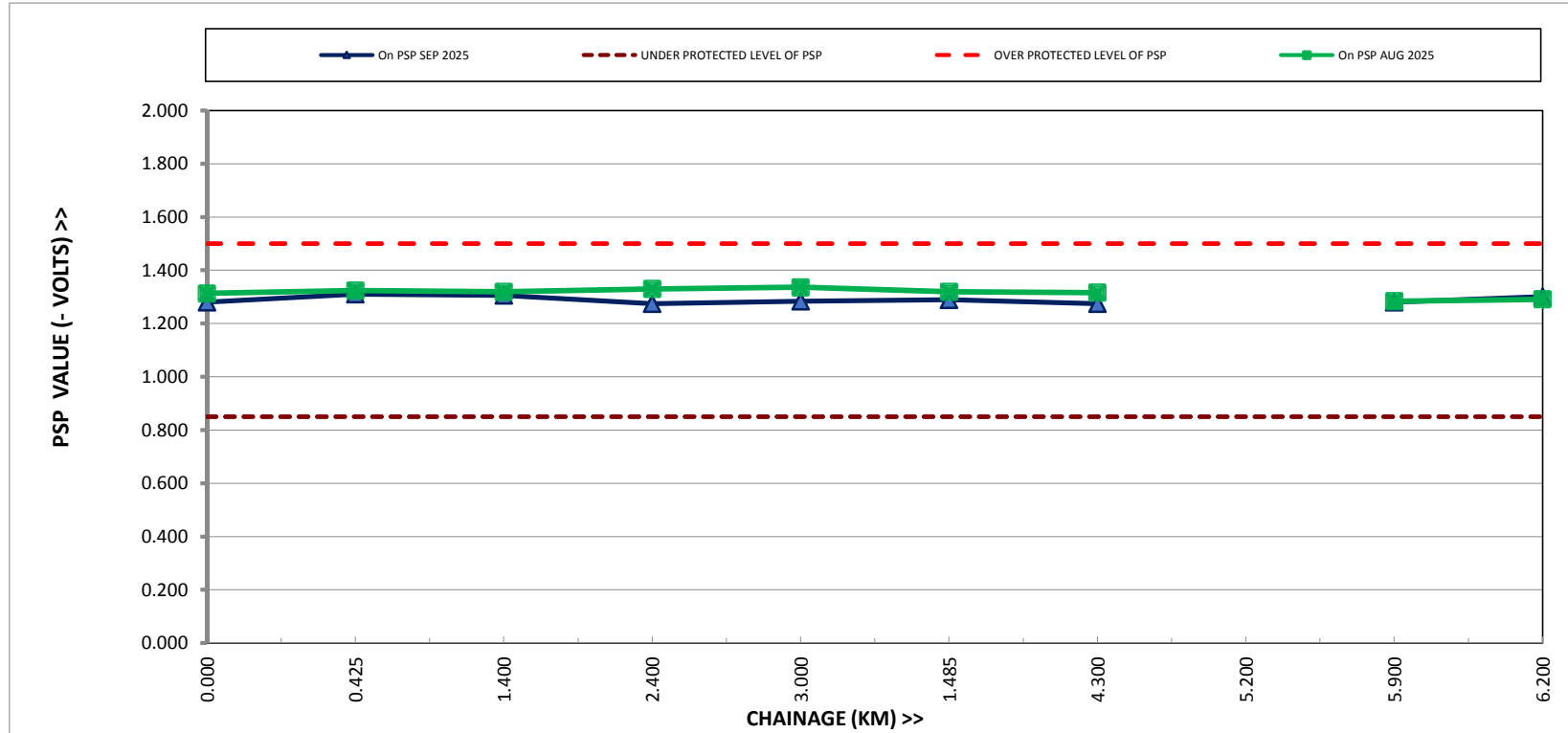
MAINTENANCE BASE : MUNDRA

PIPELINE SECTION : 48" X 6.2 KM SPM-IOCL CRUDE OIL PIPELINE AT ADANI PORTS, MUNDRA

CP STATION LOCATION : TP2

CP SYSTEM PARAMETERS : DC Voltage (V) = 4.50 V DC Current (A) = 3.0 A

CP CONTRACTOR: SAP ENPROCON PVT LTD



LEGENDS

SEPTEMBER 2025 ON PSP (VOLT)		(Blue Solid)
AUGUST 2025 ON PSP (VOLT)		(Green Solid)
UNDER PROTECTED LEVEL OF PSP		(Brown Broken)
OVER PROTECTED LEVEL OF PSP		(Red Dashed)

Note : PSP value measured wrt Cu-CuSO4 portable reference Cell.



Annexure – 7

Cost of Environmental Protection Measures

Sr. No.	Activity	Cost incurred (INR in Lacs)			Budgeted Cost (INR in Lacs)
		2023 - 24	2024 - 25	2025 - 26 (till Sept.'25)	2025 - 26
1.	Environmental Study / Audit and Consultancy	22.67	40.46	37.39	45.2
2.	Legal & Statutory Expenses	8.60	17.37	10.55	13
3.	Environmental Monitoring Services	13.37	17.27	8.73	20.46
4.	Hazardous / Non-Hazardous Waste Management & Disposal	130.11	122.46	70.95	156.13
5.	Environment Days Celebration and Advertisement / Business development	3.42	1.85	1.76	4.5
6.	Treatment and Disposal of Bio-Medical Waste	2.28	2.39	1.26	2.4
7.	Mangrove Plantation, Monitoring & Conservation	15	0	---	---
8.	Other Horticulture Expenses	904	570	175	655
9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	186.94	164.31	117.47	227.69
10.	Expenditure of Environment Dept. (Apart from above head)	80.39	93.40	40.32	49.41
Total		1366.78	1029.51	463.43	1173.79

Annexure – 8

Compliance Report of CIA Study Environment Management Plan

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude ¹	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
1	Land Use Change						
1.1	<p>It is predicted that the built up land in the rural areas would increase by an order 50% from the baseline 2015.</p> <p>New settlements near the SEZ area might create slums.</p> <p>Unorganized urban development leading to poor sanitation and proliferation</p>	Level - 1	<p>APSEZ has developed two townships (Shantivan and Samudra) presently accommodating 1668 households. Necessary permissions from concerned authorities were already obtained for the development of townships and Associated infrastructure facilities.</p>	<p>The existing townships will be expanded to accommodate about 4 lakh people when the APSEZ is fully developed.</p>	APSEZ	As and when Required	<p>APSEZ has developed two townships (Shantivan and Samudra) accommodating 2378 households and associated infrastructure facilities. Accommodation is made available for all interested employees working within Adani group & SEZ industries. Out of which 82.30 % Occupancies are accommodated within the townships and rest are available for employees working within APSEZ.</p> <p>At present 81 nos. of industries (processing & non-processing) are present within the SEZ (61 nos. are in operation). Township facilities are also made by some of SEZ industries within Mundra town for their employees with basic infrastructure facilities and requirements.</p> <p>Most of the employees working in SEZ industries are residing in Mundra town having all basic requirements and associated facilities.</p> <p>The existing social infrastructure facilities are adequate for present development at APSEZ. The existing townships with associated facilities will be</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
	of vectors and disease.						expanded as per requirement. APSEZ has also been granted permission for receiving domestic sewage @ 2.5 MLD from Mundra village (which was earlier discharged into open area within Mundra region) into wastewater treatment plant for treatment and disposal. APSEZ has already started receiving of domestic sewage from Mundra, which abates the poor sanitation and unhygienic condition within Mundra region. Total project cost for laying domestic sewage underground pipeline with other associated facilities from Mundra to APSEZ is 362 Lacs.
1.2	Once the project is fully developed, due to increase in built up land in the APSEZ area, there will be an increase in the storm water runoff from the facility.	Level-1	The study area experiences scanty rainfall less than 400 mm/year. Considering the natural gradient, APSEZ have designed and implemented storm water	Technical feasibility study can be carried out to explore the possibility of developing storm water collection ponds to utilize maximum possible storm water runoff for dust suppression in the coal yard areas during non-rainy days.	APSEZ	Technical Study - one time, Implementation - Continual process	Presently, ~ 39 % area is already developed & ~ 13% area is under construction phase out of the total SEZ area At present all existing coal yards are designed with drain, for collection of water during water sprinkling and rainfall, which is carried away to dump pond. Supernatant water from dump pond is being collected and used for dust suppression activities or after sedimentation, discharged to sea. Details of drain and dump pond has been submitted along with EC compliance report (Oct 19 to March 20). Analysis of said water discharging into sea during monsoon season is being carried out (twice in a year during monsoon) through NABL / MoEF&CC accredited

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
			drains in the existing facility to meet the peak daily rainfall of 440 mm/hr. Hence flooding of water in the neighboring areas is not envisaged.				laboratory. The analysis report of the same shows there is no any contamination. The report of the same is attached as Annexure - i . During compliance period FY 2025-26 till Sep'25 total recorded rain fall was 668 mm observed, which was much less than the design capacity of existing storm water drainage system. So our existing storm water management facility is adequate to handle the storm water runoff from the area. Hence flooding of water in the neighboring areas is not envisaged.
			As per the directions given in the environmental clearance issued for the proposed Multi-Product SEZ and CRZ clearance for Desalination, sea water intake, outfall	The channel depth in all the natural streams shall be maintained to accommodate peak flood flow during the monsoon and periodical desilting activities in the natural streams passing through the APSEZ area	APSEZ, District Administration* and Irrigation department	As and When Required	Presently there is no Desalination plant, sea water intake and outfall facility developed as part of EC & CRZ clearance of Multiproduct SEZ. The project will be designed and implemented as per requirement without disturbing the natural flow of rainwater in all the seasonal streams.

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
			facility and pipeline project, the master plan of the project was designed and being implemented without disturbing the natural flow of rainwater in all the seasonal streams.				
1.3	Due to conservation and protection of mangroves in the designated conservation area, it has been predicted	Positive Impact with ecological benefits	In addition to conservation of the identified 1254 ha mangrove areas around Mundra port and SEZ, APSEZ has taken up large scale	APSEZ will continue mangrove afforestation as per the commitment made with concerned regulatory authority	APSEZ	Short Term	<p>APSEZ has carried out mangrove afforestation in 4140 ha. area across the coast of Gujarat till date. Total expenditure for the same till Sep'25 is INR 1592.8 lakh. No further mangrove afforestation is pending w.r.t. commitment made with concerned regulatory authority for APSEZ, Mundra project.</p> <p>1. NCSCM (MoEF&CC promoted Government Agency) study on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around APSEZ.</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
	that the current mangrove footprint area would marginally increase in next 15 years due to natural growth. This will enhance the overall biodiversity in the local coastal ecosystem.		mangrove afforestation activities in an area of more than 2800 ha at various locations across the coast of Gujarat state in consultation with various organizations				<p>As a part of mangrove conservation plan, APSEZ has done following activities.</p> <ol style="list-style-type: none"> a. To comply with the GCZMA recommendations regarding mangrove monitoring at every 2 years, presently APSEZ has entrusted NCSCM, Chennai to carry out the Monitoring of mangrove distribution in creeks in and around APSEZ with cost 45.87 Lacs from year 2021 to 2023. b. Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> • The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February 2021 and September 2023. • Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover approximately 2 hectares, accounting for about a 0.08% increase. • Hence, overall increase in mangrove cover area in creek system in and around APSEZ

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance						
							<p>from 2011 (2094 Ha) to September 2023 (2501 Ha) is 407 Ha (19.43%). The NCSCM Mangrove mapping report is attached as Annexure - 9.</p> <p>c. Tidal observation in creeks in and around APSEZ – The cost of the said activity was INR 1.0 Lacs incurred by APSEZ.</p> <p>d. Algal & Prosopis removal from Mangrove area - The cost of the said activity was Rs. 150000 during FY 2024-25. The algal removal report was submitted during the compliance submission for the period Oct'24 to Mar'25.</p> <p>e. Awareness of mangroves importance in surrounding communities & Fodder support - The expenditure for fodder supporting activities was approx. 236.66 Lacs during FY 2025-26 till Sep'25 which was incurred by APSEZ. This activity is being done on continuous basis as a part of CSR activity.</p> <p>As a part of GCZMA recommendations and NCSCM mangrove conservation action plan, APSEZ has undertaken following activities.</p> <table border="1" data-bbox="1394 1256 2018 1417"> <thead> <tr> <th data-bbox="1394 1256 1467 1333">Sr. No.</th> <th data-bbox="1467 1256 1671 1333">Recommendations</th> <th data-bbox="1671 1256 2018 1333">Compliance</th> </tr> </thead> <tbody> <tr> <td data-bbox="1394 1333 1467 1417">1.</td> <td data-bbox="1467 1333 1671 1417">Mangrove mapping and monitoring in</td> <td data-bbox="1671 1333 2018 1417"> <ul style="list-style-type: none"> APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove </td> </tr> </tbody> </table>	Sr. No.	Recommendations	Compliance	1.	Mangrove mapping and monitoring in	<ul style="list-style-type: none"> APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove
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							and around APSEZ	<p>distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</p> <ul style="list-style-type: none"> • Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> ○ The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February 2021 and September 2023. ○ Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover approximately 2

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									<p>hectares, accounting for about a 0.08% increase.</p> <ul style="list-style-type: none"> ○ Hence, overall increase in mangrove cover area in creek system in and around APSEZ from 2011 (2094 Ha) to September 2023 (2501 Ha) is 407 Ha (19.43%). The NCSCM Mangrove mapping report is attached as Annexure - 9. The cost of the said study was INR 45.87 Lacs incurred by APSEZ.
							2.	Tidal observation in creeks in and around APSEZ	<ul style="list-style-type: none"> • APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM. • The observed tidal ranges indicate that the creeks experience normal tidal ranges, adequate for the growth of mangroves. • The cost of the said activity was INR 1.0 Lacs.
							3.	Removal of Algal and Prosopis growth from mangrove areas	<ul style="list-style-type: none"> • Algal and Prosopis growth monitoring was done in and around mangrove area and algal encrustation was found in some of the mangrove areas, which has been removed manually.

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								<ul style="list-style-type: none"> The cost of the said activity was Rs. 1,50,000 during FY 2024-25. The algal removal report was submitted during the compliance period Oct'24 to Mar'25.
							4.	<p>Awareness of mangroves importance in surrounding communities</p> <ul style="list-style-type: none"> Adani Foundation – CSR Arm of Adani group has done awareness camps/activities created in the community regarding importance of mangroves. Adani Foundation provides Good Quality dry and green fodder to 36 Villages. Dry Fodder 8,65,965 Kg Green – 30,75,945 Kg. Awareness of mangroves importance in surrounding communities & Fodder support - The expenditure for fodder supporting activities was approx. 236.66 Lacs during FY 2025-26 till Sep'25, which was incurred by APSEZ. Grass Land development: 213 acres of gauchar land has been cleaned and allocated for Grass land development with strong Community Contribution and Mobilization.

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							<ul style="list-style-type: none"> • Other than this dedicated security guard with gate system deployed by APSEZ across the coastal area and no any unauthorized persons allowed within coastal as well as mangrove areas. • APSEZ has celebrated the International Day for the Conservation of the Mangrove Ecosystem with coordination of Adani Foundation from 24th to 26th July 2024 to raise awareness of the importance of mangrove ecosystems as "a unique, special and vulnerable ecosystem". The report for the same was submitted during the compliance period Apr'24 to Sep'24. • Refer CSR report attached as Annexure - 2.
1.4	Development activities along the coast might cause certain changes in		Detailed hydro-dynamic modelling and shoreline change	It is recommended to map the coastal morphology (Shoreline) at least once in three years	APSEZ	Continual Process	Shore line change aspect has been studied in detail as part of following two studies; <ul style="list-style-type: none"> • Bathymetry & Topography study, preparation of plan for protection of creeks/ mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary.

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	hydro-dynamic characteristics along the shoreline. Shoreline of any area also can be influenced by storm surges and other natural processes.		prediction for a fully developed APSEZ facility has been studied. The study reveals that the erosion and accretion in the study area at the end of 15th year will be within the designated criteria of ± 0.5 m/year. which reconfirms that the waterfront development activities of APSEZ would pose insignificant				<ul style="list-style-type: none"> A Regional Impact Assessment study to identify impacts of all the existing as well as proposed project activities in Mundra region. <p>As per the outcome of these studies, no erosion is observed on the coast of the project area. As part of the Regional Impact Assessment study, the possible changes in shoreline that may occur due to the proposed developments in 10 km area on either side of the waterfront development project have been predicted. It has been inferred from the modelling study that the shift in the shoreline will be less than 0.5 m/year, which reconfirms that the APSEZ facility would pose insignificant impact on the Mundra shoreline. Accretion is observed at South port and at West port due to approved reclamation activities.</p> <p>Based on the study outcome, it is recommended to map the coastal morphology (shoreline change) at least once in three years.</p> <p>Shoreline change study was carried out by M/s. Gujarat Institute of Desert Ecology, Bhuj in 2022 as a part of the Environmental Management Plan (EMP) compliance with the CIA study. The cost of said study was INR 17.39 Lacs.</p> <p>As per GUIDE study, the rate of shoreline changes statistics on a time series of multiple shoreline positions of a totally 43 km coastline stretches (16 km</p>

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			impact on the Mundra shoreline.				<p>on the west side and 27 km on the east side of Adani main port) on either side of Adani Ports and Special Economic Zone Ltd (APSEZL) has been taken into account for the calculation by using satellite images.</p> <p>As a part of the NGT direction, the shoreline change analysis has been carried out for the years 2015-2022 to study the immediate changes after the commissioning of the port and initiation of the activities (September 2015) for short-term variation for the year 2015-2022 using EPR method has been carried out.</p> <p>The details of the rate of shoreline changes (Short interval time) recorded from 2015 to 2022 are summarized in below table.</p> <table border="1" data-bbox="1398 1049 2013 1300"> <thead> <tr> <th rowspan="2">Period</th> <th rowspan="2">Name of the block</th> <th rowspan="2">Average Shoreline Change(M/Y ear)</th> <th colspan="2">Shoreline Change(M)</th> </tr> <tr> <th>Maximum Accretion</th> <th>Maximum Erosion</th> </tr> </thead> <tbody> <tr> <td rowspan="2">2015-2022</td> <td>West Port</td> <td>-11.43</td> <td>39.86</td> <td>-78.68</td> </tr> <tr> <td>Eastern side</td> <td>-26.60</td> <td>191.32</td> <td>-165.19</td> </tr> </tbody> </table> <p>The Shoreline Change Assessment Study report of GUIDE was submitted along with six monthly compliance report for the period Oct'22 to Mar'23.</p>	Period	Name of the block	Average Shoreline Change(M/Y ear)	Shoreline Change(M)		Maximum Accretion	Maximum Erosion	2015-2022	West Port	-11.43	39.86	-78.68	Eastern side	-26.60	191.32	-165.19
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							<p>Shoreline change study was carried out by M/s. Chola MS, Chennai (NABET accredited consultant) also as a part of Waterfront Development Project – Expansion EIA study. The summary of the said study are as below.</p> <p>To estimate the shoreline change due to the earlier approved waterfront development plan, a historical shoreline change assessment has been undertaken using the satellite imagery for a period of 2008 to 2018. In order to avoid any major errors in estimating the shoreline, the satellite data for similar tidal condition was considered for 2008, 2013 and 2018. AMBUR Methodology was used to study the historical analysis.</p> <p>10 km radius stretch of shoreline on either side of the APSEZ project boundary has been considered for assessing the historical shoreline change scenario. The baseline shoreline change assessment depicts the influence of both natural causes and also possible changes in the shore due to various development activities in the study area during the designated period. For the purpose of this study, shoreline on left side of APSEZ is termed as West Side Shoreline and that of the right side as East Side Shoreline for ease of recognition.</p> <p>The maximum accretion and erosion rate of the west side shoreline over a period of 10 years during the year</p>

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							<p>2008 – 2018 are observed to be 4.78 m/yr and 1.93 m/yr respectively.</p> <p>The maximum accretion and erosion rate of the east side shoreline over a period of 10 years during the year 2008 – 2018 are observed to be 05 m/yr and 0.82 m/yr respectively.</p>
2	Regional Traffic Management Plan						
2.1	The projected traffic data as per the EIA Report of Multi-Product Special Economic Zone, the peak vehicular traffic from the port and SEZ operations (including supporting facilities	Level-1	As per the master plan of APSEZ, eight artillery roads will be connected to either state highway or national highway for evacuating the goods from APSEZ. None of these roads are passing through settlements, thereby avoiding	Additional road as per master plan will be built in future based on the overall progress of the project. Currently about 25% of cargo from APSEZ is transported by Rail and the same will be enhanced to 40% when the facility is fully developed in future. This will further reduce the traffic volumes	APSEZ	As and When Required	<p>Presently, ~ 39 % area is already developed & ~ 13% area is under construction phase out of the total SEZ area..</p> <p>Existing road/rail/conveyer infrastructure facilities are adequate to evacuate the existing cargo. Further, APSEZ's cargo evacuation through rail / conveyer / pipeline has ~48.75 %. Additional Road facilities will be built as per master plan considering future development.</p> <p>The facilities for transportation of cargo other than road will be enhanced considering future development, which will reduce the traffic volumes on the regional road Network.</p>

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	<p>and colony) could be in the order of 18,300 and 10,400 vehicles per day respectively .</p> <p>There could be a possible increase in traffic congestions on village-highway intersections and road accidents.</p>		<p>traffic Congestions in the respective villages. The carrying capacity of the eight artillery roads connecting APSEZ is estimated to be about 16,000 PCU/hr as against the envisaged peak traffic volume of 4,500 PCU/hr.</p> <p>Out of eight artillery roads considered in APSEZ</p>	<p>on the regional road network.</p>			

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			master plan, seven roads were already developed and functional.				
			APSEZ has been imparting Driver Training Programs to all their contractors to enhance awareness on road safety.	APSEZ can undertake technical feasibility of implementing Intelligent Transport System (ITS) for the freight carriers associated with their development activities.	APSEZ & GSRDC*	Long Term	<p>APSEZ is being imparting the regular in-house training awareness program in different mode i.e., classroom, on-job training, virtual platform & Assessment by internal & external trainer to all drivers and employees on below topics:</p> <ul style="list-style-type: none"> ✓ Basic induction Training for drivers ✓ ITV Driver Training ✓ ITV Driver Induction for Supervisor ✓ Defensive Driving for LMV & HMV ✓ Defensive Driving & BBS ✓ Driver Assessment ✓ Road accident & rescue ✓ Traffic Management & Road Signage ✓ Driving safety training ✓ RORO Driver training ✓ Road Safety ✓ Defensive Driving & Emergency Action Plan ✓ Drivers Responsibilities & Safe driving ✓ Emergency Rescue (Vehicle) Training <p>Approx. 1140 Participants (On roll and contractual manpower) were benefitted from above trainings in</p>

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							<p>compliance period Apr'25 to Sep'25. The same will be continued in future also.</p> <p>APSEZ has also implemented the Remote traffic management system (RTMS) to manage the traffic movements and capturing the violations to further improve the system.</p> <p>Following steps were taken by APSEZ to reduce the accidents.</p> <ul style="list-style-type: none"> ✓ Handling and escorting of the ODC to ensure the smooth movement on the roads. ✓ Traffic Awareness programs for the drivers and regular briefing of the drivers in the parking areas. ✓ Incident handling and root cause analysis for taking necessary action in order to avoid such incidents. ✓ BAC checks for the drivers in order to identify the intoxicated drivers and necessary action is being taken against them. ✓ Water spray drive at gates are being conducted on regular basis during night hours to avoid dozing by the driver while driving. ✓ RTMS devices are being installed at 08 critical locations in order to capture speed violations and enforcing road safety regulations. ✓ Display of traffic signages and lane markings on road in coordination with the Civil team for

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							<p>ensuring road safety rules are being followed by the road users.</p> <ul style="list-style-type: none"> ✓ We have approx. 100+ cameras which are being utilized for monitoring of traffic movement through CCTV and timely response in order to avoid any congestion and during traffic incidents. ✓ Regular traffic checks by Traffic Marshalls in order to ensure road safety rules (Wearing seat belt/Wearing helmet/Carrying driving license/Speed checks/Documents) is being followed by the drivers. ✓ Installation of Road furniture's (Cones/Water filled barriers/Cats eye/Spring Posts/Jersey Barriers) for lane segregation, Channelizing the traffic, at Junctions and indicating Caution for the road users. ✓ In case on any Vehicle found breakdown in main roads, we arrange the security crane / lifting machines to remove /relocated the vehicle. Which help for smooth passage to other vehicles. ✓ Ensuring Drivers must wear near necessary PPEs, for that we have arranged a PPE's Stall at APMS parking area (issued on chargeable basis). ✓ Night Patrolling and PA announcement by Traffic DSO to manage traffic condition. ✓ Safety briefing via PA system at Security Gate.
3	Water resources Management and sewage treatment & disposal Plan						
3.1	For a fully developed	No-Impact	APSEZ is meeting the	As per the master plan and	APSEZ	As and When Required	Presently there are two fresh water sources available with APSEZ.

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	APSEZ facility, water demand will be in the order of 4,30,000 m ³ /day (430 MLD). APSEZ will be sourcing majority of the water from the captive desalination plants, which will be developed in progressive manner.		current water demand through Narmada water supply scheme and 47 MLD captive desalination plant at site. Necessary water allocation from concerned authorities was obtained and the same will be renewed from time to time as per the directions of state government.	permissions granted under EC, APSEZ will be developing progressively 4,50,000 m ³ /day (450 MLD) of desalination plants to meet the future demand. Hence stress on regional water resources due to these developmental projects will be less significant.			<p>Desalination Plant – 80 MLD Gujarat Water Infrastructure Limited (GWIL) – 9 MLD (sanctioned capacity).</p> <p>Current water demand for APSEZ along with SEZ industries including Adani Power Plant is an avg. of 39.48 MLD.</p> <p>So presently, these sources are adequate to fulfill the current freshwater requirement of entire APSEZ including member units.</p> <p>The desalination plant of additional capacities will be installed on modular basis considering future requirement of APSEZ.</p>
3.2	Existing	Level-2	Adani	Adani	APSEZ	Long Term	Water needs of APSEZ is being met through existing

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	<p>water demand in the Mundra taluk is estimated as 8500 m³/day (@55 lpcd) and the potable and sanitation water needs would increase to 37,000 m³/day (@125 lpcd) in future when the area is fully grown into larger municipality due to induced economic growth. Water</p>		<p>Foundation has been contributing to various watershed development projects in the Mundra region to enhance ground water resources in the area. Adani Foundation has contributed about Rs. 300 Lakhs so far for the development of 18 check dams.</p>	<p>Foundation is planning to implement the various water resource conservation programs in next ten years under various schemes.</p>	<p>and CGWB*</p>		<p>Desalination Plant of APSEZ and GWIL which may be further enhanced on modular basis. At present Ground water is not utilized for any activities within APSEZ.</p> <p>However various works are being carried out by Adani Foundation continuously under Water Conservation Work to achieve water security in Mundra region by Adani Foundation. Following works are carried out as a part of water conservation work since April – 2018. Water conservation Projects i.e. Roof Top Rainwater Harvesting, Desilting of Check dams, Bore Well Recharge and Pond deepening were taken up in past years, review and monitoring of all water harvesting structures had been taken up.</p> <p>To make connections between human actions and the level of biological diversity found within a habitat and/or ecosystem, this year Adani Foundation launch project “Sanrakshan” in coordination with GUIDE and Sahjeevan.</p> <p>Since, 10 years considerable Water Conservation Work carried out in Mundra Taluka. Due to satisfactory rain in current year 1.11 mtr ground water table increased as per increased in coastal belt of Mundra as per Government Figures.</p> <p><u>WORK COMPLETED:</u></p>

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	demand of the local communities is met through Narmada water supply system to some extent, but largely depending on the ground water in the study area. Mundra block is reported to be a safe ground block as on date. Due to influx of people and rapid urbanization						<p>Water Conservation Work Done during Compliance Period Apr'25 to Sep'25:</p> <ul style="list-style-type: none"> ❖ <u>Water conservation project (till date water conservation work):</u> In recent years, the villages near our operational area have experienced significant enhancements in both the availability and quality of water. These improvements stem from our focused efforts in managing and conserving groundwater and surface water resources. • <u>Key interventions—</u> <ul style="list-style-type: none"> ○ pond deepening, ○ strengthening of check dams, ○ installation of rainwater harvesting systems, borewell drilling, and clearing of river inlets— have together increased water storage capacity. • <u>Till the date (Sep'25)</u> <ul style="list-style-type: none"> ○ 145 Pond Deepening ○ 209 Bore & Wells ○ 355 Rainwater Harvesting ○ 30 Check Dams ○ 25 Percolation Wells ○ Farmers Benefitted - 1760 Storage capacity Increase – 2171435Cum.

