

adani

Ports and  
Logistics

APSEZL/EnvCell/2021-22/024

Date: 18.05.2021

To

Deputy Director General of Forest (Central),  
Ministry of Environment, Forest and Climate Change,  
Regional Office (WZ), E-5, Kendriya  
Paryavaran Bhawan, Arera Colony,  
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**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 21<sup>st</sup> July, 2004 bearing no. J-16011/30/2003-IA-III.

Dear Sir,

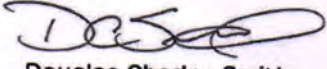
Please refer to the above cited reference for the said subject matter. In connection to the same, it is to state that copy of the compliance report for the Environmental and CRZ Clearance for the period of October-2020 to March-2021 is being submitted through soft copy (e-mail communication).

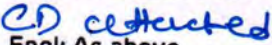
Kindly consider above submission and acknowledge.

Thank you,

Yours Faithfully,

For, M/s Adani Ports and Special Economic Zone Limited

  
Douglas Charles Smith  
Chief Executive Officer  
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) Zonal Officer, Regional Office, CPCB - Western Region, Parivesh Bhawan, Opp. VMC Ward Office No. 10, Subhanpura, Vadodara - 390 023
- 3) Member Secretary, GPCB - Head Office, Paryavaran Bhawan, Sector 10 A, Gandhi Nagar - 382 010
- 4) The Director, Forests & Environment Department, Block - 14, 8<sup>th</sup> floor, Sachivalaya, Gandhi Nagar - 382 010
- 5) Regional Officer, Regional Office GPCB (Kutch-East), Gandhidham, 370201

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एकीकृत क्षेत्रीय कार्यालय  
Integrated Regional Office  
पर्यावरण, वन एवं जलवायु परिवर्तन विभाग  
Ministry of Environment, Forest & Climate Change  
भारत सरकार, भोपाल/Govt. of India, Bhopal

By 25/05/2021

# 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:  
October-2020 to March-2021

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

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**EC & CRZ  
Clearance  
Compliance  
Report**



	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

- The name of the company was changed from **“Gujarat Adani Port Limited”** to **“Mundra Port and Special Economic Zone Limited”** on 7<sup>th</sup> July, 2006.
- Further the name of the company was changed from **“Mundra Port and Special Economic Zone Limited”** to **“Adani Ports and Special Economic Zone Limited”** on 6<sup>th</sup> January, 2012.

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

**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-160 11/30/2003-IA.III dated 21st July 2004.**

Sr. No.	Conditions	Compliance Status as on 31-03-2021
<b>A. Specific Condition</b>		
1.	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>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 date APSEZ has carried out mangrove afforestation in 2890 ha. Area across the coast of Gujarat. Total expenditure for the same till date is INR 832 lakh. Details on mangroves afforestation &amp; Green belt development carried out by APSEZ till date is annexed as <b>Annexure – 1</b>.</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 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. Please refer attached <b>Annexure – 2</b> for CSR activity report carried out by Adani Foundation.</p>
2.	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 outplay shall	<p>Complied.</p> <p>During the course of development of the project, green belt was developed in 6.18 Hectares of land. Total 7607 trees were planted with the density of 1230 trees per hectare at a cost of Rs. 25.00 Lakh. This plantation was done in consultation with Gujarat Ecological Commission (as they are one of the authorized agencies of Dept. of Forest &amp; Env. Dept., Govt. of Gujarat).</p> <p>In addition to this, various activities on green belt</p>

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	be provided to this ministry within 6 months from the date of receipt of this letter.	<p>development and mangrove plantation are being carried out on regular basis by horticulture department. Total expenditures of the horticulture dept. for the financial year of 2020-21 have been INR 689 lakhs.</p> <p>It may be noted that, APSEZ has developed 476.5 ha. area as greenbelt with plantation of more than 9.3 Lacs saplings within the APSEZ area. Details on mangroves afforestation &amp; Green belt development carried out by APSEZ till date is annexed as <b>Annexure – 1</b>.</p>
3.	No dredging activity shall be carried out.	<p>Complied.</p> <p>Construction activities are completed &amp; project is in operation stage. SPM is approximately 8.6 km inside the open sea from the shore where 30 m of draft is naturally available. Hence no dredging is required.</p>
4.	No ground water should be tapped at the project site / within CRZ area.	<p>Complied.</p> <p>No ground water is tapped at the project site. Entire water requirement is fulfilled through APSEZ Desal Water and Narmada water through GWIL.</p>
5.	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>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 01.10.2020 is in place and implemented. Updated OSCRP is attached as <b>Annexure – 3</b>.</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>Regional Level Pollution Response exercise <b>“SWACHCHH SAMUDRA-NW 2019”</b> was carried out</p>

**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021																								
		<p>by Indian Coast Guard on 18<sup>th</sup> Dec, 2019. All participants from various Oil Handling Agencies and Stakeholders (ICG, GMB Port, DPT Vadinar, IOCL, RIL, NAYARA Energy, BORL, ESBTL Salaya, APSEZL, HMEL, GSFC, PCB, Forest Dept., Customs, Fisheries &amp; DPT Kandla) were participated in this exercise.</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> <table><tr><th>Item</th><th>Quantity</th></tr><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 m<sup>3</sup> skimmer</td><td>2 sets</td></tr><tr><td>Lamor Side Collector system (Recovery Capacity 123 m<sup>3</sup>/ hr)</td><td>2 Nos.</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><tr><td>Floating Tank</td><td>25 m<sup>3</sup></td></tr></table> <ul style="list-style-type: none"><li>• 10 Tugs are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required.</li><li>• 9 Tugs are fitted with a fire curtain and remote controlled fire monitors.</li><li>• Dolphin 11 has firefighting system of 1200 m<sup>3</sup>/hr. along with 20 ton lifting “A” frame and diving support facility.</li></ul>	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 <sup>3</sup> skimmer	2 sets	Lamor Side Collector system (Recovery Capacity 123 m <sup>3</sup> / hr)	2 Nos.	Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter	1 No.	Floating Tank	25 m <sup>3</sup>
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	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
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Sr. No.	Conditions	Compliance Status as on 31-03-2021																												
		<ul style="list-style-type: none"><li>The equipment are being kept in working condition. Routine inspection, maintenance and testing is performed as per the stipulated requirements.</li><li>Detail of resource available at APSEZL is provided in annexure 3 of Oil Spill Contingency Plan.</li></ul>																												
6.	The duration of 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.	<p>Already complied. Not applicable at present.</p> <p>Construction activity is already completed and the project is in operation.</p>																												
7.	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	<p>Not Applicable</p> <p>Location of SPM is unmanned (approximately 8.6 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.</p>																												
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>Used oil / Spent oil generated is being sold to registered recyclers time to time.</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 is being carried out at a location nearby SPM by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'20 to Mar'21 is mentioned below.</p> <p><b>Sampling Locations &amp; Frequency: 9 Nos. (Monthly)</b></p> <table><tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Surface</th><th colspan="2">Bottom</th></tr><tr><th>Max</th><th>Min</th><th>Max</th><th>Min</th></tr><tr><td>pH</td><td>--</td><td>8.31</td><td>8.15</td><td>8.27</td><td>8.13</td></tr><tr><td>TSS</td><td>mg/L</td><td>197</td><td>104</td><td>235</td><td>104</td></tr><tr><td>BOD (3 Days</td><td>mg/L</td><td>3.9</td><td>3.3</td><td>ND*</td><td>ND*</td></tr></table>	Parameter	Unit	Surface		Bottom		Max	Min	Max	Min	pH	--	8.31	8.15	8.27	8.13	TSS	mg/L	197	104	235	104	BOD (3 Days	mg/L	3.9	3.3	ND*	ND*
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**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021					
		@ 27 °C)					
		DO	mg/L	6.1	5.8	5.9	5.5
		Salinity	ppt	36.9	36.1	37.3	36.4
		TDS	mg/L	38314	37294	38740	37708
		*ND = Not Detectable					
		Please refer <b>Annexure – 4</b> for detailed analysis reports. Approx. INR 19.17 Lakh is spent for all environmental monitoring activities during the FY 2020-21 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.					
10.	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.	Complied.  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.  On Site Emergency Response Plan and Crisis Management Plan is in place and implemented. The last updated in Sep-2020.  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 01.10.2020 is in place and implemented. Please refer Compliance of Specific Condition No. 5 for further details.  Mock drills are conducted regularly. Mock drill was conducted on 08.10.2020 & 24.03.2020 during compliance period. Details of mock drills are attached as <b>Annexure – 5</b> .					

**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021	
		All the recommendations given in the report of NIO and Tata AIG Risk Management Services are implemented. Few examples are provided below.	
		<b>Few Marine EIA recommendations:</b>	
		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.	Construction activity is already completed. Most of the construction labours 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, 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.	

**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021	
			<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 <a href="mailto:vtsmanagergulfofkutch@yahoo.com">vtsmanagergulfofkutch@yahoo.com</a> and <a href="mailto:vtsgok@yahoo.com">vtsgok@yahoo.com</a></p> <p>Mundra port has subscribed and taking VTMS feed from Kandla from link <a href="http://www.vts.gov.in">www.vts.gov.in</a>.</p>
		<b>Few Tata AIG Risk Assessment Recommendations:</b>	
		There should be facilities of boom, skimmer, dispersant, diving suits, firefighting equipment and excellent communication facilities.	10 Dolphin tugs fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 9 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors.
		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.	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 is attached as Annexure – 3.
11.	The entire stretch of the pipelines shall be buried underground except at the booster pumping station, which will be properly fenced and the station would be manned round the clock. The buried lines will be protected	<p>Complied.</p> <p>Entire SPM pipeline is buried underground. Total pipeline length is 15.4 km including 8.6 km inside the open sea and 6.8 km on landward side.</p> <p>Booster pump is not provided throughout the pipeline. However the material is transferred by using pumping</p>	



**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021								
	with anticorrosive coal tar based coating. The coating will be tested by high voltage detector in accordance with prescribed standards.	<p>system of respective vessels berthed at SPM. 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 five years. Last CP inspection of offshore pipeline done in Oct'2017 and report for the same was provided along with EC compliance report submission for the period of Apr'17 to Sep'17.</p> <p>For onshore pipeline also CP survey is being done by APSEZ on monthly bases. Report of monitoring done within this compliance period is enclosed as <b>Annexure – 6</b>.</p>								
12.	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>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 monitoring 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><tr><th>Activity</th><th>Adequacy of Measures</th></tr><tr><td>Hose Connection / Disconnection (liquid operation)</td><td>It is collected in deep tray in case of leakage. Stop the supply of liquid discharge.</td></tr><tr><td>Hose Connection / Disconnection (liquid operation)</td><td>Immediately stop the supply of liquid discharge. Marine break away coupling available for control of load.</td></tr><tr><td>Tanker discharge operation (SPM operation)</td><td>Emergency operation shut off (stopping the discharge)</td></tr></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)
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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.	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	<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</p>								

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	ensure prompt information regarding location of accident during any emergency. Emergency Information board should contain emergency instructions in addition to contact details.	March'17 and there is no farther change.
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. <b>ENV-10-2002-124-P (Part1)</b> dated <b>8<sup>th</sup> October 2003</b> is enclosed as <b>Annexure- A</b>.</p>
16.	All conditions stipulated in Gujarat Pollution Control Board vide their letter No. PC/NOC/381/1039 dated 8 <sup>th</sup> January, 2002 should be implemented.	<p>Complied.</p> <p>Consent to Operate (CC&amp;A) was granted by GPCB based on the compliance of conditions of the No Objection Certificate (CtE). This CC&amp;A is renewed from time to time based on its validity. The last renewal was obtained vide GPCB consent no. WH 86980 valid till 26<sup>th</sup> April, 2022. Copy of the same was submitted as part of compliance report for the duration of Apr'17 to Sep'17 and there is no further change.</p>
<b>B. General Condition</b>		
1	Construction of the proposed structures should be undertaken meticulously confirming to the existing Central / local rules and	<p>Complied. Not applicable at present.</p> <p>Construction activities are completed &amp; project is in operation stage. Entire SPM pipeline is buried underground. Total pipeline length is 15.4 km</p>

**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021				
	regulations. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Department / Agencies.	including 8.6 km inside the open sea and 6.8 Km on landward side.  Construction activities are carried out based on the approvals of the concerned state government department and prevailing laws.				
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 four persuasions as below.</p> <ul style="list-style-type: none"><li>➤ Education</li><li>➤ Community Health</li><li>➤ Rural Infrastructure</li><li>➤ Sustainability Livelihood</li></ul> <p>Brief information about activities in the main four persuasions is mentioned below. Other than this, Adani Foundation has also worked for fight against COVID – 19 pandemic situation during this compliance period Activities carried out for the same are summarized as below.</p> <table><tr><th>Area</th><th>Activity</th></tr><tr><td>Fight Against COVID-19</td><td><ul style="list-style-type: none"><li>• <b>24 villages</b> of Mundra block Sanitized.</li><li>• <b>5500</b> - Ration kit support to needy people (Specially Fisherman, daily wedge workers, widows and senior citizen).</li><li>• <b>1900</b> - Daily Food Facility (Breakfast, Lunch, Diner) for 1900 Labour per day</li><li>• <b>105000</b> - Mask prepared by women SHG for Government officers / staff of SDM, ICDS, TDO, Custom, THO, Police Dept. etc.</li><li>• <b>158</b> - Taken care of Senior citizens at old age home.</li><li>• <b>35000</b> - 'AwazDe' a voice message campaign in local Kutchi language.</li><li>• Total <b>3368</b> Covid patients got treatment from overall Ktuch with satisfaction in General hospital, Bhuj.</li><li>• Awareness drives by SuPoshan Sanginies.</li><li>• Mobile health care unit provides Primary</li></ul></td></tr></table>	Area	Activity	Fight Against COVID-19	<ul style="list-style-type: none"><li>• <b>24 villages</b> of Mundra block Sanitized.</li><li>• <b>5500</b> - Ration kit support to needy people (Specially Fisherman, daily wedge workers, widows and senior citizen).</li><li>• <b>1900</b> - Daily Food Facility (Breakfast, Lunch, Diner) for 1900 Labour per day</li><li>• <b>105000</b> - Mask prepared by women SHG for Government officers / staff of SDM, ICDS, TDO, Custom, THO, Police Dept. etc.</li><li>• <b>158</b> - Taken care of Senior citizens at old age home.</li><li>• <b>35000</b> - 'AwazDe' a voice message campaign in local Kutchi language.</li><li>• Total <b>3368</b> Covid patients got treatment from overall Ktuch with satisfaction in General hospital, Bhuj.</li><li>• Awareness drives by SuPoshan Sanginies.</li><li>• Mobile health care unit provides Primary</li></ul>
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**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021																																				
		<p>treatment at door stap.</p> <ul style="list-style-type: none"><li>• We have started Ayurvedic Kwadh Distribution at Various Public spot, Our Port Entry &amp; Exit gate and APL, AKBTP, Tuna with spreading awareness to mitigate rapid transition to combat against Covid - 19. More than 6500 people had benefitted with Ukadoand Vitamin –C tablet from Mundra, Baroi, Shantivan &amp; Samudra Township.</li></ul>																																				
	Community Health	<p><b>Community Health – Mundra</b></p> <table><tr><th colspan="4">Community Health All Project Patient Details</th></tr><tr><th>Project</th><th>Direct Beneficiary</th><th>In-Direct Beneficiary</th><th>No. of Villages</th></tr><tr><td>Medical Mobile van</td><td>16611</td><td>66476</td><td>33</td></tr><tr><td>Rural Clinic</td><td>15797</td><td>63192</td><td>11</td></tr><tr><td>Medical Supports</td><td>1008</td><td>5040</td><td>63</td></tr><tr><td>Dialysis Supports</td><td>474</td><td>2370</td><td>63</td></tr><tr><td>Senior citizen</td><td>5836</td><td>17508</td><td>63</td></tr><tr><td>Health camp</td><td>19461</td><td>58383</td><td>11</td></tr><tr><td><b>TOTAL</b></td><td><b>59187</b></td><td><b>212979</b></td><td></td></tr></table> <ul style="list-style-type: none"><li>• The mobile health care unit cover <b>25 villages and 07 fishermen settlements</b>. Around 90 types of general life saving medicines are available in these units.</li><li>• Rural Dispensaries are established where there is a gap in the healthcare services. The Adani Foundation operates Rural Dispensaries in 7 villages of <b>Mundra block, 03 villages of Anjar block and 1 clinics in Mandvi Block</b>. Mobile dispensary and rural clinics provide health services with token charge of <b>10/- rupees per patient</b> daily by a doctor and a volunteer.</li><li>• During the year 2020-21, total <b>5836</b> transactions were done by <b>8711 card holders of 68 villages</b> of Mundra Taluka. They received cash less medical services under Health Card to Senior Citizen project.</li><li>• In the year of 2020-21 total <b>97 people</b> had been benefitted by various kind of speciality camp and needy and screened patients are treated in Adani Hospital.</li><li>• Total <b>20959 patients</b> benefited in year 2020-21 from 55 different villages in Adani Hospital, Mundra.</li><li>• The TDO, THO, Flywing Foundation, Ayurved Dept. has support in UKADO and Vitamin-C tablets distribution activities. Total <b>18240 people</b> had get benefits of UKADO and Vitamin-C tablets.</li></ul> <p><b>Community Health – Bhuj</b></p> <ul style="list-style-type: none"><li>• Adani Foundation Team has initiated coordination with GKGH hospital since 2014 and established a reception area for the smooth patient</li></ul>	Community Health All Project Patient Details				Project	Direct Beneficiary	In-Direct Beneficiary	No. of Villages	Medical Mobile van	16611	66476	33	Rural Clinic	15797	63192	11	Medical Supports	1008	5040	63	Dialysis Supports	474	2370	63	Senior citizen	5836	17508	63	Health camp	19461	58383	11	<b>TOTAL</b>	<b>59187</b>	<b>212979</b>	
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**Status of the conditions stipulated in Environment Clearance under CRZ notification**

Sr. No.	Conditions	Compliance Status as on 31-03-2021	
			<p>coordination and preparation for the social networking program.</p> <ul style="list-style-type: none"> <li>• GKGH Hospital is COVID Care Hospital since 22<sup>nd</sup> March 2020. Adani Foundation staff members supported in patient counselling, coordinating and supporting for dead body COVID care van.</li> <li>• Total <b>3368</b> Covid patients got treatment from overall Kutch with satisfaction in General hospital, Bhuj.</li> <li>• Total <b>809</b> dead bodies privileged till now to different locations in Kutch including Covid Patients through Dead body medical van.</li> <li>• Mahiti Setu is linkages between various Government Schemes and beneficiaries. Through Mahiti Setu sourcing of <b>2378 beneficiaries</b> and linkages with more than <b>780 cards</b> of MAA Yojna and Ayushman Yojna.</li> </ul>
	Sustainable Livelihood – Fisher folk & Agriculture		<ul style="list-style-type: none"> <li>• Average <b>75</b> KL of water was supplied to <b>676</b> households at <b>5 fisherman vasahat</b> on a daily basis under Machhimar Shudhh Jal Yojana and other <b>4 fisherman vasahat</b> has linkaged with Narmada water through GWIL and Mundra Gram Panachayat from which <b>355 households</b> get benefited.</li> <li>• Beneficiaries of fisherman communities till date               <ol style="list-style-type: none"> <li>a) 444 Book Support</li> <li>b) 733 Vehicle transportation from Bandar to AVMB</li> <li>c) 86 Cycle Support</li> <li>d) 481 Scholarship Support</li> <li>e) 28015 Potable water provision</li> <li>f) 370 Youth Employment</li> <li>g) 2561 Fishing Net &amp; Equipment Support</li> <li>h) 195 Linkages with Fisheries Scheme</li> <li>i) 3504 Ramaotsav Community Engagement</li> <li>j) 17 Fisherman Sea Weed Culture.</li> <li>k) 46878 Man-days Mangroves Plantation</li> </ol> </li> <li>• Girl child is supported with 100% scholarship to girls &amp; 80 % support to Male Students. Total <b>59 students</b> were facilitated with scholarship current year.</li> <li>• <b>4830 Man-days</b> work was provided over <b>236 Fishermen family</b> during current year.</li> <li>• Avail easy and safe transportation service for the Fisher folk child of Various Vasahat to make them Regular and Synchronized with School atmosphere. Total <b>37 students</b> from 6 to 10 standard are benefitted.</li> <li>• <b>07 Fishermen</b> are supported for Net and Equipment <b>10 Fishermen</b> Linkage with Fisheries Department Scheme and Fishermen credit card for bankable loan.</li> <li>• Total <b>70</b> Fishermen youth are selected and working in various company current year.</li> <li>• Under Gram Utthan Project, Adani Foundation is supporting home biogas to farmers to Uthhan Villages phase wise. Current year supported <b>117 home biogas</b> in Dhrub, Zarpura and Navinal Villages. Till date 117 farmers are utilizing it with</li> </ul>

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021	
			<p>satisfaction and considerable outcome by saving avg. <b>Rs. 23,400</b> for gas and fertilizer as well.</p> <ul style="list-style-type: none"> <li>• Dragon fruit is a tropical fruit that has become increasingly popular in recent years. Five Dragon fruit farm have been developed with pole and Wire fencing support for <b>2 acre land and 1000 dragon fruit plants</b> each. Adani Foundation had given 40% contribution in this Project. Fruiting will start from June 2021.</li> <li>• <b>850 tissue culture plants</b> have been distributed to 34 farmers. 25plants/Farmers. Tissue plant cost is INR 3000/per plant with 50% famer Contribution.</li> <li>• In <b>20 villages</b> of Mundra and Anjar Block. <b>6.70 lacs kg Dry Fodder and 11.60 lacs kg Green fodder</b> has been supported.</li> </ul>
		Education	<ul style="list-style-type: none"> <li>• In COVID19 Pandemic, when the schools were completely closed, education went on mobile platform and students are still dependent on mobile internet for their education.</li> <li>• Total <b>2098 students</b> educated through virtual platform during year 2020 -21.</li> <li>• During pandemic various capacity building program and competition organized virtually.</li> </ul> <p><b><u>Impact of the Utthan Program:</u></b></p> <ul style="list-style-type: none"> <li>• Beneficiary of Online classes - 17 Utthan Sahayaks, 17 Gov. Primary Schools, 2098 total students</li> <li>• Weekly Content of IT and Physical Education - 106 Gov. Pri. School &amp; 35000+ students</li> <li>• Virtual Mothers meet - 500+ Mothers attended meeting on Google meet</li> <li>• Capacity Building Program - 70+ Webinar attended by Utthan Sahayak, 10 Seminar/ Workshop</li> <li>• Competition/Celebration - 248 Students took part virtually</li> </ul> <p>Adani Vidya Mandir Bhadreswar Gujrat Board Standard 10<sup>th</sup> Examination Result is 82.60% (19 students have passed the examination out of 23). Adani Foundation will take all responsibility of further study of students with respect to their interest.</p>
		Rural Infrastructure & Environmental Sustainability	<p>Adani foundation designed and build various structure and provide service in the Health, Education, agriculture and sustainable livelihood area.</p> <p><b><u>WORK COMPLETED</u></b></p> <ul style="list-style-type: none"> <li>• Approach Road Restoration at all Fisher folk vasahat.</li> <li>• Garden Development at Primary School Rampar village</li> <li>• Shed Development at Shukhpurvah Mundra</li> <li>• Bund strengthening work at Zarpara</li> </ul> <p><b><u>Bio Diversity Park – Mundra</u></b></p> <ul style="list-style-type: none"> <li>• Adani Foundation, Mundra-Kutchh proposed a biodiversity park at 5 acres Nandi Sarovar area and</li> </ul>

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021	
			<p>approached to Sahjeevan, Bhuj for technical support for same.</p> <ul style="list-style-type: none"> <li>Sahjeevan team visited this proposed site for development of greenbelt to support biodiversity and enhancement of overall ecological food web existing in and around the landscape in first phase.</li> </ul> <p><b><u>Coastal Bio Diversity Park – Luni</u></b></p> <ul style="list-style-type: none"> <li>Adani Foundation at Mundra-Kachchh has initiated multi-species plantation of mangroves in Kachchh in association with GUIDE. 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.</li> <li>Sea Weed Culture - A pilot cultivation facility (5 KL tanks in 6 nos) for the farming of different economically important seaweeds in the tanks on the onshore has been established and commenced the cultivation trials with red sea weeds Kappaphycus alvarezii, Gracilaria dura and green sea weed Ulva. The initial trials have given very promising results and harvested 6-7 times the seeded material in a 40-45 days cultivation period.</li> </ul>
		Skill Development	<ul style="list-style-type: none"> <li>Over the last few years, Adani Skill Development Center has assessed various aspects of the technical, leadership and soft skills gaps that organizations, in general, face and accordingly focuses on imparting required training in those areas in partnership with various colleges and institutes.</li> <li>ASDC imparted various soft skilled and technical training to make Atma Nirbhar India. Total <b>47</b> youth have been placed in various company and <b>37</b> youth are been self-employed.</li> <li>During this year Total <b>606</b> people trained in various trainings to enhance socio economic development.</li> <li>During COVID-19 pandemic, we have started virtually training on various trades like General Duty Assistant, Digital Literacy, GST with Tally, Basic Functional English etc. On Saksham Day we started E-learning training of Digital Literacy &amp; Basic Functional English on free bases.</li> <li>Till date we admitted <b>221 candidates in domain courses and 263 candidates in non-domain courses</b>. Now we started offline training with following all Covid-19 related guidelines.</li> <li>Arranged interview of DDU-GKY GDA students at Sterling Hospital –Gandhidham, GAIMS (Sodexo), Chanakya College, Accord Hospital, Fire Academy. 39 students get placement in GAIMS (sodexo), Alilance Hospital, Shreeji Hospital, Bhuj Fire Academy, Divine Hospital etc.</li> <li>Online mud work training has been organized by ASDC Mundra, after training <b>28 students</b> became self-employed.</li> </ul>

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021	
			<ul style="list-style-type: none"><li>• Soft Skill Training: 330 Nos.</li><li>• Technical Training: 276 Nos.</li></ul>
		Please refer <b>Annexure – 2</b> for full details of CSR activities carried out by Adani Foundation in the Mundra region. Budget for CSR Activity for the FY 2020-21 is to the tune of INR 1429.33 lakh. Out of which, Approx. INR 1117.45 lakh are spent during the year FY 2020-21.	
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 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.</p>	
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.	<p>Complied.</p> <p>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 Sr. Manager (Environment) at Corporate, who heads the Environment Management Cell who directly reports to the top management.</p> <p>Environment Management Cell Organogram is attached as <b>Annexure – 7</b>.</p>	
5	The funds earmarked for	Complied.	



	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	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.	<p>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.</p> <p>Budget for environmental management measures (including horticulture) for the FY 2020-21 is to the tune of INR 1257 lakh. Out of which, Approx. INR 1086 lakh are spent during the year 2020-21. Detailed breakup of the expenditures for the past 3 years is attached as <b>Annexure – 8</b>.</p>
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 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>Complied</p> <p>APSEZL is always extending full support to the regulatory authorities during their visit to the project site.</p> <p>Last visit of Regional Office, GPCB was done on 20.07.2017 for SPM facility. APSEZL has submitted the reply to the site visit report vide letter dated 04.08.2017 incorporating details of action taken in respect of the observations of the GPCB representative. Details were submitted during half yearly EC Compliance report for the period Apr'17 to Sep'17.</p> <p>There was no visit carried out by any SPCB during the compliance period of Oct'20 to Mar'21 with respect to SPM project.</p> <p>Inline to the compliance certification process of Environment Clearance condition of Waterfront Development Plan, RO, MoEF&amp;CC Bhopal had visited the site on 27<sup>th</sup> &amp; 28<sup>th</sup> January, 2020 for compliance verification. APSEZ provided all requisite information and documents required by the Regional Officer MoEF&amp;CC). During the said compliance verification visit and as per the compliance certification received, there was no major non-compliance observed.</p>
7	In case of deviation or	Point noted.

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	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.	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 any, from whom any suggestion / representation has been received while processing the proposal.	Not applicable at present
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	Already Complied.

	<b>Adani Ports and Special Economic Zone Limited, Mundra</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated in Environment Clearance under CRZ notification</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	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 <a href="http://www.envfor.nic.in/">http://www.envfor.nic.in/</a>	
13	The project proponents should inform regional Office Bhopal as well as the Ministry, the date of financial closure and final approval of the project by the concerned authority and the date of start of work.	Already Complied
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.

# **Compliance Report of CRZ Recommendations**

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		


**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 (Part 1) dated 8<sup>th</sup> October 2003.**

Sr. No.	Conditions	Compliance Status as on 31-03-2021
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 immediately by the GAPL and all future development should be based on the outcome of the said regional EIA only.	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.
4	Before commissioning of the construction activities, the construction design and pipeline alignment shall be validated/ approved by National Institute	Complied. Construction activities are completed and the project is in operation phase.  The EIA report was prepared by NIO and specific design considerations were taken into account for carrying out

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	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>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 that may be given in the comprehensive EIA shall be implemented by the GAPL.	<p>Complied.</p> <p>EIA study has been completed and report is already submitted to MoEF&amp;CC and other concerned authorities. Based on the same, Environment and CRZ clearance was granted by MoEF&amp;CC.</p> <ul style="list-style-type: none"> <li>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 GCZMA. CIA Report was prepared inline to the ToR by Chola MS and the same was submitted to the GCZMA on 30.04.2018. Details of the same were submitted along with half yearly EC Compliance report for the period Apr'19 to Sep'19.</li> <li>Presentation on the findings of the report was made to GCZMA committee on 4<sup>th</sup> October 2019 and after detailed discussion, authority has decided to constitute committee to discuss the details of the report further.</li> <li>Reminder Letter vide dated 07.09.2020 &amp; 10.03.2021 submitted to the GCZMA, Gandhinagar for further directives to present the findings of the CIA report in detail. Copy of letter is attached as <b>Annexure – 9</b>.</li> </ul> <p>However, APSEZ is already complying with the Environment Management Plan (applicable to APSEZ) suggested in Cumulative Impact Assessment report. The detailed compliance, applicable to APSEZ is attached as <b>Annexure – 10</b>.</p>
6	The ground water shall not be tapped in any case to	Complied.




	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		


Sr. No.	Conditions	Compliance Status as on 31-03-2021			
	meet with the water requirements during construction and/or operation phases.	APSEZ does not draw any ground water for the water requirement. Present source of water for entire port and SEZ is desalination plant and/or Narmada water through Gujarat Water Infrastructure Limited.			
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>NCSCM study on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around APSEZ and the same was submitted to the GCZMA on 04.06.2018. Details of the same were submitted along with half yearly EC Compliance report for the period Apr'19 to Sep'19.</p> <p>NCSCM final report on comprehensive and integrated plan for preservation and conservation of mangroves and associated creeks in and around was submitted along with half yearly EC Compliance report for the period Apr'19 to Sep'19. The same was further submitted to GCZMA and MoEF&amp;CC for their examination and recommendation vide (with a copy to MoEF&amp;CC vide letter dated 04.06.2018 &amp; reminder letter vide dated 4<sup>th</sup> Jan, 2019). Presentation on the findings of the report was made to GCZMA committee on 4<sup>th</sup> October 2019 and the recommendation for the same has been received vide email dtd 22<sup>nd</sup> Sept, 2020 with conditions. The copy of the same is attached as <b>Annexure – 11</b>.</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="657 1885 1474 1915"> <tr> <th data-bbox="657 1885 737 1915">Sr.</th><th data-bbox="737 1885 987 1915">Recommendations</th><th data-bbox="987 1885 1474 1915">Compliance</th></tr> </table>	Sr.	Recommendations	Compliance
Sr.	Recommendations	Compliance			

**Status of the conditions stipulated under CRZ Recommendation**

Sr. No.	Conditions	Compliance Status as on 31-03-2021		
		No.		
		1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"> <li>APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</li> <li>As a part of this study, overall growth of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 &amp; 2019 and it is observed that there was increase in mangrove cover between March 2017 and September 2019 to the extent of 256 Ha, which is about 10.7%.</li> <li>This suggests that the mangroves and the tidal system in the creeks remain undisturbed over this period. Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse which also shows that the growth of mangroves in a progressive direction.</li> <li>NCSCM Report of the same is attached as <b>Annexure – 12</b>.</li> <li>The cost of the said study was INR 23.56 Lacs incurred by APSEZ.</li> </ul>
		2.	Tidal observation in creeks in and around APSEZ	<ul style="list-style-type: none"> <li>APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM.</li> <li>The observed tidal ranges indicate that the creeks experience normal tidal ranges, adequate for the growth of mangroves.</li> <li>Report of the same is incorporated in NCSCM report attached as <b>Annexure – 12</b>.</li> <li>The cost of the said activity was INR 1.0 Lacs.</li> </ul>
		3.	Removal of Algal and Prosopis growth from mangrove areas	<ul style="list-style-type: none"> <li>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.</li> <li>Report of the same is attached as <b>Annexure – 13</b>.</li> <li>The cost of the said activity was</li> </ul>

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		


Sr. No.	Conditions	Compliance Status as on 31-03-2021	
		4. Awareness of mangroves importance in surrounding communities	INR 1.2 Lacs. <ul style="list-style-type: none"> <li>Adani Foundation – CSR Arm of Adani group has done awareness camps/activities created in the community regarding importance of mangroves during the year 2020-21.</li> <li>Adani Foundation has also provided 6.7 lacs kg Dry Fodder and 11.6 lacs kg Green fodder in 20 villages of Mundra and Anjar Block to support the resource dependent villagers, to avoid their dependency on mangroves. The expenditure for fodder supporting activities was approx. 120.86 Lacs during last FY 2020-21.</li> <li>Village Gauchar land development for the fodder cultivation to made fodder sustain village &amp; Avail green fodder in scarcity phase. With the support of Gauchar Seva Samiti Grassland development in Siracha – 85 Acre &amp; Zarpara – 25 Acre done which resulted in total production of 82 ton.</li> <li>The brief details of the said activities are incorporated in attached CSR Report for the FY 2020-21 attached as <b>Annexure – 2</b>.</li> <li>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.</li> </ul>
		<ul style="list-style-type: none"> <li>The overall cost incurred by APSEZ is INR 146.62 Lacs as a part of mangrove conservation plan.</li> </ul>	
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	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.	