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	<p>Due to the economic development, there could be some stress on the ground water resources in future.</p>						<ul style="list-style-type: none"> • Current year (Apr'25 to Sep'25) <ul style="list-style-type: none"> ○ Pond Deepening - 05 Village Pond ○ Check dam Re- strengthening-01 ○ Farmer - 300 farmer Land irrigated - 1800 Acre ○ 8.0% Increase in Revenue ○ 9.00 % TDS Reduction ○ Rs 1200 Reduce in health expenses Monthly ❖ ROOF TOP RAINWATER HARVESTING: <ul style="list-style-type: none"> ○ 355 RRWHS units built across 355 homes, positively impacting more than 1,760 people. ○ TDS level below 100 meeting WHO standards for safe drinking water. ○ First-time rainwater harvesting enabled for the community, ensuring quality drinking water and reducing financial burdens ○ 1760+ Residents benefited ○ 97.73% Less TDS than local municipality water Gundiyaali – 4410 TDS ○ Rs. 1125 monthly Saved on drinking water ○ Rs. 3000 yearly saved on health expense The Water Conservation Projects completed during FY 2024-25: <ul style="list-style-type: none"> ❖ Adani Foundation has undertaken significant water conservation initiatives to address water scarcity and improve water availability in rural areas. ❖ Through the creation of 737 various water structures, the project has increased water capacity by 5,400,735 cubic meters (CUM) and benefited 64,515 people.

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							<ul style="list-style-type: none"> ● Check Dam New/Renovation: <ul style="list-style-type: none"> ○ Structures: 29 ○ Water Capacity Increase: 1,072,332 CUM ○ Beneficiaries: 30,870 ○ Impact: Enhances water storage and irrigation. ● Rainwater Harvesting Structures (RRWHS): <ul style="list-style-type: none"> ○ Structures: 330 ○ Water Capacity Increase: 3,300,000 CUM ○ Beneficiaries: 1,650 ○ Impact: Maximizes rainwater capture and usage. Rs. 10950 yearly saved/house ● Pond Deepening: <ul style="list-style-type: none"> ○ Structures: 135 ○ Water Capacity Increase: 1,028,403 CUM ○ Beneficiaries: 18,350 ○ Impact: Improves water retention and availability. ● Construction of Percolation Wells: <ul style="list-style-type: none"> ○ Structures: 26 ○ Ground Water Recharge: Significant ○ Beneficiaries: 3,000 ○ Impact: Boosts groundwater levels and availability. ○ Bore/Well Recharge ○ Structures: 209 ○ Ground Water Recharge: Significant ○ Beneficiaries: 1,045 ○ Impact: Enhances groundwater recharge and sustainability. ● Construction of New Wells: <ul style="list-style-type: none"> ○ Structures: 8 ○ Purpose: Drinking Water

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							<ul style="list-style-type: none"> ○ Beneficiaries: 9,600 ○ Impact: Provides reliable drinking water sources <p>With the objective of to preserve the rainwater to reduce the impact of salinity and recharge the ground water (the main source of water) to facilitate the Agricultural activities as well as for drinking water.</p> <p>Adani foundation has spent approx. INR 10446.78 lakhs from April – 2018 to Sep - 2025 for CSR activities which also includes water conservation projects as mentioned above.</p>
3.3	It is estimated that about 60,000 m ³ /day (60 MLD) of sewage will be generated from the APSEZ facility when the project is fully developed.	No Impact	Seven sewage treatment plants with an aggregate capacity of 3.1 MLD have already built at APSEZ. Treated sewage is utilized for greenbelt development and sewage is not discharged	APSEZ is permitted to develop decentralized sewage treatment plants of total 62 MLD capacities. Existing sewage treatment facilities will be augmented progressively based on the development at APSEZ in future. Similar to	APSEZ	As and When Required	<p>Current installed capacity of wastewater treatment plants is 6.255 MLD (ETP, STPs & CETP) for treatment of effluent & sewage generated at various locations of APSEZ excluding wastewater treatment plants installed within individual member units.</p> <p>Out of 61 only 4 operational industries within the SEZ are sending their partially treated industrial as well as domestic effluent to the CETP conforming to CETP inlet norms for further treatment and final disposal. Other SEZ industries have their own STPs / ETPs for treatment of wastewater generated from their industrial operation and discharging the treated water on land for horticulture purpose within their premises as per specific permission granted by SPCB.</p> <p>APSEZ also granted permission to treat 2.5 MLD of</p>

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			into either seasonal natural streams or marine environment.	existing practices, treated sewage will be utilized for greenbelt development.			<p>sewage generated from Mundra village through CETP and STP.</p> <p>Presently avg. 2.57 MLD of wastewater (into ETP, STPs & CETP) is treated and being utilized on land for horticulture purpose within APSEZ premises during Apr'25 to Sep'25. Existing wastewater treatment plants are adequate to treat and handle the total effluent / sewage load considering current development.</p> <p>Existing wastewater treatment facilities will be augmented, or new plants will be developed on modular basis considering future requirement.</p>
4	Air quality management Plan						
4.1	Although all the regulated activities in the study area will be adopting promulgated emission norms, total air emission mass discharge	Level-2	APSEZ and other thermal power plants have obtained valid consent to operate and have been operating the facilities as per the	All existing and new industrial establishments will obtain requisite consents from GPCB and adhere to the stipulated emission norms regulations and guidelines issued by authorities from time to	APSEZ And Other Industries	Continual Process	<p>APSEZ has been granted requisite permissions from the concerned authorities with stipulated norms for air emission (flue gas as well as ambient air).</p> <p>Ambient Air Quality monitoring is being carried out by NABL accredited and MoEF&CC authorized agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi for APL as per NAAQ standards, 2009. Stack emission monitoring is also being carried out on regular basis. Reports of the same are being submitted to the concerned authorities on regular basis.</p> <p>Adani power plant has installed continuous emission</p>

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude ¹	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance																														
	from the study area would increase.		emission norms stipulated in respective consent orders. APSEZ and other two power plants are monitoring the ambient air quality on regular intervals as per GPCB/CPCB guidelines and the data is analyzed and presented to GPCB on monthly basis. Both the thermal power plants located	time.			<p>and air quality monitoring instruments as per CPCB Directive and submitting the reports also. Another power plant of CGPL is outside APSEZ area.</p> <p>The AAQM summary for last six months (Apr'25 to Sep'25) are as below.</p> <p>Locations: 21 Nos. (APSEZ – 18 + APL – 3 including 3 villages) Frequency: Twice in a week</p> <table border="1" data-bbox="1394 870 2016 1105"> <thead> <tr> <th>Parameter</th> <th>Unit</th> <th>Min</th> <th>Max</th> <th>Average</th> <th>Perm. Limit[§]</th> </tr> </thead> <tbody> <tr> <td>PM₁₀</td> <td>µg/m³</td> <td>36.45</td> <td>88.67</td> <td>62.55</td> <td>100</td> </tr> <tr> <td>PM_{2.5}</td> <td>µg/m³</td> <td>9.85</td> <td>40.51</td> <td>23.03</td> <td>60</td> </tr> <tr> <td>SO₂</td> <td>µg/m³</td> <td>6.88</td> <td>35.89</td> <td>18.98</td> <td>80</td> </tr> <tr> <td>NO₂</td> <td>µg/m³</td> <td>8.39</td> <td>39.84</td> <td>22.91</td> <td>80</td> </tr> </tbody> </table> <p>[§] as per NAAQ standards, 2009 Values recorded confirms to the stipulated standards.</p> <p>Approx. INR 8.73 Lakhs is spent by APSEZ for environmental monitoring activities during the FY 2025-26 till Sep'25, which also includes ambient air quality monitoring for overall APSEZ, Mundra.</p> <p>Other industries located within the SEZ have obtained requisite permissions from the competent authorities for their respective plant and they also carried out</p>	Parameter	Unit	Min	Max	Average	Perm. Limit [§]	PM ₁₀	µg/m ³	36.45	88.67	62.55	100	PM _{2.5}	µg/m ³	9.85	40.51	23.03	60	SO ₂	µg/m ³	6.88	35.89	18.98	80	NO ₂	µg/m ³	8.39	39.84	22.91	80
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			within the study area have installed continuous emission and air quality monitoring instruments as per CPCB directive.				<p>environmental monitoring within their premises to comply with the permission granted. The same has been ensured by APSEZ as well as SPCB during their regular visits. APSEZ carries out regular visits/inspections of member industries within SEZ and last visit was conducted during August & September, 2025 for EMS & compliance verification. During compliance verification, it was verified that monitoring of air emission was well within the permissible standards based on analysis reports. Same will be continued in future also.</p> <p>The monitoring reports of industries within SEZ are also being submitted to the regulatory authorities as a part of half yearly Compliance report of EC for Multi-Product SEZ.</p>
				A common air quality management committee may be framed under the guidance of the State Pollution Control Board and district administration to manage regional	APSEZ and Other Industries, Stakeholders, District Administration and GPCB*	Long Term And Continual	<p>APSEZ will co-operate and comply with the directions from concerned regulatory authorities for air quality management within APSEZ area. However, at present, APSEZ has formed Internal Environment Monitoring Committee, involving officials from APSEZ, Adani Power Limited and other SEZ member units with following role and responsibilities:</p> <ul style="list-style-type: none"> • Identification of sources of air & noise emission and its dispersion in surrounding villages • Remedial measures to eliminate, control, reduce or capture air & noise emission.

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				level emission inventory data that can help to manage regional level air quality management goals.			<ul style="list-style-type: none"> • Identify available resource to abate the air and noise emission. • Required additional resources for control of air and noise emission. • Drinking water and its testing of all the available fresh water sources in surrounding villages • Identify any surrounding villages affected by organization's improper waste disposal mechanism. <p>Last committee meeting was conducted on dated 10.10.2025 and below was the point of discussion for way forward.</p> <ul style="list-style-type: none"> • Brief introduction about the Environment Management Plan (EMP) • All members conveyed his environment management practices, issue & suggestions. • Discussed about the various ways to improve existing practice to control the emission in terms of Air, Water and Noise. • Discussed about the proper management of the canteen waste. • Discussed about the cleaning of outside of the SEZ units. • Discussed about the management of rain water & proper cleaning of the common storm water drainage system.

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
							<ul style="list-style-type: none"> Discussed about proper segregation & disposal of solid waste material. Discussed about to increase more green belt area inside plant premises of SEZ units. <p>APSEZ and all the industries within SEZ are complying to NAAQS and same is being ensured by APSEZ. The monitoring reports of industries within SEZ are being submitted to the regulatory authorities as part of half yearly Compliance report of EC for Multi-Product SEZ.</p>
4.2	Release of particulate emissions from handling and storage of coal at the port and power plants would influence PM10 and PM2.5 concentration in the background air. This could pose	Health Impact	APSEZ has been implementing the following management plan to control emissions as per the applicable regulations and similar practices will be adopted in future: Entire bulk material handling	All industries located in the APSEZ shall adhere to the emissions norms and minimum stack height guidelines issued by CPCB and consent to operate issued by Gujarat Pollution Control Board from time to time.	APSEZ and Other Industries	Continual Process	<p>Following safeguard measures are taken by APSEZ for abatement of dust emissions.</p> <ul style="list-style-type: none"> Adequate stack heights to the Boilers, D.G. Sets, TFHs & HWGs for proper dispersion of pollutants within APSEZ Using of liquid & Gaseous fuels instead of solid fuels in Boilers, Thermic fluid heaters and hot water generators. Regular sprinkling on road and other open area Regular cleaning of roads Dry fog Dust Suppression System (DSS) in hopper, transfer towers and conveyor belts Use of water mist canon Closed type conveyor belts Regular sprinkling on coal heaps Covering other types of dry bulk cargo heaps Installation of wind breaking wall

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	some health impacts such as asthma and COPD etc. among the local communities.		facilities are mechanized. Regular water sprinkling on road and other open areas, regular cleaning of roads, dry fog dust suppression systems (DSS) in hoppers, transfer towers and conveyor belts, use of water mist canon, covered conveyor belts, regular sprinkling on coal heaps,				<ul style="list-style-type: none"> Development of greenbelt along the periphery of the storage yards/back up area Mechanized handling system for coal and other dry bulk cargo Wagon loading and truck loading through closed silo Optimized the weigh bridge location to reduce the movement of trucks. <p>Adequate air pollution control measures like ESPs, FGDs, Bag Filters, etc. and adequate stack heights provisions are implemented within the thermal power plant.</p> <p>For reduction of emission from DG stacks, Retrofitting Emission Control Device (RECD) has been installed on 06 nos. of DG sets to reduce the particulate material from DG stacks. Photographs of RECD attached were submitted during the EC Compliance report submission for the period Oct'24 to Mar'25.</p> <p>The stack monitoring summary for last six months (Apr'25 to Sep'25) are as below.</p> <p>Total Nos. of Stacks: 23 Nos. Frequency: Monthly / Half Yearly</p> <table border="1" data-bbox="1402 1360 2011 1414"> <thead> <tr> <th>Parameter</th> <th>Unit</th> <th>GPCB Limit</th> <th>Min</th> <th>Max</th> <th>Avrg.</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Parameter	Unit	GPCB Limit	Min	Max	Avrg.						
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SO ₂	Ppm	100	6.04	16.77	8.80																				
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			covering of other types of dry bulk cargo heaps by protective materials, installation of wind breaking wall, development	An internal Coal Dust Management Working Group shall be formed by APSEZ to effectively coordinate the	APSEZ and Other Industries, Concerned Stake holders, District Administration*	Long Term	<p>As mentioned above, earlier APSEZ has formed Internal Environment Monitoring Committee, involving Officials of APSEZ, Adani Power Limited & other member units, with specific role and responsibilities as defined above.</p> <p>The dry cargo is being handled by mechanized system and transported by covered conveyer system, trucks and rail wagons.</p> <p>Wind breaking wall is provided around the coal storage yards of APSEZ as well as Adani Power Plant.</p> <p>Adequate air pollution control measures like ESPs,</p>																		

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			<p>of greenbelt along the periphery of the storage yards/back up area and mechanized handling system for coal and other dry bulk cargo and Wagon loading and truck loading through closed silo. Both thermal power plants in the study area have installed electrostatic precipitators on the boilers and are meeting the emission</p>	<p>approach to coal dust management and monitoring</p>			<p>FGDs, Bag Filters, etc. and adequate stack heights provisions within the thermal power plant for proper dispersion of pollutants.</p> <p>Green belt / plantation is provided around the periphery of dry cargo storage area and regular water sprinkling is also being done to abate the dust emission from coal hips.</p> <p>Last committee meeting was conducted on dated 10.10.2025 and below were the points of discussion for way forward.</p> <ul style="list-style-type: none"> • Brief introduction about the Environment Management Plan (EMP) • All members conveyed his environment management practices, issue & suggestions. • Discussed about the various ways to improve existing practice to control the emission in terms of Air, Water and Noise. • Discussed about the proper management of the canteen waste. • Discussed about the cleaning of outside of the SEZ units. • Discussed about the management of rain water & proper cleaning of the common storm water drainage system. • Discussed about proper segregation & disposal of solid waste material.

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			norms as per the respective ECs granted. Due to installation of tall stacks as per CPCB guidelines and EC conditions, the relative air pollution impacts due to release of emissions from two power plants is insignificant.				<ul style="list-style-type: none"> Discussed about to increase more green belt area inside plant premises of SEZ units. Discussed about disposal of minor qty. of generated hazardous waste & E-Waste materials at authorized recycler/vendor.
4.3	Ships are one of the significant sources of SO ₂ and NO _x emissions in the study	Level-2	A Standard Operating Procedure (SOP) has	The current global limit for Sulphur content of ships fuel oil is 3.5 % m/m (mass by mass). According to	APSEZ and Ship Owners	Long Term	<p>The ships coming to the APSEZ is complying with MARPOL and other shipping rules and regulations.</p> <p>APSEZ has already started providing shore power supply to the tugs (11 Nos.), dredgers (2 Nos.) and barges (1 No.). The feasibility of shore power will be explored and implemented on large scale for the visiting vessels to reduce idling stage ship emissions.</p>

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	<p>area. Marine diesel engines on the ships often utilize fuel oils that might contain higher sulphur content. As per the international best practices, these marine diesel engines are designed to meet MARPOL regulations with NOX emissions less than 14.4 gram/Kwhr</p>		<p>been developed to be included as a part of APSEZ environment management plan to verify that all ships anchored at the port are adopting the MARPOL4 regulations.</p>	<p>MARPOL, the new global cap on sulphur in the marine vessel fuels will be 0.50% m/m by the 1st January 2025. APSEZ should explore the possibility of providing shore power to the ships at the port to reduce idling stage ship emissions.</p>			

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	of engine. Due to lower stack heights of the marine diesel engine, ship emissions often gets dispersed in the local environment and might pose risk of fumigation during the early morning and evening hours due to atmospheric inversion break-up periods.						
				Due to implementation of Bharat VI fuels (MoEF&CC) in			Presently, cargo evacuation through rail / conveyer / pipeline is ~48.75 % of overall cargo evacuation. Vehicles having valid PUC certificate are only being

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4.4	Road vehicle emissions will be other major contributors to the air pollution in the region when the facility is fully developed.	Level-2	Not Applicable	near future the vehicular and diesel engine emissions will be reduced by about 50% from the current national levels. APSEZ should develop a robust contractor environmental policy to ensure that Bharat Stage VI emission norms are adopted by all their contractors and sub-contractors.	APSEZ and All Industries	Short Term	<p>allowed to enter within the APSEZ area.</p> <p>APSEZ, has procured 217 nos. of Electrical Vehicle for internal cargo movement and all E-ITV's are in operation.</p> <p>As well as procured 10 nos. LMV E-Vehicles for manpower movement and all are in operation.</p> <p>Electrification of Rail Corridor from Dhrub Railway Station to Adipur Railway Station has completed and movement started by electric locomotive. It will leads to reduce the gaseous emission and increase efficiency of transportation by rail.</p>
5	Noise emissions						
	Noise emissions are envisaged		Due to adoption of various mechanized operations at the	APSEZ, all the tenant industries and facilities within APSEZ are required to undertake noise			<p>Below Safeguard measures are already taken for abatement of noise emissions.</p> <ul style="list-style-type: none"> • Development of greenbelt along the periphery of the operational area. • D.G. Sets having Acoustic enclosures. • Maintenance of plant machineries and

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5.1	from port operations, industrial operations and power plants in the study area. Any increase in noise levels beyond three decibels from the background levels would be perceived as noise nuisance (USEPA)7.	Level-1	waterfront development, the noise emissions from the port cargo handling will be minimal. An adequate greenbelt is being developed by APSEZ to further reduce any residual impacts due to noise emissions from the facility. Periodic noise level monitoring programs were adopted by APSEZ.	monitoring at their facilities to demonstrate the compliance with the Noise level standards. Continuous noise recording units can be installed by APSEZ at facility boundary to address the community grievances, when ever required. To assess the overall site wide compliance and also to address any community grievances related to noise issues due to operation of APSEZ facilities.	APSEZ	Continual Process	<p>equipment's on regular frequency.</p> <p>Noise monitoring is being carried out by NABL accredited and MoEF&CC authorized agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi as per permission granted and reports are being submitted to the concerned authorities on regular basis.</p> <p>The noise monitoring summary for last six months (Apr'25 to Sep'25) are as below.</p> <p>Locations: 18 Nos. Frequency: Once in a month (24 hourly)</p> <table border="1" data-bbox="1398 992 2011 1208"> <thead> <tr> <th>Noise</th> <th>Unit</th> <th>Leq Min</th> <th>Leq Max</th> <th>Leq Avr.</th> <th>Leq Perm. Limit[§]</th> </tr> </thead> <tbody> <tr> <td>Day Time</td> <td>dB(A)</td> <td>51.40</td> <td>69.90</td> <td>64.01</td> <td>75</td> </tr> <tr> <td>Night Time</td> <td>dB(A)</td> <td>44.30</td> <td>64.90</td> <td>58.45</td> <td>70</td> </tr> </tbody> </table> <p style="text-align: right;">[§] as per GPCB standards</p> <p>Approx. INR 8.73 Lakhs is spent by APSEZ for environmental monitoring activities during the FY 2025-26 till Sep'25, which also includes ambient air quality monitoring for overall APSEZ, Mundra.</p>	Noise	Unit	Leq Min	Leq Max	Leq Avr.	Leq Perm. Limit [§]	Day Time	dB(A)	51.40	69.90	64.01	75	Night Time	dB(A)	44.30	64.90	58.45	70
Noise	Unit	Leq Min	Leq Max	Leq Avr.	Leq Perm. Limit [§]																				
Day Time	dB(A)	51.40	69.90	64.01	75																				
Night Time	dB(A)	44.30	64.90	58.45	70																				

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			Predicted noise levels were found to be well within the designated noise standards for Industrial facilities.				<p>All the results are well within the standards. From this it can be inferred that there no impacts on the surrounding community.</p> <p>All other industries located in the APSEZ are adhere to monitor and control the ambient noise level as per permission granted by SPCB and same is being confirmed by APSEZ as well as SPCB on regular basis.</p> <p>Further, till date APSEZ has not received any grievances/notice for noise issues from any of the stakeholders.</p>
				In order to address the public grievances related to noise from the facility, an internal Noise Management Committee can be formed by APSEZ to investigate the root cause and to develop and implement noise mitigation plans	APSEZ	Continual Process	<p>As mentioned above, earlier APSEZ has formed Internal Environment Monitoring Committee, involving Officials of APSEZ, Adani Power Limited & other member units, having role and responsibilities as defined above.</p> <p>Last committee meeting was conducted on dated 10.10.2025 and below were the point of discussion for way forward.</p> <ul style="list-style-type: none"> • Brief introduction about the Environment Management Plan (EMP) • All members conveyed his environment management practices, issue & suggestions. • Discussed about the various ways to improve existing practice to control the emission in terms of Air, Water and Noise.

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				in the specific zones.			<ul style="list-style-type: none"> Discussed about the proper management of the canteen waste. Discussed about the cleaning of outside of the SEZ units. Discussed about the management of rain water & proper cleaning of the common storm water drainage system. Discussed about proper segregation & disposal of solid waste material. Discussed about to increase more green belt area inside plant premises of SEZ units. Discussed about disposal of minor qty. of generated hazardous waste & E-Waste materials at authorized recycler/vendor. <p>No grievance received for noise related issues, and it is observed that ambient noise level are well within the permissible standards.</p>
6	Surface water quality (Terrestrial and Marine)						
6.1	In general, release of untreated wastewater from industrial facilities would pose threat to	Level -1	As per the master plan of APSEZ, 67 MLD of wastewater is expected to be generated from the fully developed	As per the master plan of APSEZ, the existing CETP shall be augmented to 67 MLD in progressive manner based on the future demand. The	APSEZ	As and When Required	<p>APSEZ has installed Common Effluent Treatment Plant (CETP) having 2.5 MLD capacities for treatment of partially treated effluent and sewage generated from industries within SEZ.</p> <p>Currently, CETP receives 1051.10KLD (Avg.) during this compliance period hydraulic load and considering the current development scenario, existing CETP is adequate to treat and handle the total effluent load coming from industries within SEZ.</p>

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	water quality of streams, estuaries and marine water bodies.		project scenario, for which necessary permissions to set up decentralized CETPs of various capacities are already obtained. Presently a CETP capacity of 2.5 MLD is in place. Presently member units treat their effluents to meet the CETP inlet norms and then send it to CETP. Treated	facility should limit the marine discharge of treated industrial wastewater to 16 MLD as per the permits. Remaining treated wastewater shall be utilized for horticulture purpose.			<p>Out of 61 operational units only 4 industries within SEZ are sending their partially treated industrial as well as domestic effluent to the CETP confirming CETP inlet norms for further treatment and final disposal. Other industries within SEZ have their own STPs / ETPs for treatment of wastewater generated from their industrial operation and discharging the treated water on land for horticulture purpose within their premises as per permission granted by SPCB.</p> <p>The capacities of CETP will be enhanced on modular basis as per future requirement.</p> <p>Presently avg. 2.57 MLD (from CETP, ETP & STPs) of treated water is being utilized on land for horticulture purpose within APSEZ premises during period Apr'25 to Sep'25 and no discharge is made to any other source.</p>

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			wastewater from CETP meets the stipulated discharge norms for utilization for greenbelt development within the APSEZ areas.				
			Online wastewater quality monitoring systems are installed at CETP to ensure quality of treated effluent meets the requisite discharge norms. No wastewater from CETP is	Efforts shall be made to recycle complete treated wastewater for port operations and industrial operations of APSEZ in future based on a detailed techno-economic feasibility study.	APSEZ	Based on outcome Techno-feasibility Study	<p>Online continuous effluent monitoring system (CEQMS) installed at the discharge point of CETP to track any deviation from discharge norms. CEQMS is connected with CPCB/GPCB server & data is continuous transferring in both servers.</p> <p>Presently entire quantity of treated water from CETP is used for gardening / horticulture purpose within APSEZ premises.</p>

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			discharged into natural bodies as on date..																										
			Runoff during monsoon from coal storage yards is collected in sedimentation ponds (dump pond) to remove any residual dust particulates for further disposal into sea	Storm water runoff from the facility during the first rain shall be sampled and analyzed for the presence of heavy metals or other criteria pollutants to adopt corrective and preventive actions to protect the marine water quality. All red and hazard category industry within APSEZ shall adopt spill prevention and control program and no effluents	APSEZ	Continual	<p>There are provision of drains around coal stack yard to carry to runoff water to dump ponds. This water is either used for dust suppression or after sedimentation (to remove residual dust), is allowed disposal to sea.</p> <p>Presently Marine monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi for APSEZ & APL both. The analysis reports of the same are being submitted to the concerned authorities on regular basis.</p> <p>The marine water quality monitoring summary for last six months (Apr'25 to Sep'25) is as per below.</p> <p>Locations: 14 Nos. (APSEZ – 9 + APL – 5) Frequency: Once in a Month / Half Yearly</p> <table border="1"> <thead> <tr> <th rowspan="2">TEST PARAMETERS</th> <th rowspan="2">UNIT</th> <th colspan="3">Cumulative Surface</th> <th colspan="3">Cumulative Bottom</th> </tr> <tr> <th>Min</th> <th>Max</th> <th>Average</th> <th>Min</th> <th>Max</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>--</td> <td>7.90</td> <td>8.28</td> <td>8.09</td> <td>7.80</td> <td>8.40</td> <td>8.05</td> </tr> </tbody> </table>	TEST PARAMETERS	UNIT	Cumulative Surface			Cumulative Bottom			Min	Max	Average	Min	Max	Average	pH	--	7.90	8.28	8.09	7.80	8.40	8.05
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				shall be discharged into storm water-drains.			<table border="1" data-bbox="1396 568 2026 950"> <tr> <td>BOD</td> <td>mg/L</td> <td>2.40</td> <td>3.50</td> <td>3.06</td> <td>BDL (MDL:1.0)</td> <td>3.30</td> <td>1.50</td> </tr> <tr> <td>TSS</td> <td>mg/L</td> <td>56.00</td> <td>164.00</td> <td>104.47</td> <td>56.00</td> <td>132.00</td> <td>93.60</td> </tr> <tr> <td>DO</td> <td>mg/L</td> <td>6.30</td> <td>7.04</td> <td>6.56</td> <td>5.90</td> <td>6.83</td> <td>6.36</td> </tr> <tr> <td>Salinity</td> <td>ppt</td> <td>35.71</td> <td>36.80</td> <td>36.38</td> <td>36.62</td> <td>37.45</td> <td>36.95</td> </tr> <tr> <td>TDS</td> <td>mg/L</td> <td>35140</td> <td>36640</td> <td>35726</td> <td>35996</td> <td>37250</td> <td>36517</td> </tr> <tr> <td>Temperature</td> <td>oC</td> <td>28.10</td> <td>30.00</td> <td>29.00</td> <td>26.60</td> <td>29.90</td> <td>28.79</td> </tr> </table> <p style="text-align: right;">BDL- Below Detection Limit MDL- Minimum Detection Limit</p> <p>Approx. INR 8.73 Lakhs is spent by APSEZ for environmental monitoring activities during the FY 2025-26 till Sep'25, which also includes ambient air quality monitoring for overall APSEZ, Mundra.</p>	BOD	mg/L	2.40	3.50	3.06	BDL (MDL:1.0)	3.30	1.50	TSS	mg/L	56.00	164.00	104.47	56.00	132.00	93.60	DO	mg/L	6.30	7.04	6.56	5.90	6.83	6.36	Salinity	ppt	35.71	36.80	36.38	36.62	37.45	36.95	TDS	mg/L	35140	36640	35726	35996	37250	36517	Temperature	oC	28.10	30.00	29.00	26.60	29.90	28.79
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			Detailed marine hydrodynamic modelling studies revealed that the current and proposed	Good dredging practices shall be adopted by APSEZ: (i).Improving the dredging accuracy (ii).Improving onboard	APSEZ	Long Term	<p>No capital dredging has been done, since Apr 2015 to Aug 2024.</p> <p>Total 3.07 MCuM Capital dredging or reclamation is carried out since Oct'24 to Sep'25 for Expansion of Waterfront Development Plan. Out of which 1.52 MCuM is carried out during the compliance period Apr'25 to Sep'25.</p>																																																

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			<p>dredged soil disposal practices, sea water intake and outfall facilities and desalination plant outfall etc have shown insignificant impact on the marine eco-system. As part of the comprehensive environmental monitoring program, APSEZ has been adopting marine water and sediment</p>	<p>automation and monitoring, (iii). Reduce spill and loss, (iv). evaluating the need for installing silt screens near mangrove areas during the dredging phase operations, (v). Environment friendly dredging activities can be undertaken in such a way that the overall turbidity levels near the mangrove and ecologically sensitive zones shall not exceed 100 NTU or 200 mg/l of TSS (10% lethal level of fish) Existing marine</p>			<p>Dredged material generated during maintenance dredging is being disposed at designated locations within deep sea as identified by NIO.</p> <p>Dredging Management plan is adopted for carrying out dredging and management of dredge material. Presently there are 3 nos. of dredgers (2 Nos. Cutter suction + 1 No. Trailer suction) are in operation for dredging.</p> <p>Marine monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi. The analysis reports of the same are being submitted to the concerned authorities on regular basis. Summary of marine water for the last six months is as mentioned above.</p> <p>The same practice will be continued in future also as per direction by MoEF&CC as well as GPCB.</p> <p>Monitoring will be focused near ecological sensitive area in case of need to carryout capital dragging near such areas.</p>

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			quality monitoring on monthly basis.	monitoring program shall be continued as per the directions of MoEF&CC and GPCB.			
7	Groundwater quality and salinity ingress						
7.1	While Mundra block is enjoying safe ground water status as on date (based on the data published by CGWB), due to induced economic and population growth, use of ground water resources by the local	Level-2	APSEZ is not utilizing ground water for any type of use. APSEZ is meeting the current water demand through Narmada water supply scheme and 47 MLD captive desalination plant at site.	A dedicated desalination plant of capacity 4,50,000 m ³ /day (450 MLD) will be developed in progressive manner to meet the APSEZ requirements.	APSEZ	As and When Required	<p>Present source of water for various project activities is desalination plant of APSEZ and/or through Gujarat Water Infrastructure Limited (GWIL) and same is sufficient to meet the present water demand.</p> <p>APSEZ does not draw any ground water.</p> <p>"Desalination plant of 47 MLD capacities already developed as part of earlier clearances granted in 2009. Additional development of 33 MLD capacity Desalination plant has been developed.</p> <p>At present total 80 MLD desalination plant developed & in operation under WFDP west port (GPCB ID – 35427) with utilization of existing intake and outfall channel (up to 300 MLD capacities) and CC&A Amendment for the same granted by GPCB board CC&A Amendment order copy for the same was submitted during the compliance submission for the period Oct'24 to Mar'25..</p>

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	people might increase in Mundra region. This might increase the TDS and chloride levels in the ground water in future.						Additional development of 80 MLD desalination plant is under progress through Mundra Petrochemical Ltd. (Subsidiary company of Adani Group). Separate Consent to Establish from GPCB has been obtained by them vide Order no. CTE-77914 dated 09.12.2024. Copy of the same was submitted during the compliance submission for the period Oct'24 to Mar'25.. Balance 287 MLD capacity desalination plant will be developed on a modular basis as per business requirement.
7.2	Due to induced growth in the region, pressure on the available ground water source would increase and this could pose some threat	Level-2	Ground water is not drawn by APSEZ for its operations. Natural streams (seasonal rivers) passing through the APSEZ area will not be disturbed, the micro-	The Govt. of Gujarat, Narmada, Water Resources, Water Supply & Kalpsar Dept.,(WRD)12 has been implementing various salinity ingress prevention projects	District Administration*	Long Term	APSEZ will co-operate and comply with the directions from concerned regulatory authorities. APSEZ does not draw any ground water for the fresh water requirement. However, Adani Foundation – CSR arm of Adani Group has carried out rainwater harvesting activities in the nearby villages for benefit of the locals. Water conservation Projects i.e. Roof Top Rainwater Harvesting, Desilting of Check dams, Bore Well Recharge and Pond deepening were taken up in past years, review and monitoring of all water harvesting structures had been taken up.

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	to salinity ingress.		watershed in the area will not be disturbed. Due to the above reasons, the possibility of salinity ingress due to APSEZ development is not envisaged. Mundra and Anjar blocks fall under fresh water to medium salinity zones. It can be observed that little variation was observed in the ground water salinity levels				<p>To make connections between human actions and the level of biological diversity found within a habitat and/or ecosystem, this year Adani Foundation launch project "Sanrakshan" in coordination with GUIDE and Sahjeevan.</p> <p>Since, 10 years considerable Water Conservation Work carried out in Mundra Taluka. Due to satisfactory rain in current year 1.11 mtr ground water table increased as per increased in coastal belt of Mundra as per Government Figures.</p> <p><u>WORK COMPLETED:Water Conservation Work Done during Compliance Period Apr'25 to Sep'25:</u></p> <ul style="list-style-type: none"> ❖ <u>Water conservation project (till date water conservation work):</u> In recent years, the villages near our operational area have experienced significant enhancements in both the availability and quality of water. These improvements stem from our focused efforts in managing and conserving groundwater and surface water resources. • <u>Key interventions—</u> <ul style="list-style-type: none"> ○ pond deepening, ○ strengthening of check dams, ○ installation of rainwater harvesting systems, borewell drilling, and clearing of river inlets—

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			<p>from year 2013 to 2016 across the Mundra and Anjar blocks. This aspect confirms that the overall salinity ingress from the shore into the land due to existing APSEZ facilities and power plant outfalls are less significant.</p>				<p>have together increased water storage capacity.</p> <ul style="list-style-type: none"> • <u>Till the date (Sep'25)</u> <ul style="list-style-type: none"> ○ 145 Pond Deepening ○ 209 Bore & Wells ○ 355 Rainwater Harvesting ○ 30 Check Dams ○ 25 Percolation Wells ○ Farmers Benefitted - 1760 Storage ○ capacity Increase – 2171435Cum. • <u>Current year (Apr'25 to Sep'25)</u> <ul style="list-style-type: none"> ○ Pond Deepening - 05 Village Pond ○ Check dam Re- strenghtining-01 ○ Farmer - 300 famer Land irrigated - 1800 Acre ○ 8.0% Increase in Revenue ○ 9.00 % TDS Reduction ○ Rs 1200 Reduce in health expenses Monthly ❖ <u>ROOF TOP RAINWATER HARVESTING:</u> <ul style="list-style-type: none"> ○ 355 RRWHS units built across 355 homes, positively impacting more than 1,760 people. ○ TDS level below 100 meeting WHO standards for safe drinking water. ○ First-time rainwater harvesting enabled for the community, ensuring quality drinking water and reducing financial burdens

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							<ul style="list-style-type: none"> ○ 1760+ Residents benefited ○ 97.73% Less TDS than local municipality water Gundiyaali – 4410 TDS ○ Rs. 1125 monthly Saved on drinking water ○ Rs. 3000 yearly saved on health expense ❖ The Water Conservation Projects completed during FY 2024-25: Adani Foundation has undertaken significant water conservation initiatives to address water scarcity and improve water availability in rural areas. ❖ Through the creation of 737 various water structures, the project has increased water capacity by 5,400,735 cubic meters (CUM) and benefited 64,515 people. ● Check Dam New/Renovation: <ul style="list-style-type: none"> ○ Structures: 29 ○ Water Capacity Increase: 1,072,332 CUM ○ Beneficiaries: 30,870 ○ Impact: Enhances water storage and irrigation. ● Rainwater Harvesting Structures (RRWHS): <ul style="list-style-type: none"> ○ Structures: 330 ○ Water Capacity Increase: 3,300,000 CUM ○ Beneficiaries: 1,650 ○ Impact: Maximizes rainwater capture and usage. Rs. 10950 yearly saved/house ● Pond Deepening: <ul style="list-style-type: none"> ○ Structures: 135

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							<ul style="list-style-type: none"> ○ Water Capacity Increase: 1,028,403 CUM ○ Beneficiaries: 18,350 ○ Impact: Improves water retention and availability. ● Construction of Percolation Wells: <ul style="list-style-type: none"> ○ Structures: 26 ○ Ground Water Recharge: Significant ○ Beneficiaries: 3,000 ○ Impact: Boosts groundwater levels and availability. ○ Bore/Well Recharge ○ Structures: 209 ○ Ground Water Recharge: Significant ○ Beneficiaries: 1,045 ○ Impact: Enhances groundwater recharge and sustainability. ● Construction of New Wells: <ul style="list-style-type: none"> ○ Structures: 8 ○ Purpose: Drinking Water ○ Beneficiaries: 9,600 ○ Impact: Provides reliable drinking water sources <p>With the objective of to preserve the rainwater to reduce the impact of salinity and recharge the ground water (the main source of water) to facilitate the Agricultural activities as well as for drinking water.</p> <p>Narmada Water Resources, Water Supply & Kalpsar</p>

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							Dept., (WRD)1 has been implementing various salinity ingress prevention projects. Under Sardar Sarovar canal project, Govt. of Gujarat has proposed to implement about 8200 Km stretch of water canal and the project is at various stages of implementation. Under this project about 112,000 ha of land in about 180 villages will be benefitted with irrigation needs. This will significantly reduce the pressure on the ground water resources in the region.																				
				While the individual industries in the study area will continue to undertake ground water quality monitoring as per the environmental clearances issued for the respective projects,	All Concerned Stakeholders, District Administration and CGWB*	Continual Process	<p>APSEZ (9 Locations – half yearly) & Adani Power Ltd. (5 Locations – quarterly) is carrying out ground water sampling and reports of the same are being submitted to the regulatory authorities on regular basis.</p> <p>The summary of APSEZ ground water quality monitoring for last six months (Apr'25 to Sep'25) are as below.</p> <p>Nos. of Location: 09</p> <table border="1"> <thead> <tr> <th>Parameters</th> <th>Unit</th> <th>Min</th> <th>Max</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>pH @ 25 ° C</td> <td>--</td> <td>7.38</td> <td>8.36</td> <td>7.81</td> </tr> <tr> <td>Salinity</td> <td>ppt</td> <td>1.40</td> <td>20.58</td> <td>6.09</td> </tr> <tr> <td>Oil & Grease</td> <td>mg/L</td> <td>BDL(MDL: 2.0)</td> <td>BDL(MDL: 2.0)</td> <td>BDL(MDL: 2.0)</td> </tr> </tbody> </table>	Parameters	Unit	Min	Max	Average	pH @ 25 ° C	--	7.38	8.36	7.81	Salinity	ppt	1.40	20.58	6.09	Oil & Grease	mg/L	BDL(MDL: 2.0)	BDL(MDL: 2.0)	BDL(MDL: 2.0)
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				regional level ground water conservation action committee can be formed under the guidance of state ground water board and district Administration.			Hydrocarbon	mg/L	Not Detected	Not Detected	Not Detected	Lead as Pb	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	Arsenic as As	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	Nickel as Ni	mg/L	0.07	0.12	0.041	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	Cadmium as Cd	mg/L	0.08	0.08	0.0093	Mercury as Hg	mg/L	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	Zinc as Zn	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	Copper as Cu	mg/L	0.06	0.10	0.060	Iron as Fe	mg/L	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	Insecticides/Pesticides	µg/L	Absent	Absent	Absent	Depth of Water Level from Ground Level	meter	1.90	2.10	2.01
<p style="text-align: right;">BDL – Below Detection Limit MDL – Minimum Detection Limit</p> <p>Approx. INR 8.73 Lakhs is spent by APSEZ for environmental monitoring activities during the FY 2025-26 till Sep'25, which also includes ambient air</p>																																																																		

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							<p>quality monitoring for overall APSEZ, Mundra.</p> <p>The freshwater requirement of all the industries within SEZ is being satisfied through APSEZ. All the industries are encouraged to monitor ground water quality as per the permissions granted by competent authorities.</p> <p>As mentioned above, presently, APSEZ has formed Internal Environment Monitoring Committee, involving Officials of APSEZ, Adani Power Limited and other member units, having role and responsibilities as defined above.</p> <p>APSEZ will co-operate and comply with the directions from concerned regulatory authorities for ground water management.</p>
8	Waste Management						
8.1	Solid waste will be generated from industrial activities of APSEZ and other permitted facilities in the study area	Level-2	APSEZ has been adopting Zero waste Initiatives and the entire waste generated from existing operations is segregated and disposed	APSEZ will continue to adopt Zero Waste Initiative and wastes will be segregated at source and disposed to various recycling vendors, co-processing in cement plants.	APSEZ	Continual Process	Presently APSEZ has implemented Zero waste Initiatives as per 5R (Reduce, Reuse, Recycle, Recover & Reprocess) principles of waste management. At present, APSEZ has developed material recovery facility for 6.0 TPD capacities. A well-established system for segregation of dry & wet waste is in place. All wet waste (Organic waste) is being segregated & utilized for compost manufacturing and/or biogas generation for cooking purpose. The compost is further used by in house horticulture team for greenbelt development. Whereas dry recyclable waste is being sorted in various categories. Presently manual sorting

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	including Mundra town. These wastes would contain recyclable material, construction debris, organic waste, inert material and e-waste etc. In the absence of any organized source segregation programs and material recycling strategies and infrastructure facilities, these		to recycling vendors, thereby APSEZ has achieved zero landfill status as on date.	This initiative helps not only to reduce the waste to landfill significantly, but also to recycle the materials there by avoiding ecological impacts.			<p>is being done for sorting of different types of solid waste. Segregated recyclable materials such as Paper, Plastic, Cardboard, PET Bottles, Glass etc. are then sent to respective recycling units, whereas remaining non-recyclable waste is bailed and sent to cement plants for Co-processing as RDF (Refused Derived Fuel). The same practice will be continued in future also. APSEZ has also been recognized for Zero Waste to Landfill certification from reputed organization.</p> <p>APSEZ, Mundra is certified for Zero Waste to Landfill management system (Certificate No.: CII/ZWL/2025/001) by Confederation of Indian Industry (CII). (valid up to 22.12.2027). The copy of certificate was submitted during the compliance submission for the period Oct'24 to Mar'25..</p> <p>APSEZ is being done proper solid waste management in his operational area with 5R principle as per Waste Management Plan.</p>

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	wastes will enter into environment and would pose long term health impacts.						Industries located within the SEZ area are also complying with the waste management rules stipulated by statutory authorities and same is also being confirmed by APSEZ as well SPCB on regular basis.
8.2	Considering an average solid waste generation of 0.25 Kg/person/day, the estimated solid waste from facilities within APSEZ will be in the order of 100 TPD (36,500 TPA).	Level-2	APSEZ has made a provision for central waste management facilities within the existing site based on the future needs. As part of the Zero Waste Initiatives, no landfill facilities will be installed at APSEZ.	The existing waste segregation and material recycling facilities will be augmented to dispose safely the wastes generated from APSEZ areas. Solid Waste Management Program shall be adopted and implemented as per Municipal Solid Waste Management Rules 2016 and Construction	APSEZ	Continual Process	

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				Waste Management Rules 2016			
8.3	About 35 TPD (13,000 TPA) of solid waste would be generated from the proposed industrial areas located outside the APSEZ area.	Level-2	As per the MSW Rules 2016 all the industrial facilities and SEZs are required to adopt waste segregation facilities at the respective properties and non-recyclable waste shall be disposed to landfill sites.	Solid Waste Management Program shall be adopted and implemented as per Municipal Solid Waste Management Rules 2016 and Construction Waste Management Rules 2016	All Industries	Continual Process	
9	Ecological aspects (terrestrial and marine)						
			It is noted	APSEZ has approached concerned			Stage – 1 Forest clearance granted for diversion of 1576.81 Ha Forest land. Compliance of stage-1 forest clearance is process. After getting EC & CRZ Clearance,

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9.1	About 1576 ha of shrub forest land contiguous to APSEZ area is applied for land diversion for various developmental activities. This might have certain level of changes in the biodiversity in the study area.	Level -1	that the designated forest land is free from any native vegetation and comprises of Prosopis juliflora. It is also noted that no endangered species are present at the shrub forests that are applied for land diversion. It is also noted that no forest produce is reported from this designated	authorities for diversion of designated forest land. Suitable compensatory afforestation plan shall be adopted based on the recommendations and directions of the concerned authorities. Due to adoption of compensatory afforestation program through a scientific manner, the overall ecological footprint in the district will be increased. Due to plantation of native tree species as part of greenbelt	APSEZ/State Forest Department*	Long Term	<p>Stage-2 Forest clearance will be obtained.</p> <p>APSEZ has applied for getting EC & CRZ clearance for SEZ / Industrial Park in 1576.81 Ha Forest land.</p> <p>ToR accorded by MoEF&CC on 30.11.2021 and draft EIA is being carried out through NABET accredited consultant.</p> <p>Public Hearing (PH) has been conducted by RO-GPCB, Gandidham dated 27.03.2025. PH proceeding submitted to MoEF&CC, Delhi on 16.04.2025.</p> <p>GCZMA Meeting was held on 30.09.2025 and as per MoM received, project proposal has been recommended for CRZ clearance. Awaiting for final CRZ recommendation letter from GCZMA.</p> <p>APSEZ has applied for getting final EC & CRZ Clearance for development of 1576.81 Ha SEZ/IP @ Mundra vide dated 04.11.2025, which is under scrutiny.</p>

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			<p>forest land parcel due to lack of economic importance of plant species reported in the shrub forest. It is also noted that no tribal lands are located in the designated forest land parcel. Hence there will not be any change in biodiversity due to the proposed diversion.</p>	<p>development, the overall biodiversity of the region will increase considerably when the project is fully developed.</p>			
			No				As a part of the directions given by MoEF&CC vides

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9.2	Mangrove conservation areas are located adjacent to the APSEZ area. Accidental discharges of industrial effluents into the marine environment would pose certain ecological risk.	Level -1	development activities will be undertaken within mangrove conservation areas. APSEZ has taken up large scale mangrove afforestation activities in an area of more than 2800 ha at various locations across the coast of Gujarat state in consultation with various organizations The Adani	Mangrove footprint and health status shall be monitored annually	APSEZ	Continual Process	<p>order dated 18th Sep, 2015, following studies were conducted.</p> <ol style="list-style-type: none"> 1. NCSCM (MoEF&CC promoted Government Agency) study on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around APSEZ. <p>As a part of mangrove conservation plan, APSEZ has done following activities.</p> <ol style="list-style-type: none"> a. To comply with the GCZMA recommendations regarding mangrove monitoring at every 2 years, presently APSEZ has entrusted NCSCM, Chennai to carry out the Monitoring of mangrove distribution in creeks in and around APSEZ with cost 45.87 Lacs from year 2021 to 2023. b. Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> • The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February

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			Foundation introduced 'Mangrove Nursery Development and Plantation' scheme in the area as an alternative income generating activity for the people of the region.				<p>2021 and September 2023.</p> <ul style="list-style-type: none"> • Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover approximately 2 hectares, accounting for about a 0.08% increase. • Hence, overall increase in mangrove cover area in creek system in and around APSEZ from 2011 (2094 Ha) to September 2023 (2501 Ha) is 407 Ha (19.43%). The NCSCM Mangrove mapping report is attached as Annexure - 9. <p>c. Tidal observation in creeks in and around APSEZ – The cost of the said activity was INR 1.0 Lacs incurred by APSEZ.</p> <p>d. Algal & Prosopis removal from Mangrove area - The cost of the said activity was Rs. 150000 during FY 2024-25. The algal removal report was submitted during the compliance submission for the period Oct'24 to Mar'25.</p> <p>e. Awareness of mangroves importance in surrounding communities & Fodder support - The expenditure for fodder supporting activities was approx. 236.66 Lacs during FY 2025-26 till Sep'25 which was incurred by APSEZ. This activity is being done on continuous basis as a part of CSR activity.</p>

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							<p>As a part of GCZMA recommendations and NCSCM mangrove conservation action plan, APSEZ has undertaken following activities.</p> <table border="1" data-bbox="1392 683 2022 1422"> <thead> <tr> <th data-bbox="1392 683 1467 760">Sr. No.</th> <th data-bbox="1467 683 1671 760">Recommendations</th> <th data-bbox="1671 683 2022 760">Compliance</th> </tr> </thead> <tbody> <tr> <td data-bbox="1392 760 1467 1422">1.</td> <td data-bbox="1467 760 1671 1422">Mangrove mapping and monitoring in and around APSEZ</td> <td data-bbox="1671 760 2022 1422"> <ul style="list-style-type: none"> • APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha Island. • Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> ○ The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was </td> </tr> </tbody> </table>	Sr. No.	Recommendations	Compliance	1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"> • APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha Island. • Recently, NCSCM has conducted ground truthing during 5th to 7th Mar'25 & 22nd to 27th Apr'25 in and around our APSEZ area for mangrove mapping using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove mapping study work has been completed. The overall assessment of mangrove mapping is as per below. <ul style="list-style-type: none"> ○ The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was
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							2.	Tidal observation in creeks in and around APSEZ	<ul style="list-style-type: none"> • APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM. • The observed tidal ranges indicate that the creeks experience normal tidal

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									<p>ranges, adequate for the growth of mangroves.</p> <ul style="list-style-type: none"> The cost of the said activity was INR 1.0 Lacs.
							3.	Removal of Algal and Prosopis growth from mangrove areas	<ul style="list-style-type: none"> Algal and Prosopis growth monitoring was done in and around mangrove area and algal encrustation was found in some of the mangrove areas, which has been removed manually. The cost of the said activity was Rs. 1,50,000 during FY 2024-25. The algal removal report was submitted during the compliance period Oct'24 to Mar'25.
							4.	Awareness of mangroves importance in surrounding communities	<ul style="list-style-type: none"> Adani Foundation – CSR Arm of Adani group has done awareness camps/activities created in the community regarding importance of mangroves. Adani Foundation provides Good Quality dry and green fodder to 36 Villages. Dry Fodder 8,65,965 Kg Green – 30,75,945 Kg. Awareness of mangroves importance in surrounding communities & Fodder support - The expenditure for fodder supporting

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									<p>activities was approx. 236.66 Lacs during FY 2025-26 till Sep'25, which was incurred by APSEZ.</p> <ul style="list-style-type: none"> • Grass Land development: 213 acres of gauchar land has been cleaned and allocated for Grass land development with strong Community Contribution and Mobilization. • Other than this dedicated security guard with gate system deployed by APSEZ across the coastal area and no any unauthorized persons allowed within coastal as well as mangrove areas. • APSEZ has celebrated the International Day for the Conservation of the Mangrove Ecosystem with coordination of Adani Foundation from 24th to 26th July 2024 to raise awareness of the importance of mangrove ecosystems as "a unique, special and vulnerable ecosystem". The report for the same was submitted during the compliance period Apr'24 to Sep'24.

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9.3	Outfall from the thermal power plants desalination and CETP would pose certain level of impact on the marine environment.	Level-1	A detailed marine hydro-dynamic and dispersion modelling of the study area indicates that the background temperature and salinity at mangrove conservation area will not increase from the prevailing background levels as the outfalls are located far away. APSEZ and	All approved marine outfalls shall be monitored for salinity, temperature and other designated parameters as per consent to establish issued by GPCB. Existing marine environmental monitoring program shall be continued.	APSEZ and Concerned Industry	Continual Process	<p>Presently marine monitoring is being carried out by the Adani power plant at the marine outfall locations and reports are being submitted to the concerned authorities on regular basis.</p> <p>APSEZ is carrying out Marine monitoring once in a month at 9 locations in deep sea by NABL and MoEF&CC accredited agency namely M/s. Unistar Environment and Research Labs Pvt. Ltd., Vapi. The analysis reports of the same are being submitted to the concerned authorities on regular basis.</p> <p>Adani power plant is also doing marine water quality at 5 locations (2 locations at outfall location) in deep sea by NABL and MoEF&CC accredited agency namely M/s. Unistar Environment & Research Labs Pvt. Ltd. The analysis reports of the same are being submitted to the concerned authorities on regular basis. The summary of marine water quality is shown above.</p> <p>The comparison of marine water results between CIA and current monitoring data are as below.</p> <table border="1"> <thead> <tr> <th rowspan="2">Parameter</th> <th rowspan="2">Unit</th> <th colspan="2">Max</th> <th colspan="2">Min</th> </tr> <tr> <th>CIA</th> <th>Present</th> <th>CIA</th> <th>Present</th> </tr> </thead> <tbody> <tr> <td>Temp.</td> <td>°C</td> <td>36.40</td> <td>37</td> <td>35.20</td> <td>36.7</td> </tr> </tbody> </table>	Parameter	Unit	Max		Min		CIA	Present	CIA	Present	Temp.	°C	36.40	37	35.20	36.7
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			respective power plants in the study area have been monitoring the marine water quality status on monthly basis for the stipulated environmental and ecological parameters.				<table border="1" data-bbox="1398 570 2011 621"> <tr> <td>Salinity</td> <td>ppt</td> <td>29.50</td> <td>28.5</td> <td>29.00</td> <td>27.9</td> </tr> </table> <p>As per above results, it can be seen that there is no deviation in the concentration of parameters and thus indicates that impacts are insignificant.</p>	Salinity	ppt	29.50	28.5	29.00	27.9
Salinity	ppt	29.50	28.5	29.00	27.9								
9.4	Terrestrial Ecology: Study area doesn't have any notified national parks or ecological sanctuaries. Since the	Level-1	APSEZ has developed greenbelt in an area of 550ha as against the committed area of 430ha. A dedicated nursery is set up to promote	The compensatory afforestation area to be monitored annually to check the survival rate of the plantation.	APSEZ	Continual Process	<p>APSEZ has developed its own "Dept. of Horticulture" which is taking measures/ steps for terrestrial plantation/greenbelt development. APSEZ, Individual SEZ Industries and Adani Power Plant has developed approx. 700 Ha. area as greenbelt within the APSEZ area including SEZ industries & Adani Power Plant.</p> <p>Dedicated horticulture department is maintaining and monitoring the terrestrial green belt development on regular basis to check the survival rate of plantation.</p> <p>Budget for Horticulture Department for the FY 2025-</p>						

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	area falls under dry deciduous shrubs. Due to scanty rains in the area, the overall natural green-cover/vegetation in the area is very small.		plantation. APSEZ have undertaken a plantation with about 9.6 Lakh fully grown trees.				26 is to the tune of INR 655 lakh. Out of which, Approx. INR 175 lakh has spent during the year FY 2025-26 till Sep'25.
10	Socio-economic aspects						
10.1	Population growth in the Mundra region was reported to be in the order of 85% during the past decade (2001-2011). Further expansion of the urban	Level-1	Dedicated townships are developed within APSEZ area with necessary community infrastructures such as hospital, school, recreational facilities,	The existing townships will be expanded to accommodate about 4lakh people when the project activity is fully developed.	APSEZ	As and When Required	APSEZ has developed two townships (Shantivan and Samudra) accommodating 2378 households and associated infrastructure facilities. Accommodation is made available for all interested employees working within Adani group & SEZ industries. Out of which 82.30 % Occupancies are accommodated within the townships and rest are available for employees working within APSEZ. At present 61 nos. of industries (processing & non-processing) are operating within the SEZ. Township facilities are also made by SEZ industries within

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	<p>area could be possible due to induced economic growth in the region. Increase in population will have a additional need for public infrastructure in the region.</p>		<p>sewage treatment and waste collection facilities. Adani Foundation has been undertaking various CSR programs under the principal themes such as education, community health, sustainable livelihood and rural infrastructure. About Rs. 97 Cr has been spent on various CSR activities in the Mundra region since 2010. Similar community</p>				<p>Mundra town for their employees having basic infrastructure facilities and requirements. Most of the employees working in SEZ industries are residing in Mundra township having all basic requirements and associated facilities.</p> <p>The existing social infrastructure facilities are adequate to accommodate the people considering present APSEZ development. The existing townships with associated facilities will be expanded as per requirement. Other infrastructure facilities have been developed for people are as follows.</p> <ul style="list-style-type: none"> • Multi-Specialty Hospital • School • Commercial complex • Religious place <p>APSEZ is actively working with local community (including fishermen community) around the project area and provides required support for their livelihood and other concerns through the CSR arm – Adani Foundation in the main five persuasions is mentioned below.</p> <ul style="list-style-type: none"> • Community Health • Sustainability Livelihood – Fisher Folk • Education • Rural Infrastructures • Skill Development

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			development programs (based on need based assessment) will be continued in future as well with allocation of appropriate budget.				<p>Adani foundation has spent approx. INR 10446.78 lakhs from April – 2018 to September - 2025 for CSR activities which also includes cost of rural infrastructure projects.</p> <p>Major works carried out since April 2018 as a part of CSR activities are as below.</p> <p><u>Infrastructure development activities during FY 2025-26 till Sep'25:</u></p> <ul style="list-style-type: none"> • Pond Deepening: 03 Nos. Digital Library: 04 Nos. • Common Gathering Shed: 09 Nos. • Gaushala Development: 02 Nos. • RRWHS Construction: 25 Nos. • Community Center: 02 Nos. • Check dam strengthening: 02 Nos. • Restrengthening of Approach Road: 24 Km <p><u>LAST YEAR COMMUNITY INFRASTRUCTURE DEVELOPMENT PROJECTS & ITS BENEFICIARIES</u></p> <ul style="list-style-type: none"> • Renovation of Aanganwadi, Goyarsama Village – 40 beneficiaries • Construction of Pipe Culvert, Old Bandar Fisherman Vasahat - 1200 beneficiaries • Open Shed & Community Hall, Sukhpurvah Mundra – 1200 beneficiaries • Open Shed at PTC College, Mundra – 160 beneficiaries

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							<ul style="list-style-type: none"> • Renovation of High School, Zarapra Village – 550 beneficiaries • Open Shed at Mokha Parking – 2000 beneficiaries • Canal Cleaning & Chamber Renovation, Bhadreswar Village – 120 beneficiaries • Renovation of Approach Road, Shekadiya and Luni – 1200 beneficiaries • R.O. Plant Installation, ITI Mundra & Sanjivni School – 800 beneficiaries • Paver Block Floor Work, Wandri Village – 2000 beneficiaries <p>❖ <u>COMMUNITY INFRASTRUCTURE DEVELOPMENT</u> <u>KEY COMMUNITY INFRASTRUCTURE DEVELOPMENTS:</u></p> <ul style="list-style-type: none"> ○ Educational Facility Renovations ○ High School, Zarapra: 550 students benefited. ○ Anganwadi, Goyarsama: 40 students benefited. ○ High School, Desalpar: 550 students benefited. ○ Kasturba Girls Hostel, Desalpar: 150 girls benefited. ○ Infrastructure Improvements: ○ Pipe Culvert, Old Bandar: 1200 people benefited. ○ Box Culvert & CC Road, Zarapara: 12000 people benefited.