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	as the cost of the plantation of mangroves & its sustenance for a reasonable period of time.	
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.	<p>Complied.</p> <p>Construction activities are completed &amp; 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.</p>
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 Management System in the Gulf of Kachchh, for the purpose of the environment protection/management.	<p>Complied.</p> <p>APSEZ is practicing well defined traffic control procedure.</p> <p>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.</p> <p>Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77.</p> <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 <a href="mailto:vtzmanagulgulfokutch@yahoo.com">vtzmanagulgulfokutch@yahoo.com</a> and <a href="mailto:vtsgok@yahoo.com">vtsgok@yahoo.com</a></p> <p>Mundra port has subscribed and taking VTMS feed from Kandla from link <a href="http://www.vts.gov.in">www.vts.gov.in</a>.</p> <p>Necessary financial contribution if require will be provided on hearing from MOEF&amp;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>


	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
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 &amp; Environment Department, GoG. No such agency was appointed during the compliance period.</p> <p>As part of the directions given by MoEF&amp;CC vides order dated 18<sup>th</sup> Sep, 2015, following studies were conducted.</p> <ol style="list-style-type: none"> <li>1. NCSCM (MoEF&amp;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 2016-17. The cost of said study was 3.15 Cr, which was incurred by APSEZ.</li> </ol> <p>As a part of mangrove conservation plan, APSEZ has done following activities.</p> <ol style="list-style-type: none"> <li>a. Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island through NCSCM, Chennai. The cost of the said study was INR 23.56 Lacs incurred by APSEZ.</li> <li>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.</li> </ol>
13	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>Complied.</p> <p>Construction activities are completed &amp; project is in operation stage. SPM is approximately 8.6 km inside the open sea from the shore where 30 m of draft is naturally available. Hence no dredging is required.</p>


	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
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 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.</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>
15	<p>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.</p>	<p>Complied.</p> <p>Kandla, GMB &amp; DGLL are the agencies who financially support to VTMS. For SPM, APSEZ is mutual partner to support in case of Oil spill &amp; vice versa. For further details regarding traffic management, please refer condition no. 10 of CRZ recommendations above.</p>
16	<p>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 stakeholders including HPCL.</p>	<p>Complied.</p> <p>APSEZ has signed an 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.</p> <p><b>Interface with ROSDCP and NOSDCP</b></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. The</p>




	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
		<p>NOSDCP brings together the combined resources of the 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>Regional Level Pollution Response exercise “<b>SWACHCHH SAMUDRA-NW 2019</b>” was carried out by Indian Coast Guard on 18<sup>th</sup> Dec, 2019. All participants from various Oil Handling Agencies and Stakeholders (ICG, GMB Port, DPT Vadinar, IOCL, RIL, NAYARA Energy, BORL, ESBTL Salaya, APSEZL, HMEL, GSFC, PCB, Forest Dept., Customs, Fisheries &amp; DPT Kandla) were participated in this exercise.</p>
17	<p>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 in to operation immediately.</p>	<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 &amp; CRZ clearance above. These studies were carried out before the start of the development activity and were considered by MoEF&amp;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 (OSCRP) is prepared in accordance with the NOSDCP.</p> <p>Please refer specific condition no 5 of EC &amp; CRZ clearance for further details.</p>
18	<p>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</p>	<p>Not applicable</p> <p>Location of SPM is unmanned (approximately 8.64 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. 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</p>

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
<b>Status of the conditions stipulated under CRZ Recommendation</b>		

Sr. No.	Conditions	Compliance Status as on 31-03-2021
	and Environment Department.	out by Adani Foundation in the Mundra region, please refer to compliance of General condition no. 2 of the EC and CRZ clearance above.
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 Port shall be assessed in detail in the comprehensive EIA and a detailed management plan shall be developed to mitigate the same.	<p>Complied.</p> <p>Aspects of social and health impact were studied as part of EIA report prepared by NIO and mitigation measures have been implemented.</p> <p>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>
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	<p>Complied.</p> <p>APSEZL has a well structured Environment Cell, staffed with qualified manpower for implementation of the Environmental Management Plan. For further details on</p>

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
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Sr. No.	Conditions	Compliance Status as on 31-03-2021																																																		
	budgetary provision shall have to be made for implementation of the Environmental Management Plan.	<p>the same, please refer to compliance of general condition no. 4 of the EC and CRZ clearance above.</p> <p>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.</p>																																																		
23	Post project environmental monitoring shall be carried out regularly through a reputed institute like NEERI/NIO and report shall be submitted to the Forests and Environment Department, GoG every year.	<p>Being complied.</p> <p>Monitoring of various environmental parameters for Ambient Air, Noise, marine water and sediments is being carried out by NABL accredited and MoEF&amp;CC approved agency namely M/s. Pollucon Laboratory Pvt. Ltd.</p> <p>Ambient Air Quality (twice in a week) and Noise (once in a month) monitoring are being carried out by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Oct'20 to Mar'21 is mentioned below.</p> <p><b>Total Ambient Air &amp; Noise Sampling Locations: 4 Nos.</b></p> <table><tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit<sup>\$</sup></th></tr><tr><td colspan="5"><b>AAQM</b></td></tr><tr><td>PM<sub>10</sub></td><td>µg/m<sup>3</sup></td><td>96.75</td><td>38.42</td><td>100</td></tr><tr><td>PM<sub>2.5</sub></td><td>µg/m<sup>3</sup></td><td>56.35</td><td>18.58</td><td>60</td></tr><tr><td>SO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>25.41</td><td>6.56</td><td>80</td></tr><tr><td>NO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>44.53</td><td>14.22</td><td>80</td></tr><tr><td colspan="5"><b>Noise</b></td></tr><tr><td></td><td>Unit</td><td>Leq Max</td><td>Leq Min</td><td>Leq Perm. Limit*</td></tr><tr><td>Day Time</td><td>dB(A)</td><td>72.8</td><td>42.7</td><td>75</td></tr><tr><td>Night Time</td><td>dB(A)</td><td>69.7</td><td>41.2</td><td>70</td></tr></table> <p><sup>\$</sup> as per NAAQ standards, 2009 * As per CC&amp;A Permission 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 &amp; CRZ clearance above.</p> <p>Environmental monitoring reports for the period from Oct'20 to Mar'21 are enclosed as <b>Annexure – 4</b>.</p>	Parameter	Unit	Max	Min	Perm. Limit <sup>\$</sup>	<b>AAQM</b>					PM <sub>10</sub>	µg/m <sup>3</sup>	96.75	38.42	100	PM <sub>2.5</sub>	µg/m <sup>3</sup>	56.35	18.58	60	SO <sub>2</sub>	µg/m <sup>3</sup>	25.41	6.56	80	NO <sub>2</sub>	µg/m <sup>3</sup>	44.53	14.22	80	<b>Noise</b>						Unit	Leq Max	Leq Min	Leq Perm. Limit*	Day Time	dB(A)	72.8	42.7	75	Night Time	dB(A)	69.7	41.2	70
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24	No construction activities shall be carried out by the GAPL in any of the Forest	<p>Already Complied. Not applicable at present.</p> <p>The construction work is completed and project is in</p>																																																		

	<b>Adani Ports and Special Economic Zone Limited, Mundra.</b>	<b>From : Oct'20 To : Mar'21</b>
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Sr. No.	Conditions	Compliance Status as on 31-03-2021																					
	areas.	operation phase. No construction activity at any of the forest area is carried out for project of SPM, COT and connecting pipeline.																					
25	All necessary clearances from different Government Department/Agencies shall be obtained before commissioning any construction activities.	Complied. 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. Last compliance report including results of monitoring data for the period of Apr'20 to Sep'20 was submitted to Regional Office of MoEF&amp;CC @ Bhopal, Zonal Office of CPCB @ Baroda, GPCB @ Gandhinagar &amp; Gandhidham and Dept. of Forests &amp; Env., Gandhinagar vide our letter dated 25.11.2020. Copy of the same is also available on our web site <a href="https://www.adaniports.com/ports-downloads">https://www.adaniports.com/ports-downloads</a>. A soft copy of the same was also submitted through e-mail on 25.11.2020 to all the concern authorities. Please refer below for the details regarding past six compliance submissions.</p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Compliance period</th><th>Date of submission</th></tr> </thead> <tbody> <tr> <td>1</td><td>Oct'17 to Mar'18</td><td>29.05.2018</td></tr> <tr> <td>2</td><td>Apr'18 to Sep'18</td><td>30.11.2018</td></tr> <tr> <td>3</td><td>Oct'18 to Mar'19</td><td>31.05.2019</td></tr> <tr> <td>4</td><td>Apr'19 to Sep'19</td><td>28.11.2019</td></tr> <tr> <td>5</td><td>Oct'19 to Mar'20</td><td>20.05.2020</td></tr> <tr> <td>6</td><td>Apr'20 to Sep'20</td><td>26.11.2020</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 compliance of specific condition no. 10 of the EC and CRZ clearance above.</p>	Sr. No.	Compliance period	Date of submission	1	Oct'17 to Mar'18	29.05.2018	2	Apr'18 to Sep'18	30.11.2018	3	Oct'18 to Mar'19	31.05.2019	4	Apr'19 to Sep'19	28.11.2019	5	Oct'19 to Mar'20	20.05.2020	6	Apr'20 to Sep'20	26.11.2020
Sr. No.	Compliance period	Date of submission																					
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2	Apr'18 to Sep'18	30.11.2018																					
3	Oct'18 to Mar'19	31.05.2019																					
4	Apr'19 to Sep'19	28.11.2019																					
5	Oct'19 to Mar'20	20.05.2020																					
6	Apr'20 to Sep'20	26.11.2020																					
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 March – 2021					
LOCATION	Area (In Ha.)	Trees (Nos.)	Palm (Nos.)	Shrubs (SQM)	Lawn (SQM)
SV COLONY	71.63	34920	7962	69426.00	100646.00
PORT & NON SEZ	81.51	149192	19220	75061.78	62062.38
SEZ	116.60	227120	20489	220583.60	28162.03
MITAP	2.52	8168	33	3340.00	4036.00
WEST PORT	100.25	244112	70331	24612.00	22854.15
AGRI PARK	8.94	17244	1332	5400.00	2121.44
SOUTH PORT	14.45	27530	3470	3882.00	3327.26
Samudra Township	56.89	62522	11834	20908.89	47520.07
Productive Farming (Vadala Farm)	23.79	27976	--	--	--
<b>TOTAL (APSEZ)</b>	<b>476.56</b>	<b>798784</b>	<b>134671</b>	<b>423214.27</b>	<b>270729.33</b>
		<b>Total Saplings: 933455 Nos.</b>			



## **Details of Mangrove Afforestation done by APSEZ**

Sl. no.	Location	Area (ha)	Duration	Species	Implementation agency
1	Mundra Port	24.0	-	Avicennia marina	Dr. Maity, Mangrove consultant of India
2	Mundra Port	25.0	-	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)	298.0	2011 - 2013	Avicennia marina	-
6	Jangi Village (Bhachau, Kutch)	50.0	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)	255.0	2014-15 & 2016-17	Avicennia marina & Bio diversity	GUIDE, Bhuj
9	Dandi Village (Navsari)	800.0	2006 - 2011	Avicennia marina, Rhizophora mucronata, Ceriops tagal	SAVE, Ahmedabad
10	Talaza Village (Bhavnagar)	50.0	2011-12	Avicennia marina	SAVE, Ahmedabad
11	Narmada Village (Bhavnagar)	250.0	2014 - 2015	Avicennia marina	SAVE, Ahmedabad
12	Malpur Village (Bharuch)	200.0	2012-14	Avicennia marina	SAVE, Ahmedabad
13	Kantiyajal Village (Bharuch)	50.0	2014-15	Avicennia marina	SAVE, Ahmedabad
14	Devla Village (Bharuch)	150.0	210-16	Avicennia marina	SAVE, Ahmedabad
15	Village Tala Talav (Khambhat, Anand)	100.0	2015 - 2016	Avicennia marina	SAVE, Ahmedabad
16	Village Tala Talav (Khambhat, Anand)	38.0	2015 - 2016	Avicennia marina	GEC, Gandhinagar
17	Aliya Bet, Village Katpor (Hansot, Bharuch)	62.0	2017-18	Avicennia marina & Rhizophora spp.	GEC, Gandhinagar
<b>Total Mangrove Plantation:</b>		<b>2889.90 Ha</b>			

# **Annexure – 2**



# C S R K U T C H

# 2020-21



## Adani Foundation

Adani House, Port Road, Mundra – Kutch 370 421  
[info@adanifoundation.com] [www.adanifoundation.com]

# Our journey

The year 2020-21 has passed off with great experience and new challenges for Adani Foundation due to Covid 19 Pandemic. Adani Foundation team has started working just after one week of lockdown to keep commitment towards the community. As a part of dignity of workforce team has done remarkable work for fresh food and ration kit supply to retain them at workplace with safe and comfortable environment. Regular visit to senior citizen home and running MHCU by medical officers was not less challenging. Our women SHG has prepared more than 1 lac mask for Taluka Health office, Anganwadi Staff, Police Staff, Custom and coastguard and Education staff. Adani Hospital – Non Covid Hospital and GKGH Bhuj Hospital – Covid Care Hospital remained opened 24x7 throughout the year which is matter of great proud.

Current year Sea weed culture and Natural Farming Promotion were the new concepts which will be planned with five years vision. Mangroves costal biodiversity, water harvesting structures and Tissue culture will have sharp turn with proper documentation and demarcation. Adani Vidya Mandir has proven best in education by reaching to unreached through digital technology, happy to see the fisherman students studying sincerely sitting in fisherfolk settlements by operating tablets. New Era touched upon Framers too who are a part of discussion about natural farming on Zoom application. "Vadil Swasthaya Yojna" and "Suposhan" were in last execution year as a Project but both project will be with us by sourcing and moral support by linkages with different Government Scheme.

Happy to share – under guidance of seniors proper frame work was developed for supporting community as a bridge between various Government schemes and needy people by "Community Resource Centre" its true need and real sustainable way. Fisherman and women employment sourcing created very positive impact as a regular source of income for them.

Adani skill Development center entered into MOU with KSKV Kutchh University for various skill development trainings. The ASDC is committed to the cause of the deprived and underprivileged to generate employment through enhancing skills. It has been working relentlessly which resulted in rapport building with District Administration Kachchh also.

Success is due to present of torch barer and mentor in life who is Respected Dr. Priti Adani. If you have mentor like her in life, she can turn a Mess into message. A Test into a Testimony, A Victim into Victory! We heartly thanks our Rakshit bhai, Respected Gadhvi sir and Respected PNR sir for guidance and motivation.

We wish all the very best to whole Adani Foundation Parivar !

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## Education (SDG - 4/4.a)



The future of India depends upon the quality of education imparted to our children. We believe that it is the joint responsibility of the Government and citizens to improve school education. With an aim to enhance the quality of primary education in Kutch District, Adani Foundation proposed to adopt 17 government schools located at Mundra Taluka under the project '*Utthan*' as a pilot project. By this intervention, Adani Foundation seeks to facilitate; Focus on 'Priya' students and celebrate their progress, Make learning joyful, provides adequate resources and facilities, strengthen the curricula to provide basic skills, especially in the areas of literacy, numeracy and skills for life and focus on Teachers' capacity building. **(SDG - 4/4.a)**





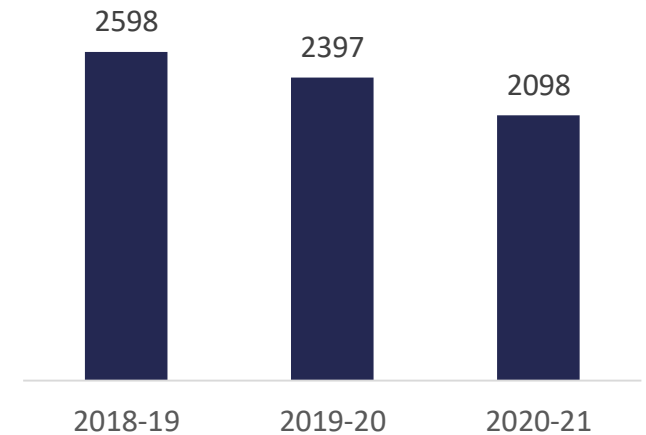
# Utthan

## How Utthan Sahayaks overcame/overcoming the Pandemic

In COVID 19 Pandemic, when the schools were completely closed, education went on mobile platform and students are still dependent on mobile internet for their education.

- ✓ During the initial phase of lockdown Utthan Sahayaks reached Priya Vidyarthi through series of curated SMS and WhatsApp messages, they share text/video/audio content focused on hands-on learning activities.
- ✓ Initial approach realized us that we need to find another way to touch our audience Utthan Sahayaks convert this challenge into opportunity. They make themselves tech savvy by learning how to conduct classes on various platform especially on Google classroom.

Year	No. of school	No. of village	No. of Girls	No. of Boys	Total
2018-19	17	7	1318	1280	2598
2019-20	17	7	1227	1170	2397
2020-21	17	7	1069	1029	2098



### Our out reach for Utthan project

- ✓ In pandemic times ,Priya Vidyarthi' meet were scheduled on Google meet platform. Primarily Utthan Sahayaks faced the challenges that students are unable to meet them virtually due to the single smart phone availability in the family.
- ✓ Here with us a only solution to make them study available at their door step by following all the guidelines suggested by government to maintain social distances.
- ✓ From October onwards Utthan sahayks approached their students by taking physical classes at their respective residence.

## Utthan – during pandemic

Pandemic situation has challenged the functioning of various activities of the project but team Utthan and Adani Foundation adapted to the transitions required to continue with its outreach. With the travel restrictions, team Utthan has adopted all the protocols assigned by the Adani Foundation and the health authorities and has continued both its offline activities while adopting online methods to carryout its activities especially to reach out our students.



### Capacity Building Program

- Usage of Google meet and Google classroom
- Art of living
- Individual learning
- Digital Bookmarks
- Vedic maths
- Gandhian Education Philosophy

### Competition

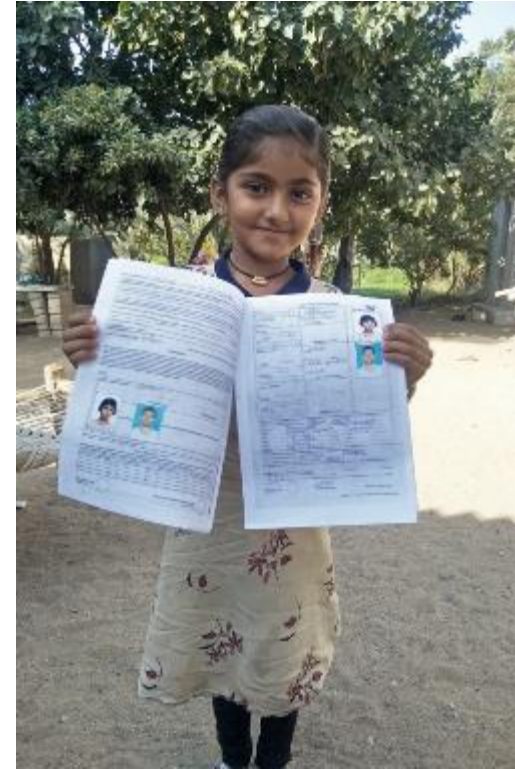
- Essay writing
- Ganpati idol making
- Doha recitation
- Garba decoration
- Christmas celebration
- Makarsankranti celebration





## Utthan Additional achievements

Solar panel has been installed in 17 schools of Utthan – so now the schools will be using renewable energy. Support of teachers and Principal during installation was substantial. This is changing and challenging step for Utthan Project to convert whole school running on renewable energy. In coordination with Mundra Solar Panel manufacturing unit – systems installed with inverters.



Utthan is not only deals with Education – but the main strength of the Project is Sahayak. Sahayaks remain in touch with parents and make them understand the value of education. Apart from it, Utthan Sahayaks motivated more than 700 parents of girl students to open "Sukanya Samriddhi Bank Account" for their bright future

# Utthan – Capacity Building Programmes



## Staff Training - Adani Schools

Date: Saturday, February 20, 2021

10.00 hrs to 12.30 hrs

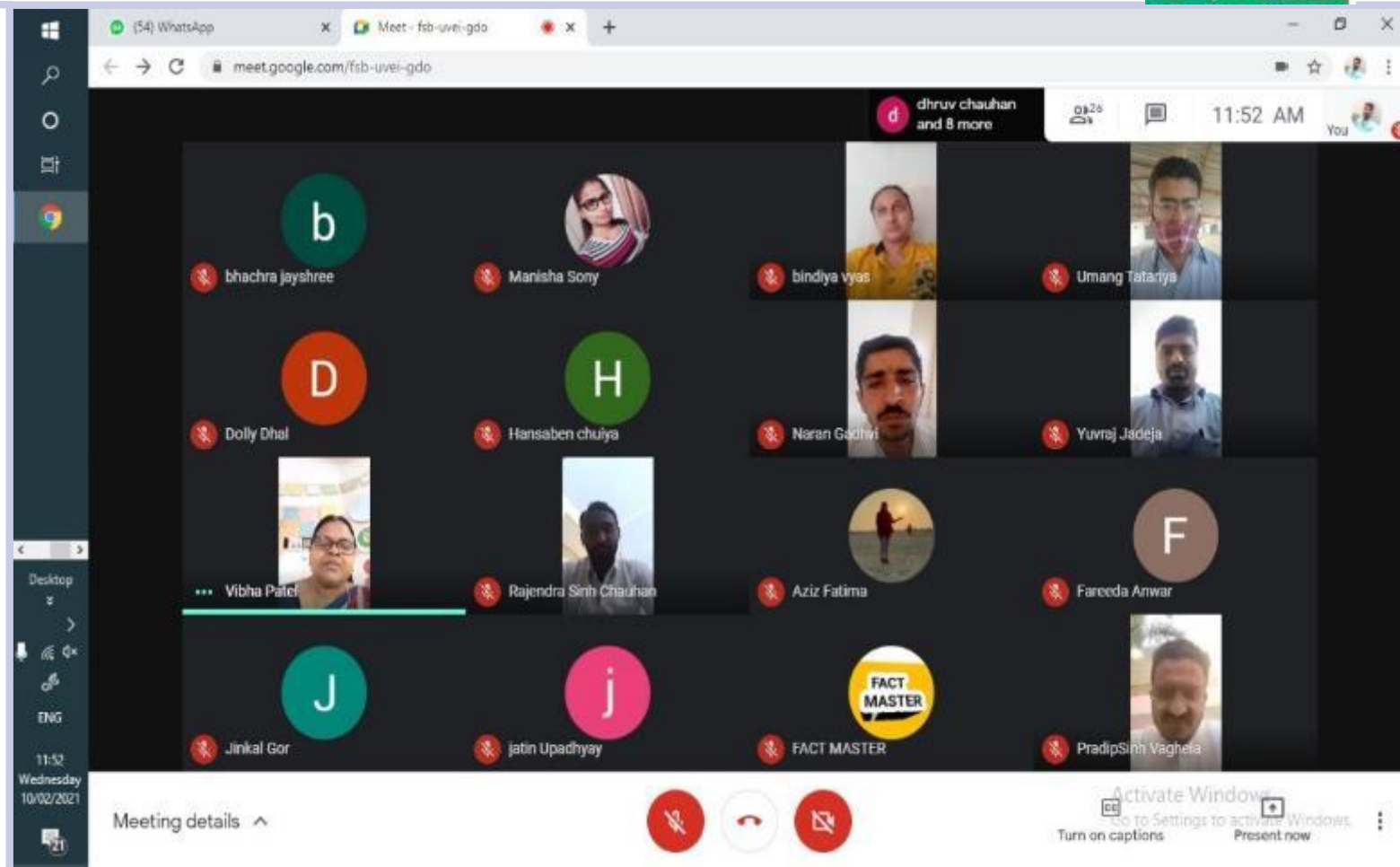
Platform: ZOOM

Topic: **A Blissful Journey: From Entropy to Stillness**

Resource Person: **Mr Saurabh Beniwal**

15+ years of Corporate and Educational Training Experience during association with various organizations like Next Education, Educamp, Airtel, Intelnet PAN India. He has been associated with Indiannica Learning Pvt. Ltd. as National Head –Teacher Empowerment Initiatives, conducted more than 700 highly energetic Workshops, Seminars and counselling sessions for Teachers, Students, Principals and Parents on various topics listed in profile below. Served more than 1,00,000 teachers, students and Parents across nation.

Timings	Discussion Point	Material/Activity
10:00 to 10:30 hrs	Presence of Mind, Comfort Zone	PPT presentation, Discussion
10:30 to 11 hrs	Types of learners and how to deal with them, 3 C's of Life	PPT, Discussion and Activity
11 to 11:30 hrs	Human Experiential Model, Effective Communication with blocks to listening, Power of positive thinking	PPT, Story, Discussion
11:30 to 12 Noon	Goal Setting for teachers, communication Gap, Outer world Vs Inner World	PPT, Video, Story, Discussion
12:00 Noon to 12:30 hrs	Material Vs Spiritual Knowledge, Meditation	PPT, Guided musical meditation for 15 minutes





# Utthan - Impact



## IMPACT OF THE PROGRAM

### Beneficiary of Online classes

- 17 Utthan Sahayaks
- 17 Gov. Primary Schools
- 2098 total students

### Weekly Content of IT and Physical Education

- 106 Gov. Pri. School
- 35000+ students

### Virtual Mothers meet

- 500+ Mothers attended meeting on Google meet

### Capacity Building Program

- 70+ Webinar attended by Utthan Sahayak
- 10 Seminar/Workshop

### Competition /Celebration

- 248 Students took part virtually

# Uthhan – Testimonials

## Confessions



'Solar Panel installation in Uthhan Schools is biggest step towards best usage of renewable energy. Now our students can study comfortably during absence of electricity and not only this – student can understand value of solar energy too"

Principal,

Mundra, Kutch, Gujarat



'Utthan Sahayaks with the help of customized curriculum and structured time table meet huge success to achieve the main objective of the program

In corona pandemic Uthhan Sahayak acted as a main force for students to remain active during lockdown through home visits, various competitions and E-events.

In future, Utthan will be sound support system for Government Schools of Mundra

I wish all the best to Team Uthhan

Haresh Patel  
Taluka Primary Education Officer  
Kachchh- Bhuj

# Uthhan – Testimonials

## Confessions



'During this pandemic period Utthan Sahayaks are doing very commendable job. We will receive an encouraging feedback from Parents too. Project Utthan has made a positive impact on our students as well as in school too.

Mahendrasingh Solanki  
Principal,  
Zarpara Shaala no. 3  
Mundra, Kutch, Gujarat



'Education is what builds a nation generation after generation and the process begins early on; first at homes/communities and then in the schools. With an aim to enhance the quality education in government primary school in Kutch district project Utthan launched by Adani Foundation with the close monitoring by GoG as a pilot project with 17 schools at Mundra.

After the completion of 2 years, project marks a very positive impression not only in school but also in community. Utthan Sahayaks played a vital role to transfer Priya *Vidyarthi* into main stream. School culture and environment has become more advanced and techno based with the up skilling of government teachers through various capacity building program. Attendance of schools has increased due to active Mothers meet and SMC meetings.

I am sure in near future with the active involvement of this project performance level of government primary school shall further improve.

My good wishes and support are always with the team!'

Prabhav Joshi (IAS)  
District Development Officer  
Kachchh- Bhuj



# Adani Vidya Mandir, Bhadreshwar (SDG - 4/4.1)

**EDUCATION: FREE AND COMPULSORY** – WHAT A WAY TO LEARN LOGIC!" The quote mentioned unfolds the distinguished vision of Adani Foundation to provide cost-free education, food, uniform, books to the children of economically challenged families of Mundra Bock. Adani Vidya Mandir, Bhadrashwar was established in June 2012, with aim of uplifting the communities through education. The school is equipped with excellent infrastructure and resources required for all-round development of the student. The child is given admission in class 1 and is molded to be an educated and a good human being by experienced and compassionate teachers. The school follows a curriculum designed by GSEB.



# Adani Vidya Mandir, Bhadreshwar

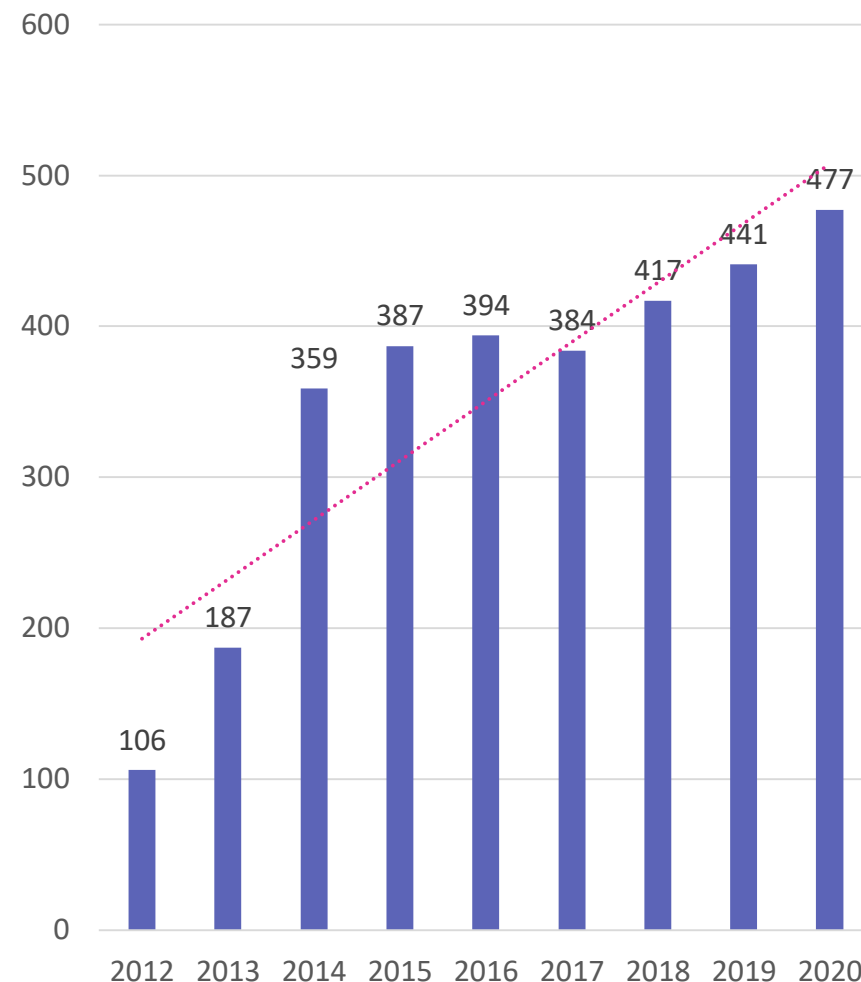
Adani Vidya Mandir Bhadreshwar Gujrat Board Standard 10th Examination Result is 82.60% (19 students have passed the examination out of 23). Adani Foundation will take all responsibility of further study of students with respect to their interest.

The global upsurge of the Covid-19 pandemic and the resultant lockdown has brought all of us to face such unprecedented times and situations. The challenge was rural locality, network unavailability, lack of health awareness, apprehensions for technology and gadgets and financial crunch to spend on mobile / Internet.

But We did not Give-up and reached out to our students to pursuit educational through virtual platform by various initiative.

AVMB STD - 10 SECOND BATCH RESULT		
Year 2020-2021		
SR NO	GRADE	STUDENTS
1	Above 80 %	00
2	Above 70 %	02
3	Above 60 %	05
4	Above 50 %	07
5	Above 40 %	05
6	Fail	04
TOTAL		23

No's of students



## Activities Covered

- Admission process of Std 1 students through draw system.
- Online Class through What Sapp and YouTube video
- DD Girnar Timetable intimation and & Follow-Up
- Regular home visit for homework and lessons with PPE's by Teachers
- Textbook support to students of all classes.
- 10th standard students divided into small Group and Mentoring by AVMB Teachers.
- Unit test conducted as per GSEB circular for the students
- Offline Examination for class 3rd to 10th
- G Suite & Diksha Training for Teachers
- Opened G-Mail Account of Each Child
- **Tablet support to 10th class students for Online Classes by Employees Volunteering Programme**
- Self Learning Material Distribution to 1st to 9th standard students who don't have access for online education.
- Parents Meeting : Regular basis
- Start Remedial Classes at 3 villages with Following all Gov Covid Guide
- reopens Schools class 9th to 10th Standard
- Day Celebration ( Fit India, Children day and Mathematic day & Republic day ) Virtually and Physically to get rid off from the Covid Stigma





# Community Health (SDG - 3/3.8)

*Access to quality healthcare is a  
fundamental right of every individual*

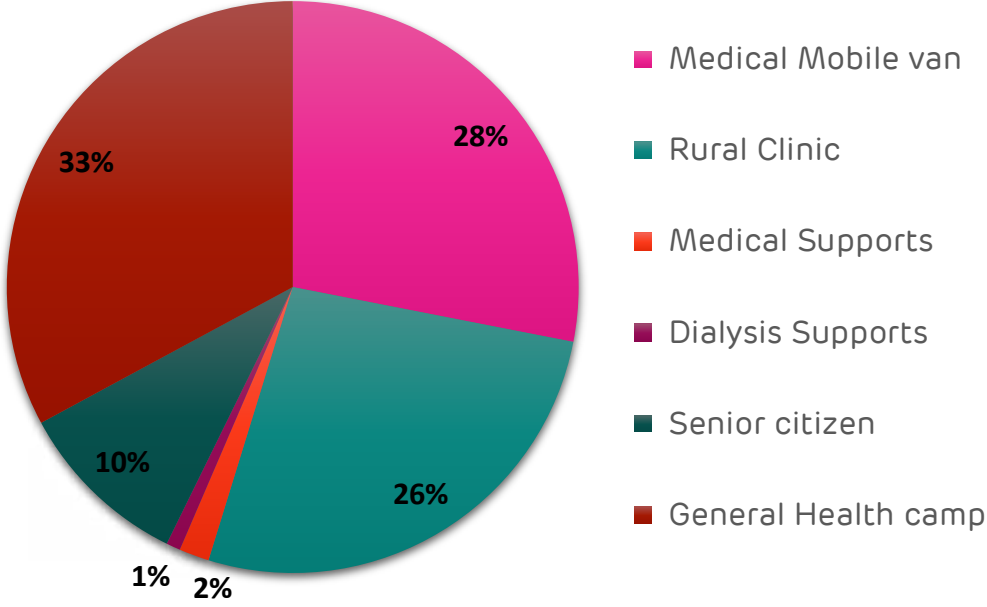


Health plays a crucial role in transforming people's lives. Throughout the year, COVID-19 has taught us the lesson about the importance of health. Access to quality health care gives a fair chance to lead healthy, productive lives. Healthy people can utilize opportunities available to them.

# Community Health

CH All Project Patient Details			
Project	Direct Beneficiary	In-Direct Beneficiary	Remarks
Medical Mobile van	16611	66476	33 Villages
Rural Clinic	15797	63192	11 Villages
Medical Supports	1008	5040	63 Villages
Dialysis Supports	474	2370	63 Villages
Senior citizen	5836	17508	63 Villages
Health camp	19461	58383	11 Villages
Total	59187	212979	

## Direct Beneficiary



**“Healthy mind remain in healthy body which create health community to make healthy Nation.”**

Adani Foundation relentlessly working for same in each health core area through various kind of health activities i.e. Mobile Health Care Unit, Rural Clinics, Special Innovative Projects i.e. Health Card to Senior Citizens, “Project Abhimanyu” and support to dialysis patients projects. Adani Foundation had also organized special medical camps during Corona pandemic

## Rural Clinic & Mobile Health Care unit

Adani Foundation focuses on ensuring good health for better contribution to growth and progress. During this pandemic situation health is the basic need for development of community. Their objective is to live healthier lives by promoting healthcare seeking behavior.

Mobile Health Care Units and Rural Clinic Services are deployed with the objective of providing basic healthcare facilities to remote rural areas as well as poor peoples. The service is being executed by Adani Foundation is to reduce travel time, hardships and expenses.

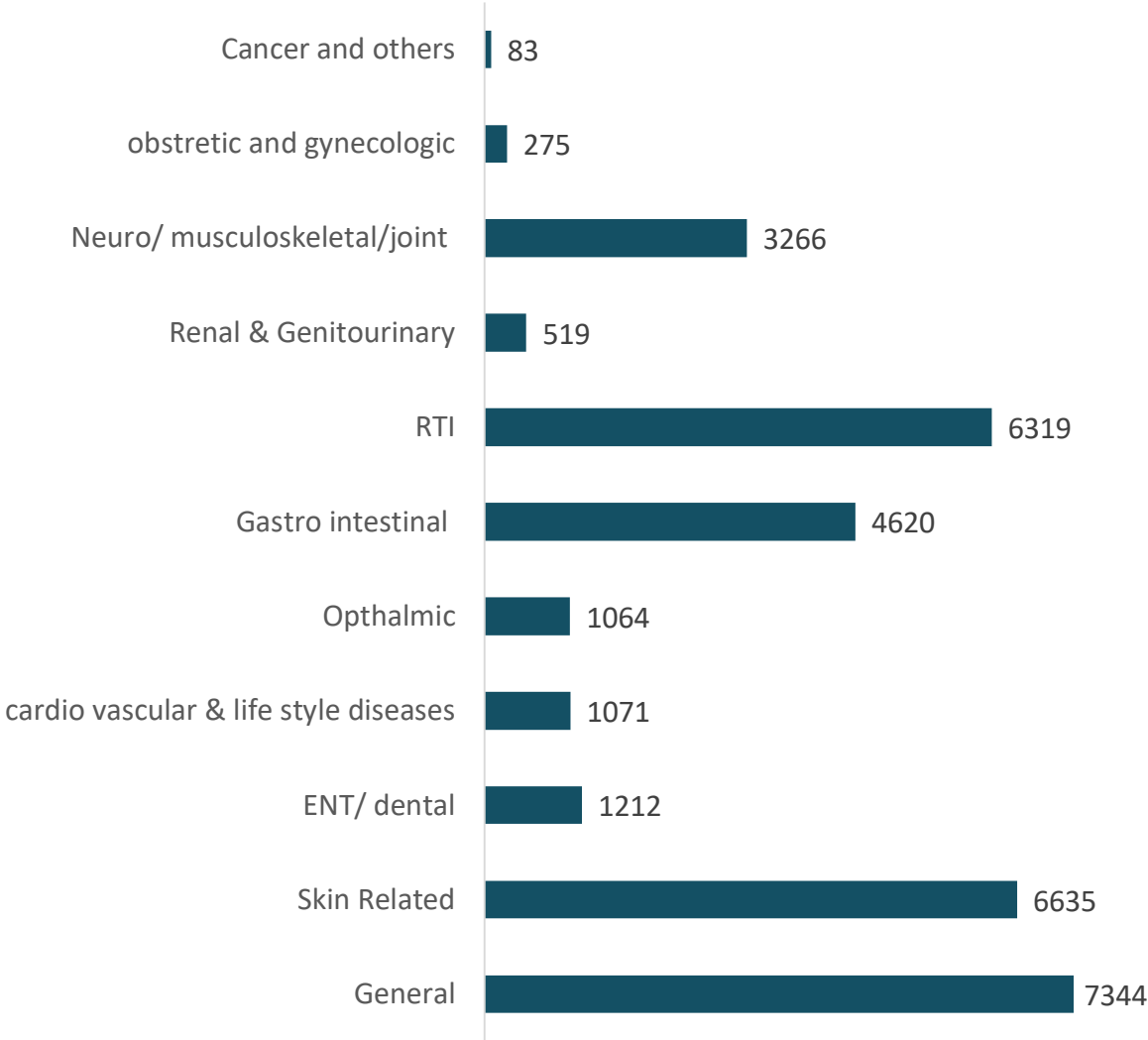
The mobile health care unit covers 25 villages and 07 fishermen settlements. Around 90 types of general life saving medicines are available in these units. This service has become a boon for women, elderly and children as the service is available at their doorstep.

Rural Dispensaries are established where there is a gap in the healthcare services. The Adani Foundation operates Rural Dispensaries in 7 villages of Mundra block, 03 villages of Anjar block and 1 clinic in Mandvi Block. Mobile dispensary and rural clinics provide health services with token charge of 10/- rupees per patient daily by a doctor and a volunteer.

During this year total 16611 beneficiaries 6141 male and 10470 female were benefitted by Mobile van and total 15797 beneficiaries 7128 male and 8669 female were benefitted by Rural clinics.



# Community Health – Disease wise Distribution





## Health Cards to Senior Citizens

Senior citizens often face difficulties in getting treatment for want of financial, social and moral support. In this stage of life is there is need special care for health and warmth hence Adani foundation has started senior citizen project in Mundra Block since 10 years. The main objective is to provide specialized, timely and hassle-free healthcare services according to the needs of senior citizens. The initiative also encourages them to pay attention to their health and promotes preventive healthcare.

During the year 2020-21, total 5836 transactions were done by 8711 card holders of 68 villages of Mundra Taluka. They received cash less medical services under this project.

The limit for the beneficiary has been set Rs.8000/- in exit year. the senior citizens get emergency medical care at Adani Hospital, Mundra and refer to GKGH, Hospital ,Bhuji in Emergency.



## Specialty Camps

General health camps, Pediatric Camp, breast and cervical cancer screening camp and surgical health camps was organized at frequently to meet the specific requirements of the community and in disease outbreak season with following the guideline of COVID-19.

In the year of 2020 -21 total 97 people had been benefitted by various kind of camp and needy and screened patients are treated in Adani Hospital.



Sr. Citizen status Year-2011 to 2020-21											
Number of Villages	Total Cards	Total Survey	Pending Renew Cards	EXP	Green cards	Blue Cards	BPL Cards	APL Cards	No Ration Cards	RSBY Cards	MA Cards
68	8711	7095	901	715	6328	767	2493	4555	47	77	222

## Medical Support Detail

Adani Foundation provides primary health care and financial assistance to needy poor people for ailments such as kidney related problems, paralysis, cancerous and tumor surgeries, neurological and heart problems, blood pressure, diabetes etc.

Partial Medical Support had been given to 1008 beneficiaries of Mundra, Mandvi and Anjar Block at Adani hospital, Mundra. where as in the Critical cases after stable them we refer them to GKGH, BHUJ for further treatment.

## Dialysis Support

The drinking water of Mundra contains high TDS (Total Dissolved Solids). Hence, the proportion of patients with urinary stones and kidney failure is more. Patients suffering from kidney-related diseases require regular dialysis which is costly and adds to the financial burden of the family.

Hence, the Foundation has undertaken a programme to providing dialysis treatment to help the extremely needy patients to live a healthy life. During this year, 6 patients were supported for regular dialysis (twice a week) with partial support.

## Ukado & Vitamin-C Tablets Distribution

Covid-19 pandemic is at the peak level And there is no any specific treatment But as preventive measure and immunity booster we had started Ayurveda UKADO distribution at various public spot in Mundra.

The TDO, THO, Flywing foundation, Ayurveda Department had support and coordinate in UKADO and Vitamin-C tablets distribution activities. Total **18240 people had get benefits of UKADO and Vitamin-C tablets.**



## Machhimar Shudhh Jal Yojana (SDG 6/6.4)

To reduce water born disease and women drudgery to get water, Potable water is provided to the fishermen communities at different vasahat through water tanker since 8 years.

Sr.	Vasahat	Family	Requirement Per day	Remarks
1	Luni	116	15000	9 Months
2	Bavdi Bandar	107	15000	9 Months
3	Kutdi Bandar	118	15000	9 Months
4	Randh Bandar	245	25000	9 Months
5	Zarapra Vasahat	90	5000	12 Months
6	Vira bandar	80	--	Linkages with GWIL
7	Juna bandar	160	--	Linkage with Mundra GP
8	Ghavarvaro Banada	60	--	Linkages with GWIL
9	Zarapra chacha	55	--	Linkages with Port GWIL
	TOTAL	1031		





# Community Health Bhuj (SDG 3/3.8)

- Adani Foundation Team has initiated coordination with GKGH hospital since 2014 and established a reception area for the smooth patient coordination and preparation for the social networking program.
- GKGH Hospital is Covid Care Hospital since 22<sup>nd</sup> March 2020. Adani Foundation staff members supported in patient counselling, coordinating and supporting for dead body covid care van.
- Total 3368 Covid patients got treatment from overall Kutch with satisfaction.
- Dead body medical van – Dignity to death is one of the noble initiatives taken up by the Adani Foundation. If any death occurs in GKGH, dead bodies are shifted to the native village of the concerned in the Kutch District free of cost. Total 809 dead bodies privileged till now to different locations in Kutch including Covid Patients.
- Mahiti Setu is linkages between various Government Schemes and beneficiaries. Through Mahiti Setu sourcing of 2378 beneficiaries and linkages with more than 780 cards of MAA Yojna and Ayushman Yojna



## Community Health - Impact



### IMPACT OF THE PROGRAM

#### Benefits of MHCU and Rural Clinics

- 44 Villages
- 23000 Population Coverage
- Saving of Rs. 150 per day
- Total Revenue saved – Rs. 44.26 Lacs

#### Senior Citizen Health Card

- All Senior Citizens of Mundra – 8711 cards
- Unique Project with focus on preventive care
- Revenue generated @ Rs. 63 Lacs

#### Corona pandemic Times

- More than 12 camps of Ukala Distribution
- Outreach @ 2,50,000 for awareness and immunity boosting methods

#### Potable Water to Fisehrfolk

- Covering 676 Families with 75000 liters per day water for drinking purpose at Vasahat
- 3 Vasahat became self sustain with coordination of Gram Panchayat

#### AHMPL

- Total 20959 patients benefited in year 2020-21 from 55 different villages .
- Goodwill created as a only hospital remained 24x7 opened during whole year of pandemic

# Environmental Sustainability

Sustainable development has many important facets/components like social, economic, environmental, etc. these components are closely interrelated and mutually re-enforcing. Under Corporate Environmental responsibility 10 km radius villages from SEZ Boundaries.

Water conservation Projects i.e. Roof Top Rain Water 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. Including this a big recharge operation by bunding was taken up for Zarpara village as rainfall was very good current year

To make connections between human actions and the level of biological diversity found within a habitat and/or ecosystem, this year we launch project "Sanrakshan" in coordination with GUIDE and Sahjeevan.





## Water Conservation Projects (SDG 6/6.6)

**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 Government Figures. Our water conservation work is as Below.**

- A large number of water harvesting structure ( 18 Nos. of check dams in coordination with salinity department)
- Ground recharge activities (pond deepening work for more than 52 ponds) individually and 26 ponds under Sujlam Suflam Jal Abhiyan were built leading to a significant increase in water table and higher returns to the farmers
- Roof Top Rain Water Harvesting 54 Nos. which is having 10,000 litre storage which is sufficient for one year drinking water purpose for 5 people family.
- Recharge Bore well 75 Nos which is best ever option to
- Drip Irrigation 823 Farmers benefitted in coordination with Gujrat Green Revolution Company
- Bund construction on way of Nagmati River could save more than 575 MCFT water quantity which recharged in ground due to which borewell depth decreased by 50-100 Ft in Zarpara, Bhujpur and Navinal Vadi Vistar.





# Jiv Srishti Saurakshan Yojana (SDG 15/15.9)

## Bio Diversity Park – Mundra

Ecological greenbelt development plan expects to attract and provide habitats for many species of major faunal groups such as amphibians, reptiles, birds (terrestrial and aquatic), butterflies and mammals. Further this developed area can act as recreational, educational and interpretation center for the community of the corporate sector to understand and enhance their knowledge base on local environmental and ecological scenario.

Adani Foundation, Mundra-Kutchh proposed a biodiversity park at 5 acres Nandi Sarovar area and approached to Sahjeevan, Bhuj for technical support for same. Sahjeevan team visited this proposed site for development of greenbelt to support biodiversity and enhancement of overall ecological food web existing in and around the landscape in first phase.

In addition, senior team of Adani Foundation and Sahjeevan also discussed in details for this program and suggested to initiate an interpretation center for awareness to various stakeholders on very unique

biodiversity of Kutchh region in second phase.

Zone wise different habitats identified by technical team, i.e. Outside Plot Area, Along Waterlogged Area, Climber/Twiner Area, New Plantation Area, Entry Gap Filing Area, Gate Area, and Wetland Area within the proposed project area, technical team will develop a list of species that are representative of mature, undisturbed local forests, grasslands and wetlands. The chosen species will be typical of the species composition of local habitats.

Develop a list of plant species that can be chosen on the basis of aesthetic characteristics, in particular for the beauty/abundance of their flowers, eventually of their fruits/foilage.

Define information on different types activities involved under this ecological greenbelt development project (i.e. butterflies areas, medicinal plants areas, birds areas etc.).

Develop a manual that will give guidelines for habitats based on local practices, for short term and long-term management.









# Jiv Srishti Saurakshan Yojana (SDG 15/15.9)

## Coastal Bio Diversity Park – Luni

In the coastal environment mangroves and mudflats are dynamic ecosystems that usually support a large population of floral and faunal life forms. Mangrove forests are highly productive ecosystems, which provide numerous goods and services both to the marine environment and people. Mangroves in India are spread over nine maritime states and three Union Territories. Gujarat has the longest (1,650 km) coastline among the maritime states of the country. With the second largest mangrove cover in India after West Bengal, Gujarat's mangrove area has increased from 1,140 km<sup>2</sup> in 2017 to 1,177 km<sup>2</sup> now.

A major portion of human population of Gujarat is solely dependent on these coastal ecosystems for their livelihood. Thus, several mangrove restoration programmes/ activities are in progress in the state. Mangrove restoration activities in Gujarat are mostly single species stands of *Avicennia marina*. Adani Foundation at Mundra-Kachchh has initiated multi-species plantation of mangroves in Kachchh in association with GUIDE. 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. Due to geological set up of Kachchh where fresh water source is atypical, the survival and growth of mangrove plantation remains poor. Thus, a survival rate of 30% is expected for this multi-species plantation. Mangrove biodiversity park of its kind will help in disseminating knowledge on mangrove ecosystem and simultaneously conserving the species.

Since, some of the mangrove species are not readily available in Kachchh, their seeds/ propagules were procured from other districts of Gujarat and other states. The proposed species of mangroves that have the potential for enhancing mangrove biodiversity in and around APSEZL include *Rhizophora mucronata*, *Ceriops tagal*, *Ceriops decandra*, *Rhizophora apiculata* and *Aegiceros corniculatum*.



## Vision

Enhance the diversity of mangrove and its associated species in suitable coastal region of Kutchh, which in turn increase the faunal diversity and fishery resources of the area by providing suitable habitats and breeding ground. The ultimate aim of the project is to improve overall coastal biodiversity of the region.

## Mission

- Reconnaissance and identification of potential sites for technical suitability for enhancing mangrove biodiversity in Kutchh.
- Examine tidal pattern, availability and duration of fresh water, water regime/inundation, and substratum and water quality, species association at the site (based on secondary literature).
- Development of different plots based on combinations of species and site characteristics.
- Nursery development, transplantation of nursery grown seeds / propagules, monitoring its survival, etc.
- Examine the physico-chemical characteristics of water and sediment in the selected plantation sites.
- To detailed out the diversity, species richness of marine faunal component in the selected plantation sites
- To assess natural (algal encrustation, shift in substrate nature) as well as anthropogenic threats (cattle grazing, lopping) to the plantation site and provide suggestive measures.
- Long term monitoring plan and protection of the developed mangrove patches and coastal biodiversity in the plantation sites.



# Sea Weed Culture

## Primary Information About Sea Weed

Recently, seaweeds have gained substantial traction globally owing to the appreciation of the benefits that they provide in societal, economic and environmental realms. Ever since the economic and ecological benefits of seaweeds recognised, there has been a constant and sustained global effort to further increase their production and utilisation by following innovative practices along the various value chains. Seaweeds are farmed commercially in several Asian countries where their utilisation for food and phycocolloids (agar, carrageenan and alginate) is intense, and their farming has indeed evolved into a social enterprise particularly in some Asian and tropical countries in the world. Seaweed farming has indeed emerged as an economic growth engine in several developing economies in Asia.

Adani Foundation Kutch

## Utilization in India

In India so far, seaweed resources have been utilized exclusively for the production of typical phycocolloids such as agar and alginates by local processing units (about 30 MSMEs) from the wild harvest, particularly from the coast of Tamil Nadu. Despite developing pioneering technologies in both farming and processing for different economically important seaweeds, seaweed cultivation has not gained momentum and widespread in the country as expected but rather continued to confine to limited geographical regions in the state of Tamil Nadu alone. This could be partly due to different inherent challenges associated with open sea cultivation. The seaweed farming in the open sea is

interrupted by monsoon and hampers the year-round production efforts and sustainability. With this backdrop, and further to give traction to the seaweed industry in the country, a unique consortium of industry partners have come together on a common platform with a unified interest to build a technologically competitive and viable platform for the production and processing of the seaweed feedstock for harnessing the associated economic and ecological (climate reversal and prevention of coastal water eutrophication) benefits to the fullest extent possible while providing livelihoods to the coastal communities, in the spirit of creating and sustaining “Blue Economy” as also “Inclusive Economy/Circular Economy”





# Sea Weed Culture

## Vision

The consortium aims to take a holistic view of transforming seaweed resources as natural capital and use open source knowledge to build an innovative technology platform for harnessing the economic potentials along with the associated ecological benefits thereof. Also, foster a cordial relationship with visionary sponsors and collaborators from India and abroad for sustainable production and utilisation of seaweed resources for the production of innovative products while engaging the coastal communities as direct beneficiaries (human capital) of this unique effort.

## Collabration

Agrocel, Piddilite, Adani Foundation has jointly initited the Pilot Project with a objective transform sew weed into Natual Capital as well as engaging community as a human capital.

## Achievements

A pilot cultivation facility (5 KL tanks in 6 nos) for the farming of different economically important seaweeds in the

tanks on the onshore has been established and commenced the cultivation trials with red seaweeds *Kappaphycus alvarezii*, *Gracilaria dura* and green seaweed *Ulva*. The initial trials have given very promising results and harvested 6-7 times the seeded material in a 40-45 days cultivation period.

The successful completion of pilot cultivation trials of *Kappaphycus* has helped to move forward to set up raceway type tanks of 26 m Length × 6 m Width × 1.1 m Height in 2 nos for large scale cultivation of *Kappaphycus* in Balavadi campus at Juna Bandar, Mundra. The cultivation trials are in progress.



Growth of Kappaphycus



in various durations

# Sea Weed Culture

## Further plan for Adani Foundation Mundra

The initial seaweed cultivation findings have provided enough evidence for upscaling the facility over a one-hectare area in 2021-22 engaging the local fishers who can earn reasonable monthly income by formation of Group of Fisherman.

Fisherman Group is initially consist of 15 members. Adani Foundation will provide off shore and on shore cultivation of sea weed, its further process i.e. cleaning and drying and expolore market opportunities.

In recent times, two outreach programmes were also conducted for fishers living in the Juna Bandar area to ascertain their interest in adopting seaweed cultivation as an alternate profession to fishing which is fastly dwindling. There is a scope for providing an additional income stream through seaweed farming to fishers if we set up model demonstration farms. These farms can be utilised for showcasing the cultivation technology, training purpose and seed supply for those fishers who likely to become seaweed entrepreneurs.



Raceway tank with Kappaphycus seaweed







## Drip Irrigation Project (SDG 2/2.4)

- **Basis of Requirements of Drip Irrigation**

The main source of livelihood being agriculture, the cultivators tend to use more and more underground water for irrigation. Underground waters have gone very highly saline. The use of such water for irrigation has made the soil also saline and the crop yields have dwindled.

- **Process of Drip Support**

Farmer have to applied in the prescribed form of Adani foundation with photograph.

Inspection and verification will be by AF representative.

Ration card, work order of G.G.R.C, 7/12 certificate and all bills must be attached.

Farmer will be informed by telephonic to have form query.

Primary information about farmer land will be received by telephone.

Farm visit within 10 days of after received of application and verified the installation of system as per map and material as per bill will be checked and get farmer feed back.

Verification report submitted to account office.

Payment within 20 days if all document is complete through net banking.

Farmer economic study after our support. – Follow up

- **We have covered 295 farmers and 1422 acre drip irrigation area in last two years which is remarkable for water conservation in first phase – in this phase we have covered 66 farmers and 360 Acre land for the same.**
- **Total 968 Farmers and 5626 Acre Drip since 2011-12 to 2020-21.**



# Sustainable Livelihood Development



In the villages at Mundra Taluka, several communities are economically side-lined and weaker that depend on a sole income source or are unemployed. Sustainable livelihood projects have been launched to cater financial independence through building local partnerships, providing diverse livelihood avenues, inculcate the attitude to establish savings, equipping to earn and updating local skills by making use of existing resources to encourage self-reliant lifestyles. Participation Is encouraged by launching specific projects for fishermen communities, farmers and cattle owners, youth and women.



# Work till date for Fisherman Development

**444 Book Support**

**733 Vehicle transportation from Bandar to AVMB**

**86 Cycle Support**

**481 Scholarship Support**

**28015 Potable water provision**

**370 Youth Employment**

**2561 Fishing Net & Equipment Support**

**195 Linkages with Fisheries Scheme**

**3504 Ramaotsav Community Engagement**

**17 Fisherman Sea Weed Culture.**

**46878 Man days Mangroves Plantation**



## Fisher Folk Education (SDG 4/4.2)

Fisher folk are having less illiteracy level so they are not motivating their ward education, Children are engaged in fishing practices since child hood ,which pushed them in terribly poor scenario in every aspect of life. Hence Adani foundation have started education program in dynamic manner to cover each segment of life from the Balwadi to Higher education study through various Intervention.



**Scholarship Support** Scholarship Support is a programme to motivate fishermen students for High school and secondary education . Girl child is supported with 100% scholarship to girls & 80 % support to Male Students. Total 59 students were facilitated with scholarship current year

**Fishermen Balwadi** Education system were ceased in the covid-era. But with telephonic talk and home visit were continue since May 2020 with child & parents to keep them update for education, lesson revision and Covid awareness.

**Vehicle transportation-** Avail easy and safe transportation service for the Fisherfolk child of Various Vasahat to made them Regular and Synchronized with School atmosphere. Total 37 students from 6 to 10 standard are Benefitted.



## Fisher Folk Education (SDG 4/4.2)



### Book Support-

55 Higher secondary (9 to 12 standards) students were benefited with Books material from Juna Bandar, Zarpara, Luni, Navinal , Bhadreshwar Villages.

### Cycle Support

Cycle support to Juna Bandar 9<sup>TH</sup> standard fisherfolk students to continue their study and Up down who are studying in Mundra Government School . This year 5 students were supported for the same

### Ramaotsav

Ramaotsav Program was held at all fishermen vasahat for child motivation and aware parents for their ward education. This year total 442 students(1 to 10th standard ) had participated in various outdoor game. Winner were felicitated with prize and others are appreciated with School bags.





# Machhimar Ajivika Uparjan Yojana (SDG 14/14.B)

Fishermen are too vulnerable and marginalised community. Moreover due to uncertainty of fish catch and Four month Fishing band season they have to face vicious debt cycle. Adani Foundation with Gujrat Fisheries Board are providing Fishing equipment support as per Government Schemes.

Also AF has started various intervention for their alternate Livelihood and Employment.

## Net & Equipment Support

Seven Fishermen are supported for Net and Equipment  
10 Fishermen Linkage with Fisheries Department Scheme and Fishermen credit card for bankable loan

## Mangrove Plantation

It is a win-win situation which provide 4830 Men days employment over 236 fishermen as well as created Environment sustainability as well.

## Soft skilled & Technical training

Survey had been carried out in APSEZ Companies to Know human resource requirement And According that Fisher Youth youth were trained and interviewed for the Placement.

**Total 70 Fishermen youth are selected and working in Various company current year.**



# Natural Farming Promotion

Soil is the key point for successful Agri-farming, it is the Millions of microorganism habitat which keeps an alive media for agricultural purposes, with improving water holding capacity, infiltration rainfall water rate, with improves plants ability to take soil nutrients which reflect on farmers Yield and returns. But the Imprudent & over use of chemical fertilizers & Pesticides deteriorate soil & Plant condition which made the ill effect on consumer health and farmer Livelihood .The permanent and cheapest solution to overcome the dangerous effects of modem agriculture to develop a farming system is to do natural farming which is economically productive and long lasting with various integrated and judicious method and management technique which play important role to maintaining or improving soil , plant health and farmers socio economic status.

## Objectives

- Maximize biological activity in soil and minimize soil erosion.

- Enhance the genetic and biological system and its surroundings.
- Provide livestock with optimal living conditioned for wellbeing and better health.
- Promotion of environmentally friendly use of soil, water and air thus minimizing agricultural pollution.
- To improve the physical and biological properties of soils, self-life and flavor of farm Produce
- To reduce the use of inorganic fertilizers and pesticides.
- To convert Farm waste Biomass into renewable energy & rich Fertilizer. To increase export of farm produce

## Implementation

A village level capacity building programs are organized for the farmers as awareness campaign and farmers are trained to adopt & implement Model farm initiative into their own farm. This Project will be implemented on cluster approach basis mean each cluster will have five to six model which will be used as demonstration and farmer to farmer

training to adopt and replicate in their own farm.







જીવરાજ મેઘરાજ ગઢવી (ભોરા) મો. નં.૯૯૭૮૪૧૭૮૪૧

સૌજન્ય:- adani સદાશી ડાહિડેશન



## Model Farming : Parameters

Sr. No	Activity Name	Objective
1	Soil Health Analysis	To Provide require Micro nutrient and improvement of soil quality
2	Cow Urine Collection	To prepare Jeeva Mrut, Gau Krupa Amritam Bacteria and Panchgavya
3	Cow base Farming	To use as liquid fertilizer
4	Home Bio Gas	Source of Renewable from Farm waste
5	RRWHS	To use of natural resource (rain water) to made independent Water sustain family.
6	Kitchen Garden	Ensure inexpensive ,regular and handy supply of fresh and healthy vegetables
7	Herbals crop farming	To avail herbal medicines at Home.
8	NB-21	To create individually fodder sustainability.
9	Farm Banding	To reduce soil erosion and retained moisture in the soil.
10	Bore well & well recharge	Enhance the ground water level.
11	Drip Irrigation	To save ground water & reduce salinity ingress.
12	Fruits Crop farming (seasonal)	To Fetch high yield and returns perennial
13	Compost Fertilizer	To act As conditioning soil with increase the Nutrients and water holding capacity.
14	Wormy Compost	Increase porosity and microbial activity in soil to improve water retention and aeration.
15	Training Otlo (Farmer to Farmer )	To deliver TRAINING IN FORMAL & Informal way.
16	Jiva Mrut	As source of Natural Fertilizer and micro nutrients to healthy crop and yield.
17	Vegetable Fertilizer	To create healthy soil condtion.
18	Mulching	To create microclimate around plants root to create healthy environment for plant growth.
19	Chaft Cutter	To made easy for cattle chewable & digestion.
20	Modern Agri Tools	To have great benefit in production
21	Nursary development	To avail local plants & seed.
22	Intern Crop	To produce greater yield in limited resources.
23	Mix Farming	
24	Government Scheme Linkage	
25	Dates Tissue & Offsuit Plantation	To produce uniform date fruits in the siza shape and taste.
26	Linkage with KRPC	To become share holder and ben



## Promotion of Natural Farming –Home biogas



Home biogas is the Israel based company was founded in 2012 manufactures dynamic biogas unit not only for farm waste but for kitchen waste too. Under Gram Utthan Project, Adani Foundation is supporting home biogas to farmers to Uthhan Villages phase wise. Current year supported 117 home biogas in Dhrub, Zarpara and Navinal Villages.

- Reducing organic waste,
- Transitioning to renewable energy
- Motivation for reduction in use for fertilizer

Adani Foundation Kutch

And Improving the health and living conditions for the millions of families that are still cooking on charcoal and wood. Adani Foundation is not only supporting but creating awareness to save environment and health of the community who regularly cooking on Chula. It is proven that one hour cooking on Chula is as dangerous as smoking 40 cigrates.

As a Main Process, Bacteria break down organic waste in a naturally occurring process, and Home Biogas stores and harnesses the energy created so that it can be used for gas.

Earlier we had proceeded for capacity 2 cum but after visit and series of meetings with farmer group – we need to take up plant capacity 6 cum

Till date 117 farmers are utilizing it with satisfaction and considerable outcome by saving Average Rs. 23,400 for gas and fertilizer as well.





# Benefits of Home biogas

Plants without bio slurry:



Difference between plant growth



Plants with bio slurry:



Before home biogas



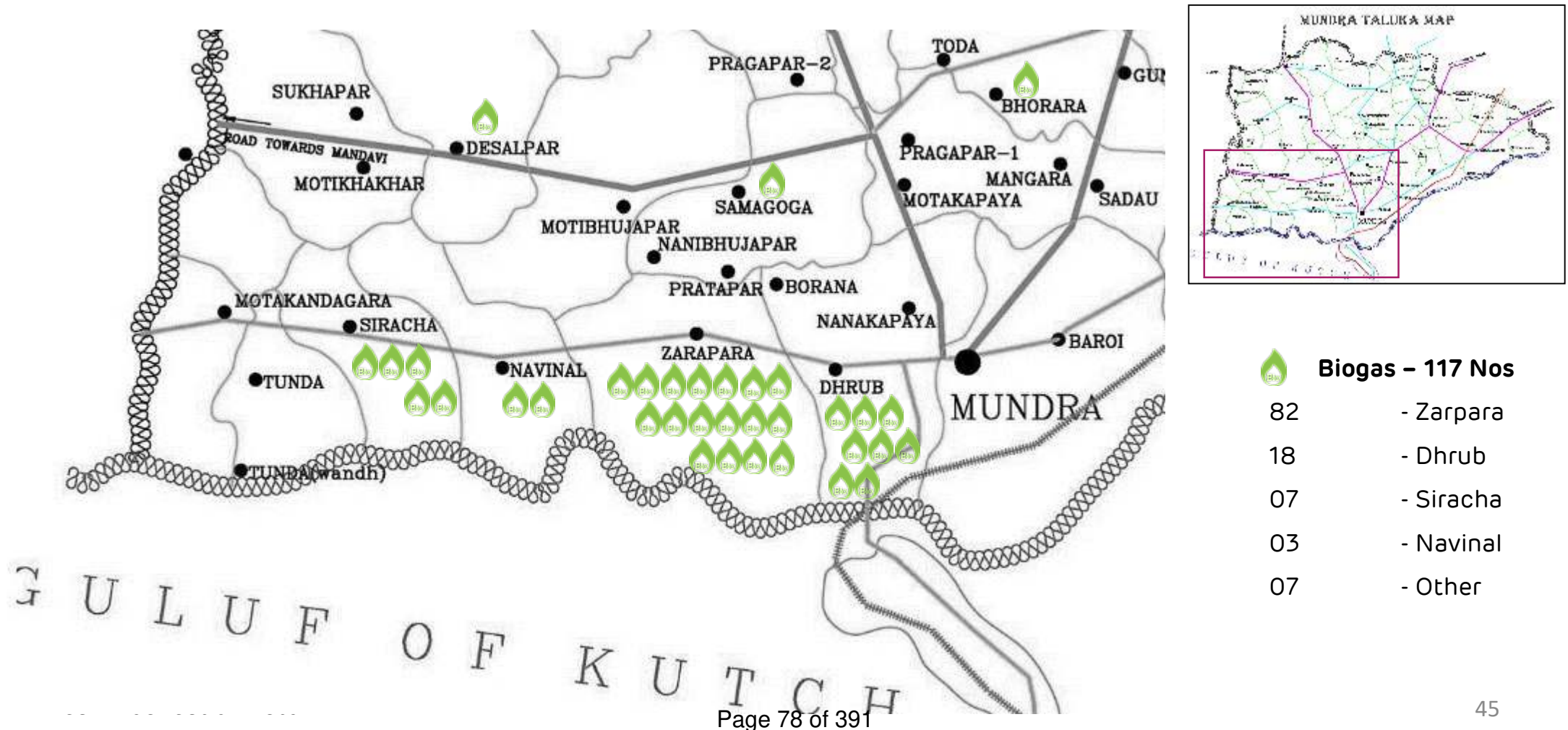
After home biogas



# Usages of biogas in villages of Mundra block

Selection of village by some important parameters i.e. Mobile Van data of lungs related issues, Ambient air quality, cattle population, agriculture land availability, willingness for natural farming

Selection of beneficiary base on willingness of Natural Farming and Number of Cattle. In this Project Primary Stakeholders are also partnering project by financial contribution as well.





# Dragon Fruit Farming (SDG 2/2.4)



Dragon fruit is a tropical fruit that has become increasingly popular in recent years. Though people primarily enjoy it for its unique look and taste, evidence suggests it may provide health benefits as well.

Dragon fruit grows on the *Hylocereus* cactus, also known as the Honolulu queen, whose flowers only open at night. The two most common types have bright red skin with green scales that resemble a dragon — hence the name.