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							<ul style="list-style-type: none"> ○ Approach Road, Shekadiya & Luni: 1200 people benefited. ○ Approach Road, Vadi Vistar: 800 farmers benefited. ○ Water Management Projects: ○ Percolation Well, Mota Bhadiya: 80 farmers benefited. ○ Percolation Bore Cleaning, GPVC Villages: 3150 farmers benefited. ○ Pond Deepening & Road Cleaning, GPVC Villages: 6KM cleaned. ● Sanitation and Health Initiatives: ○ R.O. Plant, ITI Mundra & Sanjivni School: 800 students benefited. ○ Toilet Block for Disabled, GPVC Villages: 5 families benefited. ○ Painting & Office Work, CHC Mundra: 14600 people benefited. <p>Similar community development programs (based on need based assessment) will be continued in future as well with allocation of appropriate budget.</p>
10.2	The overall sex ratio was found to reduce by 28% in the Mundra taluk (study area)	Level-2	Adani foundation is taking up several girl child	Suitable regional level awareness programs on the girl child protection and encouragement programs in line	APSEZ, Other development projects and District Administration*	Long Term	<ul style="list-style-type: none"> ● Major works carried out since April 2018 as a part of CSR activities to create awareness about girl child protection are as below. ● The Adani Foundation provided scholarship support to motivation and encouragement of fishermen boys and girls for higher education under this program. We extend 100% fee support

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	during the period 2001 - 2011. This could be attributed to increase in influx of working men in the region due to rapid economic development. Similar trend might continue in future due to induced economic growth in the region.		education programs as part of CSR activities to create awareness about girl child protection.	with state and national policies shall be adopted under Corporate Social Responsibility programs in association with district authorities.			<p>to female candidates and 80% to male candidates.".</p> <p>Student Benefitted Under Utthan Project during the FY 2025-26 till Sep'25:</p> <p>Strengthening Government Primary Schools: Adopting and upgrading government 81 nos. of primary schools & High school to model schools.</p> <p>Main streaming Progressive learners:</p> <ul style="list-style-type: none"> • 2776 students of classes 4 & 5 were assessed. • 1151 students emerged as progressive learners • Personalized learning through different activities and TLM • 220 students mainstreamed. <p>Library Activity:</p> <ul style="list-style-type: none"> • Library books issues & Activities planned every Saturday. • 45000+ Books issued. • 300+ Oasis workshop arranged to increase reading habits of students. <p>IT on wheels:</p> <ul style="list-style-type: none"> • 1187 primary & 1448 high school students are learning basic computer skills. • Students gain essential computer skills, enhancing their digital literacy and preparing

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							<p>them for future academic and career opportunities.</p> <p>Mothers Meet:</p> <ul style="list-style-type: none"> • Mothers' meetings conducted every second Saturday in Utthan schools. • Over 95,00 mothers have joined. • Guidance on exams, scholarships, and healthy eating. • Home visits and discussions on academic performance. <p>Competitive Exam:</p> <ul style="list-style-type: none"> • 1050 passed and 21 students made it to the merit list. • 2726 students are preparing for exams like JNV, NMMS, PSE, and CET. • Meetings with 560 high school parents to encourage their support. <p>Gunotsav Primary School Performance:</p> <ul style="list-style-type: none"> • Gunotsav Results: Gunotsav grades are assessment by GoG as part of its statewide initiative to assess and enhance the quality of education in government schools. • 4 High Schools Achieved 100% Pass Rate in Results • All Utthan-supported schools showed a marked rise in Gunotsav grades, with many moving up to

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							<p>A & B categories—reflecting the positive impact of targeted academic and co-curricular interventions.</p> <p>Abacus & Vedic Maths:</p> <ul style="list-style-type: none"> • Utthan initiative has introduced Abacus and Vedic Mathematics in 54 primary and 08 high schools. Abacus is a tool used for performing arithmetic calculations, while Vedic Mathematics is an ancient system of Indian mathematics that simplifies complex calculations. Total 1800 nos. of Abacus and 1302 nos. of Vedic math's Students are benefited. <p>Project Udaan:</p> <ul style="list-style-type: none"> • Adani Foundation's Project Udaan empowers youth through immersive educational tours to key Adani Group facilities, offering real-world exposure beyond the classroom. • Students gain firsthand insights into industries like ports, power, and refineries, sparking curiosity and ambition for future careers. • The initiative nurtures entrepreneurial thinking, leadership qualities, and a vision for innovation among school and college students. • Faculty participation strengthens academic-industry linkages, enriching the learning ecosystem.

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							<ul style="list-style-type: none"> Project Udaan has become a catalyst for inspiring young minds to dream big and pursue meaningful, future-ready paths. Total 229 institute visit & 05 corporate visit done with 16380 students <p>About INR 10446.78 lakhs has been spent on various CSR activities in the Mundra region since April 2018 to till September 2025 including cost of community health and education for woman and girl child.</p>
10.4	Due to economic growth leading to rapid urbanization, which prompts the need for healthcare facilities in the region. For an influx of 6 lakh people from APSEZ operations and additional 3	Level-2	Adani hospitals, Mundra is setup by Adani group near Samudra township with a goal to provide primary and secondary health care services to Adani group employees and the local populace of Mundra. The existing 100 bed Adani	APSEZ will explore other possibilities to augment the primary and secondary healthcare facilities in future depending on the growth scenario at APSEZ development.	APSEZ	Long Term	<p>Adani hospitals (Multi-specialty), Mundra is having 100 bed facility and same is setup by Adani group near Samudra township.</p> <p>Primary health center and community health center are in place within the Mundra taluka.</p> <p>Other than this Adani foundation is doing various activities as part of community health. The details of FY 2025-26 till Sep'25 are below.</p> <ul style="list-style-type: none"> Students Health Screening Camp Beneficiary: 1093 Nos. Cataract Camp Beneficiary: 67 Nos. MHCU - Labour Colony v: 591 Nos. Health Awareness Session Beneficiary: 711 Nos. Specialty Health Camp Beneficiary: 1882 Nos. General Health Camp Beneficiary: 958 Nos. Rural Clinic Beneficiary: 6123 Nos. Mobile Van Beneficiary: 6719 Nos.

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	Lakh from induced growth by the year by 2030 (fully developed scenario), total hospitals facilities with about 540 beds would be required.		hospital at Mundra has been catering the services ranging from wellness and preventative care.				<ul style="list-style-type: none"> • Medical & Dialysis Supports Beneficiary: 995 Nos. ❖ Mobile Health Care Units and Rural Clinics • Rural Clinics: 7 Nos. • MHCU Stoppages: 31 Nos. • Villages Covered: 29 Nos. • Total individuals benefited from MHCU and Rural clinic services: 9867 Nos. • 33% average savings on healthcare-related costs. • 42% People are aware and become health Conscious • Adani Foundation's medical support program has provided critical care to 1,071 underprivileged patients, addressing serious health issues like kidney and heart conditions at Adani Hospital Mundra. • In life-threatening cases, patients are stabilized and referred to GKGH, Bhuj, with full coordination for advanced treatment—ensuring no one is left behind in their journey to recovery. ❖ Awareness and Screening Drive in Mundra Schools: • Adani Foundation conducted health and hygiene awareness sessions across primary

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							<p>schools in Mundra Block, fostering lifelong wellness habits among children and educators.</p> <ul style="list-style-type: none"> • Over 584 students and teachers participated in interactive sessions focused on hygiene practices and healthy living. • Comprehensive health screenings were carried out for 1,093 students, enabling early detection of health issues and timely intervention. • Core topics included handwashing, dental care, nutrition, personal cleanliness, and environmental health. • Adani Foundation organized a focused TB awareness initiative in Mundra Block, enhancing health literacy among affected individuals through expert-led sessions. • Patients received vital education on symptoms, medication, hygiene, diet, and lifestyle from healthcare professionals including the District TB Health Officer. <p>❖ Animal Husbandry:</p> <ul style="list-style-type: none"> • Awareness meetings on modern dairy farming in villages, engaging local cattle owners. • Organized vaccination camps across villages, covering 1,647 animals (1,410 camels + 237 cattle). • Improved livestock health and productivity by reducing disease risk and promoting sustainable care practices.


S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
							APSEZ will explore other possibilities to augment the primary and secondary healthcare facilities in future depending on the future development at APSEZ.
10.5	<p>Due to rapid economic development in the region, several employment opportunities can be generated to the local people.</p> <p>When the area is fully developed by the end of 2030, the working population of the Mundra taluk would increase from current level of 55,000 to as high as 4,00,000,</p>		<p>APSEZ has been giving preferences to people from Gujarat for providing employment opportunities based on eligibility and skills. In Mundra, special programmes have been conducted by Adani Foundation to enhance the employability of youth from fisherfolk communities. Based on the need assessment</p>	<p>APSEZ is committed to provide support for fishermen livelihood activities and has submitted a detailed 5 years plan to MoEF&CC with a total budget of Rs.13.5 Cr.</p>	APSEZ	Short Term	<p><u>Fishermen livelihood development activities during FY 2025-26:</u></p> <p><u>WOMEN EMPOWERMENT:</u></p> <ul style="list-style-type: none"> ❖ Self Help Groups: Women were mobilized into 82 SHGs through formal registration, laying the foundation for collective growth and financial inclusion. ❖ Skill Building: Tailored workshops and hands-on training empowered members with entrepreneurial, financial, and operational skills. Conducted 12 workshops for 1000 women's. ❖ Exposure & Learning: 60 nos. exposure visits to successful enterprises inspired SHG members, boosting confidence and sparking innovative ideas. ❖ Need-Based Support: Adani Foundation provided timely support— equipment, funding, and guidance—based on each group's evolving needs and goals 52 times. ❖ Community Impact: SHGs now uplift entire communities— enhancing household income, promoting leadership, and driving social change and 1450 people are benefited.

S. No.	Identified environmental and social impacts for the fully developed scenario (year 2030)	Type of Impact & Magnitude	Environment management plans adopted or being adopted by APSEZ as per permits, clearances, applicable regulations and guidelines etc.	Additional Risk Mitigation Measures/ESMP	Responsible agency	Timeframe for implementation	Compliance
	which will be 45% of the total envisaged population in Mundra Taluk by the end of 2030.		results, several livelihood options have been introduced by the Adani Skill Development Centre, Mundra. In these centres, youth can join and get vocational training for a number of technical and non-technical skills. An industrial Training Institute is set up at APSEZ, Mundra, to enhance the skill levels of the local youth to maximum possible extent.				<p>CHETNA" - initiative with gender diversity:</p> <ul style="list-style-type: none"> ❖ Women Mobilization & Employment Facilitation: Adani Foundation, in partnership with Unnati Portal and Adani Solar, mobilized and counseled women and their families, enabling them to confidently enroll, attend interviews, and secure jobs. ❖ Empowerment Through Opportunity: Women from Kutch began working in formal roles, gaining financial independence, self-confidence, and inspiring broader community acceptance of female workforce participation. ❖ Till Now 600+ Female Joined Adani Solar @Pan India and 459 are from Kutch. ❖ 12th passed student benefited with 1.8 lac/annum and graduate students benefited with 2.16 Lac/Annum. <p>Empowering Fisherfolk Community:</p> <ul style="list-style-type: none"> • Distributed education kits to HSC and graduation-level students, including notebooks, guides, stationery, and study bags. • Facilitated job opportunities and skill development for youth through community engagement and support programs.

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							<ul style="list-style-type: none"> • Provided daily transportation for 86 school-going children to ensure consistent access to education. • Awarded scholarships totaling ₹3,58,765 to 34 students for higher secondary and technical education. <p>❖ Job initiatives:</p> <ul style="list-style-type: none"> • Acting as a bridge between industries and fisherfolk youth, the Adani Foundation facilitated job placements for 30 fisherfolk as RTG operators, in the HR department, and as supervisors in APSEZ companies. • In the APSEZ area and colony, 45 fisherfolk youth have been offered professional painting roles. To ensure they are skilled for the role, they underwent comprehensive training in partnership with Asian Paints. <p>❖ Potable water Distribution:</p> <ul style="list-style-type: none"> • Providing access of potable Drinking water Facilities to Nine fisherfolk vasahat on Daily bases, either By Water tanker or Linkage with Nearest Gram panchayat. • More than 5000 Fisherfolk Population are getting benefit which impact on their health and well-being. <p>APSEZ is carrying out various initiatives specific to the Fisherfolk community which includes:</p>

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							<ul style="list-style-type: none"> ❖ Vidya Deep Yojana ❖ Vidya Sahay Yojana – Scholarship Support ❖ Adani Vidya Mandir ❖ Fisherman Approach in SEZ ❖ Machhimar Arogya Yojana ❖ Machhimar Kaushalya Vardhan Yojana ❖ Machhimar Sadhan Sahay Yojana ❖ Machhimar Awas Yojana ❖ Machhimar Shudhh Jal Yojana ❖ Sughad Yojana ❖ Machhimar Akshay kiran Yojana ❖ Machhimar Suraksha Yojana ❖ Machhimar Ajivika Uparjan Yojana ❖ Bandar Svachhata Yojana <p>These initiatives are planned for the period 2016 – 2021 with a committed expense of INR 13.5 Cr as submitted earlier in detail in the report namely “Silent Transformation of Fisher folk at Mundra”,</p> <p>Till, Sep’25 approx. 16.43 Cr. INR, has already been spent in support for fishermen livelihood activities. Further, details regarding the expenditure incurred against the commitment are attached as Annexure – 10.</p>

Annexure – 9



**PROJECT REPORT ON MONITORING OF
MANGROVE DISTRIBUTION IN CREEKS IN
AND AROUND ADANI PORT AND
SPECIAL ECONOMIC ZONE LTD. (APSEZ),
MUNDRA, GUJARAT**

**Submitted to
M/s Adani Ports and Special Economic Zone Ltd
Mundra, Gujarat**

Prepared by



**National Centre for Sustainable Coastal Management
Ministry of Environment, Forest and Climate Change
Chennai**

July 2025

EXECUTIVE SUMMARY

The Adani Ports and Special Economic Zone Ltd (APSEZ) was directed by the Ministry of Environment, Forest and Climate Change (MoEF&CC) to develop a Comprehensive Integrated Conservation Plan for the preservation and protection of mangroves and creeks in the Mundra region as part of the conditions for Environmental Clearance (EC) issued in July 2014 and September 2015. To fulfil this requirement, APSEZ entrusted the National Centre for Sustainable Coastal Management (NCSCM) with the task of preparing the conservation plan and carrying out periodic monitoring. The present study reports the findings of the mangrove monitoring undertaken between 2021 and 2023, utilizing high-resolution WorldView-3 satellite imagery and detailed ground validation, covering Koldi, Baradimata, Navinal, Bocha, and Khari Creeks, including Bocha Island.

The monitoring results indicate a marginal overall increase in mangrove cover by approximately 2 hectares (around 0.08%), from 2499 ha in 2021 to 2501 ha in 2023. However, the area under dense mangroves increased by 56 hectares during this period, suggesting positive ecological succession and improving vegetation density. Among the individual creeks, Koldi Creek recorded 6 hectares decrease in mangrove extent, mainly in the scattered category, which may be attributed to human induced pressures, although increases in dense and sparse mangrove categories reflect good tidal connectivity. Baradimata Creek showed a net gain of 16 hectares, driven by the formation of new dense mangroves, while minor losses in sparse zones were likely caused by tidal erosion. In the Navinal–Bocha Creek system, a slight reduction of 6 hectares was noted, primarily due to erosion at the tip of Bocha Island. However, sparse mangrove cover showed localized increases, indicating ongoing regrowth in some areas. Khari Creek remained largely stable, with only a minor decline of 1 hectares offset by the expansion of scattered mangroves on adjacent mudflats.

Despite the overall stable condition of mangroves in the APSEZ region, several localized issues require attention. Ongoing erosion at Bocha Island is leading to loss of dense mangrove patches, while the formation of sand spits in Navinal Creek may potentially hinder tidal water flow, affecting mangrove health in the future. Additionally, small areas of mangrove clearing were observed near the downstream section of Navinal Creek and in the upper Baradimata Creek due to road expansion activities. In view of these observations, the report recommends that mangrove monitoring continue on a biennial basis using high-resolution satellite data and field surveys. Where necessary, dredging should be undertaken in a phased manner to enhance tidal water inflow, especially in Navinal and Bocha Creeks. Dumping of dredged material must be strictly avoided near creek mouths and interiors to prevent siltation and bank erosion. Control measures to mitigate erosion at Bocha Island, such as dredging shallow areas and constructing sand bunds, should be implemented if erosion persists.

Furthermore, the practice of restricting entry to mangrove areas should be continued to prevent cutting of vegetation, and awareness campaigns must be strengthened to highlight the ecological value of mangroves. In order to reduce pressure on mangrove resources for fodder, local communities should be encouraged to adopt sustainable fodder cultivation with support from the Adani Foundation and local authorities. The study underscores that tidal flow, elevation, and substrate conditions are critical in maintaining mangrove health. While the mangrove ecosystems in and around APSEZ appear to be functioning well, ongoing management and timely interventions will be essential to ensure their long-term sustainability in the face of developmental pressures.

List of Contributors from NCSCM

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Project facilitation and review of report	Dr. Deepak Samuel, Scientist E
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1. INTRODUCTION

The northern Gulf of Kachchh in the western coast of India has extensive formation of mangrove. Ministry of Environment, Forest and Climate Change have accorded Environmental Clearance (EC) vide Letter No. F.No.10-138/2008-IA.III dt. 15th July, 2014 & 12th February, 2020 to M/s Adani Ports and Special Economic Zone Ltd (APSEZ), to set up a multi-product SEZ at Mundra, Kachchh, Gujarat. The project involves development of SEZ in a notified SEZ area of 8481.2784 ha.

While according Environmental Clearance (EC) to the project, the MoEF&CC have stipulated General and Special conditions in their Environment Clearance. Further inline to the MoEF&CC final order, vide F.No.10-47/2008-IA.III dtd 18th September 2015 which also contained special conditions, two of which (sr. no iv and v of the order) are as follows:

(iv) A Comprehensive and integrated conservation plan including detailed bathymetry study and protection of creeks/mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary will be put in place. The plan will take note of all the conditions of approvals granted to all the project proponents in this area, e.g., the reported case of disappearance of mangroves near Navinal Creek. The preservation of entire area to maintain the fragile ecological condition will be a part of the plan in relation to the creeks, mangrove conservation and conservation of Bocha Island up to Baradimala and others.

(v) NCSCM will prepare the plan in consultation with relevant stakeholders, PP and GCZMA. In recognition of the fact that the existing legal provisions under the E(P) Act 1986 do not provide for any authority to impose ERF by the Government, the plan will be financed by the PP. The implementation will be carried out by GCZMA. The monitoring of the implementation will be carried by NCSCM.

In line with the above conditions, APSEZ entrusted NCSCM for the preparation of a Comprehensive and Integrated plan for the conservation of mangroves and associated creeks. The Conservation plan was prepared and submitted to the Gujarat Coastal Zone Management Authority and in its meeting held in October 2019, then plan was approved as per their email dt. 22nd September 2020.

2. COMPLIANCE TO THE EC CONDITIONS

M/s Adani Ports and Special Economic Zone Ltd (APSEZ) has submitted the conservation plan and submitted it to the Gujarat Coastal Zone Management Authority in its meeting held in October 2019, and then plan was approved as per their email on 22nd Sept 2020. The major recommendations relating to mangroves that were specified in the conservation plan are as follows:

"The APSEZL shall carry out mangrove monitoring every two years and submit the data to Forest Department/GCZMA and MOEF&CC, GOI".

In order to comply with the above recommendations relating to the assessment of the health of mangroves, APSEZ again entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ. NCSCM carried out mangrove monitoring in the year 2020-21 comparing Google Earth images of 2017 and 2019. A report of the same was submitted to APSEZ in April – 2021. Accordingly, APSEZ has requested NCSCM to monitor the mangrove coverage using the satellite images of 2021 and 2023 to comply with the recommendations of GCZMA.

3. SCOPE OF WORK

The scope of the present consultancy is to prepare a mangrove distribution map between March 2021 and March 2023 for all the creeks of the APSEZ area including extent, and vegetative features. Besides, the current map will be compared with the previous map to understand the changes in mangrove cover, if any.

4. STUDY AREA

The study area includes a creek and mangrove areas within and around the boundary of APSEZ as indicated in Fig. 1. The creeks present in and around APSEZ are two parts of Kotdi, two parts of Baradimata, Navinal, Bocha, and Khari Creeks. The land adjoining the creeks has mangrove formations, which vary from creek to creek. Dense mangrove formations are common in Bocha Island along Bocha and Navinal Creeks, and along Baradimata Creek.

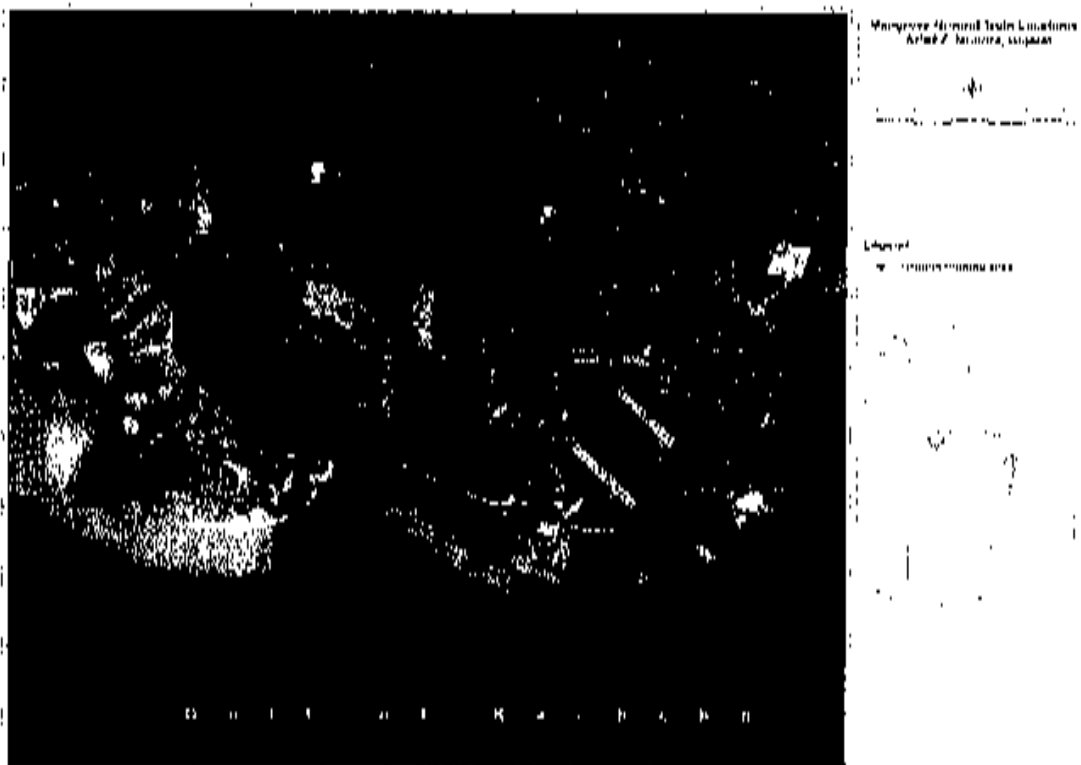


Fig. 1 Study Area -- Adani Ports and Special Economic Zone (APSEZ), Mundra

5. TASKS PROPOSED TO BE CARRIED OUT

Details of tasks proposed to be carried out are.

1. Mapping of mangrove distribution in the APSEZ area
2. Mangrove coverage in creeks in and around APSEZ, Mundra using the latest satellite images for the duration of year March 2021 to March 2023

6. TASKS PERFORMED

6.1 MAPPING OF MAGROVES

6.1.1 Satellite Data used

Mapping of mangroves carried out using High resolution Multispectral satellite images with scenes of the years 2021-2023. The mangrove maps were prepared using ArcGIS. Further, ground truth was performed along the creeks in the APSEZ area such as Bocha (including the island), Navinal, Kotdl, Baradimata (including land mass) and Khari by the team of Scientists from NCSCM to verify the distribution of mangroves. In 2019 and 2021, the Gujarat Institute of Desert Ecology mapped the mangroves using IRS P6 LISS-IV satellite imagery with a spatial resolution of 5.8 m, recording mangrove areas of 2,670.08 ha and 2,722.87 ha, respectively. In the present study, high-resolution WorldView-3 (pan-sharpened) imagery with a spatial resolution of 0.5 m was employed for more accurate mapping for the years 2021 and 2023. The ability to map mangroves from satellite imagery mainly depends on the sensor's spatial resolution (pixel size).

Each pixel indicates a particular ground area, defining the smallest object that can be accurately detected and outlined. LISS-IV imagery (5.8 m spatial resolution) covers an area of approximately 33.6 m² per pixel, making it suitable for regional-scale mangrove mapping at cartographic scales of 1:25,000 to 1:50,000. In contrast, WorldView-3 imagery (0.5 m pan-merged) offers significantly finer spatial detail, with each pixel representing 0.25 m². This high-resolution data supports mapping at scales of 1:1,500 to 1:2,000, enabling the detection of small mangrove patches, seedling zones, canopy gaps, and edge degradation. For such site-level mapping, WV3 ha can be considered for delineating fine-scale mangrove features. Therefore, LISS-IV is suitable for assessing broad-scale mangrove distributions, whereas WorldView-3 enables high-precision mapping for localized conservation, restoration, and monitoring studies (<https://doi.org/10.3390/rs14102317>).

The specifications of the satellite images used in the study is listed below:

Table 1. Data source for mangrove mapping

Year	Satellite Data	Spatial Resolution
2021	Worldview3	50 cm
2023	Worldview3	50 cm

6.1.2 Methodology

The various steps involved in mapping of APSEZ mangroves is outlined in Fig. 2.