The most widely available variety has white pulp with black seeds, though a less common type with red pulp and black seeds exists as well. In Kutchh Red variety is available due to its weather condition and soil type.

Dragon fruit contains small amounts of several nutrients. It's also a decent source of iron, magnesium, and fiber. Dragon fruit contains several types of antioxidants. These are compounds that protect your cells from unstable molecules called free radicals, which are linked to chronic diseases and aging.

Due to all these benefits and suitable weather condition and soil type, Adani Foundation has provided technical support and awareness training to start the dragon fruit farming. Five dragon fruit farms have been developed with pole and wire fencing support for 2-acre land and 1000 dragon fruit plants each. Adani Foundation had given 40% contribution in this project. Fruiting will start from June 2021.



# Tissue Culture (SDG 2/2.4)

Date palm (*Phoenix dactylifera* L.) is one of the oldest trees known to mankind. It is popularly referred as “Kalpavriksh of Kutchh” as it is an important fruit tree of arid and semi-arid regions of the State owing to its high tolerance to environmental stresses especially abiotic.

The biggest constraint faced for the improvement of date palm following conventional breeding approaches includes its long generation cycles. Nonconventional approaches like Marker Assisted Selection is not possible as there is no true breeding population and very trace molecular work has been carried out till date.

Due to its cross-pollinated nature, date seeds are highly heterogeneous and heterozygous which give rise to 50% unproductive male trees and 50% female trees with poor or varying productivity in terms of both yield and quality.

Date palm cultivation is the only means of livelihood for majority of farmers belonging to Kutchh region of the state. Looking to aforesaid limitations in applying traditional and non-traditional approaches, mass multiplication (Tissue Culture) of superior quality date palm is the need of time to increase the socio-economic status of the farmers and date growers

## Advantage

Tissue culture plants bearing offshoots are true-to-type in nature and hence, in short duration a uniform population could be developed. Availability of planting material of Barahi genotypes round the year.

Selection of offshoots is carried out which are disease free, higher in yield and having good fruiting characteristics, hence export of fresh dates could be carried out by the farmers. Due to Large scale plantation of Barahi trees can be increased.



Dates is the nectar of the kutchh and Our periphery villages are known to produce exportable dates belt as having appropriate weather condition.

To increase the farmer income and over all production individual farmer We have provide “Barahi Varities Tissue plant” which has good strength and productivity.

850 plants have been distributed to 34 farmers. 25 plants / Farmers.

Tissue plant cost is 3000/ per cost with 50% famer Contribution. As per tracking record more than 97% plants are growing very well as per expectation.



# Agri mall by Kutchh Kalptaru FPO

Kutchh Kalptaru producer company is a registered FPO by central registration center has Started Agro cum Women empowerment Mall at Shantivan complex Nana-kapaya Mundra with support of AF to provide platform for farmers and SHG women to fetch the right value of their products.

The Grand Inauguration of Agri Mall was done on 26<sup>th</sup> October in presence of Mr.K.G Chaudhary (Sub District Magistrate Mundra) and Mr. Joshi Director (District Rural Development Authority, Kutchh) and Mr. Rakshit Shah EDM, APSEZ.

Currently more than 170 types of items i.e. Chemical free Grain, pulses, sugar, Jaggery, oil, masala, Vegetables ,dry Snacks made by women group, handicraft items, Mud Utensils, toys, handmade chocolates and many more are placed for sell.

Under the Umbrella of Kutchh Kalptaru farmers producer company more than 200 Farmers and 112 women been engaged. KKPC Agri –cum Women Empowerment mall Approx. Rs.4.07 lacs turn over till end Feb (for 6 months)





GOVERNMENT OF INDIA  
MINISTRY OF CORPORATE AFFAIRS  
Central Registration Centre

**Certificate of Incorporation**

[Pursuant to sub-section (2) of section 7 and sub-section (1) of section 8 of the Companies Act, 2013 (18 of 2013) and rule 18 of the Companies (Incorporation) Rules, 2014]

I hereby certify that KUTCH KALPATARU PRODUCER COMPANY LIMITED is incorporated on this Sixteenth day of July Two thousand twenty under the Companies Act, 2013 (18 of 2013) and that the company is limited by shares.

The Corporate Identity Number of the company is U01100GJ2020PTC114677.

The Permanent Account Number (PAN) of the company is AAICK1700C \*

The Tax Deduction and Collection Account Number (TAN) of the company is RKTK05184E \*

Given under my hand at Manesar this Sixteenth day of July Two thousand twenty .



Digital Signature Certificate  
Mr RAJENDER KUMAR  
DEPUTY REGISTRAR OF COMPANIES  
For and on behalf of the Jurisdictional Registrar of Companies  
Registrar of Companies  
Central Registration Centre

Disclaimer: This certificate only evidences incorporation of the company on the basis of documents and declarations of the applicant(s). This certificate is neither a license nor permission to conduct business or solicit deposits or funds from public. Permission of sector regulator is necessary wherever required. Registration status and other details of the company can be verified on [www.mca.gov.in](http://www.mca.gov.in)

## Animal Husbandry-SLD (SDG 2/2.5)

The less rainfall and high saline ground water kept agriculture practices in threaten situation. Adani foundation have started various intervention for the Holistic development of Agriculture and Animal Husbandry

### Fodder support

In 20 villages of Mundra and Anjar Block. 6.70 lacs kg Dry Fodder and 11.60 lacs kg Green fodder has been supported.

**95 Farmers** benefitted with NB -20 Off suite to bring fodder sustainability.

**125** farmers are supported with 40KG maize per farmer with Micronutrient for **Individual Fodder Cultivation** during winter Season.



Sr. No	Village Name	No of Farmers	Average Production	Average rate	Average Value
1	Zarpara	64	4562.26	2.5	7,29,961
2	Navinal	23	3973.91	2.5	2,28,499
3	Siracha	35	3910.28	2.5	3,42,149
4	Desalpar	3	3733.33	2.5	27,999

### Fodder Cultivation

Village Gauchar land development for the fodder cultivation to made fodder sustain village & Avail green fodder in scarcity phase.

With the support of Gauchar Seva Samiti Grass land development in Siracha-85 Acre & Zarpara -25 Acre done which resulted in total production 82 ton.



## Animal Husbandry-SLD (SDG 2/2.5)

### Bovine brucellosis

Bovine brucellosis is chronic factious cattle disease that causes abortion, dead & weak birth of calves, and infertility which reduced milk production and ill effect on health as well. Cattle and buffaloes are susceptible and persist for many years. It's a zoonotic disease (that can be transmitted from animals to people)

Brucellosis disease Control and management project has been started in our 11 Villages with **(National Dairy Development Board and KFFFDK(Kutch fodder fruit & forest development trust)** is ongoing with awareness & vaccination to (0 to 3 yrs female cattle).

#### **Total 2132 Cattles have been vaccinated**

Under this project following activities were carried out so far,

- Meeting with Gram Panchyat, Farmers and Livestock Owners
- Development and Distribution of the Awareness Materials among the stakeholders
- Mass Level awareness by pasting the poster and meetings with Village Leaders and Gram Panchyats
- Primary Survey and Sample Collections i.e. Milk Ring Test, Blood Collection and testing
- Brucella Vaccination and Ear Tagging etc.
- Expense per Animal = Rs. 177 / Cattle – including awareness and vaccination





# Women Empowerment (SDG 5/5.4)

Today entire world is nothing against the corona pandemic ...not only India but all the nations world wide are striving hard to fight against this and come out of it at earliest . The situation lies in invisibility and severity of the causative agent . It is generally observed that the newly discover diseases are such which could be avoided by being more cautions.

Adani foundation works hard for upliftment of women, it has noteworthy history of completing and executing projects addressing issues like educations, health and empowerment from grass root level in Kutch district many project are done for females by various organizations but there are certain issue specially pertaining to women 's health which are still remaining unaddressed due to the social stigma and hesitations issues' like usage and importance of sanitary pad during menstrual cycle to protect oneself from fatal disease . This simple precautions can also help a female to fight against cervical cancers like

disease as well. Keeping this thought in 8<sup>th</sup> March 2020 Adani foundation held a seminar on awareness during menstrual cycle -Myth and facts . The seminar witnessed 300-400 Participants including women college going girl ,homemakers etc.. This initiatives helped the females to voice out their quarries and problems and to get a solutions for the unusual problems. District Development officer was the part of the seminar.

District development officer of kutch shri Prabhav Joshi was highly impressed with the task been undertaken for women empowerment and the motivated for production of sanitary pads to the women of adani foundation . This task was very planned and executed by the enthusiastic women group – it was a great journey towards success”

Initially the works seemed toughed as the outcome /day was 150-200 pads with minimum profits . Bit real salute this women that they did not lose hope and tirelessly kept working for this

mission . It is rightly said “practice make a men perfect and the graph of producing the pads per day rose from 300 to 350 and further elevated to 400 to 500 by proper distribution of work with strict target . Simultaneously the order started pouring in from District were satisfactorily completed . Today each woman is earning average 2900 Rupees /Month ,expansion of this task is being planned by Marketing it to every small and making it a sustainable model which may be a benchmark in itself.

The spirit hard work and motivations of these women have given a way to increase in demand from district development office ,PHC,CHC office Aganvadi and even out of state orders will be very soon catered to.

This is an example showcasing how women empowering can bring about development of as small scale task to a full- fledged Endeavour.

## Women Empowerment (SDG 5/5.4)

Empowered women and girls contribute to the health and productivity of their families, communities, and countries, creating a ripple effect that benefits everyone.

An initiative under the Sustainable Livelihoods Development Program to encourage women, sense of self-worth, decision-making power, access to opportunities and resources, power and control over her own life ability to be effect change.

11 SGH Group have been engaged with 127 Women



**Saheli Swa Sahay Juth** are trained for Sanitary pad preparation and supported with semi Automatic sanitary pad making unit. In the year of 20-21 total turn over was Rs.3.12 Lacs

## Self Help Groups

**Adhar Saheli Swa Sahay Juth** is engaged making dry nasta preparation got Fssai Certificate in current March which will help to market the products

**Sonal Saheli Swa Sahay Juth** is engaged in Phynale & Washing powder making its Current year turn over was Rs.4.50 Lacs

**Tejasvi Saheli Swa Sahay Juth-** is expert in Stitching practices & made approx. Ninty thousand Three layer mask which had generate Rs.9.45 lacs revenue over 10 Women.



Sr. No.	Name of Group	Village	Skilled	Member	Total saving (In Rs)
1	Sonal Saheli Swa Sahay Juth	Shekhadiya	Phynale & Washing Powder	11	1,32,500
2	Jay Adhar Saheli Swa Sahay Juth	Baroi	Dry Snake	10	84,000
3	Tejasvi Saheli Swa Sahay Juth	Mundra	Stiching,Uniform,Bag	14	84,000
4	Umang Saheli Swa Sahay Juth	Mundra	Soft toyes, Jula,	11	84,000
5	Vishvas Saheli Swa Sahay Juth	Navinal	Tie & Die, Stiching	11	84,000
6	Jay Momay Saheli Swa Sahay Juth	Kandagara	Tie & Die, Stiching	10	84,000
7	Meghadhanush Saheli Swa Sahay Juth	Mudara	Mud Works,	10	84,000
8	Saheli Swa Sahay Juth	Mundara	Sanitary Ped	11	84,000
9	Radhe Saheli Swa Sahay Juth	Zarapara	Dhadaki, Small Godadi	14	84,000
10	Shrddha Saheli Swa Sahay Juth	Mota Kapaya	Snacks,Thepala,Vada Pav	15	84,000
11	Mogal Saheli Swa Sahay Juth	Shekhadiya	Roti,Ladu ( Churama )	10	84,000
Total				127	9,72,500



# Community Infrastructure Development (SDG 9,6)

Community infrastructure development includes both public and privately provided facilities and services required to accommodate and support community services, programs, activities, which is significant to improve their quality of life & Productivity. Adani foundation designed and build various structure and provide service in the Health ,Education, agriculture and sustainable livelihood area.



## Community Infrastructure Development (SDG 9,6)

To store rainfall water and increase water level, Pond Bund strengthening work had been carried out at Zarpara Village apart from this various activity like approach Road Restoration at All Fisherfolk Vasahat, Bus Stand with wall Construction, Open Shed Sukhpurvah Mundra, Shelter at Randh Bandar , Garden Development Primary School Rampar village has been done in this year.





# SuPoshan (SDG 3/3.8)

The objective of the Project is to reduce occurrence of malnutrition and anemia. create awareness about malnutrition and anemia and related factors amongst all stakeholders and role they may play in curbing the issue.

To successful implementation of the project, "Sangini – Village Health Volunteer" plays major role in the Project. The purpose of the Project is to reduce occurrence of malnutrition and anemia. create awareness about malnutrition and anemia and related factors amongst all stakeholders and role they may play in curbing the issue.

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As per Global Nutrition Report, Children below five years- 23 % Stunted and 8 % are wasted. 69.5 % children 6-59 months old, 55.8% adolescent girls aged 15-18 years, 55.3% women aged 15-49 years have Anaemia. Moreover anaemia prevalence in pregnant women is as high as 58.7 %) Curbing Malnutrition was part of Millennium Development Goals and again focussed through second and third Sustainable Development Goals on Zero hunger and Good Health & Wellbeing respectively.



During the year various activity like, Covid-19 awareness in village & Slum Area, Menstrual Hygiene Day, Breastfeeding Week, National Deworming Day, National Nutrition Month had been celebrated.

With slogan of "RED-ACHHA HAI" - 100 beneficiaries in Menstrual Hygiene Day, 204 beneficiaries in Breastfeeding Week, 320 beneficiaries in National Deworming Day, 20 villages covered in celebration of NATIONAL NUTRITION MONTH and 42 Family counselling had been done.



Community Engagement and other Activities		
Sr.No	Activity	Total
1	No of Sangini	24
2	Total Village Cover	41
3	Total Anganwadi Cover	70
4	SAM to MAM Monitoring Progress	03
5	MAM to Normal Monitoring Progress	15
6	Focus Group Discussion	85
7	Family Based Counselling	42
8	Village level Events	05
9	No of SAM children referred to CMTC	06
10	Total Anthropometric screening	140
11	Total Family Cover through video & Audio Calling	20
12	Total House Hold Family Visit	130
13	No. of Severe Acute Malnourished children (SAM) Telephonic Counselling	08
14	No. of Severe Underweight children (SUW) Telephonic Counselling	03
15	No. of adolescent girls-Telephonic Counselling	190
16	No. of pregnant women-Telephonic Counselling	100
17	No. of lactating mothers-Telephonic Counselling	230
18	No IFA Tablet Distribution to adolescent girls	200
19	Total Family Cover	9178
20	No of Sangini completed online POSHAN Abhiyan E- Learning module	15

## THANKS GIVING PROGRAMME” MUNDRA & BITTA Site

SuPoshan Thanksgiving program was organized. In this webinar DDO, CDPO Mundra and other dignitaries remained present and appreciated the efforts to overcome malnourishment in Mundra and Bitta.



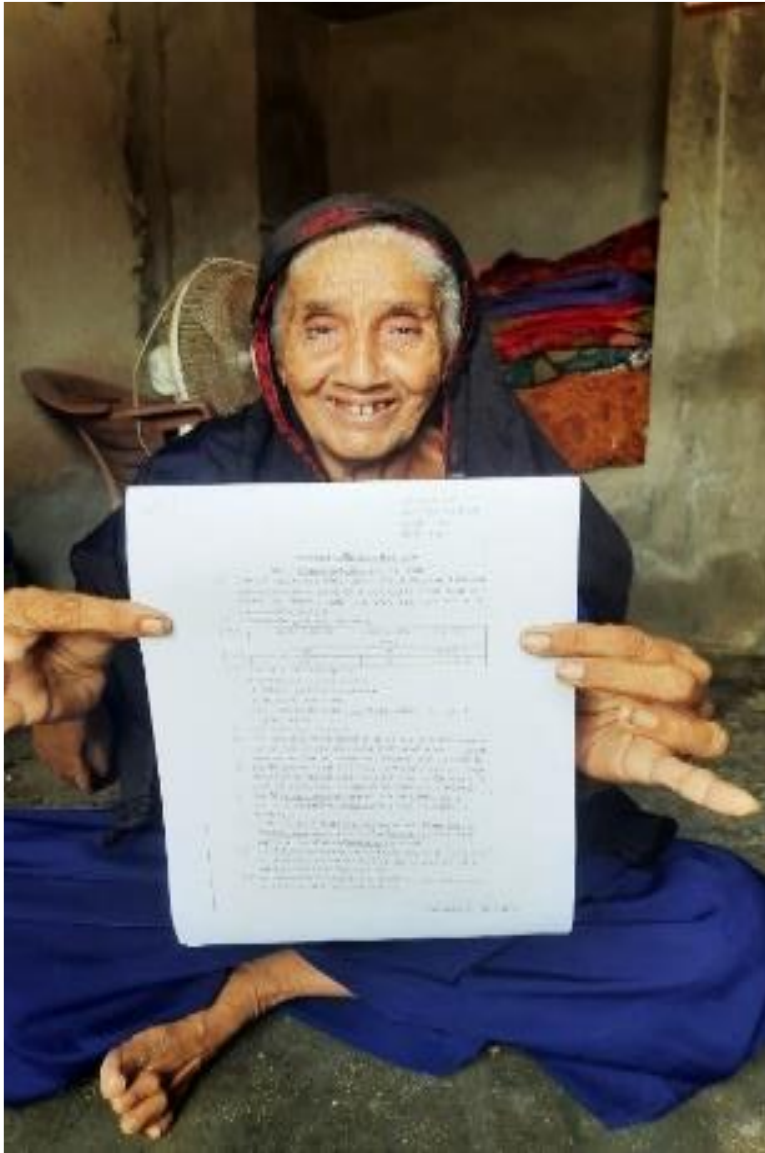
# Community Resource Center (SDG 3)

Community resource center is the bridge between Government Schemes and real Beneficiaries. It is situated at Adani Field Office, Baroi with the motive to be Single window point solution (Online Application & Documentation) to Facilitate Government Schemes leveraged to needy and Eligible people.

- ✓ Listed out the Widow ,Senior Citizens ,Handicapped & Orphan Child from seven Utthan villages and linkages accordingly with the Social Defense Department Scheme,. 276 people are Facilitated in coordination with Bhuj Samaj Suraksha Khata.
- ✓ With a slogan "Beti Bachavo – Beti Padhavo" to ensure better future for Girl child education by Linking 1001 Girl child with Government "Sukanya Samrudhhi Yojna" & Vahali Dikri Yojna.
- ✓ 48 SC Farmers were Linked Kitchen Garden Scheme.
- ✓ To avail Fishermen Government scheme (Fishermen Credit card) one day program was arranged with social distancing and all precaution.
- ✓ 30 KCC form fill-up at Navinal. Created awareness with Telephonic about same



## Project Swavlamban



Project Swavlamban Launched for linkages of differently abled people of Kutchh District to Social Welfare Department. Foundation is playing supporting role to increase awareness and tie up with Government schemes for Divyang people, widows and senior citizens and coordinate them with Social Welfare Department.

The identity cards - UDID are issued for the handicapped in coordination with Bhuj Samaj Suraksha Khata which is beneficial for them to get specific kit for their disability type.

After getting income generation equipment support - Proper training provision is given to make them self-reliant in true sense!!

**Till date Total 1057 beneficiaries have been linked up with various government schemes and 519 beneficiaries have been supported through various schemes of income generation.**



# Project Swavlamban

**Total 1576 beneficiaries have been benefited and get support of Rs.24,12,550/- through Government and Adani Foundation.**

No	Government Schemes	Beneficiaries	Per / Month	Total Amount	Government Scheme	Beneficiaries	Amount	Total Amount	Details	Beneficiaries	Amount	Total Amount
1	Widow women	237	1250	296250	Artificially foots	14	15000	210000	Cabin	6	15000	90000
2	Senior citizen	94	750	70500	Artificially Hand	1	5000	5000	Fridge	1	18000	18000
3	Sankat Mochan (One Time)	2	40000	40000	Blind satick	7	200	1400	Fruit Shop	2	8000	16000
4	Widows Ration card Renewal	13	0	0	Bycycle	9	4500	40500	Grocery Shop Item	5	5000	25000
5	Diviyang Pension Scheme	5	1000	5000	Crutches	4	200	800	Hand Cart	3	9000	27000
7	Palak Mata Pita Pension	9	3000	27000	Hand cart	4	5000	20000	Harmonium	1	10000	10000
					Hearing Aid	13	3000	39000	Rikshaw	1	80000	80000
					M.R kit	20	500	10000	Sewing Machine	27	5500	148500
					music	1	500	500	Tricycle	44	6800	299200
					RTE Admission	1		0	Wheelchair	60	4000	240000
					Sewing Machine	30	5000	150000	Lims	9	14000	126000
					Tricycle	43	6500	279500				
					Walker	3	1000	3000				
					walking satick	12	200	2400				
					Wheelchair	33	4000	132000				
					Bus pass	427		0				
					Rasion card renew	13		0				
					Medical certi	422		0				
					Total	1057		894100				
	Total	360	-	438750					Total	159		1079700

# Adani Skill Development Centre



India has highest population of the youth yet there has always been a major issue of increasing unemployment on one side and non-availability of skilled professionals for industries.

Adani Group has initiated Adani Skill Development Center model with broad and long term vision to enhance employability of youth and getting right people at the right place of skilled requirement.

Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state. ASDC is envisioned to be playing a major role in elevating the socio-economic status of the people belonging to the lowest strata of the society by empowering them with various skill development training for employability and livelihood.

Over the last few years, ASDC has assessed various aspects of the technical, leadership, and soft skills gaps that organizations, in general, face and accordingly, focuses on imparting required training in those areas in partnership with various colleges and institutes.

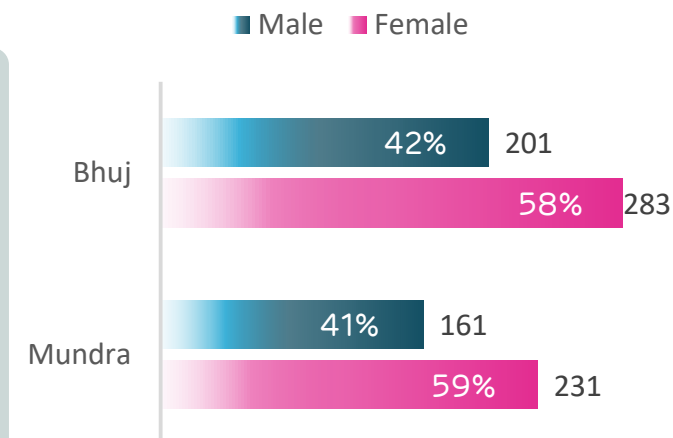
Several miscellaneous industries exist in Kutch district. Adani Skill Development Centre has started a center in Mundra and Bhuj block so that the needs of these industries are fulfilled.

## Admission for the F.Y. of 2020-21

### Bhuj

Free Training Model  
Paid Training Model  
Kachchh University

General Duty Assistant	Basic Functional English	Digital Literacy	Entrepreneurship Skills	Financial Literacy	Mud Work	GST with Tally
0	185	25	0	0	0	40
140	3	47	1	2	4	18
0	0	2	0	5	0	12



### Mundra

Free Training Model  
Paid Training Model

Basic Functional English	Basic Home Health Care	Beauty Therapist	Business Training (MS-Office)	Digital Literacy	Financial Literacy	General Duty Assistant	Marketing Skill	Mud Work	Non Domain Skills	GST with Tally	Training Skill
43	12	00	66	57	07	04	11	00	03	00	15
07	00	56	00	20	00	13	00	73	00	05	00



## Placement Details

ASDC imparted various soft skilled and technical training to make Atma Nirbhar India.

Total 47 youth have been placed in various company and 37 youth are been self employed.

### Bhuj

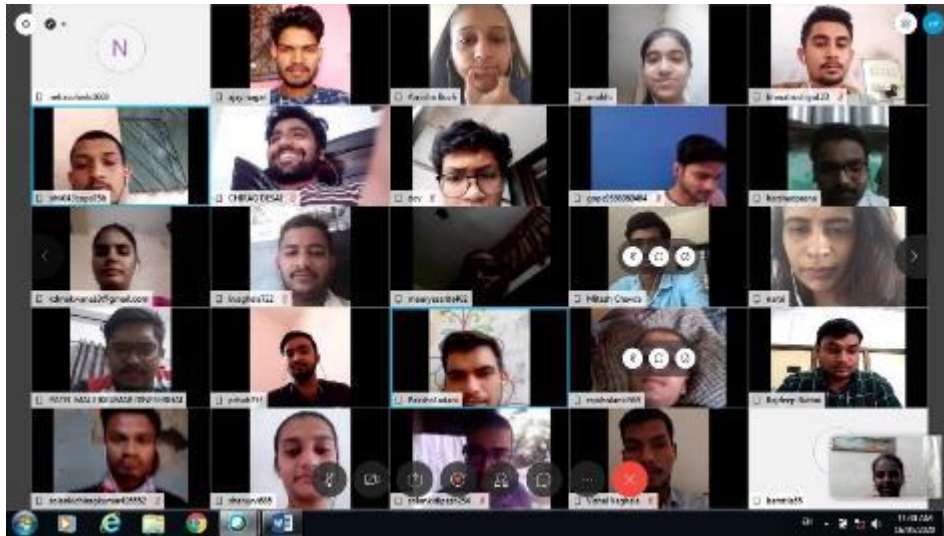
Trade	Total Trained
General Duty Assistant	51
Basic Functional English	79
Digital Literacy	61
Entrepreneurship Skills	1
Financial Literacy	2
Mud Work	4
GST with Tally	16
<b>Total</b>	<b>214</b>

### Mundra

Trade	Total Trained
Basic Functional English	50
Basic Home Health Care	12
Beauty Therapist	52
Business Training (MS-Office)	66
Digital Literacy	77
Financial Literacy	7
General Duty Assistant	13
GST with TALLY	9
Marketing Skill	11
Mud Work	73
Non Domain Skills	3
Pedicurist and Manicurist	4
Training Skill	15
<b>TOTAL</b>	<b>392</b>



## E-Learning Training at Bhuj



In this type of pandemic we have started virtually training on various trades like General Duty Assistant, Digital Literacy, GST with Tally, Basic Functional English etc. On Saksham Day we started E-learning training of Digital Literacy & Basic Functional English on free bases.

Till date we admitted 221 candidates in domain courses and 263 candidates in non-domain courses.

Now we started offline training with following all Covid-19 related guidelines.



The students of DDU-GKY (GDA) creating awareness regarding Covid-19 in their own village through various activity



Meeting at Palara Jail and after that meeting we did skill survey of around 150 prisoners.



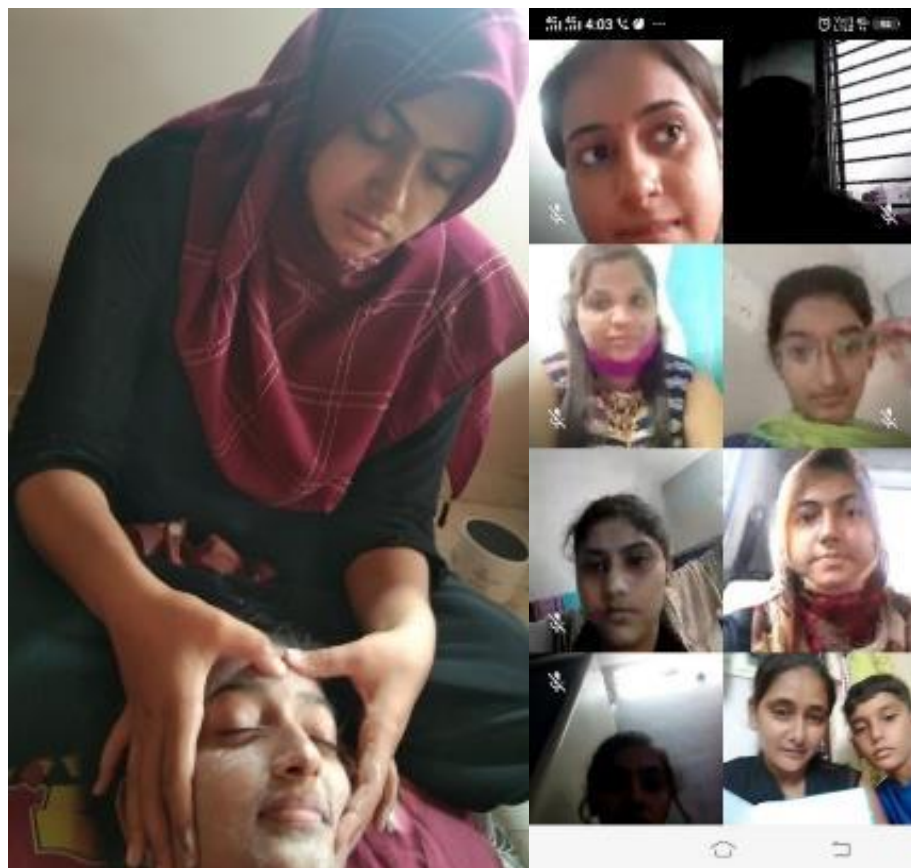
MoU signing ceremony was arranged by **Krantiguru Shyamji Krishna Verma Kachchh University** on 11<sup>th</sup> January, 2021. In this project we will provide training in 4 courses (General Duty Assistant, Digital Literacy, GST with Tally & Financial Literacy).

MoU signing ceremony was arranged by **The Takshshila Educational & Charitable Trust - Bhuj** on 06<sup>th</sup> March, 2021. In this project we will provide training in 7 courses (Entrepreneurship skills, Non Domain employability skills, Diet & Nutrition, First aid, Digital Literacy, GST with Tally & Financial Literacy).



Arranged interview of DDU-GKY GDA students at Sterling Hospital – Gandhidham, GAIMS (Sodexo), Chanakya College, Accord Hospital, Fire Academy. 39 students get placement in GAIMS (sodexo), Alilance Hospital, Shreeji Hospital, Bhuj Fire Academy, Divine Hospital etc. 3 students are working in COVID-19 Hospital





online beauty therapist course has been conducted by  
ASDC Mundra



Online mudwork training has been organized by ASDC Mundra,  
after training 28 students became self employed.

## Soft skill training for Fishermen youth & Industrial Employer meet



Organized industrial employer meet at Adani House with support by Adani foundation team. And conformed Vacancy details in respective Company. After that ASDC mundra team and Adani foundation jointly given 3 days soft skill training for Fisherman youth. The main objective of this training are to provide alternate livelihood to Fisherman community group specially those youth who are 10th -12th, ITI, diploma and graduates.

# CSR Nakhatrana



Adani Green Energy(MP) (AGEMPL) set –up approx. 1250 windmill from Dayapar to Nakhtrana in Kutch (Gujarat). And as the part of our corporate social responsibility adani foundation have started various intervention for the holistic development of community since 2019 in the Ratalita , Amara, Deshalpar ,Jinjay, Dhamay & Ugedi Villages with Community Involvement by means Participatory Rural appraisal (PRA), and VDC (Unnati manch) formation to identified real need and extended our arm to render Education , Health , Livelihood and community infrastructure facilities.



**Water through construction** with 10 KL capacity in the barred land to avail drinking water for domestic cattle and wild animal at Ugedi & Deshkapar Villages.

**Urinary Block Construction** in the Ugedi village to keep Swachh Villages swachh and to provide privacy for women

**Swachh Village** Cleanliness is the beauty of village and to inculcate the habit to keep villages swachh and clean. 100 Dustbin were provided to 8 Villages of Nakhtrana which are been kept at Public places and maintain and monitoring by GP

**Sitting arrangement** with Benches and tree plantation around the cricket ground of Kotda madh villag with tree Guard.

**Uakdo distribution** it is been said that Prevention is the better than care hence to mitigate the ill effect of covid-19 we organized Ayurvedic Kwadh & Immunity booster medicines distribution camp in the Nakhtrana city. And aware to take precautionary care.

Adani Foundation Kutch

Total 500 people were benifitted with the same.

#### Event

- **World Environment Day Celebration** on 5<sup>th</sup> June and **Van Mahotsav week celebration** in Ugedi village with awareness and tree planation Program.
- **Women day celebration** on 8th march with Collaboration of ICDS Department in the Ugedi Village . On this occasion Elocution competition were held on the topic of women empowerment and women right among primary students and winner were felicitated with memento prize. More than 60 Women were remain present and motivated and Encouraged .
- **Tree Plantation** have been done in the Ratadiya and Deshalpar villages with tree guard with sensitization about the important of trees and responsibility for watering and caring of trees.

**Lakhpat** : Tree plantation with awareness at Kapurashi & Koriyani village of Lakhpat Taluka. Adani Foundation had also provided 150 cages.



# CSR Nakhatrana

## Setu

we are acting as the bridge between Beneficiaries and Government to facilitate government welfare scheme. due to this effort 82 widow women are getting widow pension of rs.1250 per month which is worth for them.

## Swavlamban

Adani foundation provide tool & Kits support to Physically disable person the main objective of the program is to made them self sustain and "Atma Nirbhar" We are supporting various Tool & Kits to various Villages

Swavlamban Support To Disable Person								
Sr. No	Village Name	Sewing Machine	Cabin Shop	Flour Mill	Wheel chair	Trycycle	Hand Cart	Total
1	Dahmay	1						1
2	Aamara	4		1			1	6
3	Jinjay	2		1	1			4
4	Deshalpar	1	1					2
5	Ugedi	1	3		1	1	1	7
6	Ratadiya		3					3
Total		9	7	2	2	1	2	23

Sr. No	Scheme	Beneficiaries
1	Widow Pension	82
2	Bus pass	5
3	Wheel Cahir	2
4	Panchar Kit	1
Total		91





## CSR Nakhtrana

Semi arid climate with very scanty rain fall does not support extensive and water intensive agriculture in the nakhtrana region

more ever Farmer are not aware about modern agri technology adani foundation have started some intervention for the integrated agriculture development .

### Kitchen Garden Kit

To promote the horticulture farming practices farmers are provided with Kitchen garden kit with twelve type if Vegetables , fertilizers and plastic carret.

**Promote for Vegetable farming** with structure support i.E Bamboo ,wire and cement Pole support to set up structure for vegetable support and grow.