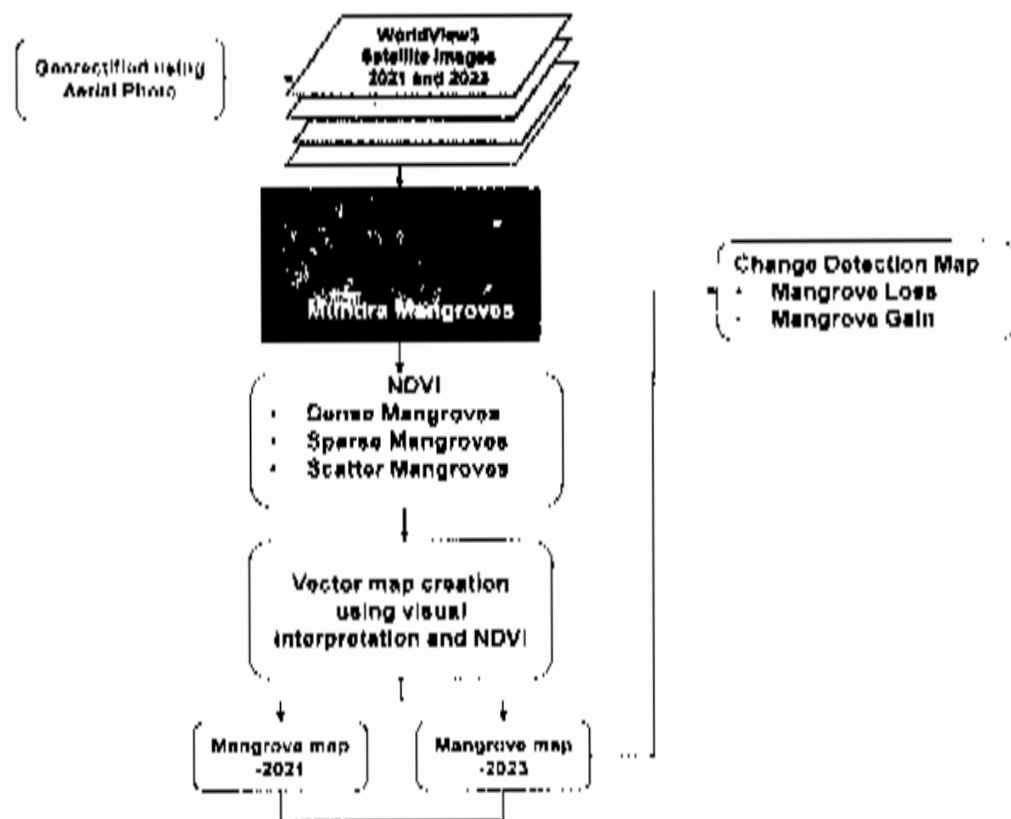


Fig. 2. Mangrove mapping workflow

a. Pro-processing of Satellite Images

The extraction of mangrove areas from satellite data involves the geo-referencing of satellite images using aerial photographs, followed by digital image classification to identify mangrove extents. Rigorous geometric correction was performed to minimize both systematic and non-systematic errors in the satellite imagery. In this study, image-to-image registration was applied to rectify the satellite images using orthophotos as the reference in

ERDAS Imagine software. Geo-referencing all satellite images to a common coordinate system using orthophotos is essential to enable accurate comparison of historical imagery and to analyse mangrove change detection across the entire study region.

b. Mangrove Extraction

The study area involves in and around Mundra region, Kachchh district for mapping mangroves using remote sensing satellite data. Previously, mangrove delineation have been completed for the study for the year 2019. Monitoring of mangrove extent for the year 2021 and 2023 was delineated through visual interpretation of WorldView3 satellite imagery with a spatial resolution of 0.5 meters. Level III classification scheme adopted by Space Application Centre (SAC), Ahmedabad. Visually, these mangrove categories were mapped using key interpretation elements adopted by Space Application Centre (SAC), Ahmedabad. The high spatial detail provided by the WorldView3 sensor is particularly effective for mapping narrow and fragmented mangrove patches along complex shorelines. Delineation was performed in a GIS environment using digitization techniques, allowing precise manual tracing of mangrove boundaries. Interpretation classified as dense, sparse and scatter mangroves guided by key visual indicators such as:

- **Tone and color:** mangroves typically appear as dark red or dense textured patches in false color composites for dense mangroves, slight red with segregated for sparse and very light red with isolated patches for scatter mangroves
- **Canopy texture and pattern:** the uniform texture and crown clumping differ from surrounding vegetation types.
- **Contextual information:** proximity to tidal zones, estuarine areas, and wetland environments was used to refine delineation.

The approach follows accepted visual interpretation standards for coastal vegetation mapping and has been widely used in similar high-resolution mangrove studies (e.g. Giri et al., 2011).

c. Normalized Difference Vegetation Index (NDVI)

The Normalized Difference Vegetation Index (NDVI) was utilized to classify mangrove density into dense, sparse, and scattered categories using ERDAS Imagine software. NDVI was computed from Near-Infrared (NIR) and Red (R) spectral bands based on the standard formula (Eq. 1):

$$NDVI = \frac{NIR - R}{NIR + R} \quad (Eq. 1)$$

This spectral index effectively highlights vegetation health and density by exploiting the contrast between high reflectance in the NIR band and absorption in the Red band.

Post-calculation, the NDVI raster was reclassified using the following thresholds:

Dense Mangroves: NDVI values greater than 0.45

Sparse Mangroves: NDVI values ranging from 0.30 to 0.45

Scattered Mangroves: NDVI values between 0.00 and 0.30

Boundary polygons were delineated by overlaying the classified NDVI outputs onto base vector datasets. Manual editing and correction were performed in areas where clarification was required, ensuring accurate extraction of mangrove boundaries.

6.2 MONITORING ON DISTRIBUTION OF MANGROVES IN CREEKS IN AND AROUND APSEZ

6.2.1 Overall assessment

The Kotdi, Baradimata, Navinal, Bocha and Khari Creeks experience high tidal ranges, reaching up to 6 m, with an average tidal range of 2 to 4.5 m that varies annually. These creeks support mangrove formation due to muddy substratum. The mangroves are tide fed, with tidal flow into the mangrove areas occurring only during high tide. This characterizes them as inter-tidal mangroves, making their growth and distribution highly sensitive to changes in tidal conditions within the creeks.

The distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha, and Khari Creeks, as well as on Bocha Island, was assessed using WorldView-3 satellite images from February 2021 and September 2023. Regarding the overall health of mangroves in the creeks in and around APSEZ, it was observed that there was a stable growth in mangrove cover approximately 2 hectares, accounting for about a 0.08% increase. Further analysis of mangrove categories revealed an increase in dense mangroves, suggesting that mangrove growth is progressing in a positive direction (Table 2; Figs. 3 to 5).

Table 2. Distribution of various categories of mangroves in the creeks in and around APSEZ in 2021 and 2023

Category	Area (Hectares)	
	2021	2023
Dense	1003	1059
Sparse	476	462
Scatter	1021	980
Total	2499	2501

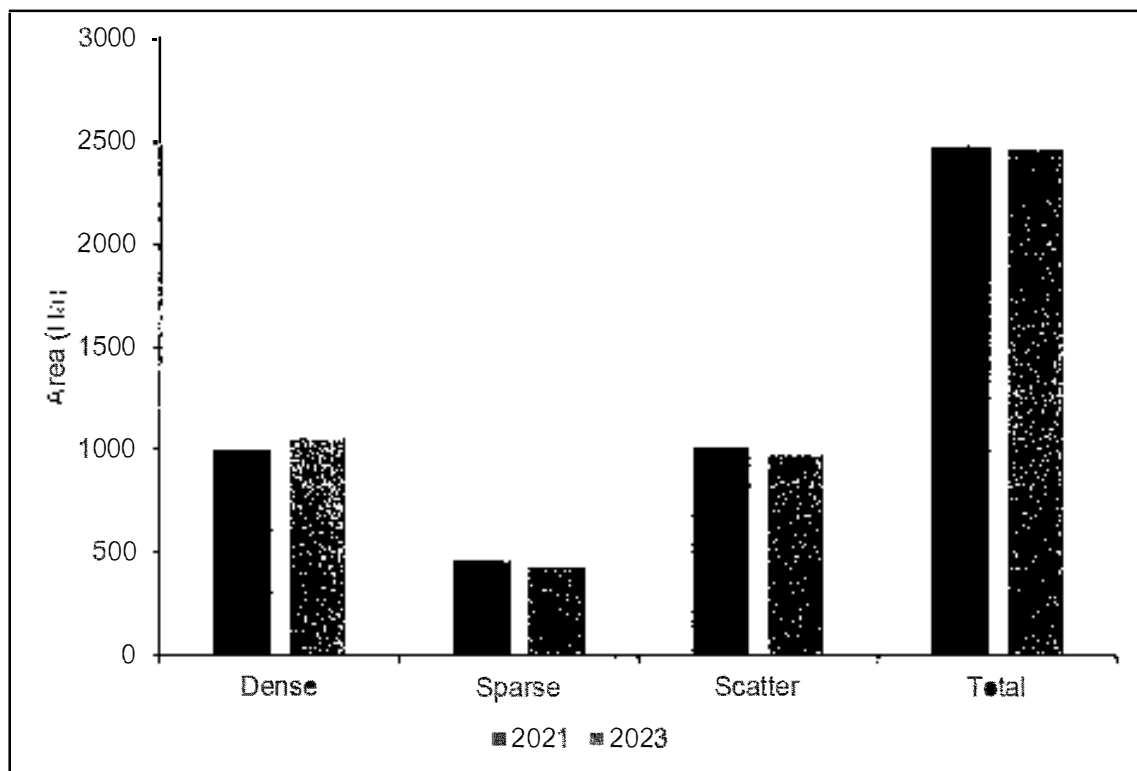


Fig. 3. Comparison of various categories of mangroves in creeks of APSEZ between 2021 and 2023

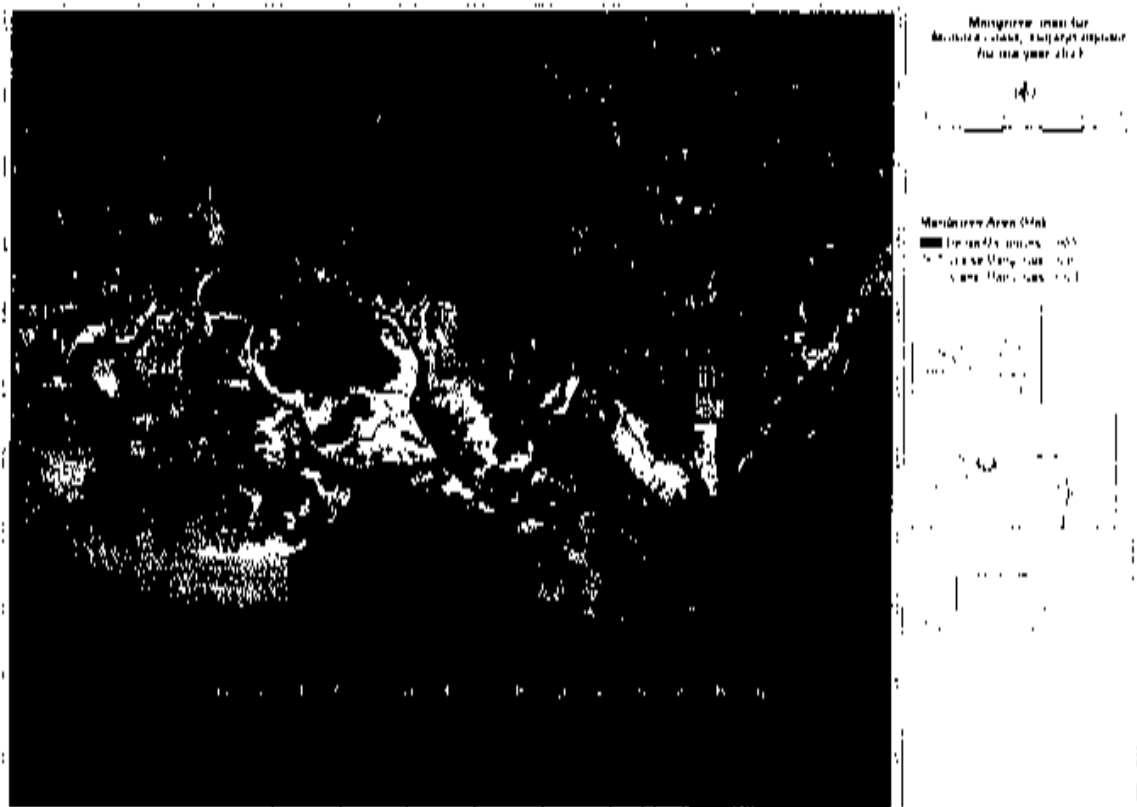


Fig. 4. Distribution of various categories of mangroves in 2021

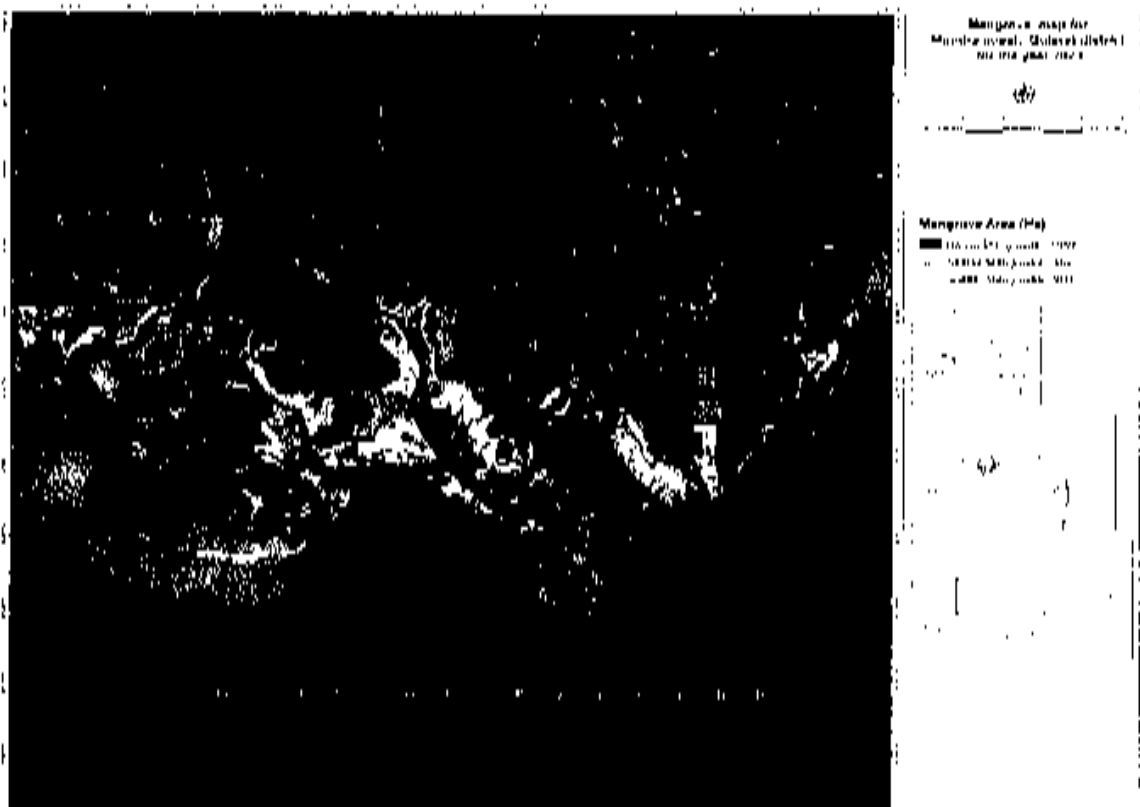


Fig. 5. Distribution of various categories of mangroves in 2023

Vegetation Structure Assessment

Field surveys were carried out in April 2025 across four creek systems (Fig. 1), with sampling points spaced at a minimum interval of 50 meters along the creeks to evaluate the mangrove vegetation structure. In each creek, 10 m × 10 m quadrats were randomly established to capture variability in vegetation characteristics, resulting in 77 sampling plots (Table 3). Within each plot, all mangrove trees with a girth at breast height (GBH) greater than 8 cm were identified to the species level, counted, and their heights measured. The corresponding diameter at breast height (DBH) is greater than 2.5 cm. To assess regeneration, seedlings (individuals less than 1 meter in height) were counted within randomly placed 1 m × 1 m sub-quadrats inside the larger plots. From these measurements, tree basal area (m² ha⁻¹) and stand density (trees ha⁻¹ or seedlings ha⁻¹) were calculated to quantify the mangrove structure. The Importance Value Index (IVI), which integrates relative density, relative frequency, and relative dominance, was computed to assess the ecological significance of each species. All sampling followed non-destructive protocols, ensuring that no trees were felled during the survey.

Relative density (%)

$$= \frac{\text{Number of individuals of a species}}{\text{total number of individuals of all species}} \times 100 \quad (\text{Eq. 2})$$

Relative frequency (%)

$$= \frac{\text{Frequency of a species}}{\text{Sum of frequency of all species}} \times 100 \quad (\text{Eq. 3})$$

Relative dominance (%)

$$= \frac{\text{Basal area of a species}}{\text{Sum of basal area of all species}} \times 100 \quad (\text{Eq. 4})$$

IVI (%) = Relative density + Relative frequency

$$+ \text{Relative dominance} \quad (\text{Eq. 5})$$

Table 3. Summary of sampling details

Zones	No. of tree species observed	No. of quadrats laid
Baradimata Creek	1	30
Khari Creek	1	11
Kotdi Creek	1	12
Navinal-Bocha Creek	3	24
Overall	3	77

6.2.2 Creek wise assessment

a. Kotdi Creek

The Kotdi Creek, with two mouths—Kotdi I, located on the western end of the South Port of Adani, and Kotdi II, situated east of Kotdi I—experiences tidal inflow extending up to 4.5 km in Kotdi I and 7.4 km in Kotdi II during high tide. The tidal range observed in 2020 varied between 2.9 and 4.7 meters. During the study period, the creek exhibited significant growth across all categories of mangroves, though a slight overall decrease of 26.43 hectares (approximately 5%) was recorded in 2023 compared to 2021. Notably, dense and sparse mangrove cover increased by 0.1 and 3.4 hectares, respectively, while the scatter category decreased marginally by 29.8 hectares (Table 4; Figs. 6 to 8). These findings indicate good tidal connectivity and suggest that the mangrove ecosystem in Kotdi Creek remains in generally healthy condition.

Table 4. Distribution of mangroves in Kotdi Creek system in 2021 and 2023

Category	Area In Hectares	
	2021	2023
Dense	182.33	182.43
Sparse	98.64	101.99
Scatter	278.06	268.18
Total	559.03	552.60

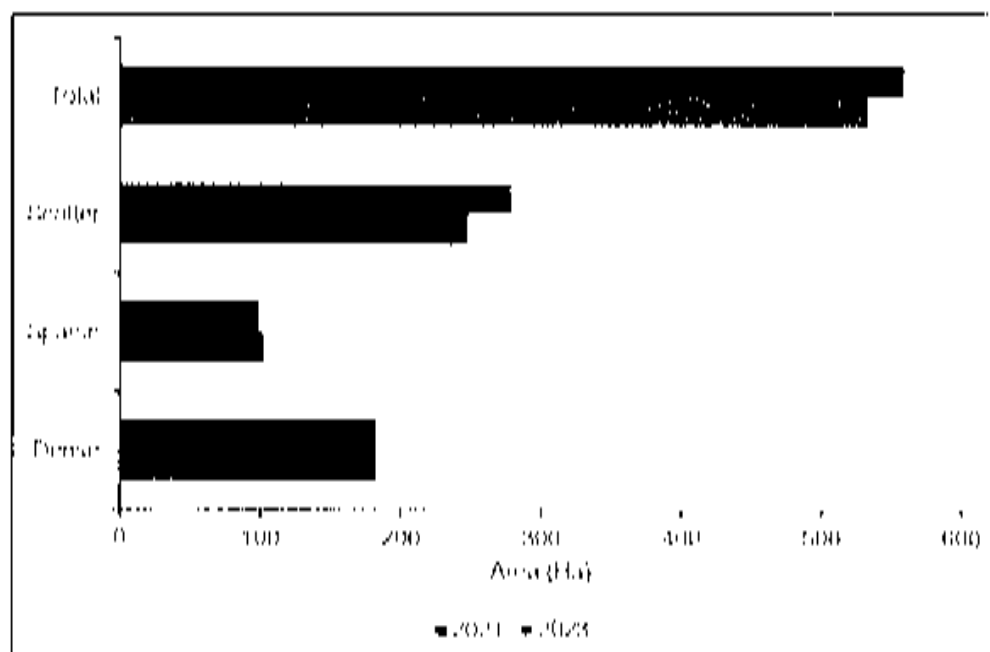


Fig. 6. Comparison of mangrove distribution between 2021 and 2023 in Kotdi Creek

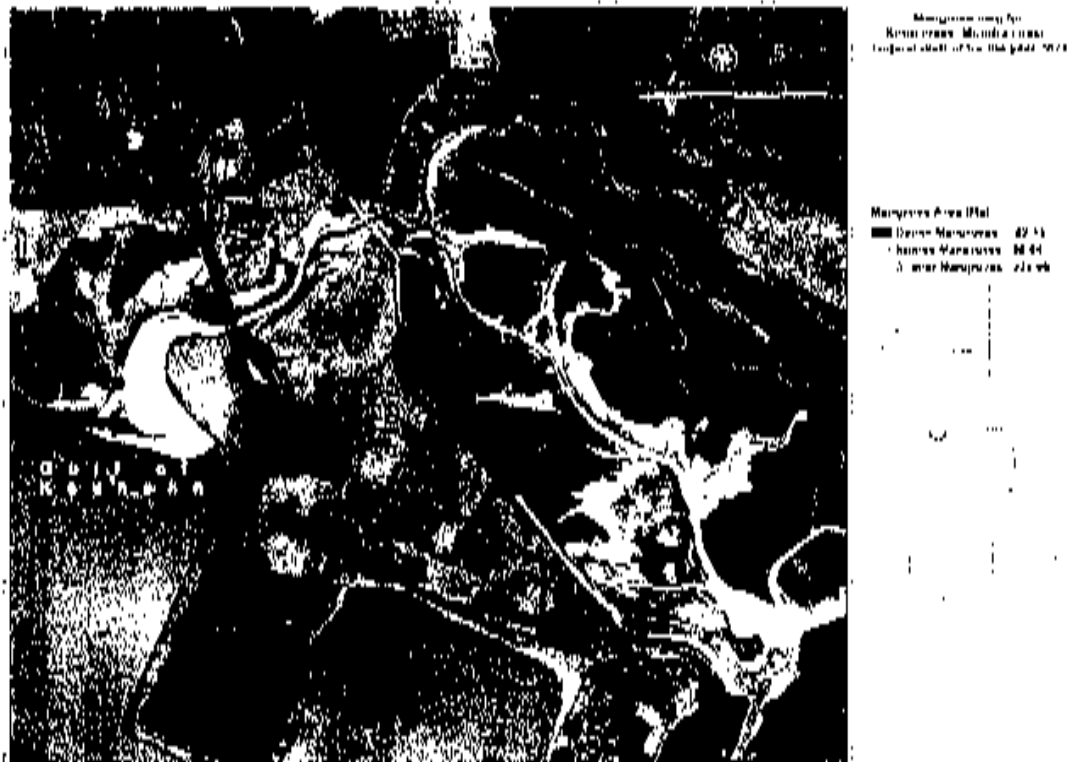


Fig. 7. Distribution of mangroves in 2021 in Koldi Creek system



Fig. 8. Distribution of mangroves in 2023 in Koldi Creek system

Change analysis In Kotdi Creek

A reduction of approximately 12 hectares in mangrove cover was observed in Kotdi Creek between 2021 and 2023, with the most significant losses occurring along the western and south-western tip of the creek (Fig. 9). This decline is primarily in the scattered mangrove category, which is more vulnerable to environmental stress and human-induced pressures. The likely causes include anthropogenic disturbances such as mangrove clearing, land conversion, and infrastructural development near the creek.

In contrast, an increase in sparse mangrove cover was observed, suggesting natural transitional processes within the ecosystem. These changes are characteristic of intertidal mangrove environments, where tidal dynamics, sedimentation patterns, and ecological succession drive the gradual shift in mangrove density—from scattered to sparse, and eventually to dense formations.

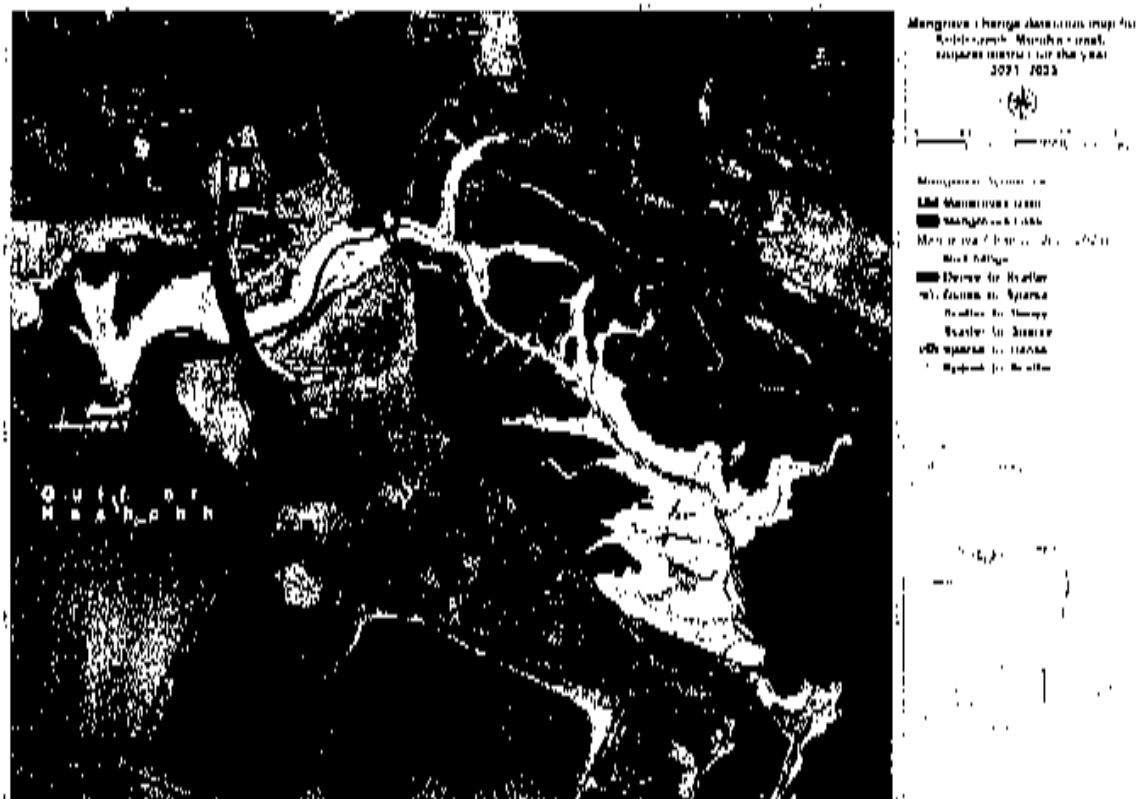


Fig. 9. Result of change analysis from 2021 to 2023 on categories of mangroves in Kotdi Creek system

Vegetation Structure in Kotdi Creek

The mangrove stand structure in Kotdi Creek was predominantly composed of *Avicennia marina*, which emerged as the dominant species (IVI = 300). *Ceriops tagal* species was also observed along with the creek. The density of *A. marina* was estimated at 5,100 trees ha⁻¹, with a corresponding basal area of 24.08 m² ha⁻¹. The average tree DBH was 6.51 cm, ranging from 2.70 cm to 26.79 cm. The average tree height was 2.71 m, ranging from 0.80 m to 5.50 m.

The distribution of trees across various diameter at breast height (DBH) classes is presented in Fig. 10, indicating a strong dominance of smaller-sized individuals and a complete absence of trees exceeding 27.5 cm DBH. This suggests a relatively young or regenerating mangrove population structure.

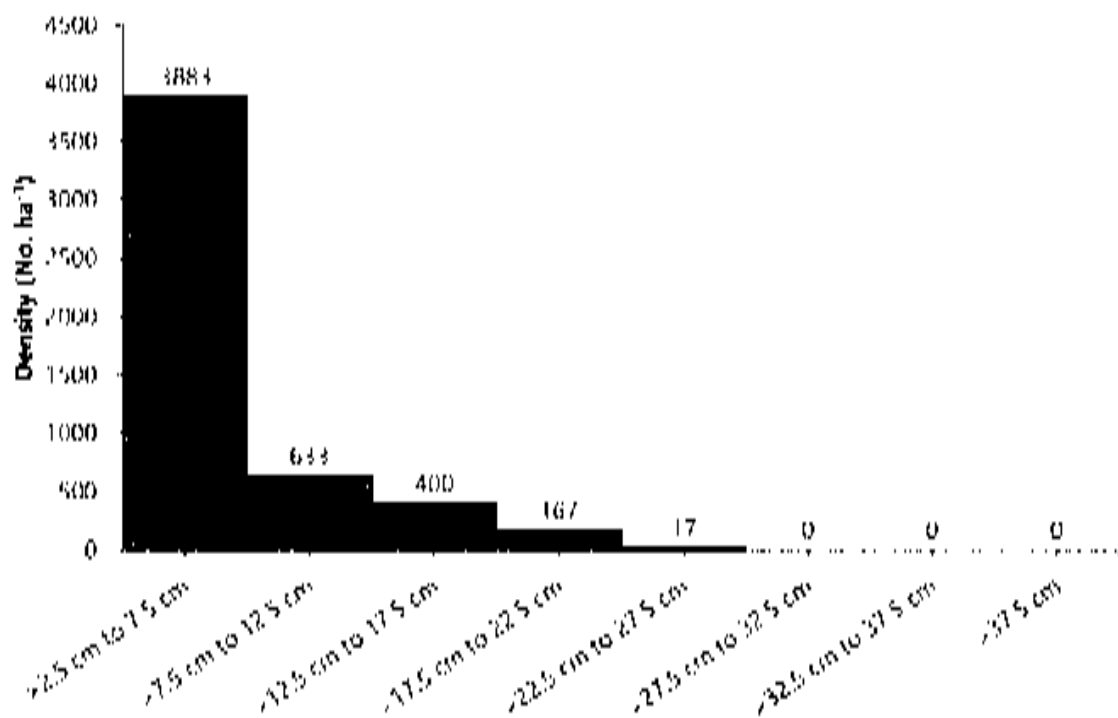


Fig. 10. Mangrove tree density by DBH (cm) size classes in Kotdi Creek

Tree height class distribution (Fig. 11) further supports this pattern, with the majority of individuals falling within the >1.5–2.2 m height range, followed by trees in the >2.2–2.9 m and >3.6–4.3 m height categories. This skewed distribution toward smaller size classes may reflect ongoing recruitment and limited presence of mature trees.