Sr.	Village Name	Kitchen Garden Farmers	Vela Vala Farming
1	Ugedi	8	3
2	Ratadiya	8	
3	Aamara	7	
4	Deshalpar	10	2
5	Jinjay	7	
<b>Total</b>		<b>40</b>	<b>5</b>

### Organic Farming training

To aware about the ill Effect of pesticides and chemical fertilizer in farming and promote toward organic farming training was organized at Deshalpar with hand on training for Jivamrut preparation.Total 38 Farmers were participated

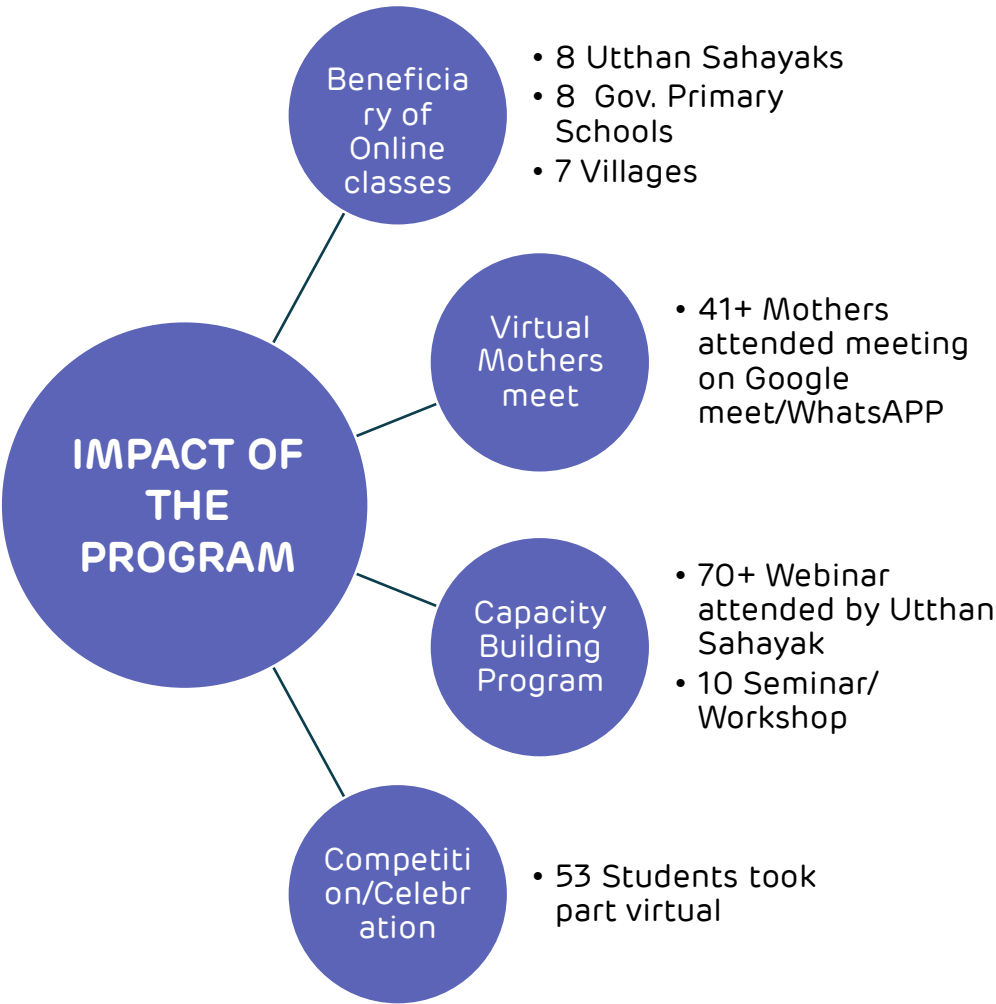
**Modified Dev-6 wheat seed Distribution** to two farmer of Deshalpar and Ugedi Village as demonstration which resulted that it produce High yield with less irrigation comparatively.





# Utthan Nakhtrana

Large-scale efforts have been made by the government and non-government sectors, especially in rural government primary schools, but coverage and quality of education are still not satisfactory. Adani Foundation leveraging their experience, to intervene in Government Schools. These interventions will aim to enhance the quality of primary education in Government schools. Under Project UTTHAN 8 primary government schools of Nakhtrana Taluka of Kutch district have been adopted to take up various initiatives aimed to improving quality of education these schools. Total 234 priya vidyarthi are benefiting from a meaningful education in these schools. .



Year	No's of School	No's of village	No's of Girl	No's of Boys	Total
2019-20	8	7	560	590	1150
2020-21	8	7	593	570	1163







## CSR Nakhtrana

Environment and bio diversity conservation is always been the prime responsibility of adani Foundation. with this objective we started such work in Ugedi village near Nakhtana to develop Ecological green belt to attract major faunal group such as amphibians, reptiles, birds ,butterflies and mammals and restoration of native vegetation to improve overall ecological food web of landscape.

This work has been entrusted to Sahajivan, an expert organization for the protection and conservation of biodiversity as part of which following work have been carried out.

- BMC –Bio diversity conservation committee has been formed in Ugedi Village.
- Habitation Improvement by removed "***PROSOPIS JULIFLORA***"- **Ganda Bavar** from 8-10 hectare and native tress seed has been sprinkled As well as in the garden of Ugedi village and in the place of Angalwadi, trees have been planted.Also,in the seam land seam area of Ugedi village, more than 300 native trees have been planted like Desi baval (*Acacia nilotica*), Mithi Jar (*Salvadora oleoides*), Liyar (*Cordia sp.*) and Gugal (*Commiphora wightii*) Pilu, Khejari, have been planted.
- Improvement of Catchment : approx. 750 cubic meter excavation and embankment in sloping ground to increase catchment area of open pond to support existing Vegetation and other Biodiversity
- Three species **1. Bird - Peacock 2. reptile-Spiny tailed lizard 3. mammal-Chinkara** are selected for Conservation
- Started awareness program with pamphlet, Leaflet and IEC Material distribution in the Villages and School to sensitize about their important to maintain ecosystem and Bio diversity.







ગુજરાતી નામ : મોર

અંગ્રેજી નામ : Peacock

વૈજ્ઞાનિક નામ : *Pavo cristatus*

**સાતો મોરને જાણીએ અને તેને બચાવવામાં યોગદાન આપીએ...**

- આપણું રાષ્ટ્રીય પક્ષી મોર શ્રાવ્યકુશ પક્ષી છે તેથી તે કમળમાં હોવાનું પસંદ કરે છે.
- સામાન્ય રીતે તે જંગલમાં રહે છે. તેને છુટા હવામાં, ખાલભર, હેજ વાળા, તથા સૂકા જંગલો પસંદ છે. તે ખોરાકની શોધમાં અવારનવાર ગામ, ખેતર-વાડી વિસ્તરમાં ફરે છે.
- શિકારી, પ્રાણીઓથી બચવા તરીકે દરમ્યાન તે મોટા વૃક્ષો જેવા ઊંચા રહેછાવનાં રહે છે.
- તેને ખોરાકમાં વિવિધતા પસંદ છે.વામી તે જીવજંતુઓ, ફુલો, ફળો, ગામડાં, દાણા, ફૂલ, ફળ, ગાંધા, સસ્તપાણીઓ અને સરેશુઓ વગેરેને ખોરાક તરીકે લેવાય છે.
- હિંદુ ધર્મમાં તેની કલિકાતનું ગાન, બૌદ્ધ ધર્મમાં મનુષ્યનું પ્રતિક તથા હરણા ધર્મમાં પદ્મ તેનું પ્રતિક ગણાય છે.
- દેવ જાતીના પંડિતો મુકે છે અને તેની હરતે ઝાડના પાન અને ડાહ્યાઓ, બી વાડ બનાવે છે. ઉનાચણ દેવ કાંટા ઉપર મુકે છે, અને મેઘ મંડિત, સુષીમાં એ હોય છે. બરમાં ઈંડા માંથી બહાર નિકળીને તરતજ તેની માતાનું અનુકરણ કરવા સમર્થ હોય છે, જ્યાં યાદ દોડા મહેલમાં મુકે, માતા તે બચાવેલીનું સ્વરૂપ છે તે બચાવેલા તરફ દોડે છે.

**તેને શાનો ભય છે?**

- મોરનો પીંછા, ખોરાક તથા દવાઓ બનાવવા, માટે શિકાર થાય છે.
- પાકને બચાવવા ખેતરોમાં હેરી દવાઓના છંદકાવથી તેનું મૃત્યુનું પ્રમાણ વધે છે.
- જંગલોના વનસ્પતિ ગાંધા કાપી પેરના ફુલો, શિવાસસ્થાનોની વાડ શવાથી તે માનવ મનુષ્યની નજીકનાં રહે છે તેથી જંગલોની પડ શિકાર મને છે.
- જંગલોમાં નિર્જાતિના તારા પર મેળવાતી વિદ્યુતના ચોક લગાવવાના પરિણામો અને પવનવર્ધકને કારણે પાક નુકસી લીધાય છે.

**સંરક્ષણ માટે શું કરી શકાય?**

- તેના ફુલો, શિવાસસ્થાનો જેમકે જંગલોનો નાશ, ખોટા વૃક્ષોની નાશ થતી અટકાવવી.
- ખેતરોમાં હેરી દવાઓની છંદકાવ કરવાનું કાપીએ...અને કરીએ દેહી જીવત ખેતી અપનાવીએ.
- આપણા રાષ્ટ્રીય પક્ષીનો ખોરજસાથેમ રીતે શિકાર કરી શકાય તે નજીકના વન વિભાગને કે આપણા ગામની બી.એમ.સી.જી.કે. સિવિલના તથાવાજાન સમિતિ ને જાણ કરીએ.

અમારીસહાય

કોઈ સેવિક વિદિયા અપનાવના સમિતિ  
ગ્રામ પંચાયત, કોઈ, તા. નવમથા-કાંઠા

આદાની સહયોગ

adani  
અદાની



ગુજરાતી નામ : સંકો

અંગ્રેજી નામ : Spiny-tailed Lizard

વૈજ્ઞાનિક નામ : *Sceloporus hispidus*

**પર્યાન**

હાથી સામાન્ય રીતે રૂષ્ક તેમજ અર્ધરૂષ્ક પ્રદેશમાં જોવા મળે છે. દુનિયામાં તે ભારત, પાકિસ્તાન તેમજ અફઘાનિસ્તાન, ખીરા મળે છે અને ભારતમાં તે ગુજરાત, ગજરાત, બેનર પ્રદેશ તેમજ મહેસાણાના વિસ્તાર વિસ્તરમાં જોવા મળે છે. ગોળા મળે છે. ગોળાથી જાળવેલે તથા પૂરે જવી પરિસ્થિતિથી બચવા માટે તે પોતાનું દર વેચાણ વાળા વિસ્તારમાં બનાવેલું પસંદ કરે છે. તથા મોઝાની શોધ માટે માં પોતાના દરથી તથા ફરતી જતી. ગોળામાં રહેવામાં માં પોતાનું દર બેંકરો બેંક કરી, રીત કમ, પિમાં ઘણી જાય છે અને ઘણીમાં સંગ્રહ કરેલા ખોરાકની માદાથી જનીનામાં રહે છે.

**ગેટ માન્યતા અને અંદાશદાડા (જેને દૂર ભવી જણી છે...)**

- આ તથા સાંધાના દુખવામાં સાહજી તેલ લગાવવાથી દુખાવી મળે છે. તેજ તેલથી પીડાયેલ વધે છે.
- સાંકો જોરને બચાવવાથી તેની શક્તિ વધે છે.
- અમાન જુવાનો ભલે સોફે કામિક સિધ્ધિમાં કિયોતીન કરવો.

**ભય**

- આપણા ઘરા પેલી તથા અન્ય વ્યવસાય માટે દબાવે કરી તેના ફુલો, શિવાસસ્થાન પર મૃત્યુ નુકસાન.
- ખોરાક તથા અંદાશદાડા માટે ગેરજાતી રીતે જતો શિકાર.
- ગાંધીયા જામીનીમાં જતુ બાવેલ.
- ખાણીમાં આવાન-અવાન અને ઘોળાઓમાં કાંટા ફેરવેલ.

**સંરક્ષણ માટે આટલું કરીએ**

- સાંકો અસ્તિત્વ આપણા પર્થીવરક માટે ખૂબ જરૂરી છે તેથી દેશ તથા વિશ્વ સ્તરે તેના સંરક્ષણ માટે કચડા પ્રયાતમાં આવેલ છે. ભારતમાં સાંકોને વન્યજીવ સંરક્ષણ કાયદેનિયમ નજીક અંતર્ગત અનુસૂચિત માં આવા આમ અંગ્રહિત કરેલ છે.
- સાંકોનો શિકાર કરવો, વેચાર કરવો, ગાંધીયા કરવો કે કીડીયા રીતે તેના ફુલોની નિવાસસ્થાન ને નુકસાન કરવું એ બેંક ગણીત જુનો બને છે. આવી કરનાર વ્યક્તિને બચાવ સનુક પર કાયદેસરના પગલા લેવામાં આવે છે.
- તમારી અટકાવ ના વિસ્તારમાં આવી પુનર્ગતી કરી શકાય નજીકના અમારોગ પોલીસ સ્ટેશન, સામુદાયિક વન વ્યવસ્થાપન સમિતિ (OCFMC) અથવા સંસ્થાને સંપર્ક કરવો.

અમારીસહાય

કોઈ સેવિક વિદિયા અપનાવના સમિતિ  
ગ્રામ પંચાયત, કોઈ, તા. નવમથા-કાંઠા

આદાની સહયોગ

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ગુજરાતી નામ : હચક

અંગ્રેજી નામ : Chinkara

વૈજ્ઞાનિક નામ : *Gazella bennettii*

**પર્યાન**

શિકાર સામાન્ય રીતે પશ્ચિમ મેદાન, રણ, તથા શુષ્ક અને અર્ધ શુષ્ક વિસ્તારમાં જોવા મળે છે. ભારતમાં તે ૧૧ રાજ્યોમાં મોખાયેલ છે. ગુજરાત તથા મહારાષ્ટ્રમાં તેમાં માટે સ્થિત વિસ્તાર જાહેર કરવામાં આવેલ છે. જેમાં ગુજરાતમાં કલ્યાણ અર્થેલ નાકચાકતેવર વન્યજીવ પક્ષચાકલ એ વિશ્વમાં માટે સ્થિત વિસ્તાર જાહેર કરવામાં આવેલ છે. ગોળા, ગોળામાં જોવા મળેલ દેશીબચા, પીંડુ, ગોળા, પીંડુની જેવા વન્યજીવે આકાશીત વિસ્તારમાં વધારે રહેવાનું પસંદ કરે છે.

**ભય**

- તેના પક્ષીસરના મા ભય અનુસાર પોતાની પુંછડી કાપી છે અને આગળના બે પગ જામીલ પર પાડે છે.
- પોતાના બાક વધે મુખ જોરથી હવા બહાર કાઢી કીડી જેવો અવાજ કરતું હોવાથી તેનું નામ કીડાર/ચિંકાર પડ્યું છે.
- ગુજરાતી નિવાસસ્થાન પર ઘણું નુકસાન, તેમજ નુની રીતે થતી શિકાર,કેબનિક ઝાડી વૃક્ષોનું હેનું નિકેલ અને આકાશ અનુજામીને નુકસાન તેના કાવળા કારણે છે.
- સ્થાનિક લોકો આ પ્રાણીના મદ્યક અને કીડારના યાત્રીમાં જુવા પાણીની જાગીતો અટકાવ પગાડવાનું કારણ છે.

**સંરક્ષણ માટે આટલું કરીએ**

- ચિંકારાનું અસ્તિત્વ આપણા પર્થીવરક માટે તથા ફુલોની આધાર મુખસાના નિભાવ માટે ખૂબ જરૂરી છે, તેથી દેશ તથા વિશ્વ સ્તરે તેના સંરક્ષણ માટે કચડા પ્રયાતમાં આવેલ છે.
- ભારતમાં ચિંકારાને વન્યજીવ સંરક્ષણ અધિનિયમ નજીક અંતર્ગત અનુસૂચિ ૧ મા અવા આવી સંરક્ષિત કરેલ છે.
- ચિંકારા નો શિકાર કરવો, તેને પેરશાન કરવો કે કીડીયા રીતે તેના ફુલોની નિવાસસ્થાન ને નુકસાન કરવું એ બેંક ગણીત પકારની ગુનો બને છે. આવી કરનાર વ્યક્તિને બચાવ સનુક પર કાયદેસરના પગલા લેવામાં આવે છે.
- તમારી અટકાવ ના વિસ્તારમાં આવી પુનર્ગતી કરી શકાય નજીકના અમારોગ પોલીસ સ્ટેશન, સામુદાયિક વન વ્યવસ્થાપન સમિતિ (OCFMC) અથવા સંસ્થાને સંપર્ક કરવો.

અમારીસહાય

કોઈ સેવિક વિદિયા અપનાવના સમિતિ  
ગ્રામ પંચાયત, કોઈ, તા. નવમથા-કાંઠા

આદાની સહયોગ

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# CSR Tuna



Adani Kandla Bulk Terminal Pvt. Ltd. is joint venture of Adani Ports and SEZ Limited as well as Kandla Port. There are three Villages & Two Fishermen Vasahat where Adani Foundation Doing various CSR activities in the Education, Health , SLD and Community Infrastructure area. Adani Foundation are running Rural Clinics in 3 villages on regular basis and supporting the villages in water storage and distribution networks. Current year supported for Drainage network for Tuna and Wandi as per MOU between Pandit Dindayal Trust and Adani Foundation

## Drainage work

As per MOU between Dindayal Port Trust and Adani Foundation – Contribution of Rs. 40 Lacs for Drainage Facility Provision in Tuna and Wandri Village was taken up and work will be completed upto June 2021

## Water facility

To reduce water born disease, we are providing portable drinking water facility at Dhavalvaro bandar and Vira bandar.

## Ration kit support

During covid -19 pandemic & lock down directly and adversely affect over Poor and vulnerable families whose are sustain daily wages work. We Distributed Ration kit to those people with aware to take precautionary measures as well. Total 1100 Ration Kits were distributed to Tuna Rampar and Vandi Villages

## Tree plantation

Tree plantation has been carried out at Tuna, Vandi & Rampar village and

Garden development work has been done at Rampar primary school which would create healthy environment and entertainment over students.

## Fodder support

in Rampar and Tuna village 47950kg dry fodder and 335730kg fodder has been supported during this year.

## Rural Clinics

Rural Clinics 2 hours per day are operated by Adani Foundation to ensure primary health at door step. Total OPD is @ 350 per month.





# CSR Bitta



Under Adani Solar Limited – 40 MW Solar Panel Power Unit is Situated at Bitta Village in Abdasa Taluka. We have done various activity under the CSR work.

As Abdasa is water scared region with list amount of rain Fodder support had been provided to 100 ton fodder to Bitta, Dhruvi and Moti Dhruvi villages.

Cleanliness of village Pond inlet in the Bita Village which lead more storage capacity and Village. Pond bunding construction in Dhufi village.

Cricket ground of bitta village has been upgraded and cricket kit provided to youth.

Panchayat Building construction was carried out by Adani Foundation's support and technical guidance.

Drainage line maintenance and Cleanliness is frequently done in Bita which lead Swachh Village

# EVP

## Employee Volunteering program

Since last few years adani group employees are adopting students of migrant labours. this year also all the 802 students of Vallabh vidhalaya were adopted. All this students are belongs to migrants labour families who are working in various industries in and around of Mundra. The students does not feet any difficulty of language because the vallabh vidhalaya is Hindi medium school.

On 1st may i.e. on the world labour day, all the cheques of rs.16.04 lacs had been handed over to Mr. Dharmendra who is the director of vallabh vidhalaya

Due to COVID-19, the 10th standards students of AVMB felt difficulties in study as they do not have any digital gadget for online learning. Our APSEZ Employee had been voluntary support to provide Lenova tablet to the AVMB Students.



# WORK DURING COVID-19

To fight against the COVID19, Adani foundation has stepped up to guard the health and well-being of rural communities, provide relief material to needy.

Chemical sanitization was carried in various villages of Mundra with the coordination of Fire Department APSEZ. With coordination of Port, Wilmar and Foundation free cost food facility (Breakfast, Lunch and Dinner) in port & SEZ premises and AWL area.

24

Sanitization work in villages

1900

Daily Food Facility (Breakfast, Lunch, Diner) for 1900 Labour per day

5500

ration kit support to needy people (Specially Fisherman, daily wedge workers, widows and senior citizen).

105000

Mask prepared by women SHG for Government officers / staff of SDM, ICDS, TDO, Custom, THO, Police Dept. etc.





## WORK DURING COVID-19

Providing treatment is prime thing in case if any outbreak but making people aware about safety n self quarantine plus to handle the panic situation. Our mobile health care unit had provided primary treatment to community at door step and also created awareness. In this panic situation Adani Hospital Mundra had continue his IPD and OPD services. SuPoshan Sanginis led awareness drives for conveying correct hand washing techniques, importance of sanitization. They also visited pregnant women and counselling regularly. 'Awaz De' a voice message campaign was started in local kutchi language to make the people aware on COVID-19.

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Taken care of Senior citizens at old age home

-

Awareness drives by SuPoshan Sanginis

-

Mobile health care unit provides Primary treatment at doorstep

35000

'Awaz De' a voice message campaign in local Kutchi language



Adani Foundation Kutch



# Our Change Makers



In critical time of Corona, Medical Officer Dr. Deven Goswami, Dr. Narendra Dodiya and Dr. Mukesh Parmar has performed their duties at GKGH Hospital for 1.5 month period.



## My Mother's dream became true

Name: Mura Keshabhai Dhuva

Place: Khavda, Bhuj, Kutch, Gujarat

Employer: Alliance Hospital (Covid 19 hospital), Mundra, Kutch, Gujarat.

Job: Joined as Nursing Assistant.

Salary: Rs. Up to 9000/- per month with lodging and boarding facilities.

### **Candidate Brief:**

He belongs to rural family. Father is Carpenter and mother is Home maker. Parental household's monthly income prior to his placement was Rs.8, 000. His prior educational qualifications is 12th pass.

### **In his own words:**

My mother's dream is that one of the sons should be in medical field. But due to financial constraint, I couldn't study further. I thought I will never be able to fulfill my mother's dream but fortunately, I got opportunity to get trained under GDA course and soon after its completion, I got placement in hospital. I feel proud to serve Covid19 patients and will continue doing fearlessly.

Thanks to Adani Skill Development Centre to give me opportunity to take training under DDU-GKY scheme and make me capable to take care of my family.





## It helped me to become good team member and work efficiently

Name: Nipul Punjabhai Sanjot

Place: Bidada-Mandvi, Kutch, Gujarat

Training Trade & PIA: Completed a course in General Duty Assistant from Adani Skill Development Centre, Bhuj under DDU-GKY.

Employer: Alliance Hospital (Covid 19 hospital), Mundra, Kutch, Gujarat.

Job: Joined as Nursing Assistant.

Salary: Rs. Up to 9000/- per month with lodging and boarding facilities.

He can be contacted at: 9726242085

### **Candidate Brief:**

His father and mother works as helping staff (housekeepers) in another hospital. Monthly income of family prior to his placement was 10,000/-. His prior educational qualifications is 12<sup>th</sup> pass.

### **In his own words:**

I am youngest in Covid19 hospital here but I know this is the time to act wise. When my friends ask me do you fear working as PCA? I simply laugh and say I am trained in GDA course and fully prepared for this work. My duty is to check patient's temperature, blood pressure and oxygen level and maintain record. We get residential facility nearby hospital. To Treat Covid19 patients, needs a courage and team work and I am blessed I got this wonderful chance.

Thanks to Adani Skill Development Centre to give me opportunity to take training under DDU-GKY scheme and make me capable to take care of my family.



Name: Khoja Sahista Hussenali

Place: Kera, Bhuj, Kutch, Gujarat

Training Trade & PIA: Completed a course in General Duty Assistant from Adani Skill Development Centre, Bhuj under DDU-GKY.

Employer: Om Maternity Home, Bhuj, Kutch, Gujarat.

Job: Joined as Nursing Assistant.

Salary: Rs. Up to 7000/- per month with lodging and boarding facilities.

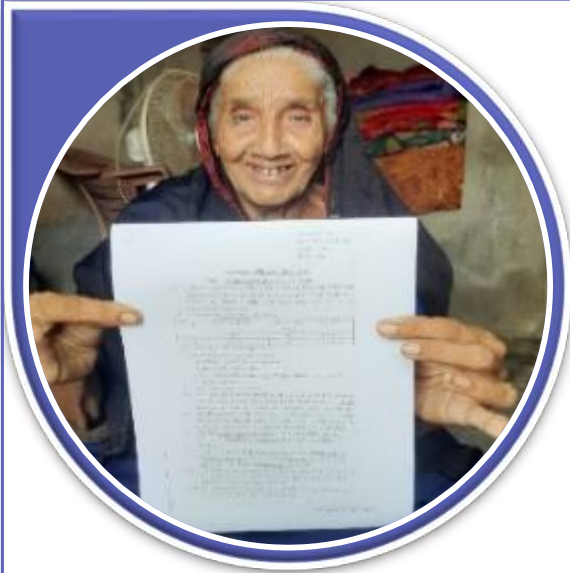
He can be contacted at: 8347304586

**Candidate Brief:**

She is belong to poor family. Her family's monthly income prior to his placement was Rs. 8,000 and source of income is from grocery store. Her prior educational qualifications is 12th pass.

**In her own words:**

My name is Sahista khoja i am living in kera village . My father's dream is that my daughter should be in medical field. But due to my mother's health issue i completed my SSC and HSC external And i thought i will never fulfill my father's dream but fortunately i came to know from my friends about GDA course and i got opportunity to trained under that course. And I started my internship at Om maternity home and on last day of internship i got placement their. I want to thank Adani skill development from the bottom of my heart to give me opportunity to take training under DDU - GKY and make me capable to became a second earner for my family.



## Stick at old ages

Dhanuba a self-esteem lady from Zarpara Village. While I peeped in her life it seems like that her existence is only to bear grief and sadness. Her husband was passed away before 20 Years since that she has been enduring social and economic responsibility of her family by drudgery daily wages. She have two daughter who are married and two sons who are supporting her for daily end meet, day was passed little more good combatively ....Who knows it was for short times .....

Unfortunately one more shock in her life that her elder son get Heart attack and passed away & younger son got mentally ill again she have to drudgery to get them daily bread and butter... Though her daughters called her to lives with them but she denied strongly believed to don't be burden & belongs to daughter. Now she is 70 years old and physically weak and also get ill often.

One day she came to our Rural clinic for medical check-up and was talking with deep sigh & despair about her problem. Fortunately our Employee Mr. Karsanbhai was present at their and promptly talked with her and comprehend the reality. She could not availed benefit of widow pension scheme because of the certain government limitation even after numbers of time applied and Follow-up for the same. He went along with her and Collected the essential document and submitted to the respective department later within two month she received sanction order for the same and further Rs.1250 /- Widow pension has been started which been the great support for daily meet.

She and her daughters expressed great gratitude and said that Adani Foundation is hope For the Poor and needy persons.





## "Vidyadan Mahadan"

Name: Sohil Gafur Manjaliya

Place: Luni ,Mundra

AF intervention:- Education Scholarship Support

Progress & Achievement:- Studied intently and perused Graduation

Degree and process for LLB admission

Salary: Working with Lawyer as a practicenor and earn Rs. 8000/Month

Back Ground : He belongs to Poor Fishermen family and sincere to study since child hood. He belongs to Poor Fishermen family and sincere to study since child hood. His father is used to Pagadiya fishing practice to get the daily end meet.

### In his own words:

In our community most of the youth left study after 8<sup>th</sup> standard and engaged in Fishing practice but when I had interacted with AF staff and persuaded for further study and Scholarship support. I realized that the only education can be the game changer to strengthen my Financial condition. Later I focused to study Intentionally and dreamed to be Lawyer.

Now am working with Advocate as Assistance and do Financially support to my family.

Indeed AF sensitized me and act as catalyst to transform my life than others really I am honored by friends and Society

## Real Support



Name: Harkhumben hirabhai Rabari

Place: Jinjauu, Nakhtrana

AF intervention:- Sewing Machine Support.

Progress & Achievement:- Started Embroidery and sewing work

Income : Rs.2500 to 3000/Month

**Back Ground :** She is 40 year old lady and disable by polio in childhood. They are five members three Children and Husband wife. Her husband is driver and the only person to earn hence financial problem is always remain host.

However She is illiterate & handicapped but symbol of etiquette and dedication. She always thought to be financial Supporter to her life partner . As belongs to Rabari community stitching & hand work is imbibed in her and she want to purchase Sewing machine for the same but Financial constrain did not allow them for same.

During community interaction she express her willing sewing machine support. we met her and after verification Support accordingly.

In his own words:

It was difficult to me as house wife to maintain budget but since I have started sewing work which added some extra money which can we expence for our children nurturing and education for their bright future.

Thanks to Adani foundation to be supporter to such disable persons



## Sea of Change – I can !!

Manjaliya Jakum Osman is 36 years old Fishermen Youth though he was little dull in study but has insight sense and dedication to work. After completion of primary education he had been engaged in fishing practice with his father. Though he was earning but not enough to sustain his big family with Five Daughters .

He was always thinking to get hike and asking to provide work according to his skill like drivering ,electrician and painting work.

One day we offer him contract work in our dry cargo department for loading Unloading work. He started enthusiastically with 30 Labors teams and paid 100% Efforts to fetch the targets but.....Unfortunately he had to left contract due to some constrain.

Again he engaged in fishing as routine but destiny define another for him. we had called From APSEZ to need Casual labors and referenced for Jakum as having Good feedback for dedication toward work.

he accepted opportunity even did not know the process. Initially We supported for gate pass and other mandatory formalities. Currently 22 Fishermen youth are working under him. He is saying that I am earning Approx Rs.40000/Month. And massage to Fishermen youth that I am grateful to AF to provide chance to proof my self and sustaining well. now I can Fulfill all basic amenities and invest to my daughter education.

He message to Fishermen Youth that we have great Opportunity as having ADANI port and companies to get employed.





## Fostering for Future

Life without parents is like boat in the mid of the ocean without compass , Krishna was cute and beloved girl of her family. Though her parents was labour but had been grew with lots of love & fulfilled all her wishes. But who knows the destiny ,when she was 8th year old she lost her father due to heart attack. yet she get back from the shocked, her mother got remarried which pushed her in the sorrow of ocean.

she is from Siracha village & studying in 5th standard. However her uncle and aunty are looking after her fostering with all possibility, she is but since they are poor, the financial constrain cant allow them to do much more even they wish. One day when our Employee Mr. Karshanbhai Gadhvi knew about its , he met them and get review from the village leader about the reality ,They are really poor and has been taking care of Krishna with soft intend & Love. Later we informed them about the Government scheme and did all the necessary documentation to linked with Government Orphan Yojna. Now they are being facilitated with Rs.3000 pension /Month which they deposit in Krishna bank Account to invest for their Education and wish to made her Officer now Krishna s future is secured...

# Events

## World Environment Day

World Environment Day was celebrated in Four Talukas by different activities related to conservation of Environment. The events were organized with coordination of Sarpanch, village leader and village committee members and difference type of activity had been carried out in this events.

### Activity

- Mangrove Plantation at Luni sea coast with fisher folk community
- Tree Plantation at Mundra, Nakhtrana, Lakhpat & Tuna block.
- Inauguration of Gauchar land development work in 22 acres at Siracha village
- Tissue culture plant distribution to farmer
- 1500 herbal plants like meshvak, amla, galo, gugal, ardusi, pilu, etc planted at Nandi Sarovar biodiversity park



## World Mangrove day



Web talk show was organized on the occasion of "World Mangrove days On Multi species Mangrove bio diversity with Joint effort of Guide and Adani Foundation, mundra.

Dr.V.Vijayan Kumara (Director of Gujarat institute of Desert ecology) , Mr. C.R.K Reddy (Former chief scientist ,CSIR-CSMCRI CEO) and Respected PNR sir and Gadshvi sir had delivered occasionally speech. As well as Paper presentation by GUIDE and with KSKV Scientist . Total 70 participated had joint this webinar.

## Vanmhotsav



Vanmahotsav week had been celebrated by adani foundation. The main objective of the vanmahotsav is to promote forest conservation the tree plantation.

More than 4100 tree plantation activity had been carried out in Tunda, Siracha, navinal , Zarpara, Dharb, baroi, luni, samgoga, Nani bhujapar, moti bhujapar, Mota bhadiya, Gundiyali , Anjar, tuna, rampar and wandi villages of Mundra & Anjar.



## World ocean day



8th June is celebrated as world ocean day. adani foundation had celebrated the world ocean day by coastal cleaning activity at Juna Bandar, Luni Bandar and Bavadi Bandar.

More than 105 Fisherman took part in this activities with great enthusiasm and zeal. Adani Foundation has scheduled awareness of coastal biodiversity, No fishing in monsoon period and conserving mangroves by allege removal and sweet water usage in initial period.

## National Youth Day



The National youth day was celebrated by motivation the youth who had play significant role during corona period as a warier in various sector and society.

On the occasion Mr.Sharad Sharma –AWL plant head and Mr. Vijay Saxena –HR head MUPL were remain present and delivered speech accordingly.

17 youth (3 utthan sahayak, 4 fishermen youth, 3 corona warriors, 7 women - animal husbandry & gram rakshak dal) were appreciated.

## International Women's day



Adani foundation and Britannia had jointly celebrated women's day on 10th March 2021 in which Guest of honour was Pabiben Rabari Entrepreneur Kutchh. 283 women are working at Britannia and preparing biscuit and rusk. Adani foundation is supporting for sourcing, motivation training for them and on job training plus convincing of families of women for shift duties also. Pabi ben had given information about her life journey and struggle and congratulated women for their joining the work. Dr Punam has informed about how to stay mentally and physically healthy plus maintain hygiene. Felicitation of 25 women by Medal who become permanent in Britannia company. Five Women shared their journey of life.

## The National girl child day



Women are the epitome of strength, Love, sacrifice and courage. and In the fast growing world women role is more important for the Socio, Economical & political development of Family, Nation and world. The National girl child day was celebrated with ICDC Department with Vahli Dikri Yojna form filling, paediatric health camp and Baby health kit distribution at Mundra. Mrs. Ashaben - CDPO Mundra was remain present in this event. Total 61 forms has received approval letter from GOG and 15 forms filled up on the same day.

## Ayurvedik Ukalo Distribution



Covid-19 pandemic is at the peak level and while don't having Specific treatment and vaccine taking precautionary measure and immunity boosting is the only weapon to keep away our self from Covid-19.