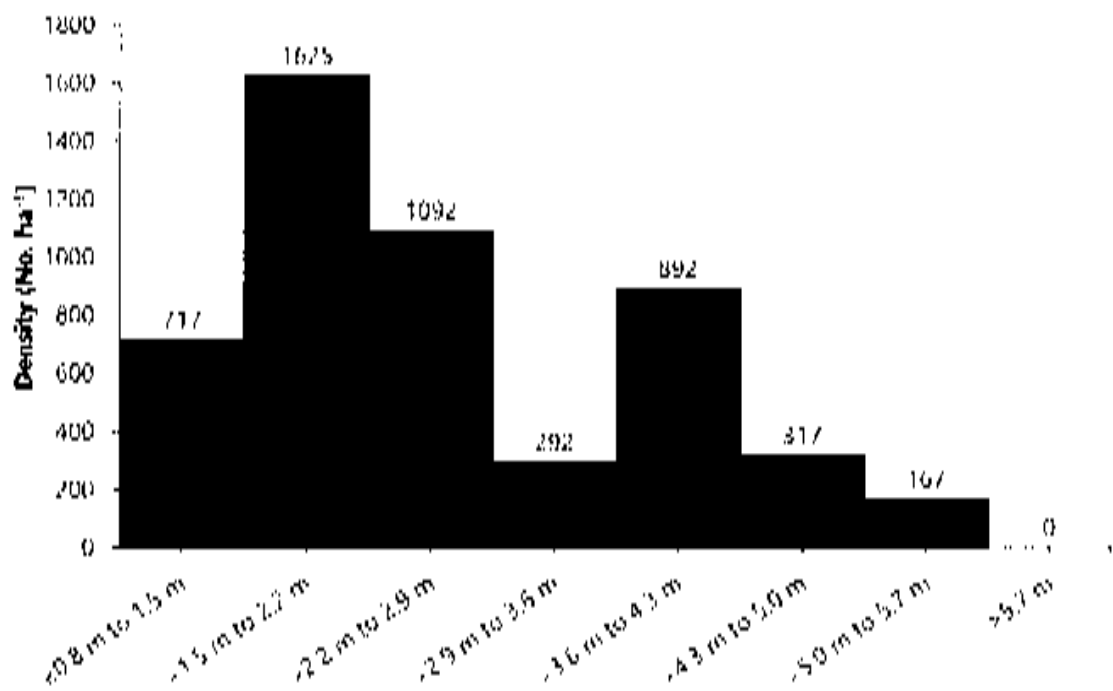


Fig. 11. Mangrove tree density by height (m) size classes in Kotdi Creek

The seedling (*A. marina*) density in Kotdi Creek was estimated at 62,500 seedlings ha⁻¹, indicating active natural regeneration within the mangrove stand.

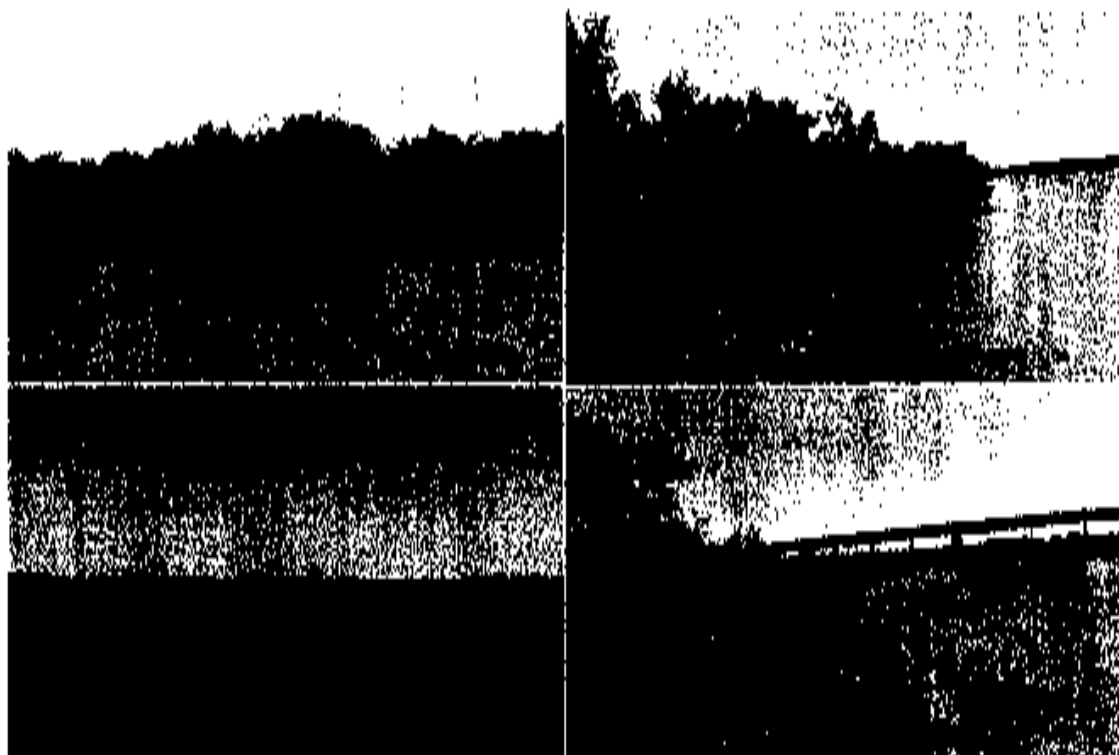


Fig. 12. Mangroves along the Kotdi Creek

b. Baradimata Creek

Baradimata Creek is one of the well tide-influenced creeks in the region. As of 2020, it exhibited a tidal range of 2.7 to 5 meters, with high tide penetration reaching up to 6.15 km from the creek mouth. The creek remains largely free from human interventions, aside from navigation by local fishing communities from nearby villages. The health of mangroves in the creek was assessed for the period 2021 to 2023, and the findings are presented in Table 5 and Figures 13 to 15. The analysis revealed increase in overall mangrove coverage, with major change of 16 hectares. Most of this variation is due to the formation of new mangroves, primarily in the dense category, along with minor inter-conversions, such as transitions from sparse to dense mangroves and new growth observed along smaller feeder creeks. A -0.7% decrease in sparse mangroves, particularly in the south-western portion of the creek, is attributed to hydrodynamic activity that impacts edge vegetation, likely due to tidal scouring or erosion.

Table 5. Data on various categories of mangroves in the years 2021 and 2023 in Baradimata Creek

Category	Area in Hectares	
	2021	2023
Dense	324.27	382.41
Sparse	266.15	248.57
Scatter	513.76	489.26
Total	1104.18	1120.24

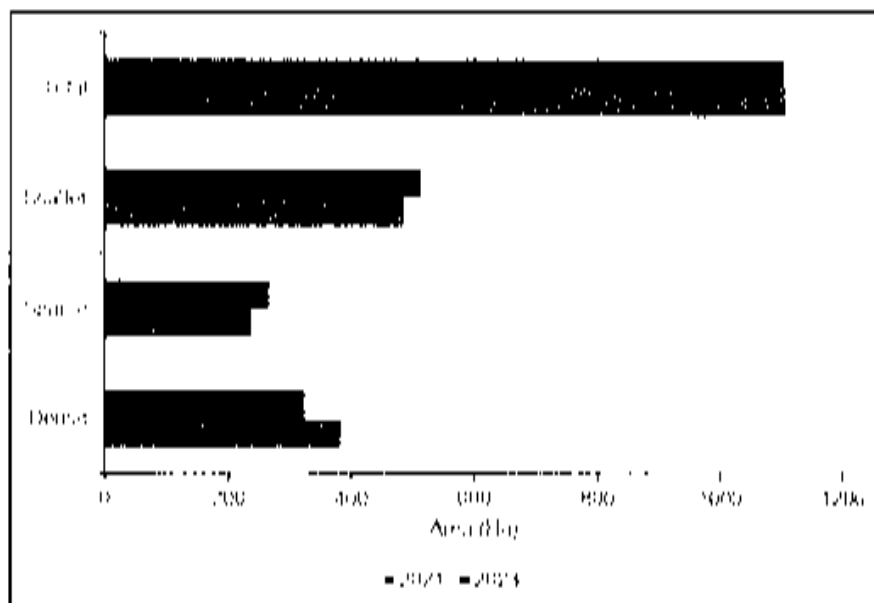


Fig. 13. Comparative analysis of various categories of mangroves in 2021 and 2023 in Baradimata Creek

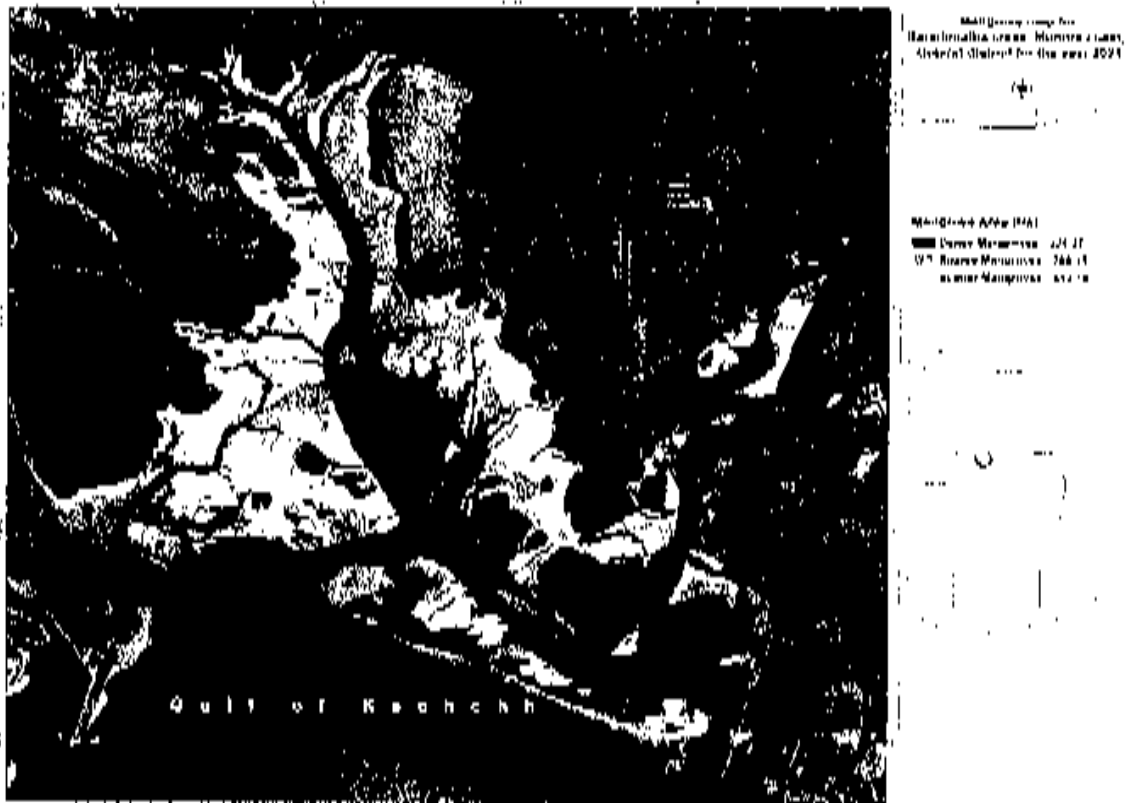


Fig. 14. Distribution of mangroves in Baradimata Creek during 2021

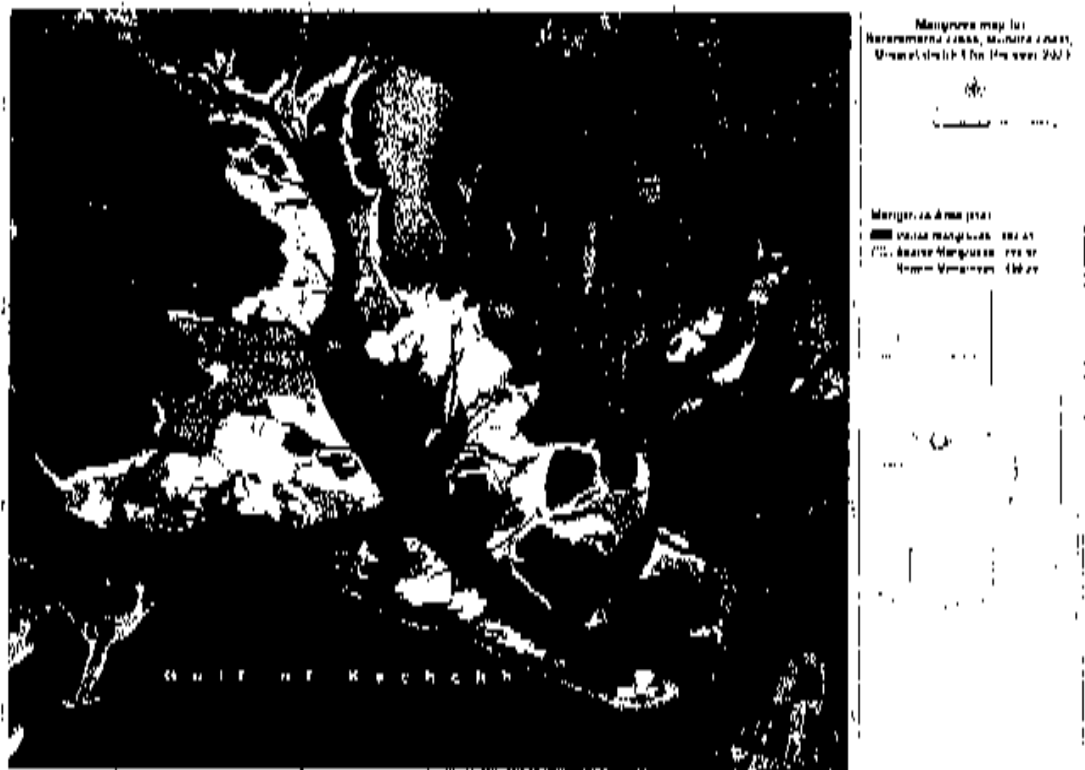


Fig. 15. Distribution of mangroves in Baradimata Creek during 2023

Change analysis in Baradimata Creek

A focused change analysis of the southern tip of Baradimata Creek reveals that this area has undergone notable transformation between 2021 and 2023. Approximately 5.4 hectares of mangrove cover was lost in this zone, marking it as one of the more dynamic and vulnerable sections of the creek system.

This mangrove loss is primarily attributed to natural tidal processes, which include strong tidal currents, sediment redistribution, erosion of the creek banks, and prolonged submergence of mangrove root zones. These natural forces often act more intensely at the southern fringe, where tidal energy is typically higher, leading to gradual degradation of loosely established or younger mangrove stands.

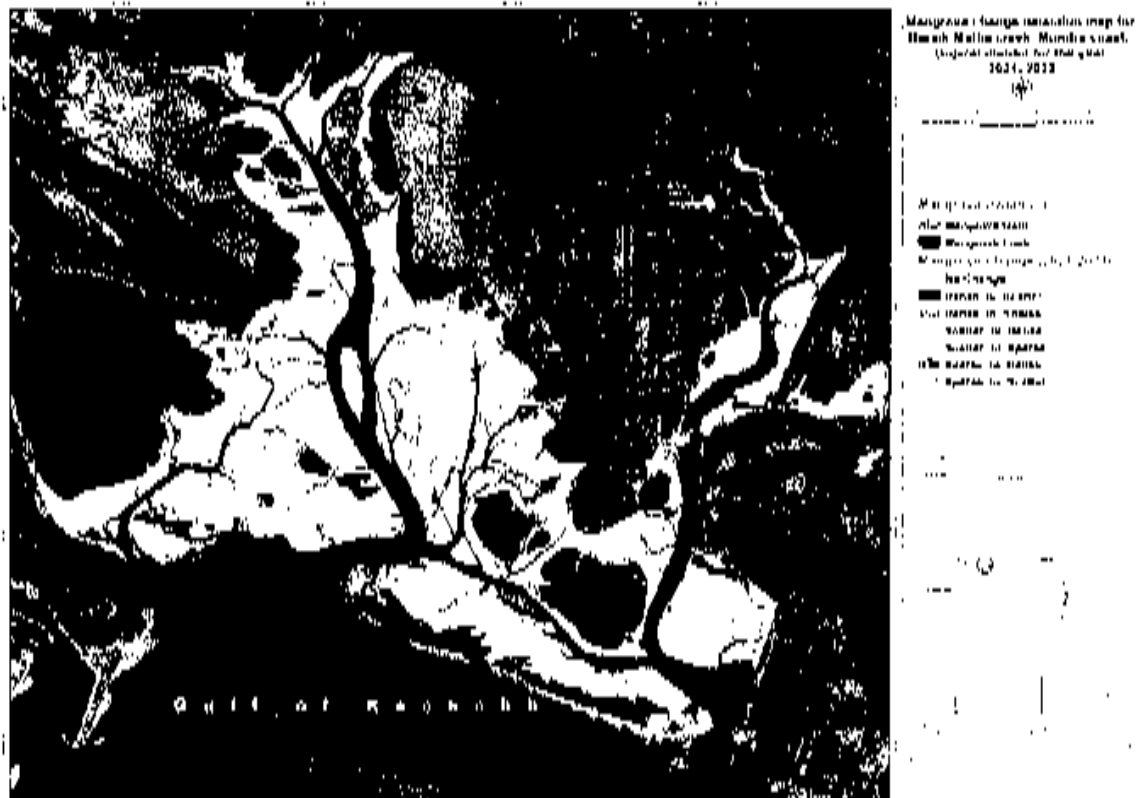


Fig 16. Result of change analysis from 2021 to 2023 on categories of mangroves in Baradimata Creek system

Vegetation Structure in Baradimata Creek

The mangrove stand structure in Baradimata Creek was primarily dominated by *Avicennia marina*, which was identified as the most abundant species (IVI =

300). The density of *A. marina* was estimated at 5,220 trees per hectare, with a corresponding basal area of 25.18 m² ha⁻¹, indicating a well-established stand. The mean diameter at breast height (DBH) of the trees was 6.53 cm, with values ranging from 2.61 cm to 24.50 cm. The average tree height was recorded at 3.21 meters, ranging from 1.0 m to 6.0 m, reflecting a population structure dominated by small- to medium-sized individuals.

The diameter at breast height (DBH) distribution of mangrove trees in Baradimata Creek exhibits a highly skewed structure dominated by smaller-sized individuals (Fig. 17). The highest density was recorded in the >2.5 cm to 7.5 cm DBH class, with 3,793 trees ha⁻¹, followed by 840 trees ha⁻¹ in the >7.5 cm to 12.5 cm class and 407 trees ha⁻¹ in the >12.5 cm to 17.5 cm class.

Tree density significantly declined in higher DBH classes, with only 120 trees ha⁻¹ and 60 trees ha⁻¹ in the >17.5 cm to 22.5 cm and >22.5 cm to 27.5 cm classes, respectively. Notably, no individuals were recorded in DBH classes above 27.5 cm, including >32.5 cm to 37.5 cm and >37.5 cm.

The observed DBH distribution reflects a reverse J-shaped pattern, typical of young and regenerating mangrove stands. The dominance of smaller diameter classes indicates a high rate of recruitment and regeneration, while the absence of large-diameter trees suggests limited representation of mature individuals. This may be due to recent establishment, selective harvesting, natural disturbance, or environmental constraints that inhibit long-term growth.

Such a structure is indicative of an early to mid-successional stage, where the forest is actively regenerating but has not yet reached maturity. Continued protection and monitoring will be essential to support the transition toward a more structurally diverse and ecologically stable mangrove ecosystem.

The height class distribution of mangrove trees in Baradimata Creek revealed a unimodal pattern (Fig. 18). Tree density was highest in the >2.2 m to 2.9 m height class, with 1,640 individuals ha⁻¹, followed by the >3.6 m to 4.3 m class with 1,340 individuals ha⁻¹ and the >2.9 m to 3.6 m class with 973 individuals ha⁻¹. The lowest densities were recorded in the >5.7 m (27 individuals ha⁻¹) and >5.0 m to 5.7 m (93 individuals ha⁻¹) categories. The shortest height class (≥0.8 m to 1.5 m) had 233 individuals ha⁻¹, while the >1.5 m to 2.2 m class recorded 540 individuals ha⁻¹.

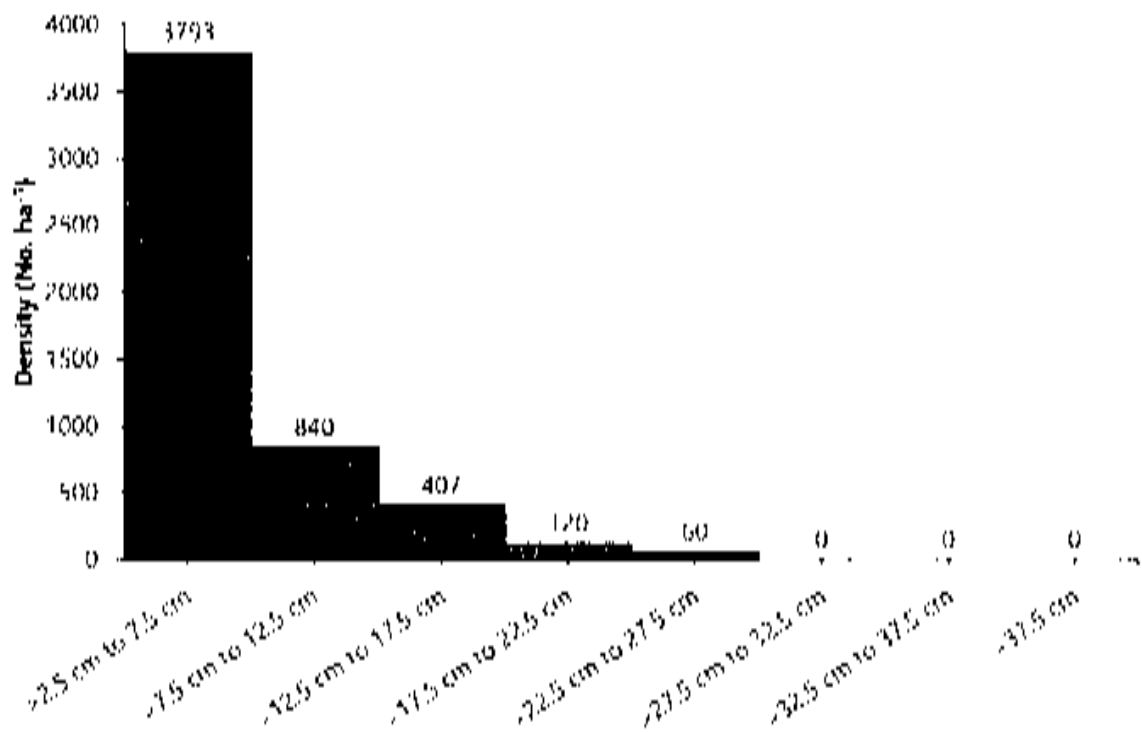


Fig. 17. Mangrove tree density by DBH (cm) size classes in Baradimata Creek

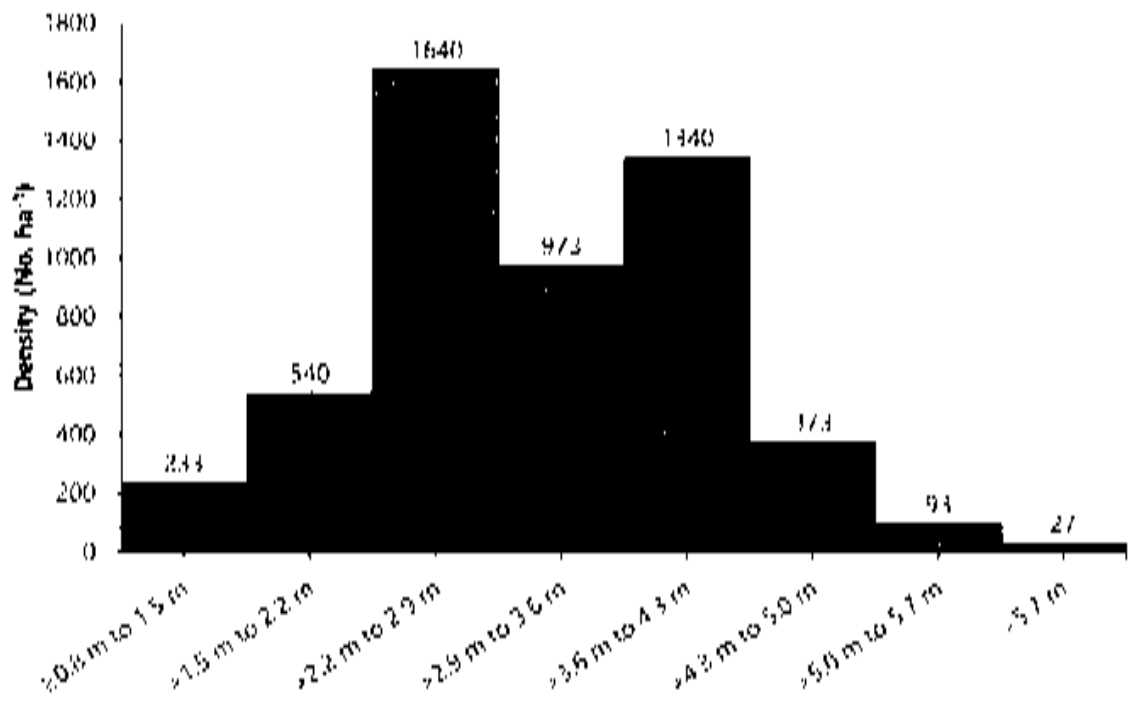


Fig. 18. Mangrove tree density by height (m) size classes in Baradimata Creek

The dominance of trees in the >2.2 m to 4.3 m height range indicates that the mangrove stand in Baradimata Creek is primarily composed of young to mid-aged individuals. The relatively low density of trees in the taller height classes (>5.0 m) suggests a limited presence of mature trees, potentially reflecting either recent regeneration, past disturbance, or environmental limitations affecting tree growth. The presence of trees in the shorter height classes also indicates ongoing recruitment. Overall, the structure suggests a regenerating or early successional mangrove forest in the creek.

The seedling (*A. marina*) density in Baradimata Creek was estimated at 1,16,000 seedlings ha⁻¹, indicating active natural regeneration within the mangrove stand.



Fig. 19 Mangroves along the Baradimata Creek

c. Navinal-Bocha Creeks Including Bocha Island

The Navinal–Bocha Creek system is a complex tidal network, with Navinal Creek located adjacent to the Adani Port and Bocha Creek connecting to Navinal in the north, leading to the formation of Bocha Island, which supports substantial dense mangrove cover. The mouths of these creeks receive strong tidal inflow, particularly Navinal Creek, as its mouth serves as a primary water entry point to the port. Moving northward, Navinal Creek narrows and flows eastward to connect with Bocha Creek. The creek banks support fair to good

mangrove growth, with Bocha Island exhibiting dense mangrove stands. The spatial distribution of mangroves in 2021 and 2023 is illustrated in Figures 20 to 22, and the corresponding area statistics are provided in Table 6.

The analysis shows that the mangrove cover in the system remained largely stable, with only a marginal decrease of 6 hectares (~1.1%) between 2021 and 2023. Dense mangrove cover declined from 287.25 ha to 281.13 ha, with most of the reduction observed in the southernmost part of the coastline. Scattered mangroves also showed a decline, primarily along creek edges, likely due to periodic tidal submergence and inundation, resulting in natural stress and erosion along the mangrove fringe.

Conversely, a slight increase of 0.5% in sparse mangrove cover was observed across the Navinal–Bocha Island and Bocha Creek system, indicating localized regrowth or transitional changes. Overall, the mangroves appear to be in stable condition, supported by normal tidal flow patterns.