We have started Ayurvedic Kwadh Distribution at Various Public spot, Our Port Entry & Exit gate and APL ,AKBTPT una with spreading awareness to mitigate rapid transition to combat against covid -19. More than 6500 people had benefitted with Ukado and Vitamin –C tablet from Mundra, Baroi Shanti van & Samudr township.

## World Water day



Adani Foundation Mundra & Nakhtrana had Jointly celebrated World water Day with WASMO. Mr. R J Sonkesariya - SE irrigation dept., Ms. Dimpleben Shah - District coordinator WASMO were remain present in this event. Innovative farmer Mr.Vadilal Pokar had shared his experiance and value of drip and borewell recharge activity. more then 125 farmers of Mundra and Nakhtrana block took part in this event. To understan the value of water, drawing competition on the theme of valuing water had been organized for utthan school students.

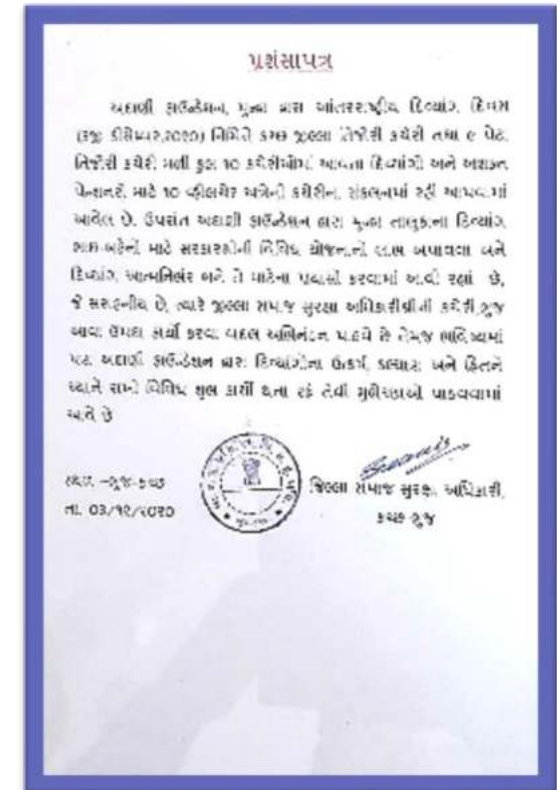


# World Disability Day

The people who living with disability, face many barriers to inclusion into key aspects of society, God blessed them with some kind of limitations with other kind of skill. Disability brings different ability.

We had celebrated world disability day on 3rd Dec with the aim to empowerment and help them to create real opportunity to make them self sustain.

In Mundra, Bita, Tuna, Anjar, Nakhtrana, Lakhpatt, Bhuj & Khavda blocks of Kutch district, total 40 people were benefitted with various Tool and Machine. The District Social Welfare Officer had issued appreciation letter for our efforts. All Divyang of kutchh, have been assured to support for Government online application to facilitate Aid & Equipment well as divvying certificate and bus pass.



## Awards

Adani Port and Special Economic zone ,Mundra has been awarded with 2nd prize for the National water Award from the Government of India Ministry Of Jal Shakti for the best industry for CSR Activity Category. and got cash Prize of Rs.1.5 lacs.





## Awards

There was state level QCFI Award competition for ( HR and CSR activity) We participated with our Namda work revival project though virtual presentation. we received diamond award.





# Beneficiaries data

No	Core Area	Direct Beneficiaries	Indirect Beneficiaries	Remarks
1	Education	2098	9424	Utthan 17 Schools
2	Adani Vidhya Mandir	472	1888	AVMB ,Students
3	Community Health Mundra	19196	212969	MHCU, Rural Clinic, Senior Citizen, Health camp,
4	Community Health, Bhuj	5870	23480	Medical Support , Mahiti setu, Dead Body , Patients Care & Co-ordination
5	AHMPUL	20959	62877	OPD & IPD Patinets
6	SLD Fishermen	8035	2330	Education, Mangrove, Water and Livelihood
7	SLD –Agriculture	21190	2991	Drip, Fodder, Home Bio Gas, Tissue ,
	SLD- Women Empowerment	127	508	SHG Group Income generation & Training
8	CRC	1079	4316	Sukanya Samrudhi Yojna, Agriculture ,Fishermen,
10	Swavlamban	276	1072	(Widow women & Divyang)
11	Community Infra Structure	111855	162488	Fishermen Amenities & Shelter ,Pond Deepening, Approach
12	Nakhtrana	18528	8168	Health ,SLD, Bio Diversity & CID
13	Tuna	6717	20151	Fodder, Health & portable water
14	Lakhpatt	2956	1380	Tree Plantation & Tree Guard
15	Suposhan	20565	0	Child ,Adolescent Girl ,RPA Women
16	ASDC Bhu & Mundra	577	1432	soft skill and DL .GDA & Online Training
<b>Total</b>		<b>240500</b>	<b>515474</b>	

# Financial Overview - Adani Foundation -Mundra

## Executive Summary-Budget Utilization F.Y. 2020-201

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget 2020-21	Total LE 2020-21	% of Total Utilization
A.	Admin Expense	61.10	56.96	93.28%
B.	Education	94.56	57.87	61.20%
B1	Utthan-Education -Mundra & Anjar	64.11	52.05	81.19%
B2	Utthan : Fisherfolk	30.45	5.82	19.12%
C.	Community Health	420.70	325.12	77.28%
D.	Sustainable Livelihood Development	365.00	336.62	92.23%
E.	Community Infrastructure Development	58.30	60.13	103.14%
F.	EDM Recommended Projects	60.00	60.00	100.00%
G.	COVID 19 Support	100.00	27.05	27.05%
H *	Budget taken against Saving			
1	Wandi – Tuna Drainage Support		45.40	
2	Support to Dhrub Hospital-Dhrub		22.00	
3	Approach Road Construction at Prasla Vadi, Zarpara		16.00	
4	Participation in Gaushala Construction at Goyersama		10.25	
	Total Budget plan against Saving:		93.65	
	Total AF CSR Budget :	1,159.66	1017.41	87.73%
[I]	Adani Vidya Mandir-Bhadreshwar	219.67	104.74	47.68%
[II]	Project Udaan-Mundra	50.00	49.30	98.61%
	GRAND TOTAL Budget F.Y. 2021-22 :	1,429.33	1,171.45	81.96%







# કચ્છમાં આંતરરાષ્ટ્રીય દિવ્યાંગ દિવસની ઉજવણી કરાઈ



## કચ્છના યુવાનોમાં રહેલા કૌશલ્યનો વિકાસ કરવા સાથે રોજગારી વધારાશે

મુજ, તા. ૧૧ : કચ્છ યુનિ. અને અદાણી સ્કિલ ડેવલોપમેન્ટ દ્વારા કચ્છના યુવાનોના આર્થિક, સામાજિક વિકાસ માથે એ મારે કૌશલ્ય વિકાસ કાર્યક્રમો આગળ વધારવા પડેલા કચ્છના કૃષ્ણ વર્માના ૧૬૦મા જન્મદિન નિમિત્તે યુનિ. આતે વર્ણુબલ બેઠકનું આયોજન કરી બંને સરનામી વચ્ચે એમ.ઓ.યુ. કરવામાં આવ્યો છે. કુલપતિ જમરાજસિંહ જાડેજા તથા અદાણી સ્કિલ ડેવલોપમેન્ટના પ્રમુખકર વી. એસ. અઢવીની ઉપસ્થિતિમાં પ્રથમ તબક્કામાં પ્રિજિટલ

બેઝીક ઈંગ્લીશ, બ્લસામલથી તાલીમ, રીટેલ સેલ્સ એસોસિએટ અને જનરલ ડ્યુટી શ્યામજી કૃષ્ણ વર્માના ૧૬૦મા જન્મદિને કચ્છ યુનિ. અને અદાણી સ્કિલ ડેવ. વચ્ચે કરાર

આસિસ્ટન્ટ જેવી તાલીમો આપુ કરવા નક્કી કરાયું છે. કુલપતિ શ્રી જાડેજાએ કહ્યું કે, કચ્છના યુવાનોને આ તબક્કાને નવી દિશા પ્રાપ્ત કરવામાં આ કૌશલ્ય વિકાસ

મકલીએ કહ્યું કે, કચ્છના યુવાનોને કૌશલ્ય વિકાસથી રોજગારી માટે વધુ પ્રયત્નો કરવામાં આવશે. સ્કિલ ડેવ.ના હેડ જસિન વિવેદી, અદાણી ફાઉન્ડેશનના હેડ પંડિતબેન શાહે ઉદ્બોધન કર્યું હતું.

મુજ અદાણી સ્કિલ ડેવ.ના હેડ સાગર કોટેકે તથા કચ્છ યુનિ.ના આંતરરાષ્ટ્રીય ભાગતોના અને કોપરેટિવ મિલિન્ટ સોલ્યુશીને બેઠકનો હેતુ રજૂ કર્યો હતો. યુનિ.ના કચિપર કાઉન્સેલર અજય રાહોડે તેમજ

# મુન્દરા તા.ના પ્રાગપર ખાતે ૫ એકરના પ્લોટમાં બાયોડાયવર્સિટી પાર્ક બનશે

નંદી સરોવરમાં એન્કરવાલા અહિંસાધામ અને અદાણી ફાઉન્ડેશન દ્વારા આયોજન



## નખત્રાણા શહેરમાં આયુર્વેદિક ઉકાળાનું વિતરણ કરવામાં આવ્યું

by કચ્છ સમાચાર -



# નર્સિંગ કોર્ષના ૨૦ તાલીમાર્થીઓને પ્રમાણપત્ર પહેલા જ નોકરી મળી

મુજમાં અદાણી સ્કિલ ડેવલોપમેન્ટ દ્વારા અપાઈ હતી તાલીમ

કચ્છમાં જરૂરિયાત મુજબ નિમણુક તાલીમ માટે અસ્મિતાબેન જેઠી અને પૂર્વી ગોસ્વામી સહાયરૂપ થયા હતા. હજુ પણ જરૂરિયાત મુજબ પ્રયત્નો કરવામાં થયા હતા.

અત્રે ઉલ્લેખનીય છે કે, ગયા ઓક્ટોબર-૧૯માં બેચ શરૂ થઈ હતી. પરંતુ, લોકડાઉન આવી જતા પરીશા લઈ શકાઈ નહોતી છતાં ફળ મળ્યું છે.



# મુન્દરા તાલુકાના વિવિધ ગામોમાં ૪ હજારથી વધુ વૃક્ષોનું વાવેતર કરાયું

અદાણી ફાઉન્ડેશન દ્વારા ઝરપરાના વીર શહિદની પુણ્યતિથિએ કરાઈ કામગીરી



મુન્દરા : વૃક્ષોએ પરતી પરના મોન રેત છે. પોતે તાપ સહન કરી બીજાને ઠંડાવો આપે છે. જેમ વૃક્ષોનું વાવેતર અને ડિફેન્ડન પ્રમાણ વધશે તેમ

## રાજ્યસરકારના આઈસીડીએસ વિભાગ દ્વારા સંયુક્ત ઝુંબેશ યોજાઈ મુંદરા તા.માં વહાલી દીકરી યોજના હેઠળ ૧૫૦થી વધુ બાળાને સહાય મળશે

મુજ, મુંદરા : બાળા હતા પ્રથમ તબક્કે ૧૫૦ ડિકરીઓના અનુરોધે કરી હતો તથા યોજના અંગે વાણીઓને સરજ અપાઈ હતી.

## મુંદરામાં અદાણી ફાઉન્ડેશન દ્વારા વિવિધ ક્ષેત્રના તારલાઓનું બહુમાન માઘીમાર સમુદાયના ઉચ્ચ અભ્યાસ કરનારા નવયુવાનોનું સન્માન કરાયું

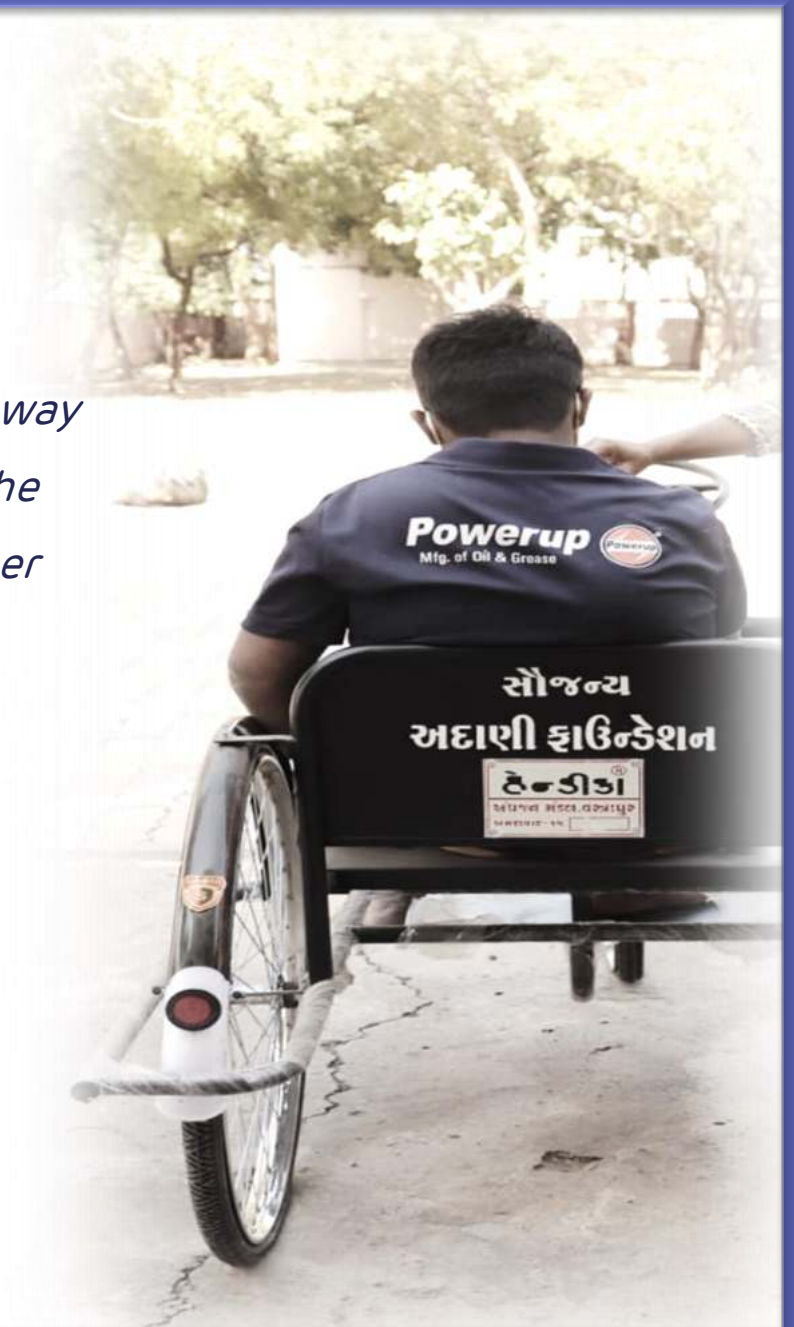
મુંદરા ખાતે અદાણી સ્કિલ ડેવલોપમેન્ટ દ્વારા સ્વામી વિવેકનંદની જન્મ જયંતી પ્રસંગે રાજીસ વિસ્તારમાં બેની પશુપાલન, કીચક, સિલણ ટેરેસિયલ, ચામ સ્લકટલ અને સ્વમાનભરે રોજગારી મેળવવા યુવાનો પારંગત અને તેવો સંદેશો અપાયો





*Disability brings different ability, it bring hope in different way  
let us pray the God to give confidence and strength to the  
person who are having some kind of limitations with other  
kind of skill*

Thank You...



# **Annexure – 3**





# **OIL SPILL CONTINGENCY RESPONSE PLAN TIER 1**

(To be used in conjunction with OSRA Vol-1 and Vol-2)

**ADANI PORTS AND SPECIAL  
ECONOMIC ZONE LIMITED**

**POST BAG NO. 1**

**NAVINAL ISLAND**

**MUNDRA 370 421**

**PH. : (02838) 289221 / 289371**

**FAX : (02838) 289170 / 289270**

Reviewed By : Capt. Divya Gupta	Issue No. : 01	Issued On : 01.10.2020
Approved By : Capt. Anubhav Jain	Revision No. : 05	Page 1 of 98

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

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# OIL SPILL CONTINGENCY RESPONSE PLAN

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

## Section 03: Strategy

### 1 Introduction

- 1.1 Authorities and responsibilities
- 1.2 Coordinating committee
- 1.3 Statutory requirements
- 1.4 Mutual aid agreements
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- 5.3 Manpower availability (on-site, on call)
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- 7.3** Notifying key team members and authorities
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- 7.6** Estimating fate of slick (24, 48, 72 hours)
- 7.7** Identifying resources immediately at risk, informing parties

**8 Operations planning**

- 8.1** Assembling full response team
- 8.2** Identifying immediate response priorities
- 8.3** Mobilizing immediate response
- 8.4** Media briefing
- 8.5** Planning medium-term operations (24, 48 and 72 hour)
- 8.6** Deciding to escalate response to higher tier
- 8.7** Mobilizing or placing on standby resources required
- 8.8** Establishing field command post communications

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- 9.2** Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)
- 9.3** Reviewing and planning operations
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- 9.5** Preparing daily incident log and management reports
- 9.6** Preparing operations accounting and financial reports
- 9.7** Preparing releases for public and press conferences
- 9.8** Briefing local and government officials

**10 Termination of operations**

- 10.1** Deciding final and optimal levels of beach clean-up
- 10.2** Standing down equipment, cleaning, maintaining, replacing
- 10.3** Preparing formal detailed report
- 10.4** Reviewing plans and procedures from lessons learnt

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## Data Directory

### Maps / Charts

1. Coastal facilities, access roads, telephones, hotels etc.
2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds
3. Risk locations and probable fate of oil
4. Shoreline resources for priority protection
5. Shoreline types
6. Sea zones and response strategies
7. Coastal zones and response strategies
8. Shoreline zones and clean up strategies
9. Oil and waste storage / disposal sites
10. Sensitivity Maps/ Atlas

### Lists

1. **Primary Oil spill Equipment:** booms, skimmers, spray equipment, dispersant, absorbents, oil storage, Radio communications etc. (Manufacturer, type, size, location, transport, contact, delivery time, cost and conditions)
2. **Auxiliary Equipment:** Tugs and work boats, aircraft, vacuum trucks, tanks and barges, loaders and graders, plastic bags, tools, protective clothing, communication equipment etc. (Manufacturer, type, size, location, transport, contact, delivery time, cost and conditions)
3. **Support Equipment:** Aircraft, communications, catering, housing, transport, field sanitation and shelter etc. (Availability, contact, cost and conditions)
4. **Sources of Manpower:** Contractors, local authorities, caterers, security firms (Availability, numbers, skills, contact, cost and conditions)
5. **Experts and Advisors:** Environment, safety, auditing (Availability, contact, cost and conditions)
6. **Local and National Government contacts:** Name, rank and responsibility, address, telephone, fax, telex.

### Data

1. Specifications of oils commonly traded
2. Wind and weather
3. Information sources

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**Annexures**

Annexure 1	Initial Oil Spill Report
Annexure 2	POLREP Report
Annexure 3	List of resources available
Annexure 4	List of Telephone numbers of Expert and advisors
Annexure 5	Responsibilities: Marine Officer / SPM Officer
Annexure 6	Responsibilities: Marine Manager / On Scene Commander
Annexure 7	Responsibilities: SPM Pilot
Annexure 8	Responsibilities: HOD – Marine
Annexure 9	Oil Spill Progress report
Annexure 10	Emergency response Log
Annexure 11	Classification of oils
Annexure 12	Response Guidelines
Annexure 13	Site Specific Health and Safety Plan.
Annexure 14	Indian Chart 2079
Annexure 15	List of recycler approved by state of Gujarat
Annexure 16	List of agency for support & guidance for rescue & rehabilitation of oiled bird & mangroves management during oil spill

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## **Strategy**

### **1. Introduction**

The movement of Petroleum/ Petroleum-products from the production centre in middle east to Adani Ports and SEZ Ltd and various other ports in Gulf of Kutch is handled through ships at sea and to refineries using pipe lines on ground. Like any other port, Adani Port is very much vulnerable to oil spill disaster arising due to collision, leakage or grounding of vessels in sea and damage to pipelines on ground.

This action plan prepared by Adani Ports and SEZ Ltd, Mundra is to combat the oil spill (LOS-DCP) is in accordance with the NOS-DCP, International Petroleum Industry Environmental Conservation Association (IPIECA).

#### **1.1 Authorities and responsibilities**

##### **Adani Ports and SEZ Limited**

APSEZL has responsibility for dealing with oil spillages which occur within port limit if the estimated quantity of product lost is 700 tons or less.

Should the spill migrate to other areas, the Coast Guard Monitor will assume the position of On Scene Commander and will direct the response effort. In both cases, APSEZL will act and deploy their resources as required by the relevant On Scene Commander.

This operational version of Oil Spill Contingency Response Plan for the Adani Ports and SEZ Ltd, Mundra is intended for use by all such personnel like Marine Personnel, Tug Masters and all others as indicated in the Spill Response Organization who may be involved in the response to oil spills which may occur within Adani Port Limits.

This plan has been prepared as per the stipulation of Ministry of Environment and Forest Clearance (MoEF) and Coast Guard Requirements.

##### **Gujarat Maritime Board**

While responsibility for oil spill contingency remains with conservator of the port – Gujarat Maritime Board Port Officer, this plan (Tier 1) demonstrates the readiness of Adani Port for mitigating oil spill incidents.

Port Conservator will monitor and provide the necessary assistance required for administering the oil spill operation within the port limit.

##### **Indian Coast Guard**

The Indian Coast Guard has a statutory duty to protect the maritime and other national interests of India in the Maritime Zones of India and to prevent and control marine pollution. Coast Guard is also the Central Co-ordinating Authority for marine pollution control in the country. The Indian Coast Guard is responsible for implementation and enforcement of the relevant marine pollution laws.

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The National Oil Spill Disaster Contingency Plan stipulates the organizational and operational details to effectively combat a national oil spill contingency. The plan promotes the development of Regional and Local Contingency Plans in the three Coast Guard Regions.

The Coast Guard Monitor will assume the role of On Scene Commander in the event that any oil spill involving PLL operations exceeds 700 tons.

**Gujarat Pollution Control Board**

The Gujarat Pollution Control Board is responsible for, and control, waters up to 5 km from the shoreline. They require to be advised of all pollution incidents.

**Ministry of Environment, Gujarat**

The Ministry requires to be informed of all pollution incidents.

**Emergency Response Team**

Emergency Response Team (ERT) is the nomenclature used to describe the command and control team established for an oil spill incident at the jetty or in the jetty approaches, with representatives of organizations attending as described in section 2.4.

The ERT will convene at the Terminal Control Room, under the chairmanship of the Terminal Manager, and will consist of a Management Team and a Support Team as noted in section 2.3.

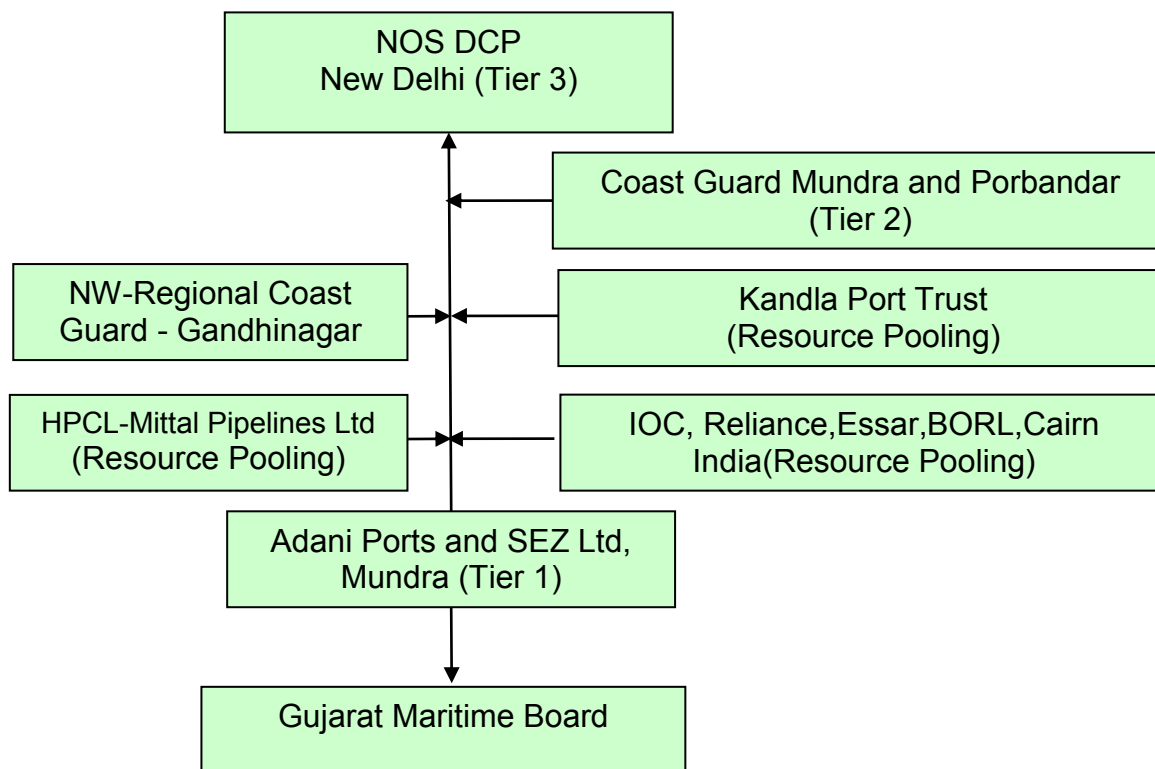
It is a strategic plan to quickly call on additional resources in a systematic manner firstly from Adani port and subsequently from other ports.

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**1.2 Coordinating Committee**



**1.3 Statutory requirements**

The Indian Government is a signatory to the International Convention on Oil Pollution Preparedness, Response and Co-operation which came into force in May 94. Under the NOSDCP, it is obligatory for a port to have a Local Oil Spill Contingency Plan to combat oil spills within port limits.

This oil spill contingency response plan (Tier 1) is the response plan in accordance with the facilities available at Adani Port only.

This plan is prepared in accordance with:

- a) Marine Environmental Impact Assessment of SPMs, COTs and connecting pipelines of APSEZL at Mundra dated February 2001, prepared by National Institute of Oceanography, Mumbai.
- b) Report on Risk assessment study and On-site disaster management Plan for SPMs, COTs and connecting Pipelines of Adani Ports and Special Economic Zone Limited, by TATA AIG Risk Management Services Limited, dated February 2001.
- c) HAZOP study report of SPM Terminal pipeline project by Intec Engineering, dated 26/02/2004.
- d) IPIECA guide to Contingency planning for oil spills on water.
- e) Oil spill risk assessment and contingency plan study done by M/s Environ Software Pvt. Ltd. (Copy enclosed)

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#### **1.4 Mutual aid agreements**

APSEZL signed MOU with HPCL Mittal Pipelines Limited, Mundra operating in the region of Gulf of Kutch to have mutual aid agreement for the purpose of assisting each other within stipulated time frame with best combination of resources to combat and overcome any large and worst spill with the intent of maximizing the availability of the private, public and government sector response resources during oil spills where assistance is requested by another member.

As per agreement, the member agencies of the affected member state or province may directly request cascable response resources located in oil handling agencies operating in the region of Gulf of Kutch.

#### **1.5 Geographical limits of plan**

Adani Ports and SEZ Ltd, Mundra is situated at the North head of Gulf of Kutch which is at the west coast of India. Ships calling Adani Port therefore have to traverse across the GOK. This oil spill contingency response plan (Tier 1) is applicable for the following:

- 1) Loading and Unloading of liquid cargo at the Multi-purpose terminal jetty at the Adani Port.
- 2) Unloading of the crude oil the vessels at the single point mooring (SPM) to offload 70,000 to 3,00,000 DWT.
- 3) Bunkering operations carried out within the port limits.
- 4) Any spill that occurs from any source within port limit (including West Basin, South Basin and LNG Terminal) whether at berths, anchorages or in the channel.

APSEZL falls within the area jurisdiction of The Commander, No.1 Coast Guard District (Gujarat), located at Porbandar. Mundra has a full-fledged Indian Coast Guard Station. The Port limit of APSEZL, Mundra is shown in enclosed chart in annexure 14.

#### **1.6 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 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.

The NOSDCP sets out a clear definition of the responsibilities of the major participants, such as the Coast Guard, various ministries and departments, ports and oil industry.

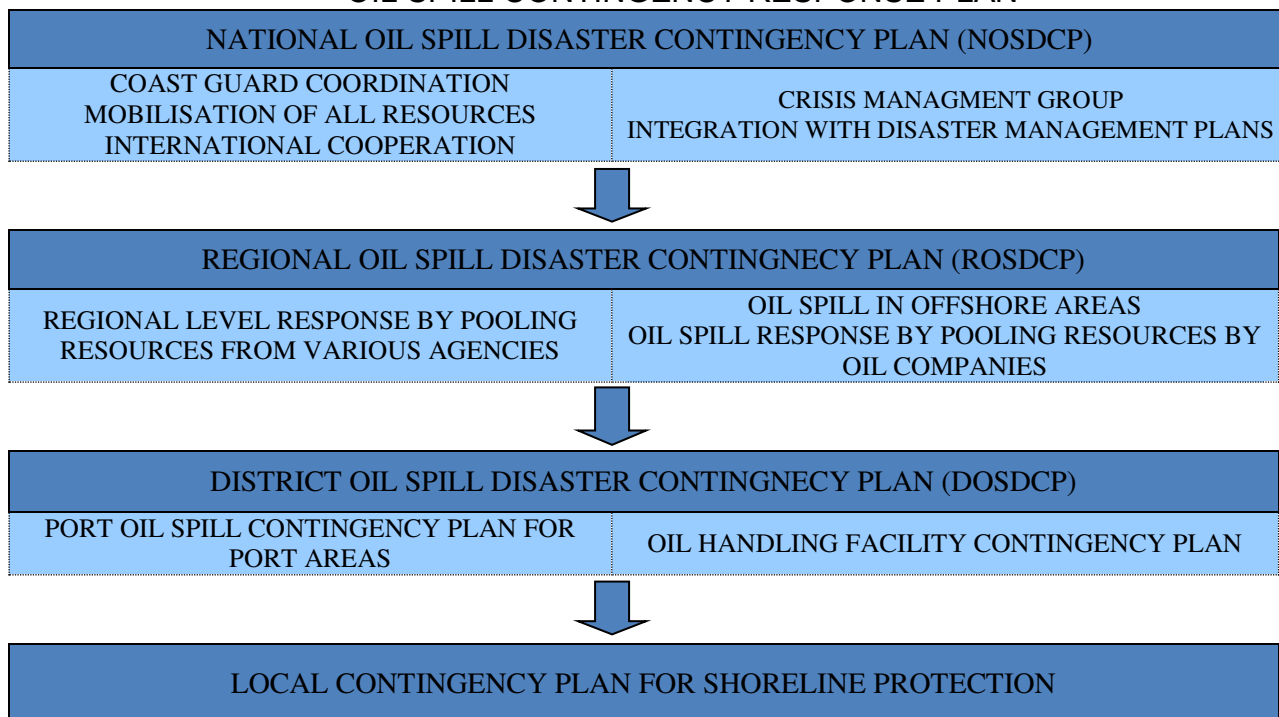
The national oil spill contingency plan hierarchy outlined in Figure 1 consists of NOSDCP at the apex level to coordinate significant or disaster type spills, the Regional Oil Spill Disaster Contingency plan (ROSDCP) to coordinate spill in the Gulf of Kutch, utilizing the resources available within the region.

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**Figure 1 - Contingency Plan hierarchy**

The aim of Local Contingency Plan - for the Mundra Port, is to outline arrangements for responding to oil spills in the coastal and shoreline areas, with the aim of protecting against environmental pollution as a result of oil spill or, where this is not possible, minimize the effect and respond the oil spill in an environment friendly manner and dispose the collected oil/debris in according to the existing laws/regulations/orders in force. CONTINGENCY PLAN FOR SHORELINE PROTECTION  
DISTRICT OIL SPILL CONTINGENCY PLAN

## **2 Risk Assessment**

The number of vessels calling annually at APSEZL is more than 3000 including Chemical, Gas and oil tankers. The threat of oil spill is much high in Gulf of Kutch and is very oil spill sensitive area. A marine national park is located in the Southern shore of GOK. There is a popular beach spot on the Northern shore namely Mandvi. Lastly, as GOK is a closed system, any oil spilled will arrive to the shores.

### **2.1 Identification of activities and risks**

The scenario of the spill are classified under two categories :

- Oil Spill at Mundra Port Multi-Purpose Terminals
- Oil Spill at SPM

The oil spill could occur due to various reasons at any of the APSEZL's marine facilities (SPMs, Basins/ berths, anchorage or approach channel) within the new Mundra Port limit. The spills beyond these areas are not covered in this plan. Both the categories are discussed in detail

Accidental oil spill at Multipurpose terminals/ Basins/ berths, anchorage or approach channel is possible from overflow of slop tanks, bunker tanks, reception facility and road tankers (generally a low pressure operation).

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Accidental oil spill at the SPM may be due to hose puncture while unloading, failure of swivel joint of SPM or Leakage of Crude Oil at PLEM or from the submarine pipeline.

Following risks are being addressed to mitigate incident of oil pollution:

- Connection of hoses with established work instructions for use of blank flanges, drip trays etc.
- Thorough understanding of use of OSD and limitations of vessel surging due to slack mooring ropes in given weather conditions.
- Monitoring of ships pump room atmosphere, display of fire notices and acknowledging accidental explosion through the use of IMO ship / shore check list.
- Spillage of F.O. during bunkering operations by using bunkering check list
- Ballast discharge contamination or malfunction of ship's sea side valves by prohibiting such operations without written permission of the port.
- Non use of reception facility of the port by ships on cost plus basis.

**Operational leakage**

**Spill due to floating hose failure at SPM: (183 t, at pumping rate of 10000 m<sup>3</sup>/h of crude oil for 75 sec): (Spill points - S1 at HMEL SPM & S2 at Mundra SPM)**

Crude oil pumping rate from the tanker to the shore tanks will be varying between 5000 m<sup>3</sup>/hr and 10000 m<sup>3</sup>/hr. In the present study, the maximum pumping rate of 10000m<sup>3</sup>/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 a few seconds in the event of hose rupture or hose failure. Again for the sake of assessing higher risk, a response time of 60 sec – 75 sec (worst case scenario) is considered to estimate the amount of oil that would spill at the SPM. Thus the quantity of crude oil spill has been estimated to be a maximum of 183 tons in the event of hose failure or rupture.

**Spill due to rupture of sub-sea crude oil pipeline from SPM to shore tanks: (384 tons of crude oil, at pumping rate of 10000 m<sup>3</sup>/hr for 60 sec): Spill point S3 taken at midpoint of the pipeline from HMEL SPM to LFP)**

Crude oil pumping rate from the tanker will be in the range of 5000 m<sup>3</sup>/hr to 10000 m<sup>3</sup>/hr. In the present study, to assess the maximum risk, pumping rate of 10000 m<sup>3</sup>/hr has been considered. 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 (weight coating) is provided on the surface of the pipeline. Crude oil pipelines designed, constructed and laid as per the international norms are safe and leakages are extremely rare during their designed life. However, a rupture of size 1 cm x 12.7 cm has been assumed for assessing the quantum of oil spill through sub-sea pipeline.

The maximum manifold pressure will be 12 kg/cm<sup>2</sup> and crude oil will be pumped to the shore tanks without any boosting device in-between. As the level in the tanker depletes, discharge pressure would also be reduced. Moreover, with the flow 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, an average pressure of 10 kg/cm<sup>2</sup> and a water column height of 35 m have been considered.

Accordingly the quantity of Crude oil spill has been estimated using the formula given by

$$Q = C_d A (2gH)^{1/2}$$

Where,

Q = quantity of spill (m<sup>3</sup>/s)

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$C_d$  = coefficient of discharge (0.9)

$A$  = Area of rupture ( $m^2$ ) (1 cm x 12.7 cm)

$H$  = Net head (m) ( $6.5 \text{ kg/cm}^2 = 65 \text{ m}$ )

This would give a value of  $0.04 \text{ m}^3$  of crude oil per sec spilling out of the pipeline through the rupture as the pump will be in operation.

The availability of solenoid operated hydraulic shutoff valves in the sub-sea pipeline, which will get activated in less than 15 seconds time as soon as the pressure falls, will limit the amount of oil leaked in case of pipe rupture and consequent drop inside the pipeline. However 60 sec response time has been considered for quantification of oil spill. Accordingly the quantity of Crude oil spill has been estimated to be  $2.4 \text{ m}^3$  before the pump discharge valve closes. However, there will be high pressure inside the pipeline initially and the oil inside the pipeline will start leaking into the waters through the hole as the pressure inside the pipe line is higher than the outside pressure, even after the valve is closed and pumping is stopped. Even after the pipeline inside pressure equalises the outside static pressure acting on the rupture, oil continues to start leaking as the density difference between the oil and water; oil being lighter and LFP is higher in elevation compared to the pipeline elevation. Two factors need to be considered here; the specific gravity of the crude oil inside the pipeline is less than 1 whereas the sea water specific gravity is more than 1. Also depending on the location of the hole/leak, there will always be a static head of sea water acting on the leak when the oil tries to flow out and sea water trying to flow in to occupy the place vacated by the leaked oil. Hence all the oil in the pipeline will not leak and there would be an equilibrium point reached when there would be no more oil leaking from the hole as the sea water pressures effectively blocks the oil leak. Also, the leak would be attended to within the stipulated time as per the standard maintenance procedures followed by the organisation. For the purpose of this study and as a worst case scenario before the leak is repaired by the established maintenance procedures, it is assumed that a maximum of 5% of the pipeline oil volume would leak and though it would be a continuous leak, this total quantity is taken to be instantaneous for the purpose of the study.

The pipeline length is approximately 10 km (from SPM to LFP) and the pipeline size is 42" NB. The pipeline volume works out to be approximately  $8662 \text{ m}^3$  or 7622 t.

Hence the total oil leaked due to rupture in sub-sea pipeline will be  $2.15 \text{ t} + 5\%$  of pipeline volume of oil in t ( $0.05 \times 7622 = 381 \text{ t}$ ) which works out to be a maximum of 383.45 t, say 384 t of crude oil.

For the purpose of simulation studies, this spill on the pipeline is assumed to have taken place at the midway point from HMEL SPM to LFP (designated as spill point **S3** in the report) and is taken on the sub-sea pipeline from HMEL SPM to LFP. As the pipeline from HMEL SPM to LFP and the Mundra SPM to LFP run very close only one leak point in the pipeline is studied as it gives a representative oil spill study for the pipeline leakage scenario.

**Spill due to collision at SPM: (Spill points S1 & S2)**

Crude Oil is received at SPM by ocean tankers having capacity between 90,000-360,000 metric tons. Crude Oil is pumped to shore tanks through pipeline/s from the SPM. In the present scenario, collision of the vessel at the SPM or tanker route with another vessel enroute to other terminals can cause partial damage to the vessels cargo tanks (not more than 3 nos. of cargo tanks) leading to a maximum oil spill of about 700 tons to 25,000 tons of crude oil. In the present study, the probable quantity of crude oil spill due collision at SPM is considered as 700 tons at the minimum and as 25,000 tons at the maximum.

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**Spill due to collision or grounding in the tanker route: (Spill point S4)**

Tankers are expected to call at the SPMs frequently depending upon the demand for the refineries for the crude oil. These tankers may meet accidents like collision with other vessels or grounding in the vicinity of the SPM. In case of such accidents, the spillage may vary depending on the size of the tanker and the extent of damage and number of cargo tanks ruptured etc. In the present study the probable quantity of spill in the tanker route considered for modelling is 25000 tons at a point which lies on the tanker route to SPM not exactly within Mundra port limit; but a spill point is taken along the tanker route in the Gulf but close to the Mundra port limit.

**Spills at the berths (applicable to berths at West Basin, South Basin, East Basin, North Basin, LNG berth and existing cargo berths of Mundra port.)**

Oil spills can take place at the berths in the basins during the loading / unloading as well as berthing and traversing operations. The likely spill scenarios are discussed below:

**a) Spills during the navigation of the vessel along the approach channel: (Spill point S7 for West Basin)**

The spill location can be anywhere in the path. One location along the approach path has been selected for carrying out for model runs.

**b) Spills around the jetty (in the maneuvering basin / turning circle): (Spill point S6 for West Basin and Spill point S10 for South Basin)**

This can occur due to tug boat impacting the vessel and grounding of the vessel. One location around the jetty at the turning circle has been considered for the computational runs

**c) Spills at the berths: (Spill point S5 for West Basin, Spill point S9 for South Basin, Spill point S13 for East Basin, Spill point S14 for North Basin, Spill point S8 for LNG jetty, Spill point S11 for MMPT 1 and Spill point S12 for MICT / AMCT berth locations)**

During the loading/unloading operations spills may take place due to one or more of the following: –

Hose/ loading arm leakage (liquid products handled at the liquid berth), overflow on the vessel deck, vessel grounding at the jetty, vessel colliding with jetty, fire and explosion on the vessel or at the jetty, during bunkering operations etc.

**Spills along approach Channel / Route**

Vessels to the port berths follow the Deep Water route in Gulf of Kutch and Pilot boards at Pilot Boarding Ground “A” or “B”, subject to tide and the berth allotted to the tanker.

While the risk of grounding is low, it cannot be wholly eliminated; the most likely causes are steering or propulsion system failure or navigational error, any of which could result in grounding on the channel margins. Given that the bed of the Gulf is rocky at some places the likelihood of any significant hull damage cannot be ruled out. In a general case scenario, weld fractures in the forward bunker tanks could give rise to a release of approximately 10 Tons of diesel oil and in a worst case scenario extensive damage to the bunker tanks may occur which would cause a spill of 500 to 700 t of FO spill.

**Collision**

The risk of collision while transiting the channel is negligible given the reason that port authorities use sophisticated ship tracking and navigational systems as the Gulf traffic has increased. These systems would ensure that the chances of any collision are remote or non-existent when ships / marine craft traverses / transits through the channel. However, even if any collision occurs, it is beyond reasonable

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doubt that such an incident would result in the fore part rather than the parallel mid-body of the vessel and the loss of integrity of hull plating of a cargo tank is most unlikely. A spill quantity of 700 t can be the maximum in such a scenario.

**Berthing Incident**

Oil and/ or liquid chemical spill can occur as a result of hull coming in contact with the corners of the jetty structure during ship berthing or un-berthing maneuvers. Such incidents are generally due to failure of a

vessel's main propulsion or steering systems, loss of control onboard on support tug in attendance or Master error or wrong judgment.

The potential spill quantities involved depend on the vessel type and the location and extent of the impact damage; hull damage to a 20000 DWT – 80000 DWT tanker / vessel in way of a forward or aft wing tank, for example, could give rise to a release of some 500 Tons of product. The potential spill quantity, should hull plating be ruptured in way of an aft wing diesel oil bunker tank can, historically, be up to 100 Tons.

**Tug Impact**

There are well-documented incidents where cargo or bunker oil has been released as a result of hull impact damage by tugs. This can occur when tugs are approaching a vessel underway prior to berthing, or when coming alongside a moored vessel prior to un-berthing. The potential spill quantities again depend on the location and extent of the impact damage but can be over 20 tons for Diesel oil and 100 Tons for cargo (FO) oil. Spills from this cause are considered to be of low likelihood but the risk is acknowledged.

**Loading Arms / Flexible hoses**

The operation of loading arms / flexible hoses can lead to minor releases of oil. Common sources are vent valves, swivel joints and hydraulic lines. Such spillage seldom exceeds 0.1 Tons.

**Cargo Tank Overflow**

Cargo tank overflows can occur on board loading vessels; spills of this nature can be due to instrumentation failure, tank valve mismanagement or operator error. The spill quantity is a function of the flow rate and also the number of tanks being loaded at the time of the incident. Some of the oil and/or chemical will be retained on deck but, in a worst case scenario, up to 3 tons could escape overboard.

**Hull Failure**

The incidence of oil pollution due to hull failure is low and some 84% of the incidents attributed to this cause by ITOPF involved spill quantities of less than 7 tons; these spills were caused mainly by minor hull fractures and weld failures. The potential for more serious incidents with spill quantities in excess of 700 tons must however be acknowledged.

**Fire and Explosion**

Fires and explosions on board ship represent a safety hazard with the risk of pollution as a secondary impact. Most tankers engaged for trading will be equipped with inert gas systems. Given the controls, which are imposed and enforced by APSEZL authorities in respect of the oxygen content of cargo tanks, the risk of fire and/or explosion in the cargo spaces must be regarded as minimal, insofar as cargo transfer operations are concerned.

Strict monitoring and control of the main cargo pump room atmosphere will minimize the fire and explosion risks associated with this space.

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Fires resulting from uncontrolled smoking in the accommodation, unauthorized hot work such as welding, and engine room fires can spread rapidly if not dealt with swiftly and can give rise to incidents of a very serious nature.

While the likelihood of fire or explosion occurring on board vessels berthed at the Mundra port berths is low, the risk is nevertheless acknowledged. Such an incident could give rise to a spillage of 700 tons or more.

**Bunkering – spillage of fuel oil**

Bunkering at the port may sometimes give rise to spills due to hose failure and / or bunker tank overflow etc. in spite of the strict regulatory supervision of the port operations. These spills could be as small as a few kgs to a maximum of 500 t of FO.

As can be seen from the spill scenarios mentioned above, the spills 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. Though the software is intended to be used for specific scenarios so as to get the trajectory and other weathering information; in this study, a few hypothetical scenarios have been simulated and computations carried out considering the worst-case scenarios of oil spills at the different likely locations in the domain.

Based on the above deliberations, the following scenarios for computations have been selected for carrying out modeling studies for the oil spill trajectory and weathering processes.

**Computational Scenarios:**

<b>Spill Locations</b>	<b>Pre-monsoon (Jan)</b>	<b>Monsoon (July)</b>	<b>Post monsoon (Nov)</b>
<b>SPM</b>			
Crude oil spill of 183 t at the pumping rate of 10000 m <sup>3</sup> /hr (for 75 sec release) at the SPMs (due to Hose failure) Spill points: <b>S1</b> and <b>S2</b> During spring and neap tide conditions (tide conditions : PF and PE)	▪	▪	•
Instantaneous crude oil spill of 700t at the SPMs Spill points: <b>S1</b> and <b>S2</b>	▪	▪	•
Instantaneous crude oil spill of 25000t at the SPMs -- Spill points: <b>S1</b> and <b>S2</b>	▪	▪	•
<b>Pipeline Leakage</b>			
Crude oil spill of 384 t at the pumping rate of 10000 m <sup>3</sup> /hr (for 60 sec release) along the pipeline corridor at a select (midway) point of subsea pipeline in the pipeline routes. -- Spill point: <b>S3</b>	▪	▪	•
<b>Tanker route</b>			
Instantaneous crude oil spill of 25000t along the tanker route at select location. Spill point: <b>S4</b>	▪	▪	•

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<b>West Basin (berths)</b>			
100 tons (due to Berthing incident/ collision) at the West Basin berths (FO) Spill point: <b>S5</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the West Basin berths (HSD) Spill point: <b>S5</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berths -- Spill point: <b>S5</b>	■	■	●
In the maneuvering basin: ○ 20 Tons of HSD oil due to Tug Impact (HSD) ○ 100 Tons of FO due to Tug Impact Spill point: <b>S6</b>	■	■	●
Along the vessel route at one location: Instantaneous oil spill of 700t along the tanker route at a select location.(FO): Spill point: <b>S7</b>	■	■	●
<b>LNG Berth</b>			
100 tons (due to Berthing incident/ collision) at the LNG berth (FO) -- Spill point: <b>S8</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the LNG berth (HSD) – Spill point: <b>S8</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth-- Spill point: <b>S8</b>	■	■	●
<b>South Basin (Berths)</b>			
100 tons (due to Berthing incident/ collision) at the South Basin berths (FO) -- Spill point: <b>S9</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks) at the South Basin berths(HSD) – Spill point: <b>S9</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth -- Spill point: <b>S9</b>	■	■	●
At the turning circle: ○ 20 Tons of HSD oil due to Tug Impact ○ 100 Tons of FO due to Tug Impact Spill point: <b>S10</b>	■	■	●
<b>At the existing MMPT 1 Berth: : Spill Point S11</b>			
100 tons (due to Berthing incident/ collision) at the berth(FO) -- Spill point: <b>S11</b>	■	■	●
50 Tons (due to Berthing incident/ collision (diesel oil tanks)) at the berth (HSD) – Spill point: <b>S11</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth	■	■	●

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<b>At the existing MICT / AMCT Berths:</b> <b>: Spill point S12</b>			
100 tons (due to Berthing incident/ collision) at the (FO) - Spill point <b>S12</b>	■	■	●
700 Tons due to Hull Failure / Fire / Explosion (FO) at the berth - Spill point <b>S12</b>	■	■	●
<b>At the East Basin:</b> <b>Spill point S13</b>			
100 tons (due to Berthing incident/ collision) at the East Basin berth (FO) - Spill point <b>S13</b>	■	■	●
<b>At the North Basin:</b> <b>Spill point S14</b>			
100 tons (due to Berthing incident/ collision) at the North Basin berth (FO) - Spill point <b>S14</b>	■	■	●

## 2.2 Types of oil likely to be spilled

Mundra Port mainly deals with Vegetable oils, Furnace oil, Naphtha, Methanol, High Speed Diesel, Super Kerosene Oil and other light oils at its Multi-Purpose terminal. The vessels calling at the port (or the designated anchorage areas) may spill fuel, diesel or a minimal quantity of lubricating oils. The SPM is being used to discharge crude oils from tankers.

At Berths:

- Vegetable oils,
- Furnace oil,
- Naphtha,
- Methanol,
- High Speed Diesel,
- Super Kerosene Oil,
- Carbon Black Feed Stock (CBFS),
- Motor Spirit,
- Other light oils
- Other HNS Substances

At SPM:

- Crude oil

At anchorages or within port limits:

- Fuel oil,
- Diesel oil,
- Minimal quantity of lubricating oil.

## 2.3 Probable fate of spilled oil

APSEZL is all weather, commercial port with geographical and hydrological advantages on the West Coast of India, in the Gulf of Kutch. Tidal range is between +0.37 m during Neaps and + 6.40 m during springs. Tidal streams flow 070<sup>0</sup> – 250<sup>0</sup> at an average rate of 3 kts and 4-5 kts during spring tides.

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It has been observed from the modeling study that during pre-monsoon season, the spills occurring at the APSEZL marine facilities move towards the southern / southwestern part of the Gulf of Kutch nearer to the facilities depending on tide phase.

The spills taking place at the APSEZL marine facilities move towards northern coast of Gulf of Kutch during monsoon season and affect the coast near Mundra, Kandla etc.

During post - monsoon season, the spills taking place at the APSEZL marine facilities move towards south / southwest and affect the islands /coast on southern side of the Gulf of Kutch.

The surface or subsurface oil spill consists of slick floating on the water surface, which partially dissolves in the water and partially evaporates into the atmosphere. There is a continuous exchange between the suspended and surface oil (floating oil). The assumption made in deriving the governing equations is that the thickness of the oil layer is negligible in comparison with the water depth.

In addition to the location, size and physico-chemical properties of the spill, other major factors affect the fate of the oil slick are governed by complex interrelated transport (turbulence) and weathering processes (evaporation, emulsification and dissolution). The spilled oil spreads and moves by the forces of winds and currents. A small portion of hydrocarbons begin to go into solution in the underlying water column, but most of the oil is lost through evaporation into the atmosphere. In the present model, all these processes are considered in the transport of Oil Slick.

Out of the above mentioned oils the vegetable or light oils do not pose any significant threat to the environment.

The spilled 'persistent' crude oil (or fuel oil) undergoes a number of physical and chemical changes known as "weathering". The major weathering processes are spreading, evaporation, dispersion, emulsification, dissolution, oxidation sedimentation and biodegradation.

*The term persistent is used to describe those oils which, because of their chemical composition, are usually slow to dissipate naturally when spilled into the marine environment and are therefore likely to spread and require cleaning up. Non-persistent oils tend to evaporate quickly when spilled and do not require cleaning up. Neither persistence nor non-persistence is defined in the Conventions. However, under guidelines developed by the 1971 Fund, an oil is considered non-persistent if at the time of shipment at least 50% of the hydrocarbon fractions, by volume, distill at a temperature of 340°C (645°F), and at least 95% of the hydrocarbon fractions, by volume, distill at a temperature of 370°C (700°F) when tested in accordance with the American Society for Testing and Materials Method D86/78 or any subsequent revision thereof."*

- a) **Spreading:** is one of the most significant processes during early stages of a spill is initially due to gravity. The oil spreads as a coherent slick and the rate is influenced by its activity. After a few hours, the slick begins to break-up and after this stage, spreading is primarily due to turbulence. Wind and wave actions also tend to fragment the slick, breaking it up into islands and windrows.
- b) **Evaporation:** The rate and extent of evaporation depends primarily on the volatility of the oil. In general, oil components with a boiling point below 200 D C evaporate within 4 to 16 hours in tropical conditions. Spills of refined products such as kerosene and gasoline evaporate completely and light crude lose up to 40 % of its volume within a few hours. In contrast, heavy crude and fuel oils undergo little evaporation.
- c) **Dispersion:** Waves and turbulence act on the slick to produce droplets of oil of different sizes. Small droplets remain in suspension while the larges ones rise to the surface. The rate of dispersion mainly depends on the nature of the oil and the sea state. Oils which remain fluid can spread unhindered by other weathering processes can disperse completely in moderate sea conditions within a few days. Viscous oils tend to form thick lenses on the water surface with slow

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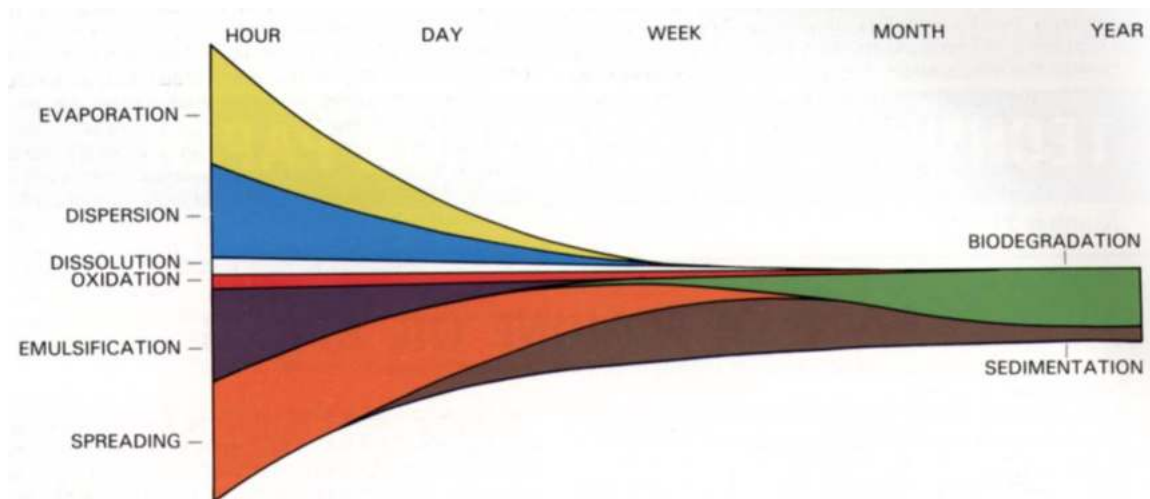
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tendency to disperse, which can persist for several weeks.

- d) **Emulsification:** Several oils have tendency to absorb water to form water-in-oil emulsions thereby increasing the volumes of the emulsified mass by a factor of 3 to 4. The rate at which the oil is emulsified is largely a function of sea state though viscous oils absorb water slowly. In turbulent sea conditions, low viscosity oils can incorporate as high as 80 % water by volume within 2 to 3 hours.
- e) **Dissolution:** The heavy components of crude oil are virtually insoluble in sea water while lighter compounds are slightly soluble. Hence levels of dissolved PHC rarely exceed 1 mg/l following a spill. Therefore, dissolution, does not make a significant contribution to the removal of oil from the sea surface.
- f) **Sedimentation:** Very few oils are sufficiently heavy to sink in sea water. However, the weathered residue gets mixed up with the suspended substances in water and may sink. This process becomes significant when water-in-oil emulsions attain specific gravity near to one and therefore need very little suspended substances to exceed the specific gravity of sea water (1.025).
- g) **Oxidation:** Hydrocarbon molecules react with oxygen and either breaks down into soluble products or combine to form persistent tars. Many of these oxidation reactions are promoted by sunlight and their effect on overall dissipation is minor in relation to other weathering processes.
- h) **Biodegradation :** Sea water contains a range of marine bacteria, moulds and yeasts which can use oil as source of carbon and energy. The main factors affecting the rate of biodegradation are temperature and the availability of oxygen and nutrient, principally compounds of nitrogen and phosphorous. Each type of micro-organism tends to degrade a specific group of hydrocarbons and whilst a range of bacteria exists between them which are capable of degrading most of the wide variety of compounds in crude oil, some components are resistant to attack.

Because the micro-organisms live in sea water, biodegradation can only take place at an oil/water interface. At sea, the creation of oil droplets, either through natural or chemical dispersion, increases the interfacial area available for biological activity and so enhances degradation.

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.3.1 shows schematic diagram of weathering processes with time.



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**Schematic diagram of weathering processes with time**

It should be appreciated that throughout the lifetime of an oil slick, it continues to drift on the sea surface, independent of these processes. The actual mechanism governing movement is complex but experience shows that oil drift can be predicted by taking into account wind-induced effects and surface water currents. These can be calculated using mathematical modeling to determine the oil spill trajectory. The wind-induced effect is normally taken as 1-3% of the wind velocity, and the current effect as 110% of the current velocity. Reliable prediction of slick movement is clearly dependent upon the availability of good wind, tide and current data.

An understanding of the way in which weathering processes interact is important in forecasting their combined effect in changing the characteristics of different oils and the lifetime of slicks at sea. In order to predict such interactions, numerical models have been developed, based on theoretical and empirical considerations.

Accidental oil spills as indicated in 'Oil Spill Scenario' in section 2.1 of this plan might occur in the area of SPM. On the basis of the data modeled, the results indicate that

- a) about 38 % of hydrocarbons are lost by evaporation, 2.8 % by emulsification and 0.75 % by dissolution within 5 hours;
- b) the quantum of dissolved oil increases up to initial 5 hours and thereafter decreases as lighter (more soluble) hydrocarbons evaporate;
- c) after 50 hour, no oil dissolves;
- d) the trend of emulsified oil is similar to that of evaporated oil but emulsification occurs at a slow rate;
- e) the radius of oil slicks increases to nearly 1400 m at the end of 148 hours; and
- f) the maximum PHC concentration in water is about 39 µg/l.

The spill trajectories clearly reveal the dominance of wind in deciding the location of landfall of the weathered oil. Thus during June-August, the spill will be preferentially transported in the north east direction under the influence of south west winds while during October-November, and possible up-to February, the oil will be predominantly carried to the southern shore. It is also evident that under the influence of the southwest winds, the oil will be deposited on the northern shore within 60 hours, while it might take about 80 hours to reach the southern shore during north east winds.

#### **2.4 Development of oil spill scenarios including worst case discharge**

The scenario of the spill are classified under two categories:

- 1. Oil Spill at Mundra Port Multi-Purpose Terminals/ Basins
- 2. Oil Spill at SPM

Oil Spill at Mundra Port Multi-Purpose Terminals/ Basins

- a) Leak during cargo transfer operations Minor (250 liters)

This can occur at the start of cargo operations, during operation due to leakage in pipes, expansion joints, and at the time of disconnection of hose at manifold. However, such instances are remote on implementation of International Safety Management by Ships and Quality Management systems by Port.

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b) Slop tank / bunker tank overflow at, Jetty / Ship Minor (250 - 1000 ltrs.)

This source of pollution is purely of an accidental nature. The ship is expected to be ship shape with good trained crew and this has been emphasized to the Master of the vessel at the time of cargo transfer / bunkering. Based on a rate of 20 cbm/hr. and reaction time of 1 min, and hose content of 150 ltrs., likely spill is only 250 litres. A ship shore check list for cargo operations and bunkering is employed. A joint declaration is made by Marine Staff and Chief Officer / Master and enforced by Marine Manager. This results in good ship / shore co-ordination.

c) Spill during berthing (tug impact) Moderate (3000 liters)

Accidental contact with tugs or another marine structure is a possibility but quantum is not going to be significant because of Fendering system employed and training given to tug crews. Also with concept of double hull tanker the entire cargo compartments are protected by another hull, thus cargo spillage due to impact of tug is remote.

d) Grounding / Hull Damage :

APSEZL operates dry cargo & liquid cargo berths. Tankers mainly carry Furnace oil, Naphtha, Methanol, High Speed Diesel, Super Kerosene Oil and Vegetable oil. Oil transfer operations at the jetty are supervised by Liquid terminal staff. Manifold area has receptacle facilities to prevent accidental spills at connection / disconnection time. Berthing is done under controlled conditions and spill due to contact damage to underwater oil tanks is very remote. Radio officer controls movement of vessels in and around the berth and traffic presently is insignificant to pose any collision damage risk. Under water sea bed characteristic is soft sand. The berth area of about 500<sup>2</sup> m is surveyed monthly for any changes and underwater obstructions; hence grounding resulting into oil spill is very remote.

**Oil Spill at SPM**

a) Hose Puncture while unloading:

In such an event, crude oil, about 10670 Kgs may spill onto water. On spillage the oil slick will be carried away at a distant location depending upon water current and wind direction. The trained crew of the maintenance vessel patrolling the area during unloading, would control the oil slick movement by using booms and subsequently, the oil will be collected by the skimmer.

b) Failure of Swivel joint of SPM:

In this event about 17780 Kgs of crude oil may spill onto water. In this case the leakage may be detected visually by the personnel monitoring the operation from the ship tanker or by the detectors provided on the SPM.

c) Leakage of Crude oil at PLEM or from the submarine pipeline:

This case will occur at least 20 m below the water surface, oil being lighter than water will travel upward and float on to water. By the time oil water reaches the sea water surface, the oil droplets may start undergoing “weathering process” and it may form emulsion along with water.

d) Ship Collision Frequency :

Based on the statistical data and its analysis carried out by National Institute of Oceanography, the probability of this type of accident is about one in every seven years for the traffic projection and hence, this case is ignored.

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e) Ship Grounding Frequency :

Based on the statistical data and its analysis carried out by National Institute of Oceanography, the probability of this type of accident is about one in eleven years for the traffic projection and hence, this case is also ignored. Also with concept of double hull tanker the entire cargo compartments are protected by another hull, thus cargo spillage due to grounding is remote.

## 2.5 Shoreline sensitivity mapping

Gulf of Kutch is a typical semi-enclosed basin where the tidal forces interact with the open ocean waters of the sea, across its western open boundary at Okha. The currents of the region are tidal-driven and the water column is vertically well mixed. These features make the numerical modeling task easier, as a 2-D hydrodynamic model is sufficient to accurately reproduce the tides and currents for the study region in the Gulf of Kutch at Mundra.

The model domain of longitudes of 68° 50' 56.7" E and 70° 27' 36.9" E and the latitudes of 22° 14' 58.8" N and 23° 01' 49.1" N is selected for carrying out sensitivity analysis and predicting the fate and transport of oil spill that may take place at APSEZL's SPMs, Basins, berths and tanker route near Mundra coast in Gulf of Kutch.

The bottom roughness in the Gulf of Kutch varies due to the variation of bed sediment grain sizes. The bed consists of various sizes of clay, sand, silt and rocky soils. In the present study a uniform Manning's roughness coefficient has been used for numerical runs of hydrodynamic processes. The filled contours of Chezy's roughness coefficient are shown in Fig. A.1.4. The same roughness coefficient has been used to predict tides and tidal velocities in the Mundra area for prediction of oil spill trajectory.

The interpolated Chezy's coefficient calculated based on Manning's roughness and total water depth is shown in Fig.A1.4. The sensitivity analysis has been carried out with various Manning's value, which is the combined effect of  $d_{50}$  sediment size and bed configuration, to calibrate the model with respect to the tide data of March and October 1994, at Sikka. The computational runs were continued with various sets of various bed roughness values till computed and measured tide levels are within the acceptable limit.

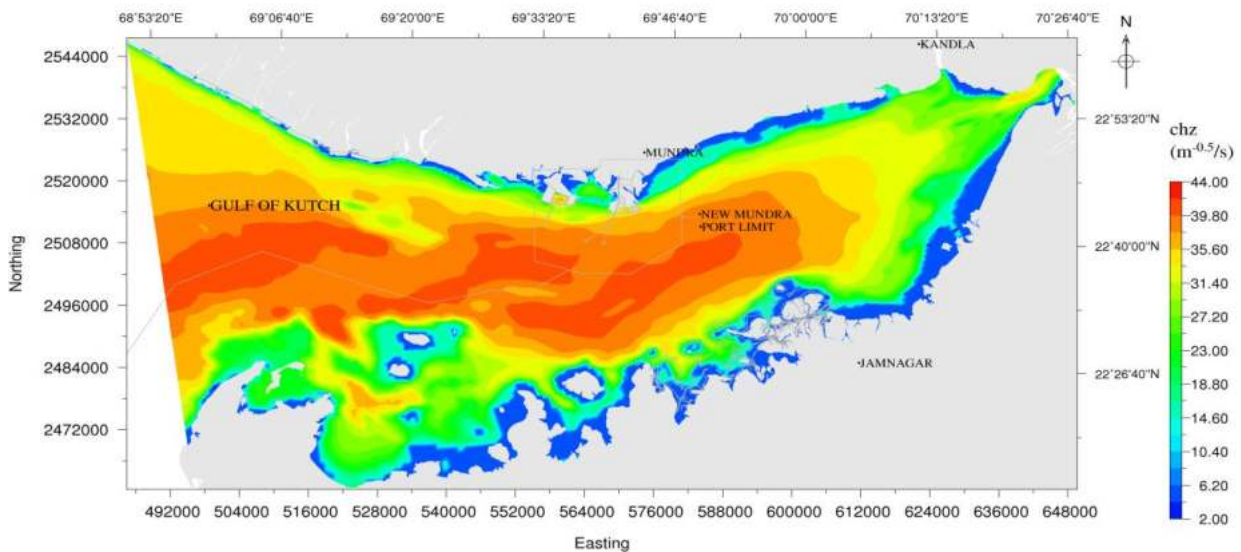


Fig.A1.4 Chezy's coefficient

For Shoreline sensitivity mapping refer Volume 2 (Annexure-V, VI and VII) of Oil Spill Risk Assessment.

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**2.6 Shoreline resources, priorities for protection**

The SPMs and the Marine facilities (Existing Berths, South Basin, West Basin, North Basin, East Basin and LNG Berth etc.) are located in the Northern side of Gulf of Kutch at Mundra. VLCCs bring Crude oil and unload at the two SPMs which are connected to the Shore tanks by means of Submarine pipelines. The Crude unloaded at these SPMs is pumped through Submarine pipeline to Shore tank farm area.