Table 6. Data on distribution of mangroves in 2021 and 2023 in Navinal- Bocha Creek system

Category	Area in Hectares	
	2021	2023
Dense	287.33	284.33
Sparse	53.17	55.71
Scatter	193.52	188.07
Total	534.02	528.11

However, the overall increase in mangrove in the Navinal-Bocha Creek system shows prevalence of normal conditions, specific attention was drawn in the case of Navinal Creek in the conservation due to formation of sand spits. It was postulated that continued growth of sand spit across the creek might reduce tidal flow in future, which may affect the growth of the mangroves. In this regard, It is pertinent to draw the following made for mangroves in Navinal Creek in the Conservation plan:

Sand/silt spits were observed on the banks of Navinal Creek and some of them were extending close to Bocha Island. If such spits continue to grow, they may obstruct tidal flow leading to reduced tidal water supply to the northern banks of Navinal Creek and the Bocha Island. Therefore, assessment of the health of mangroves should also be carried out along the Navinal Creek. If the health of

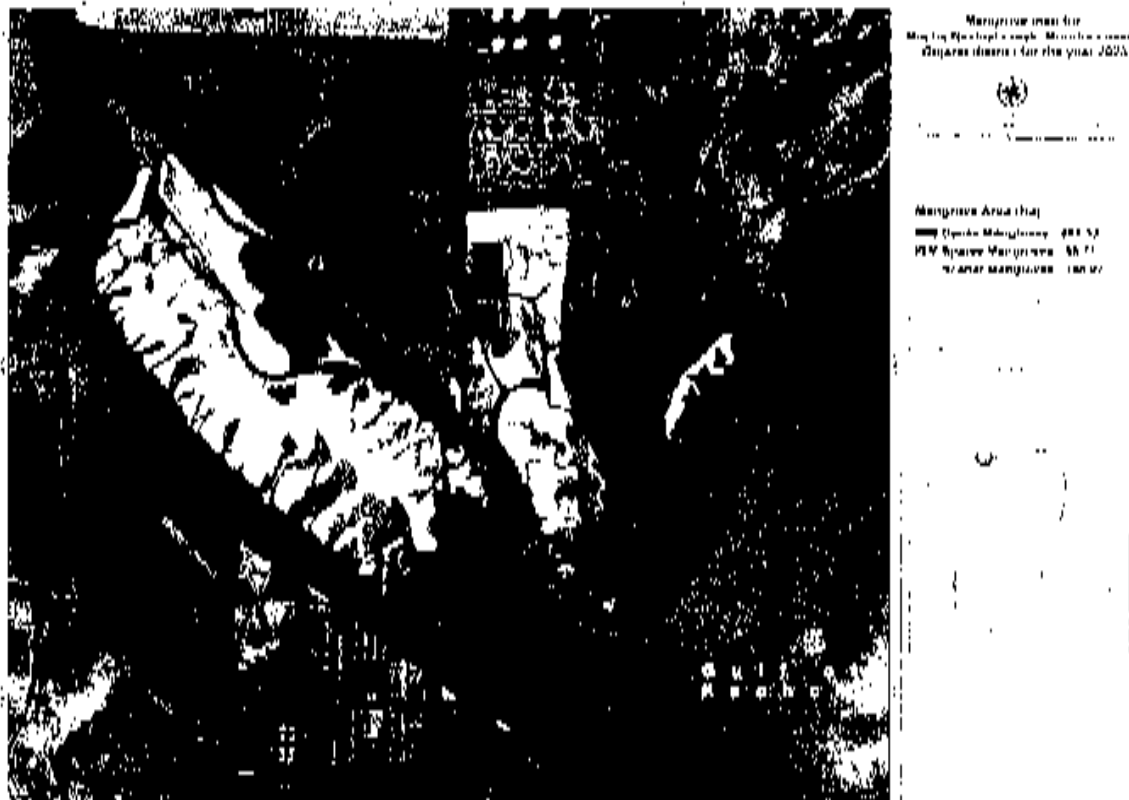


Fig. 22. Distribution of various categories of mangroves of Navinal-Bocha Creek system for the year 2023

Change analysis in Navinal-Bocha Crooks including Bocha Island

The change analysis, carried out using GIS overlay techniques to evaluate inter-conversion among dense, sparse, and scattered mangrove categories, indicates a net loss of dense mangroves totalling 0.6 hectares, primarily concentrated at the tip of Bocha Island (Fig. 23) This observation aligns with the findings from the Conservation Plan, which had reported a loss of 5.33 hectares of dense mangroves in the same location during the period 2011 to 2016–17.

The current results confirm that erosion at the tip of Bocha Island is ongoing, contributing to the continued loss of dense mangrove cover. However, a marginal gain of 1.22 hectares in sparse mangroves was recorded, which may be attributed to regrowth or colonization in adjacent mudflat areas, indicating some level of natural recovery within the system.

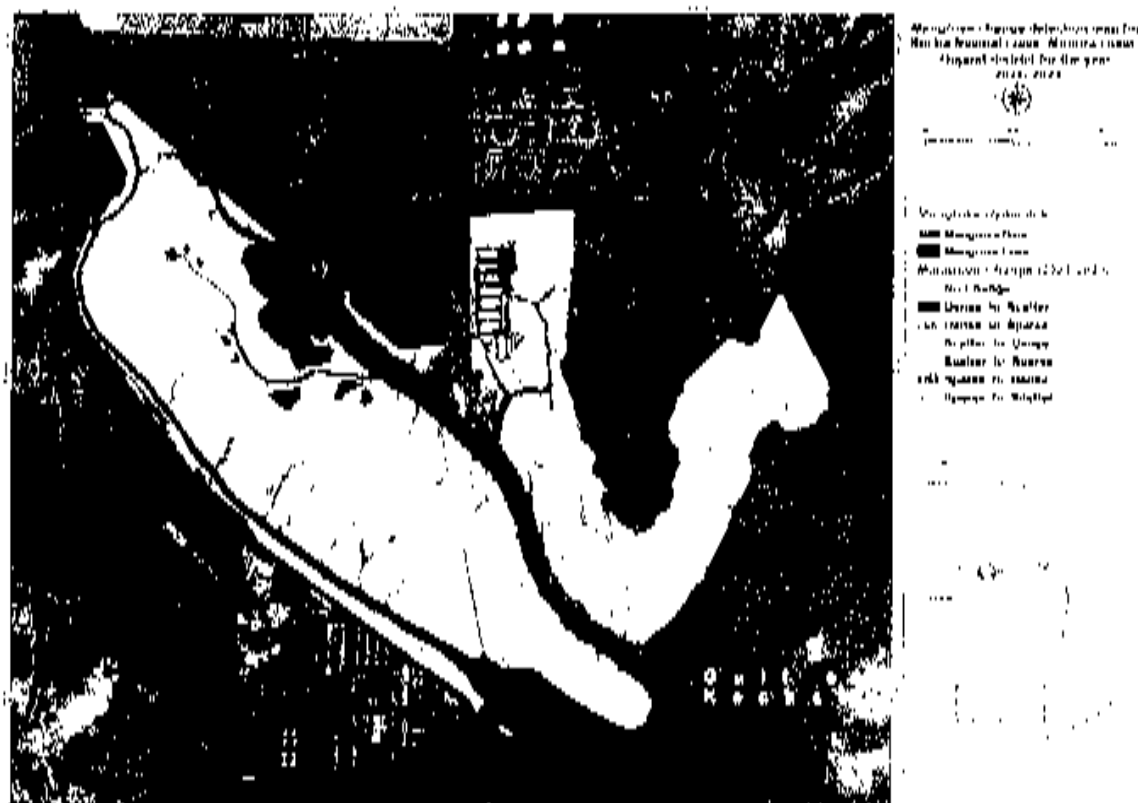


Fig. 23. Result of change analysis from 2021 to 2023 on categories of mangroves in Navinal-Bocha Creek system

Vegetation Structure In Navinal-Bocha Creek

The mangrove stand structure in Navinal-Bocha Creek was predominantly composed of *Avicennia marina*, which emerged as the most abundant species based on its high Importance Value Index (IVI = 264.13). It was followed by *Ceriops tagal* (IVI = 20.01) and *Rhizophora mucronata* (IVI = 15.86). The overall density of mangrove trees was estimated at 4,533 trees ha⁻¹, with a corresponding basal area of 25.17 m² ha⁻¹, indicative of a well-established and mature mangrove stand. Among the species, *A. marina* exhibited the highest density, accounting for 3,958 trees ha⁻¹ and a basal area of 24.36 m² ha⁻¹. This was followed by *R. mucronata* with 333 trees ha⁻¹ (0.46 m² ha⁻¹) and *C. tagal* with 242 trees ha⁻¹ (0.34 m² ha⁻¹).

The mean diameter at breast height (DBH) of trees in the Navinal-Bocha Creek mangrove stand was 6.75 cm, with values ranging from 2.83 cm to 41.36 cm. The average tree height was 2.57 m, varying between 1.0 m and 5.2 m, indicating a population structure largely composed of small- to medium-sized individuals.

Among the species, *Avicennia marina* exhibited an average DBH of 7.13 cm (range: 2.83–41.36 cm) and an average height of 2.62 m (range: 1.0–5.2 m). *Ceriops tagal* had an average DBH of 4.22 cm (range: 3.09–4.26 cm) and an average height of 1.91 m (range: 1.9–2.1 m). *Rhizophora mucronata* showed an average DBH of 4.09 cm (range: 3.25–6.20 cm) and an average height of 2.41 m (range: 2.0–4.0 m).

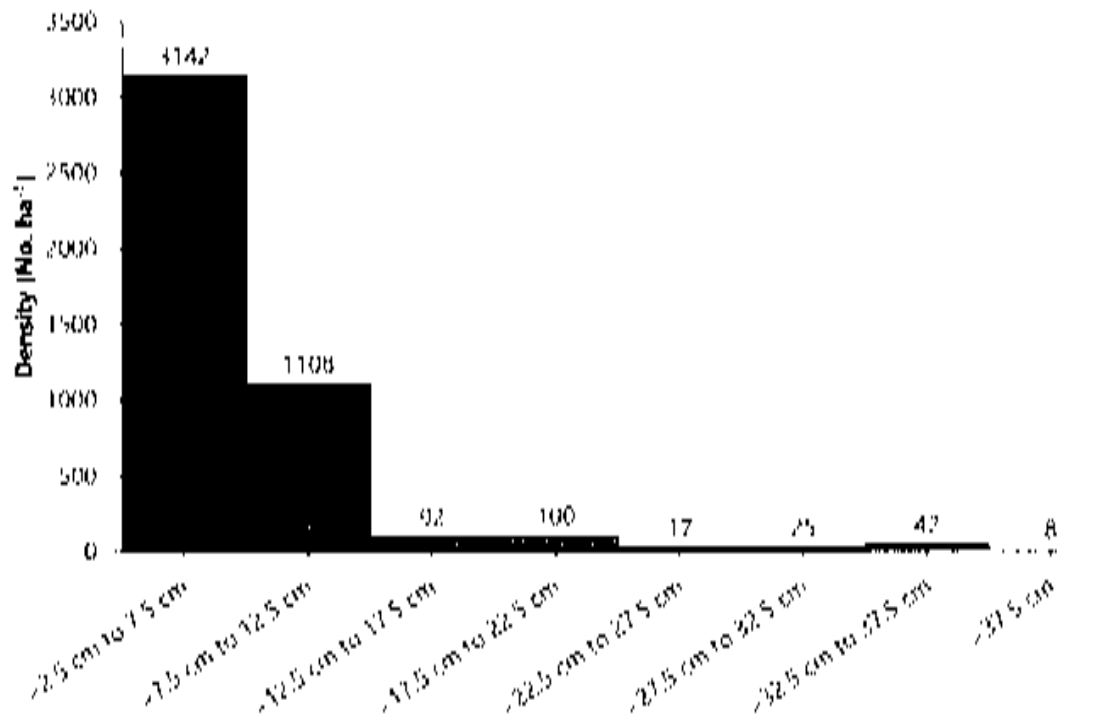


Fig. 24. Mangrove tree density by DBH (cm) size classes in Navinal-Bocha Creek

The diameter class distribution of mangrove trees in Navinal-Bocha Creek revealed a highly skewed structure, dominated by individuals in the lower DBH ranges (Fig. 24). The highest tree density (3,142 trees ha⁻¹) was recorded in the smallest diameter class of >2.5 cm to 7.5 cm, followed by 1,108 trees ha⁻¹ in the 7.5 cm to 12.5 cm class. Tree density declined sharply beyond this range, with only 92–100 trees ha⁻¹ observed in the mid-diameter classes (12.5 cm to 22.5 cm). The higher diameter classes (>22.5 cm) had very low densities, ranging from eight to 42 trees ha⁻¹.

This distribution indicates a population dominated by younger or regenerating individuals, with a progressively decreasing number of larger, mature trees. Such a pattern is characteristic of a developing or regenerating mangrove

stand, where recruitment is active but the proportion of older individuals remains low.

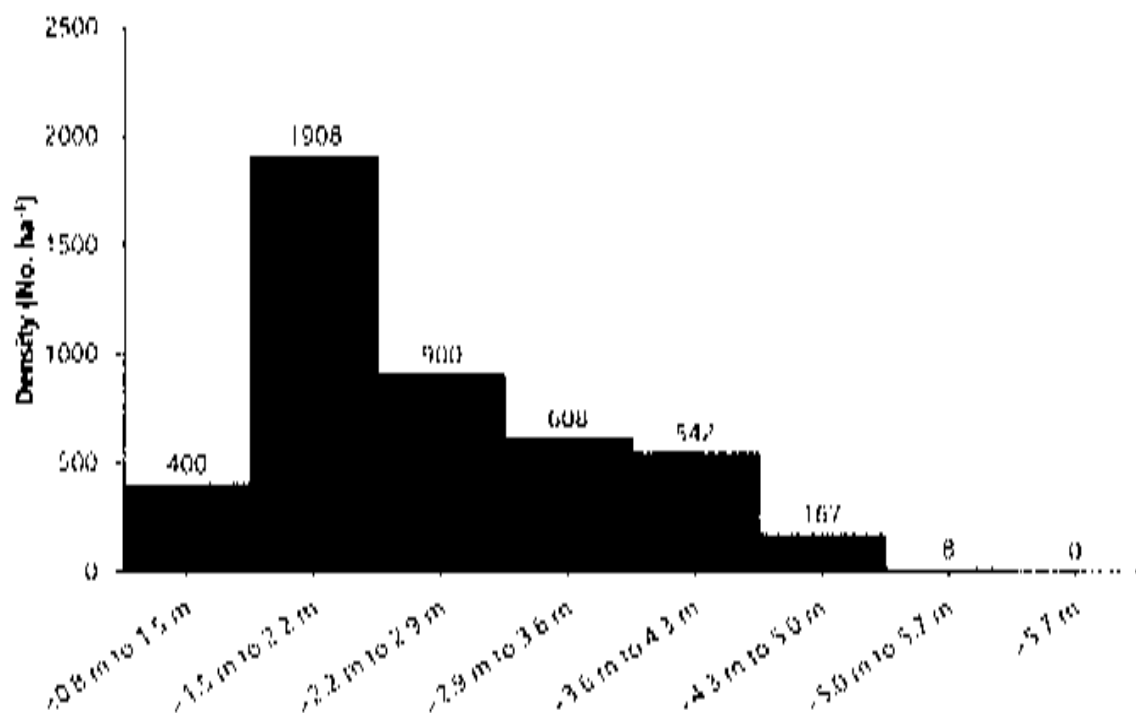


Fig. 25. Mangrove tree density by height (m) size classes in Navinal-Bocha Creek

The height class distribution of mangrove trees in Navinal-Bocha Creek exhibited a unimodal pattern, with the majority of individuals concentrated in the mid-height range (Fig. 25). The highest density (1,908 trees ha⁻¹) was recorded in the 1.5 m to 2.2 m height class, followed by 900 trees ha⁻¹ in the 2.2 m to 2.9 m class. Smaller individuals (0.8 m to 1.5 m) accounted for 400 trees ha⁻¹.

A gradual decline in density was observed in higher height classes: 608 trees ha⁻¹ (2.9 m to 3.6 m), 542 trees ha⁻¹ (3.6 m to 4.3 m), and 167 trees ha⁻¹ (4.3 m to 5.0 m). Very few individuals were recorded in the tallest height classes, with only eight trees ha⁻¹ in the 5.0 m to 5.7 m range and none beyond 5.7 m.

This pattern indicates a predominance of small- to medium-sized trees within the population, suggesting either a regenerating stand or one under environmental or anthropogenic constraints that limit vertical growth.

The seedling density of *Avicennia marina* and *Rhizophora mucronata* in Navinal-Bocha Creek was estimated at 33,333 seedlings ha⁻¹, indicating active natural regeneration within the mangrove stand.



Fig. 26. Mangroves along the Navinal-Bocha Creek

(Photographs in the last row show brown dust deposits likely originating from the adjacent port region)

Mangrove erosion along the creek has occurred primarily due to natural processes such as bank erosion (Fig. 27). Despite the diversion of two channels upstream in Bocha Creek, afforestation efforts involving *Avicennia marina* were undertaken. During the present survey, natural mangrove colonization was observed, with scattered individuals establishing alongside the salt marsh species *Suaeda nudiflora* (Fig. 28), indicating resilience and ongoing regeneration in the altered landscape.

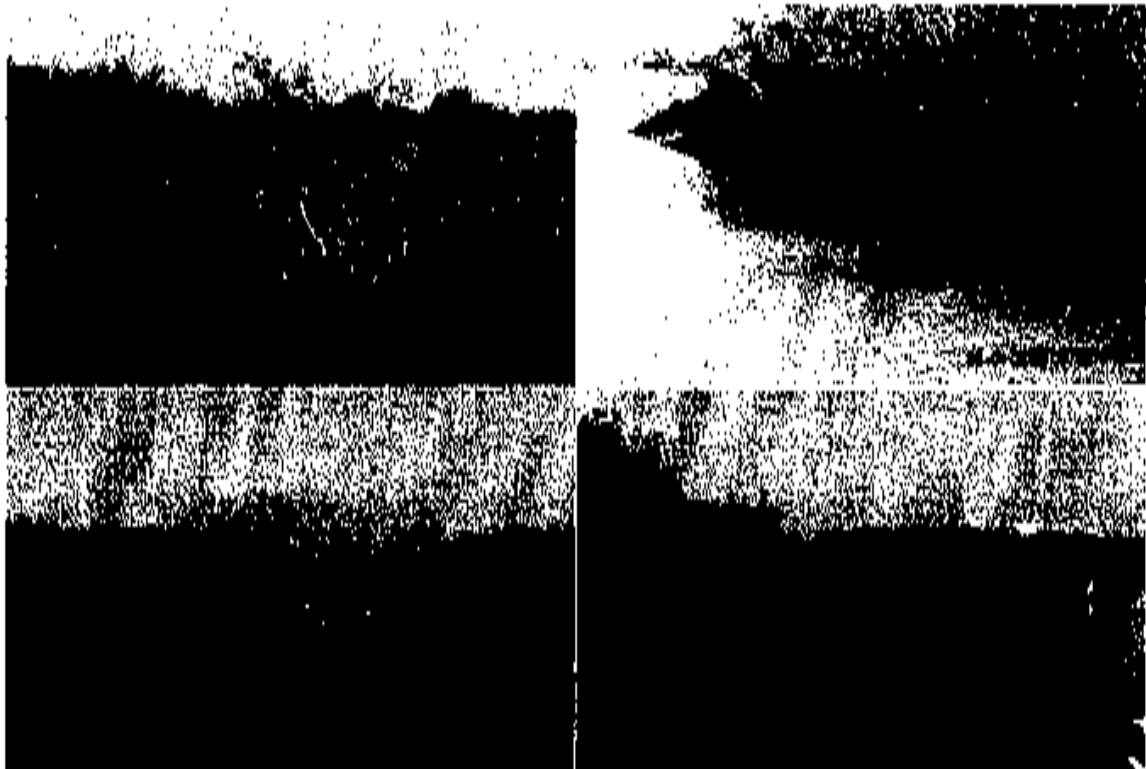


Fig. 27. Bund Erosion in the Navinal-Bocha Creek

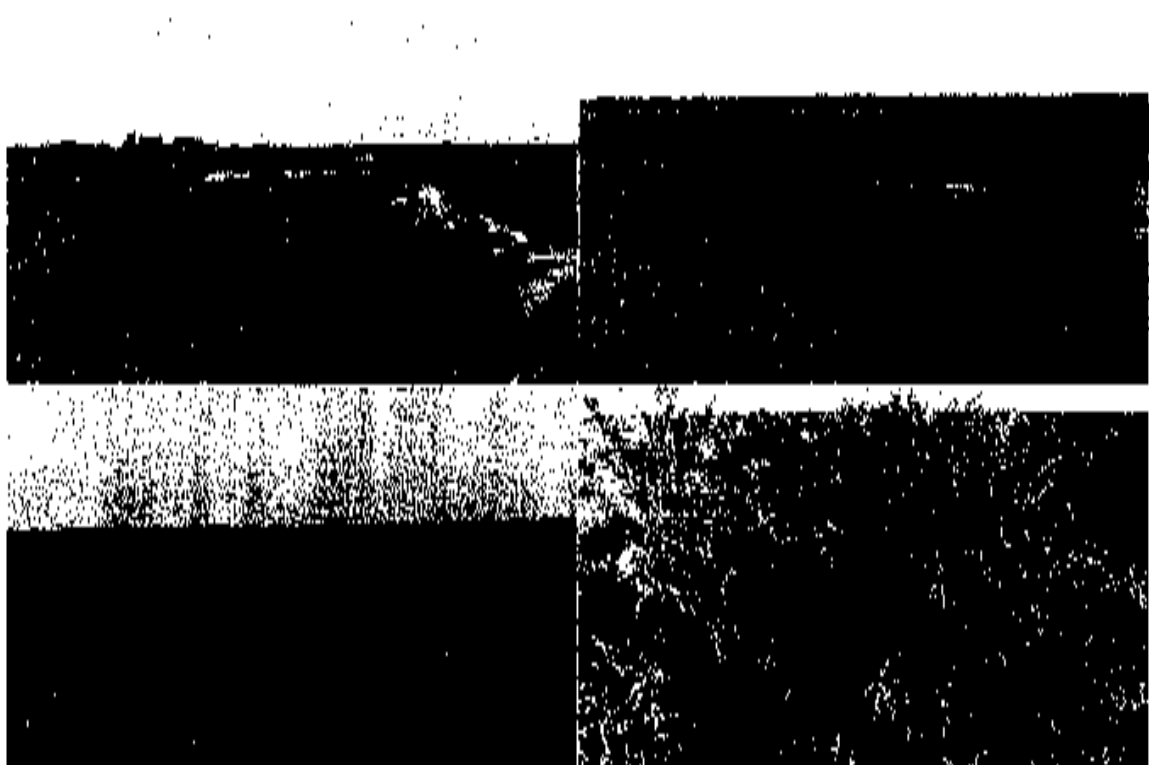


Fig. 28. Natural colonization of mangroves in the newly opened channel
(*Suaeda nudiflora* – right bottom)

d. Khari Creek

Khari Creek experiences normal tidal flow, with settlements located in its northern part, particularly near Junabunder village. The distribution of mangroves between 2021 and 2023 was analysed, and the results are presented in Table 7 and Figure 29, with mangrove categories detailed in Figures 30 and 31. The analysis indicates a marginal increase of 1 hectare, representing a 0.34% increase in total mangrove cover compared to 2021. This minor growth is primarily attributed to the conversion of sparse mangroves into both dense and scattered categories, particularly along the tip of the island, reflecting natural transitional changes associated with annual tidal variations.

In contrast, a notable gain of approximately 8 hectares was observed in the scattered mangrove category, indicating natural expansion over adjacent mudflats and colonization near the creek mouth. This suggests that, despite minor losses, the overall mangrove ecosystem in Khari Creek remains dynamic and stable, with signs of healthy regeneration.

Table 7. Distribution of various categories of mangroves in 2021 and 2023 in Khari Creek

Category	Area (Hectares)	
	2021	2023
Dense	208.95	209.97
Sparse	57.63	32.45
Scatter	35.20	57.63
Total	301.78	300.05

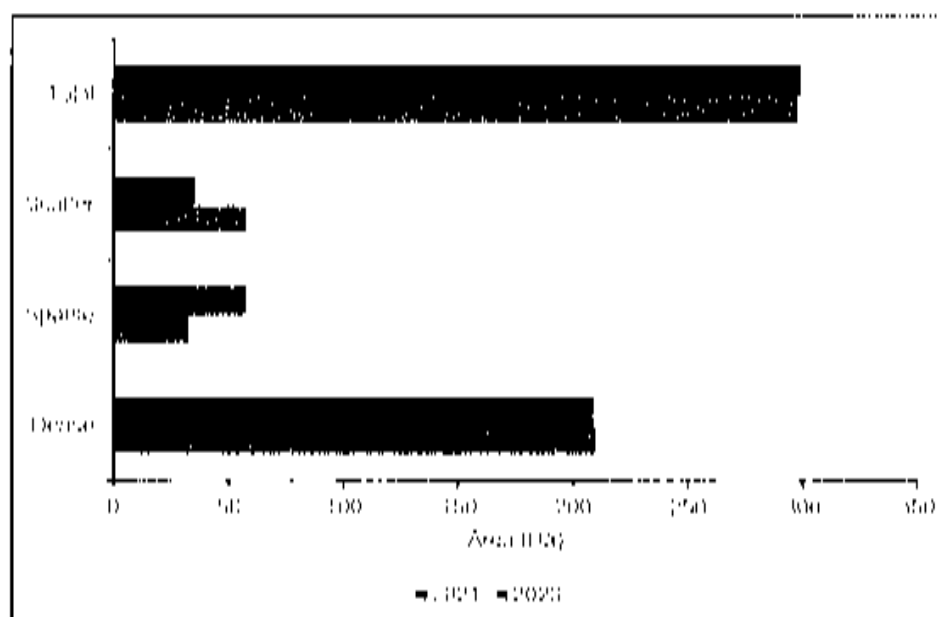


Fig. 29. Comparison of mangroves in 2021 and 2023 in Khari Creek

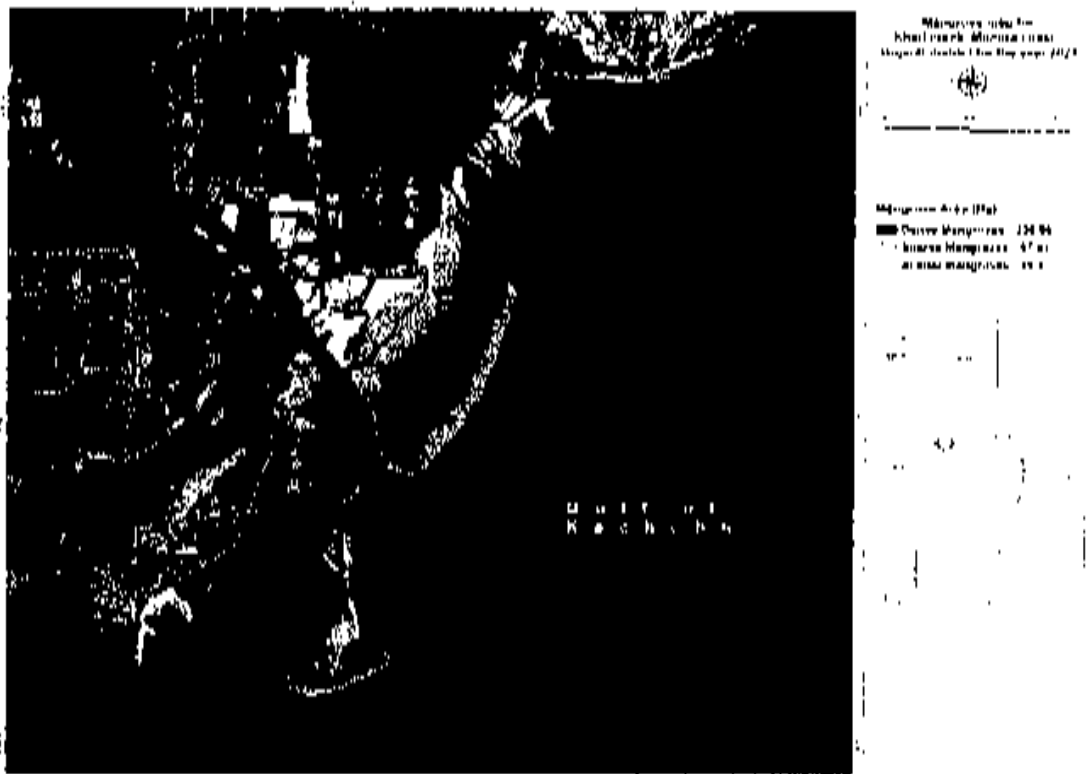


Fig. 30. Distribution of various categories of mangroves in Khari Creek system for the year 2021

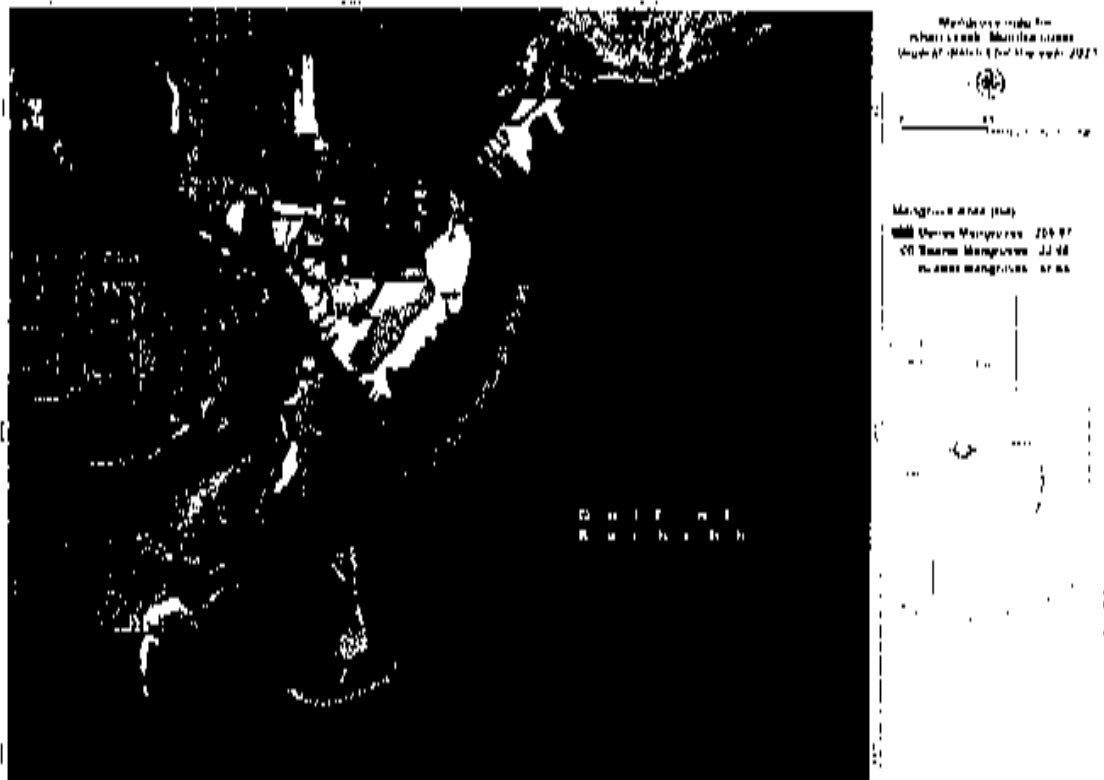


Fig. 31. Distribution of various categories of mangroves in Khari Creek system for the year 2023

Change analysis In Khari Creek

An assessment of Khari Creek between 2021 and 2023 reveals a mixed pattern of mangrove change, characterized by both localized loss and noticeable gain across different zones of the creek system (Fig. 32). A significant loss of approximately 3.5 hectares was recorded at the southern tip of the creek, where the water body opens into the tidal zone. This area is subject to intense tidal currents, wave energy, and sediment transport, which can destabilize younger mangrove stands. The loss is likely due to natural coastal dynamics, including tidal erosion and scouring of exposed mud banks. Submergence stress due to prolonged waterlogging during high tides, etc. In contrast to the loss at the tip, significant gains in mangrove cover were observed in the interior parts of the creek and along mudflat regions near the creek mouth.

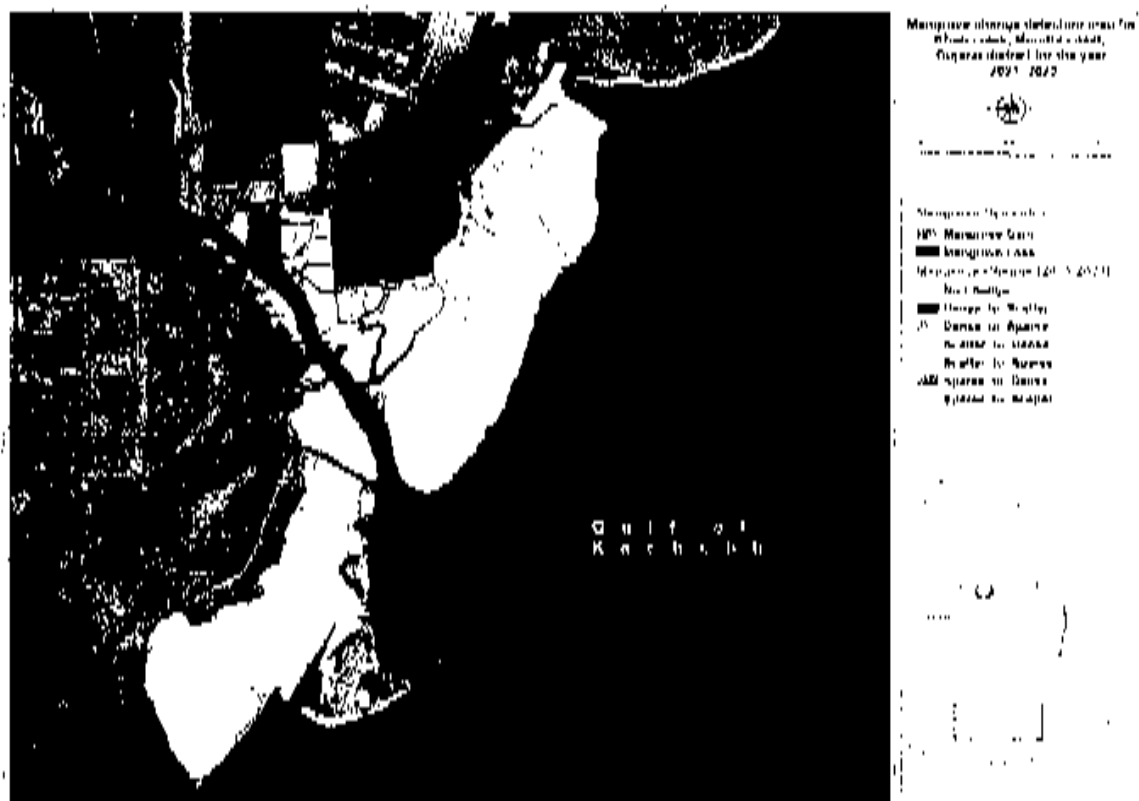


Fig. 32. Result of change analysis from 2021 to 2023 on categories of mangroves in Khari Creek system

Vegetation Structure in Khari Creek

The mangrove stand structure in Khari Creek was primarily dominated by *Avicennia marina*, which was identified as the most abundant species (IVI = 300). The density of *A. marina* was estimated at 4,300 trees ha⁻¹, with a

corresponding basal area of 33.96 m² ha⁻¹, indicating a well-established stand. The mean diameter at breast height (DBH) of the trees was 8.23 cm, with values ranging from 2.61 cm to 38.34 cm. The average tree height was recorded at 2.84 meters, ranging from 1.4 m to 6.2 m, reflecting a population structure dominated by small- to medium-sized individuals.

The diameter at breast height (DBH) class distribution of mangrove trees in Khari Creek reveals a population structure skewed towards smaller diameter classes (Fig. 33). The highest density was recorded in the smallest DBH class of >2.5 cm to 7.5 cm, with 3,045 trees ha⁻¹. This was followed by 455 trees ha⁻¹ in the 7.5 cm to 12.5 cm class and 436 trees ha⁻¹ in the 12.5 cm to 17.5 cm class. Tree density declined progressively with increasing diameter, with 245 trees ha⁻¹ in the 17.5 cm to 22.5 cm class and sharply lower densities beyond this range—45 and 55 trees ha⁻¹ in the 22.5–32.5 cm classes, and only nine trees ha⁻¹ each in the 32.5–37.5 cm and >37.5 cm classes.

This distribution suggests that the mangrove stand in Khari Creek is primarily composed of younger or regenerating individuals, with a relatively low proportion of mature trees in the higher diameter classes. The dominance of smaller DBH classes reflects ongoing recruitment and a dynamic, regenerating stand structure.

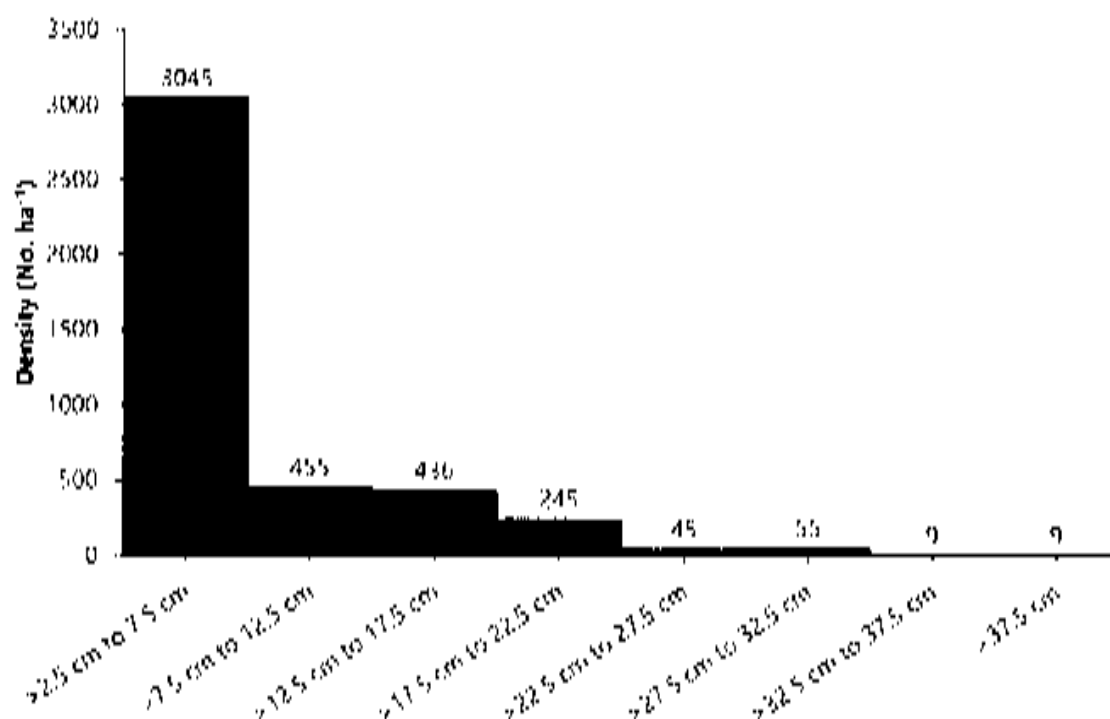


Fig. 33. Mangrove tree density by DBH (cm) size classes in Khari Creek

The height class distribution of mangrove trees in Khari Creek reflects a population dominated by medium-height individuals. The highest tree density was recorded in the 1.5 m to 2.2 m class, with 1,582 trees ha⁻¹, followed by the 2.2 m to 2.9 m class with 1,045 trees ha⁻¹.

The smallest height class (0.8 m to 1.5 m) contained 245 trees ha⁻¹, while moderate densities were observed in the mid- to upper-height ranges: 382 trees ha⁻¹ in the 2.9 m to 3.6 m class, 473 in the 3.6 m to 4.3 m class, and 355 in the 4.3 m to 5.0 m class. Tree density declined further in the tallest height classes, with 200 trees ha⁻¹ in the 5.0 m to 5.7 m range and only 18 trees ha⁻¹ beyond 5.7 m.

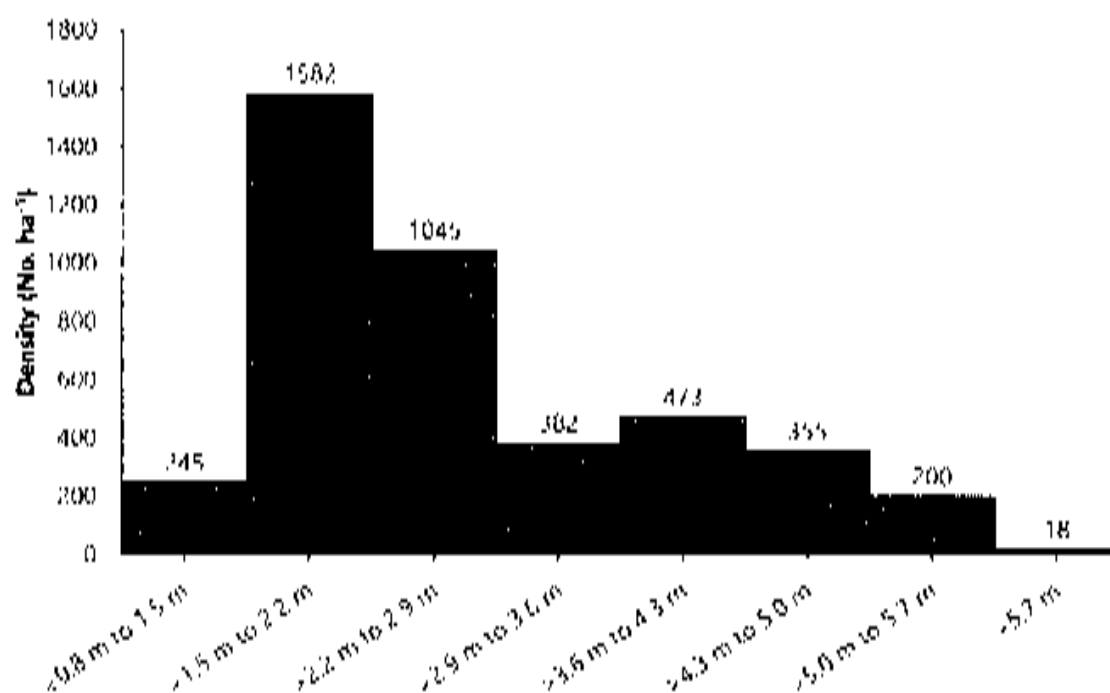


Fig. 34. Mangrove tree density by height (m) size classes in Khari Creek

This distribution suggests a well-established and vertically stratified stand, with dominance of small to medium trees and a moderate representation of taller individuals, indicative of a maturing mangrove population with ongoing regeneration.

The seedling density of *Avicennia marina* in Khari Creek was estimated at 76,667 seedlings ha⁻¹, indicating active natural regeneration within the mangrove stand.



Fig. 35 Mangroves along the Kham Creek

7. INFERENCE

- The study of mangrove distribution across four key creek systems reveals that the mangroves in the region are generally healthy and stable, with natural inter-category conversions and minor localized losses influenced by both natural and other factors.
- The overall health of mangroves in the creeks in and around APSEZ was assessed by comparing WorldView-3 images from 2021 and 2023, revealing a stable growth of approximately 2 hectares, which accounts for a minimal change of about 0.08% of the mangrove area. The analysis indicates that the mangrove and tidal systems in the creeks remain largely undisturbed and continue to flourish during this period.
- Overall stand structure of mangroves in the creeks in and around APSEZ was assessed to be:
 - Three mangrove species were recorded in the region: *Avicennia marina*, *Coriops tagal*, and *Rhizophora mucronata*
 - The overall mangrove tree density was estimated at 4,857 trees ha⁻¹, with a corresponding basal area of 26.26 m² ha⁻¹.
 - Species-wise Density and Basal Area:
 - *Avicennia marina*: 4,677 trees ha⁻¹, 26.01 m² ha⁻¹
 - *Coriops tagal*: 75 trees ha⁻¹, 0.11 m² ha⁻¹
 - *Rhizophora mucronata*: 104 trees ha⁻¹, 0.14 m² ha⁻¹
 - *A. marina* exhibited the highest IVI (288.13), followed by *C. tagal* (6.77) and *R. mucronata* (5.10).
 - Mean Diameter at Breast Height (DBH): 6.81 cm (range: 2.61–41.36 cm)
 - Mean Tree Height: 2.90 m (range: 0.80–6.20 m)
- The Kotdi Creek system shows an overall marginal decrease of 1% decline (6.43 ha), primarily due to a reduction in scatter category, which is likely caused by anthropogenic disturbances such as clearing. Slight increase in dense and sparse mangroves suggests natural succession and good tidal flow (up to 4.5–7.4 km).
- The Baradimata Creek system has an overall gain of ~16 ha, especially due to formation of new dense mangroves. Decrease in scatter and sparse (-0.7%) attributed to hydrodynamic impacts on edge zones; some inter-conversion was observed.
- Bocha Navinal Creek has six ha total loss (1.1%), mainly in dense and scattered categories, especially near Bocha island tip, due to natural erosion and tidal inundation. Sparse category increased, indicating regrowth or colonization on mudflats. Formation of sand spits near

Navinal Creek could threaten future tidal inflow, necessitating regular monitoring and possibly channel deepening.

- Khari Creek shows a slight decrease of 1.7 ha, along with an increase of 22 ha in scattered mangroves, suggesting natural expansion over exposed mudflats. Sparse mangroves decreased due to conversion into both dense and scattered, reflecting normal ecological progression
- Small area of mangrove has been cleared on the downstream bank of the Navinal Creek (22°44'58.89"N 69°42'17.17") (Fig. 36) by the Gujarat Maritime Board (GMB) for the development of facilities as per their EC & CRZ clearance Vide F. No. IA-J-11013/40/2020-IA-I dated 18th Aug, 2021.
- Ship anchoring by the GMB in the Bocha Island leads to loss of mangrove trees in trees (Fig. 37)
- Bank erosion was observed in the downstream of the Navinal Creek (Fig. 38) and upstream region of the Bocha Creek (Fig. 39), affecting the mangrove vegetation along the creek banks (Fig. 38). However, the Port Authority, as recommended in the Integrated Management Plan prepared by NCSCM and directed by the MoEF&CC has implemented erosion control measures (Fig. 40). These measures were part of the compliance actions following the Environmental Clearance (EC) conditions and MoEF&CC final order (F. No. 10-47/2008-IA.III) was issued on 18 September 2015".



Fig. 36 Mangrove cleared on the downstream bank of the Navinal Creek by the Gujarat Maritime Board for the development of facilities as per their approval from MoEF&CC



Fig. 37. Ship anchoring in Bocha Island by GMB Port



Fig. 38. Bank erosion observed in Navinal Creek

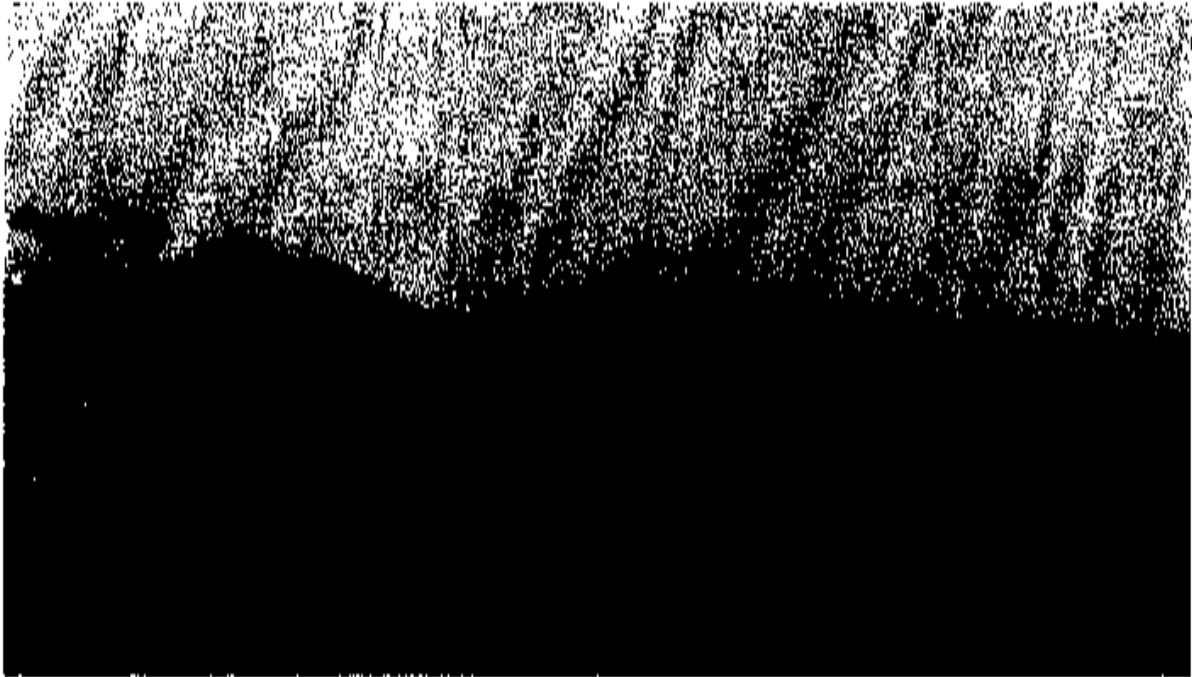


Fig. 39. Bank erosion observed in Bocha Creek



Fig. 40. Dredgers deployed near the Bocha Island as part of the erosion control measures

Annexure – 10

Expense Details for Fisherfolk Amenities work in different core areas													
Sr. No.	Details	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	TOTAL	AMT IN LACS
Expenditure Details (Amount in Rs.)													
1	Vidya Deep Yojana	2,069,300	193,000	2,087,000	1,771,000	110,225	580,103	969,660	-	-	-	7,780,288	77.80
2	Vidya Sahay Yojana	552,580	495,000	691,000	708,000	504,336	659,709	847,013	563,000	644,000	482,000	6,146,638	61.47
3	Adani Vidya Mandir – Shaping Lives	4,200,000	4,030,000	3,472,000	6,434,020	1,593,805	3,737,700	5,950,854	7,452,390	7,815,023	3,903,900	48,589,692	485.90
4	Senior Citizen Health Card	--	8,430,000	1,750,000	2,975,000	1,750,000	-	-	-	-	-	14,905,000	149.05
5	Financial Support to Poor Patients	4,439,507	1,275,000	813,000	1,296,063	763,800	1,255,000	1,691,410	1,620,000	1,666,000	895,000	15,714,780	157.15
6	Machhimar Kaushalya Vardhan Yojana	188,708	200,000	397,000	73,000	--	226,000	134,070	-	-	-	1,218,778	12.19
7	Machhimar Sadhan Sahay Yojana	--	--	315,000	522,000	--	-	-	-	-	-	837,000	8.37
8	Machhimar Awas Yojana	4,592,106	1,165,000	--	2,311,000	2,424,016	2,480,000	712,000	1,227,000	-	-	14,911,122	149.11
9	Machhimar Shudhh Jal Yojana	2,236,050	2,700,000	2,038,000	1,773,000	2,348,300	1,936,575	2,096,050	1,370,000	1,264,000	316,000	18,077,975	180.78
10	Sughad Yojana	1,367,300	170,000	--	192,000	30,000	-	-	-	-	-	1,759,300	17.59
11	Machhimar Akshay kiran Yojana	860,850	100,000	68,000	--	--	-	-	-	-	-	1,028,850	10.29
12	Machhimar Ajvika Uparjan Yojana-Mangroves plantation	1,558,800	500,000	1,382,000	1,400,000	1,900,272	2,069,432	1,914,432	-	270,000	286,000	11,280,936	112.81
13	Bandar Svachhata Yojana	106,400	50,000	--	--	367,000	145,000	25,000	-	-	-	693,400	6.93
14	Cricket league and Cycle Marathon	432,000	657,119	638,000	610,800	--	-	-	-	-	-	2,337,919	23.38
15	Sports Material For Children & Youth at Vasahats	197,797	--	--	--	--	-	-	-	-	-	197,797	1.98
16	New Pilot Initiative for Polyculture	398,240	160,000	--	--	--	-	-	-	-	-	558,240	5.58
17	New Pilot Initiative for Cage farming Asian Seabass & Lobster	864,000	660,000	--	--	--	-	-	-	-	-	1,524,000	15.24
18	Sea Weed Culture Project	--	--	--	200,000	--	-	-	-	-	-	200,000	2.00
19	Mangrove Biodiversity Project	--	--	1,890,000	684,000	499,210	997,642	1,135,000	-	191,000	-	5,396,852	53.97
20	Approach Road restoration at 9 vasahat	--	--	--	--	599,000	942,780	1,011,000	-	-	519,000	3,071,780	30.72
21	Community training Center & Maintenance work	--	--	--	--	--	6,022,000	2,051,000	-	-	-	8,073,000	80.73
TOTAL		24,063,638	20,785,119	15,541,000	20,949,883	12,889,964	21,051,941	18,537,489	12,232,390	11,850,023	6,401,900	164,303,347	1,643.03

Annexure – i

TEST REPORT

Report No.	URC /25/07/Water/ APSEZ-0001		
Name & Address of Customer	M/S. ADANI PORTS & SPECIAL ECONOMIC ZONE LTD. (WFDP-West Port) PLOT NO: - NAVINAL ISLAND, Village - MUNDRA, Tal. – Mundra, DIST. - KUTCH - 370421.	Date of Report	04/08/2025
		Customer's Ref.	As Per W.O.
Sample Details	Pond Water	Location	Near Coal Pond
Sample Qty.	5 Lit.	Appearance	Colorless
Sampling Date	26/07/2025	Sample Received Date	28/07/2025
Test Started Date	28/07/2025	Test Completion Date	02/08/2025
Sampled By	UERL Lab	Sampling Method	UERL/CHM/SOP/116
UERL Lab ID. No.	25/07/Water/ APSEZ-0001		

TEST RESULTS:

Sr. No.	Parameters	Test Method Permissible	Unit of Measurement	Results
1.	Colour	IS 3025(Part 4):2021	Pt. Co. Scale	30
2.	Odour	IS 3025(Part 5):2023	--	Agreeable
3.	Total Suspended Solids	APHA 24th Ed.,2023,2540 –D	mg/L	42
4.	pH @ 25 ° C	APHA 24th Ed.,2023,4500-H*B	--	7.28
5.	Temperature	IS 3025(Part 9):2023	°C	29
6.	Oil & Grease	IS 3025(Part 39):2021	mg/L	BDL(MDL:2.0)
7.	Total Residual Chlorine	IS 3025(Part 26):2021	mg/L	BDL(MDL:0.1)
8.	Ammonical Nitrogen	IS 3025(Part 34):1988,	mg/L	BDL(MDL:2.0)
9.	BOD (3 days at 27 °C)	IS 3025(Part 44):2023	mg/L	16
10.	COD	IS 3025(Part 58):2023	mg/L	56.2
11.	Arsenic (as As)	APHA 24th Ed.,2023,3114-C	mg/L	BDL(MDL:0.01)
12.	Mercury (as Hg)	APHA 24th Ed.,2023, 3112-B	mg/L	BDL(MDL:0.001)
13.	Lead (as Pb)	IS 3025 (Part 47):1994	mg/L	BDL(MDL:0.01)
14.	Cadmium (as Cd)	IS 3025(Part 41):2023	mg/L	BDL(MDL:0.003)
15.	Hexavalent Chromium	APHA 24th Ed.,2023,3500CrB	mg/L	BDL(MDL:0.05)
16.	Total Chromium (as Cr)	IS 3025 (Part 52):2003	mg/L	BDL(MDL:0.05)
17.	Copper (as Cu)	IS 3025 (Part 42):1992	mg/L	BDL(MDL:0.05)
18.	Zinc (as Zn)	IS 3025(Part 49):1994	mg/L	BDL(MDL:0.05)

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Note: This report is subject to terms and conditions mentioned overleaf.



TEST REPORT

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Test Started Date	28/07/2025	Test Completion Date	02/08/2025
Sampled By	UERL Lab	Sampling Method	UERL/CHM/SOP/116
UERL Lab ID. No.	25/07/Water/ APSEZ-0001		

TEST RESULTS:

Sr. No.	Parameters	Test Method Permissible	Unit of Measurement	Results
19.	Selenium (as Se)	IS 3025(Part 56):2003	mg/L	BDL(MDL:0.01)
20.	Nickel (as Ni)	APHA 24th Ed.,2023,3111-B	mg/L	BDL(MDL:0.02)
21.	Cyanide (as CN)	IS 3025(Part 27):1986	mg/L	BDL(MDL:0.05)
22.	Fluoride (as F)	IS 3025(Part 60):2008	mg/L	0.52
23.	Dissolved Phosphate (as P)	APHA 24th Ed.,2023,4500-P, D	mg/L	0.68
24.	Sulphide as S	APHA 24th Ed.,2023,4500 S ² F	mg/L	BDL(MDL:0.1)
25.	Phenolic Compound	IS 3025(Part 43):2022	mg/L	BDL(MDL:0.01)
26.	Bio Assay test (%)	IS:6582-1971	%	90 % survival of fish after 96 hrs. in 100% effluent
27.	Manganese (as Mn)	APHA 24th Ed.,2023, 3500 Mn B	mg/L	BDL(MDL:0.1)
28.	Iron (as Fe)	IS 3025(Part 53):2003	mg/L	0.159
29.	Vanadium (as V)	APHA 24th Ed.,2023-3500 – V	mg/L	N.D.
30.	Nitrate (as NO ₃ -N)	APHA 24th Ed.,2023,4500 NO ₃ -B	mg/L	0.6

Remarks: **BDL**= Below Detection Limit, **MDL** = Minimum Detection Limit

Opinion & Interpretation (If required):

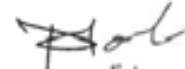
*****End of Report *****

Checked By



(Nilesh C. Patel)
(Sr. Chemist)

Authorized By



(Nitin B. Tandel)
(Technical Manager)

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