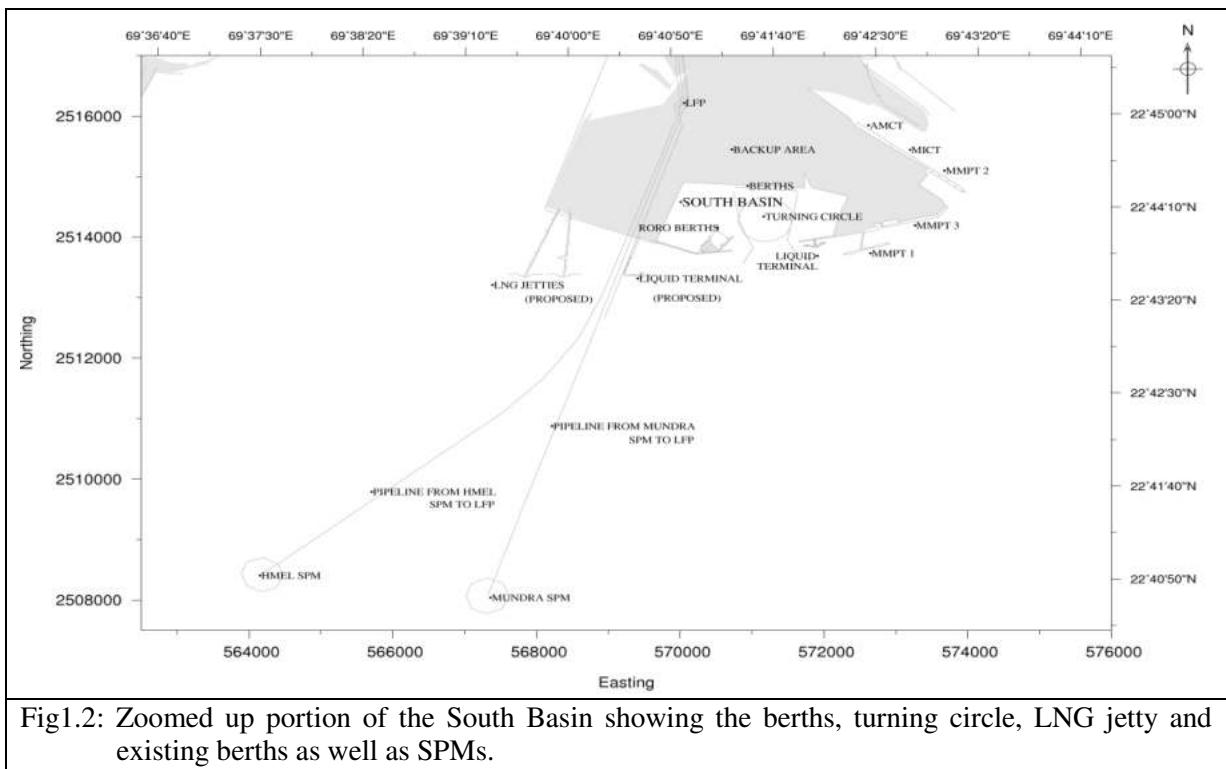
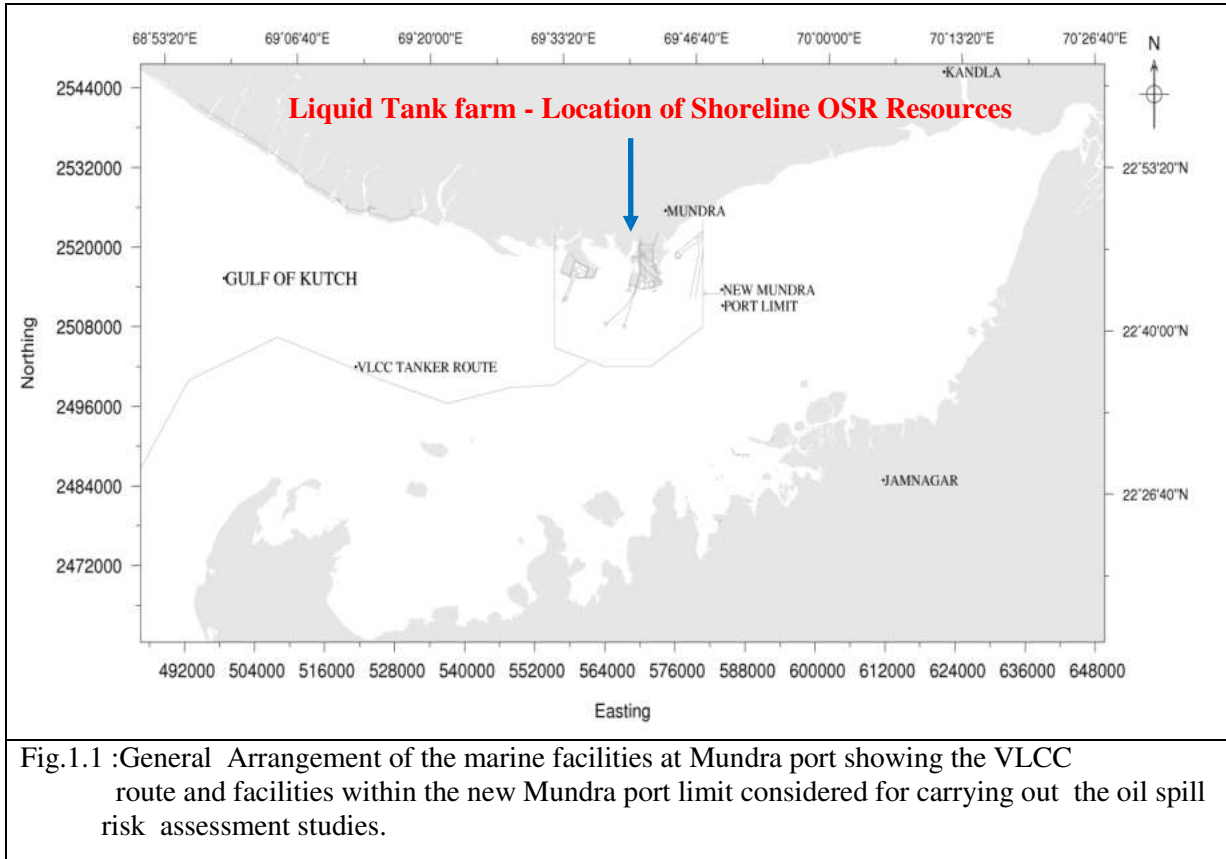
Various Marine craft / solid cargo/ liquid cargo vessels traverse through the Gulf waters to berth at the various Terminals / Berths located in the new Mundra port limit. The general layout of the various facilities like SPMs, terminals etc. within the Mundra port limit area are shown in Fig.1.1 to Fig.1.4 in chapter 1. There is a probability of spillage at SPMs, along the sub-sea pipelines and tanker route during unloading operations and transportation. Apart from these operations at the SPMs, loading / unloading operations at the different berths of the Mundra port – South Basin, West Basin, North Basin, East Basin, LNG jetty and existing berths also may give rise to accidental spills at the berth locations. The spills at these locations may affect the shore and other facilities along the coast of Gulf of Kutch. The coast of Mundra has tidal flats, sand bars and not much in the way of mangroves. The mangroves, Marine Park / Marine Sanctuary etc. are on the Southern side of Gulf of Kutch. As it was observed that the spills occurring at the various locations of the APSEZL Marine facilities may reach the Coast on the Northern side as well as on the Southern side of the Gulf depending upon the season, there is a need to protect the environment in the event of an oil spill at any of the APSEZL Marine facilities.

**Shoreline Resources available with APSEZL, Mundra for deployment during shoreline cleanup/emergent situation:**

Item	Quantity
Oil Spill Dispersants	15000 liters
Sorbent pads	2000 nos.
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Oil discharge hose, 3", 2 x 10 m	1 set
Tanker Trucks	04 nos.
Mini Vacuum Pump (30 m <sup>3</sup> / hr)	05 nos.
Sorbent Boom Pack( 12.5cm x 4 M)	500 mtr
Slurry Pump (60 m <sup>3</sup> / hr)	01 no.
Start Tank with capacity 10000 liter(10 m <sup>3</sup> )	02 nos.
OSD Applicator- Oil Dispersant Spry Unit(20 ltr) for use on beach and inter tidal zones	02 nos.

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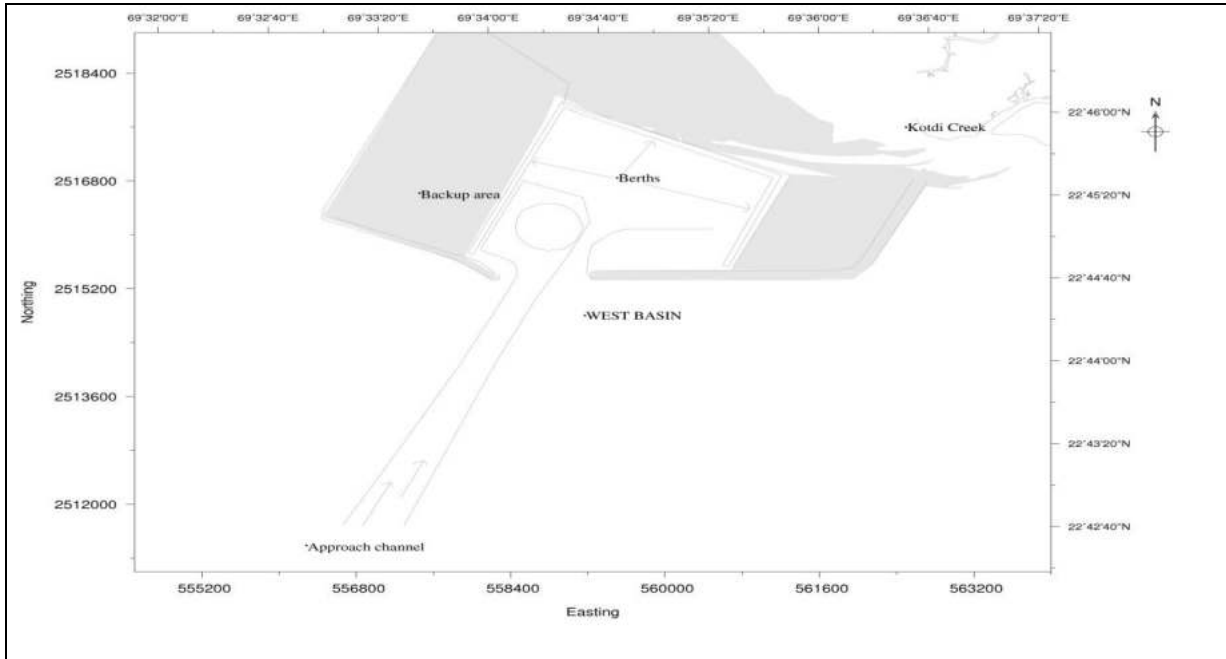


Fig.1.3 Zoomed up portion of the West Basin showing the berth locations and the approach channel for the vessels

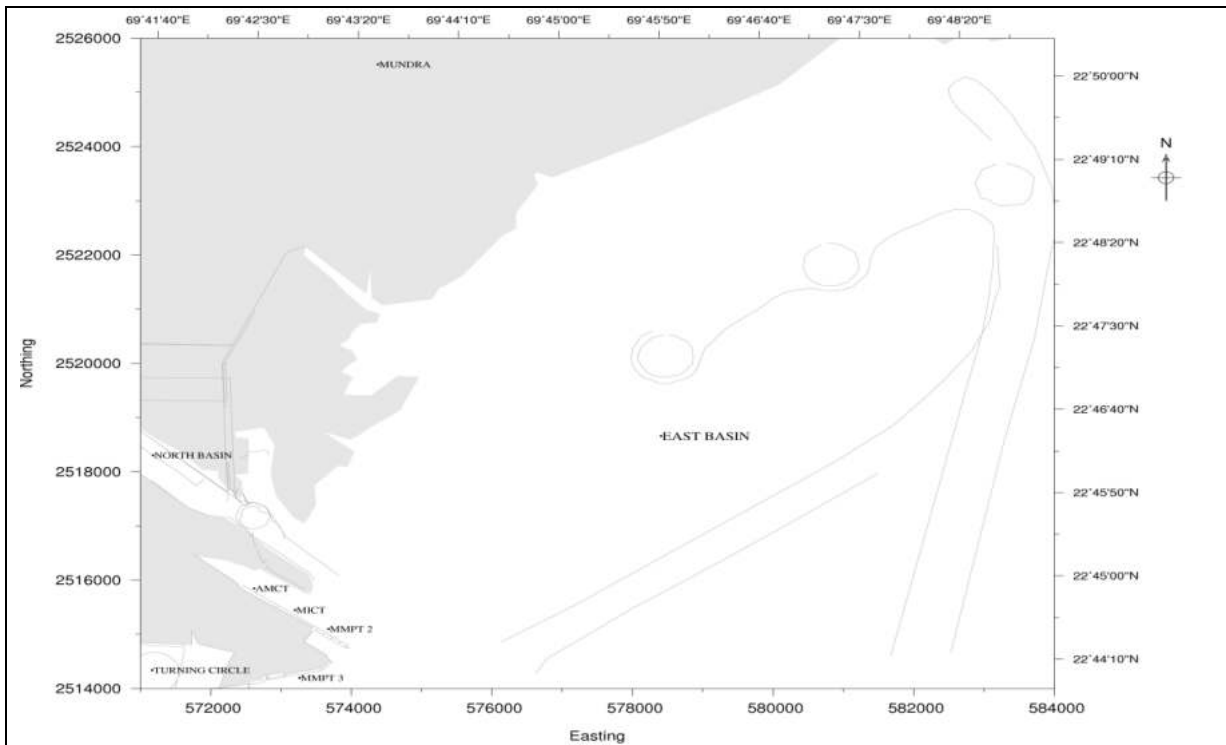


Fig.1.4 Zoomed up portion showing the East Basin & North Basin

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**Marine resources in Gulf of Kutch**

**Phytoplankton**

Phytoplanktons are vast array of minute and microscopic plants passively drifting in natural waters and mostly confined to the illuminated zone. In an ecosystem these organisms constitute primary producers forming the first link in the food chain. Phytoplankton long has been used as indicators of water quality. Some species flourish in highly eutrophic waters while others are very sensitive to organic and/or chemical wastes. Some species develop noxious blooms, sometimes creating offensive tastes and odours or anoxic or toxic conditions resulting in animal death or human illness. Because of their short life cycles, plankton responds quickly to environmental changes. Hence their standing crop in terms of biomass, cell counts and species composition are more likely to indicate the quality of the water mass in which they are found. Generally, phytoplankton standing crop is studied in terms of biomass by estimating chlorophyll and primary productivity, while in terms of population by counting total number of cells and their generic composition. When under stress or at the end of their life cycle, chlorophyll in phytoplankton decomposes to phaeophytin as one of the major products.

**Phytopigments**

During April 2010, the phytoplankton pigments viz. chlorophyll a (1.7 – 2.4 mg/m<sup>3</sup>; av 1.9 mg/m<sup>3</sup>) and phaeophytin (0.3 – 1.2 mg/m<sup>3</sup>; av 0.7 mg/m<sup>3</sup>) varied considerably. In October 2010, chlorophyll a ranged from 2.0 – 4.2 mg/m<sup>3</sup> (av 3.1 mg/m<sup>3</sup>) and phaeophytin from 0.7 - 1.1 mg/m<sup>3</sup> (av 0.7 mg/m<sup>3</sup>) (Tables 8.1 and 8.2). The average concentration (mg/m<sup>3</sup>) of chlorophyll a off Vadinar during different sampling events (2010) is listed in Table 8.1:

**Table 8.1: Average chlorophyll a (mg/m<sup>3</sup>) off Vadinar (April 2010 to October 2010)**

Area	Pathfinder	Nearshore	ESSAR DP	IOC SPM	ESSAR SPM	Salaya Creek	Gulf
April 2010	2.4	2.1	1.9	1.4	2.0	2.0	1.7
Oct 2010	2.1	4.2	2.8	4.1	2.0	-	3.7

The values of phaeophytin during the present monitoring period are given in Tables 8.2, while, the average concentrations (mg/m<sup>3</sup>) between different sampling events (April 2010 and October 2010) are listed in Table 8.2.

**Table 8.2: Average phaeophytin (mg/m<sup>3</sup>) off Vadinar (April 2010 to October 2010)**

Month	Pathfinder	Nearshore	ESSAR DP	IOC SPM	Essar SPM	Salaya Creek	Gulf
April 2010	1.2	0.6	0.8	0.3	0.6	0.8	0.6
Oct 2010	1.1	0.9	1.1	0.9	0.7	-	0.8

**Phytoplankton population**

As is generally the case with Coastal waters, the phytoplankton population density (68-332 nox10<sup>3</sup>/l; av 186 no x 10<sup>3</sup>/l) and generic diversity (11-30 no; av 18 no) varied over a wide range and in a random manner during April 2010 (Table 8.3). In October 2010 the phytoplankton population density ranged from 100-789.6 nox10<sup>3</sup>/l (av 329.4 no x 10<sup>3</sup>/l) and generic diversity ranged from 12-25 no (av 19 no) (Table 8.4) off Vadinar.

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**Table 8.3: Average phytoplankton population density (no x 10<sup>3</sup>/l) and total genera (no) off Vadinar (April 2010 to October 2010)**

Month	Pathfinder		Nearshore		ESSAR DP		IOC SPM	
	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)
Apr-10	216.2	19	200.5	17	192.7	15	127.7	18
Oct 2010	203.1	19	446.6	20	323.6	23	360.4	18

Month	Essar SPM		Salaya Creek		Gulf	
	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)	Cell count (nox10 <sup>3</sup> /l)	Total genera (no.)
Apr-10	124	16	198.5	18	211	15
Oct 2010	260	16	-	-	487.6	14

The above results indicated wide temporal and spatial fluctuations in the standing stock of phytoplankton between April 2010 and October 2010 off Vadinar. In general, the coastal waters revealed high average cell counts during October 2010 as compared to previous data. The generic diversity of phytoplankton during April 2010 widely varied with the dominance of genera such as Nitzschia (17.7%), Guinardia (16.7%), Skeletonema (9.1%), Thalassiosira (7.4%), Hemiaulus (7.2%), Navicula (6.1%), Rhizosolenia (4.5%), Biddulphia (3.4%) and Leptocylindrus (3.4%). In October 2010, the dominant phytoplankton genera were Leptocylindrus (57.6%), Guinardia (13.9%), Nitzschia (8.1%) and Chaetoceros (7.2%)

### Mangroves

According to one estimate the dense mangrove cover of Narara Bet is spread over an area of 5.5 km<sup>2</sup>. The mangrove area has increased in recent years due to extensive plantations made by the Forest Department. Mangrove cover and mudflat areas (km<sup>2</sup>) in Jamnagar, Lalpur, Khambalia and Kalyanpur Talukas estimated based on satellite data are given in Table 8.4 below:

**Table 8.4: Mangrove areas (km<sup>2</sup>) along Jamnagar coast**

Taluka	Mangroves (Dense)	Mangroves (Sparse)	Tidal mudflats
Jamnagar	12.03	23.91	83.53
Lalpur	1.96	3.95	50.50
Khambalia	3.86	11.48	101.94
Kalyanpur	0.04	0.01	0.78

\*Singh H.S., 2000. Mangrove in Gujarat, GEER foundation

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**Mangroves at Vadinar**

The intertidal expanse in the vicinity of Dargah ranged in 1 – 1.2 km. Lower intertidal zone was muddy with dense algal growth. The mid and upper intertidal zone sustained mangrove vegetation of ~ 500 m width. The zone around HTL was dominated by a sandy beach with ~ 5 m width and a narrow beam at the backshore. The distribution of mangroves at Vadinar during the present monitoring (April 2010) is given in Table 8.5 below:

**Table 8.5: Distribution of mangroves at Vadinar (Dargah - North side)**

	Location	Species	% FQ	Density	Height (m)	DBH (cm)	Seedling (no/m <sup>2</sup> )
D1	22° 26' 42.6''N 69° 42' 07.8''E	<i>A. marina</i>	100	Sep-67 -38	0.5 - 3.5	<2.6 - 6	0 - 2
D2	22° 26' 50.5''N 69° 41' 52.9''E	<i>A. marina</i>	40	0 - 5 -2	0.5 - 1.5	<2.5 - 4	0 - 1
<b>Vadinar (Dargah - south side; afforested area)</b>							
D3	22° 26' 30.8''N 69° 42' 05.6''E	<i>A. marina</i>	100	(20 - 75) -50	1.0 - 2.3	<1.5 - 5	0 - 15

As evident from above data, the stand density of *A.marina* at two locations (D1 and D2) along North-east of Vadinar Dargah varied from nil to 67 plants/100 m<sup>2</sup> with higher density of plants noticed at location D1. Frequency of occurrence ranged from 40 - 100% in the mid and upper intertidal zones. The height varied from 0.5 to 3.5 m. Mostly the plants were dwarf (av 1 m) with occasional tall plants of 3.5 m. Diameter at Breadth Height (DBH) varied from <2.5 to 6 cm. The seedling density was poor and varied from 0 - 2 no/m<sup>2</sup>. The mid intertidal segment was the popular feeding site for flocks of flamingos.

The upper intertidal expanse along South-west of Vadinar Dargah (D3) showed good growth of afforested mangroves (Table 8.5). The density of mangroves ranged from 20 - 75 plants/100 m<sup>2</sup> with an average of 50 plants/100 m<sup>2</sup>. The plant height varied from 1.0 to 2.3 m and the DBH ranged from <1.5 to 5 cm. The seedling density was low (0-15 no/m<sup>2</sup>), however, better than that noticed along North-east of Vadinar - Dargah (D1 & D2). Present results are comparable with earlier monitoring studies (2007 - 2009).

**Mangroves at Narara**

The intertidal expanse along the IOCL pipeline corridor varied from 2000 - 2200 m. The mangroves vegetation from upper intertidal region was observed to be healthy, dominated by *A.marina* on both sides of the pipeline corridor. Four locations (N1 to N4) were selected for monitoring of mangroves at Narara as detailed in below given Table 7.6.

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**Table 8.6: Distribution of mangroves at Narara**

	Location	Species	% FQ	Density	Height (m)	DBH (cm)	Seedling (no/m <sup>2</sup> )
N1	22° 27' 56.8''N 69° 43' 43.2''E	<i>A.marina</i>	100	20-45 (38)	2-3	3-8	0-85
		<i>C.tagal</i>	10	0.7*	-	-	-
		<i>R.mucronata</i>	5	0.2*	-	-	-
N2	22° 27' 59.1''N 69° 43' 21.3''E	<i>A.marina</i>	100	60-90 (85)	2-4	25-12	0-7
N3	22° 28' 03.5''N 69° 43' 27.4''E	<i>A.marina</i>	100	28-85 (50)	0.5-2.5	<15-7	0-55
		<i>R mucronata</i>	3	-	-	-	-
N4	22° 28' 07.2''N 69° 43' 24.6''E	<i>A.marina</i>	100	30-130 (80)	0.5-3.5	<2.0-3.5	0-10

\* no/500 m<sup>2</sup>

As can be noticed in the above table, the plant density of *A.marina* varied from 20 - 130 plants/100 m<sup>2</sup> with a frequency of occurrence of 100% at Narara. The species like *Ceriops tagal* (7 plants/500 m<sup>2</sup>) and *Rhizophora mucronata* (2 plants/500 m<sup>2</sup> - 3 plants/100 m<sup>2</sup>) were rarely noticed. The locations N2 (85 plants/100 m<sup>2</sup>) and N4 (80 plants/100 m<sup>2</sup>) revealed better average density of *A.marina* as compared to the rest. The height of *A.marina* varied from 0.5 to 4 m with N2 and N4 locations indicating better plant height than the rest. The DBH varied from <1.5 to 12 cm at the monitoring locations. The seedling density ranged from 0 - 85 no/m<sup>2</sup> with N1 and N3 locations sustained better seedling density than the rest. Few new plants (30 - 45 cm in height) of *C.tagal* and *R.mucronata* were noticed at the EOL pipeline corridor during the present monitoring.

#### Sand dune vegetation

The narrow beach of ~ 5 m width around HTL along Narara Bet is marked with berm of ~ 1.5-2 m width, followed by back shore sandy zone. Occasional shrubs of *Salicornia brachiata* and *Suaeda maritima* are observed on the backshore sandy zone. The sand dune flora is more predominant on berm and immediate back shore zone of ~5 m width. Sand dune flora is represented by seven species viz; *Crassa sp*, *Cyperus arenarius*, *Launea sp*, *Suaeda maritima*, *Salicornia brachiata*, unidentified *Poaceae* member and unidentified *Fabaceae* member.

#### Seaweeds and Seagrasses

Seaweeds, which are known as a source of food, fodder and manure, are mostly found attached to various substrata like sandy, muddy and coralline sediments as well as rocky areas and play a significant role in enriching the sea by adding dissolved organic matter, nutrients and detritus besides serving as nursery areas for the larvae and juveniles of innumerable marine organisms. Some green Seaweeds are edible, red algae are the important source of agar and some of the brown algae are used for manufacturing algin and alginic acid. Seaweeds are also used to produce some bioactive compounds.

The algal zone of Narara Bet is confined to 1.2-2.5 km width. A total of 62 species of algae and 3 species of sea grasses are recorded from this region. Among them *Lyngbya*, *Caulerpa*, *Cladophora*, *Ulva*, *Cystocleira*, *Dictyota*, *Hydroclathrus*, *Padina*, *Sargassum*, *Acanthopora*, *Amphiroa*, *Champia*, *Centraceros*, *Gracilaria*, *Hypnea* and *Polysiphonia* were common with the dominance of *Padina* and *Gracilaria* at the lower reef flat. The open mudflats of Narara Bet are dominated by algae like *Enteromorpha*, *Ulva*, *Lyngbya* and *Polysiphonia*, while, the upper sandy shore and mangrove areas are associated with *Enteromorpha* and *Ulva*. Seagrasses such as *Halophila ovata* and *Halodule uninervis* are common in patches on sandy regions of the reef, while, *Halophila beccarii* occasionally occurred on mudflats along the tidal channels.

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*Open mudflats near Dargah and Narara pipeline corridor supported growth of twelve marine algae dominated by Enteromorpha spp (Table 8.7). The biomass of Enteromorpha estimated at ~ 4 kg/m<sup>2</sup>.*

**Table 8.7: Marine algal flora along Narara/Vadinar**

Sr. No.	Species	% FO*	ES*
1	<i>Enteromorpha clathrata</i>	100	D
2	<i>Enteromorpha intestinalis</i>	100	D
3	<i>Caulerpa racemosa</i>	50	C
4	<i>Ulva fasciata</i>	100	D
5	<i>Ulva lactuta</i>	100	D
6	<i>Ulva reticulate</i>	90	D
7	<i>Codium elongatum</i>	30	O
8	<i>Sargassum ilicifolium</i>	45	C
9	<i>Sargassum tenerimum</i>	60	CD
10	<i>Gracilaria corticata</i>	55	C
11	<i>Gracillaria verrucosa</i>	85	C
12	<i>Polysiphonia platycarpa</i>	20	O

\*%FO: Percentage Frequency Occurrence, ES: Ecological Status, D: Dominant (% FO = 80-100), CD: Co-dominant (% FO = 60-79), C: Common (% FO = 40-59), O: Occasional (% FO = 20-39).

The intertidal zone of Kalubhar Tapu harbours 47 species of marine algae and three species of seagrasses. The reef areas of this island are dominated by *Dictyota*, *Gracilaria*, *Padina*, *Hydroclathrus*, *Ulva* and *Hypnea*. The open mudflats and sandy areas at the upper intertidal are preferred by *Enteromorpha*, *Ulva*, *Lyngbya* and *Polysiphonia*. The sandy region of the reef flat supported seagrasses like *Halophila* and *Halodule*.

### **Zooplankton**

The zooplankton standing stock in terms of biomass and population density during April 2010 (Table 8.8) varied from 0.2 to 121.2 ml/100m<sup>3</sup> (av 3.3 ml/100m<sup>3</sup>) and 2.2-722.7 x 10<sup>3</sup>/100m<sup>3</sup> (av 39 x 10<sup>3</sup>/100m<sup>3</sup>), respectively while during October 2010 the zooplankton biomass and abundance ranged from 0.2 to 12.0 ml/100m<sup>3</sup> (av 3.5 ml/100m<sup>3</sup>) and 2.5-157.8 x 10<sup>3</sup>/100m<sup>3</sup> (av 48.4 x 10<sup>3</sup>/100m<sup>3</sup>) respectively suggesting normal secondary production off Vadinar during the monitoring period.

The average zooplankton biomass (ml/100m<sup>3</sup>), population density (nox10<sup>3</sup>/100m<sup>3</sup>) and total groups (no) off Vadinar during the monitoring period varied in accordance with the data presented in Table 8.8.

**Table 8.8: Average values of zooplankton (A) biomass (ml/100m<sup>3</sup>) (B) Population density (nox10<sup>3</sup>/100m<sup>3</sup>) and (c) total groups (no) off Vadinar (April 2010 – October 2010)**

Area		Pathfinder	Nearshore	ESSAR DP	IOC SPM	Essar SPM	Salaya Creek	Gulf
April 2010	A	8.3	1.1	1.1	0.9	1.4	2.5	3.5
	B	89.9	24.6	14.4	22.7	12.7	20.4	37.4
	C	17	15	12	16	13	16	17
Oct 2010	A	4	3.9	1.5	3	5.7	-	2.1
	B	57.4	55.9	23.5	30.5	83.1	-	32.8
	C	13	11	10	10	9	-	7

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The overall zooplankton standing stock was low and highly variable off Vadinar which could be due to high patchiness and seasonal variability in their distribution apart from high grazing pressure at higher trophic levels.

During April 2010, 24 faunal groups were identified in the coastal waters off Vadinar during the monitoring period while 17 faunal groups were present in the samples of October 2010. The most common faunal groups were copepods (40.5%), decapod larvae (19%), gastropods (22.5%), lamellibranchs (10.7%), and foraminiferans (2.1%) in April 2010. In addition to the above, groups like chaetognaths, siphonophores, *Lucifer* sp, polychaetes, ctenophores, medusae, amphipods, ostracods, mysids, heteropods, isopods, stomatopod larvae, appendicularians and fish larvae were also frequently noticed but in less numbers during April 2010. During October 2010, the dominant groups were copepods (93.6%) and decapod larvae (4.8%). In general, the coastal waters off Vadinar revealed a moderate production of zooplankton associated with random fluctuations and seasonal changes.

**Macro benthos**

The organisms inhabiting the sediment are referred as benthos. Depending upon their size, benthic animals are divided into three categories, macrofauna, microfauna and meiofauna and macrofauna. Benthic community responses to environmental perturbations are useful in assessing the impact of anthropogenic perturbations on environmental quality. Macrobenthic organisms which are considered for the present study are animals with body size larger than 0.5 mm. The presence of benthic species in a given assemblage and its population density depend on numerous factors, both biotic and abiotic.

**Intertidal macrofauna**

During April 2010, Intertidal macrofauna was studied along 5 transects viz. 1 transect (Transect I) at Kalubhar Island and 4 transects at Narara Bet. Several locations were sampled along each transect between the HTL and the LTL viz; High Water (HW), Mid Water (MW) and Low Water (LW). The intertidal macrofaunal standing stock in terms of population density (50-7800 no/m<sup>2</sup>, av 2292 no/m<sup>2</sup>) and biomass (0.1-37.2 g/m<sup>2</sup>; wet wt, av. 9.2 g/m<sup>2</sup>; wet wt) varied widely During the post monsoon, only the first three transects were sampled. In October 2010, the intertidal macrofaunal standing stock in terms of population density ranged from 0-3625 no/m<sup>2</sup> (av 1185 no/m<sup>2</sup>) and biomass from 0-67.8 g/m<sup>2</sup>; wet wt (av. 14.6 g/m<sup>2</sup>; wet wt). These results are compared with historical data in Table 8.9.

**Table 8.9 Average of intertidal macro benthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m<sup>2</sup>) (B) Population density (no/m<sup>2</sup>) and (C) Total groups**

Transect		I	II	III	IV	V
April 2010	A	11.2	4.2	13.7	10.7	6.1
	B	3983	1172	1292	2401	2614
	C	5	3	6	6	3
Oct 2010	A	11.9	16.8	15.1	-	-
	B	1495	904	1156	-	-
	C	5	7	5	-	-

Overall, the intertidal region sustained good faunal standing stock and diversity and the contribution of major faunal components are comparable over the past many years at Narara Bet/Kalubhar.

**Subtidal macrofauna**

Subtidal macrofauna was studied at 13 stations in the coastal system off Vadinar during April 2010 and at 10 stations during October 2010. The distribution of subtidal faunal standing stock in terms of biomass (0.3 - 41.0 g/m<sup>2</sup>; av 8.0 g/m<sup>2</sup> wet wt) and population density (150-8925 no/m<sup>2</sup>; av 1902 no/m<sup>2</sup>) during April 2010. In October 2010 the biomass ranged from 0.3 – 23.9 g/m<sup>2</sup> (av 7.1 g/m<sup>2</sup>; wet wt) and population density ranged from 125-14975 no/m<sup>2</sup> (av 2282 no/m<sup>2</sup>) The current data is listed (April 2010 – Oct 2010) in Table 8.10.

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**Table 8.10 Average of subtidal macrobenthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m<sup>2</sup>) (B) Population density (no/m<sup>2</sup>) and (C) Total groups**

Area		Pathfinder	Nearshore	ESSAR DP	IOC SPM	ESSAR SPM	Salaya Creek	Gulf
April 2010	A	11.2	2.9	2.0	6.1	1.3	15.5	6.4
	B	3833	338	388	694	2375	1553	1865.5
	C	7	3	4	6	5	6	4
Oct 2010	A	12.1	7.7	1.9	4.9	1.8	-	10.6
	B	5019	2967	400	1169	181	-	1652
	C	8	5	4	4	2	-	7

The macrobenthic population was dominated by polychaetes (50.1%), amphipods (18.5%), pelecypods (8.2%), decapod larvae (7.4%), tanaids (3.6%) and foraminiferans (3.2%) during April and by polychaetes (76.3%), amphipods (12.3%) and pelecypods (5%) during October 2010.

### Corals and associated biota

Live corals at the Narara and Kalubhar reefs are mainly confined to the lower littoral (reef flat) and shallow subtidal zones (< 8 m). They are absent at the upper reef flat probably because of high rate of sedimentation and long exposure during low tide.

### Narara Bet

The eastern segment of Narara Bet represents a formation of vast mud flat, which resulted in significant negative influence on the live coral population. Many regions along the reef flat on the western side are exposed during low tide for prolonged periods because of which the distribution of live corals was poor. In all 30 and 22 Scleractinian species have been identified in the intertidal and subtidal zones respectively of Narara Bet with *Montipora*, *Goniopora*, *Porites*, *Favia*, *Favites*, *Goniastrea*, *Platygyra*, *Cyphastrea*, *Pseudosiderastrea*, *Turbinaria*, *Leptastrea* and *Symphyllia* as the dominant genera.

In general, the live coral density decreased with depth. The live corals were absent beyond 8 m (CD). However, the subtidal area at Narara sustained good coral populations within 5 m (CD). Distance-wise corals were rich within 250 m towards the sea from the LTL. The corals of the genera *Montipora*, *Porites*, *Favites*, *Goniastrea*, *Goniopora*, *Cyphastrea*, *Leptastrea*, *Favia* and *Turbinaria* dominated the subtidal area.

### Kalubhar

In general, Kalubhar reef sustained relatively healthy live corals at the lower intertidal and subtidal (<7 m depth) zones as compared to the population at the Narara reef. The north and north-west regions of Kalubhar had better coral density and diversity as compared to the east and south-east regions because of high sedimentation of the reef flat and the subtidal zones. Overall, 30 and 7 species of Scleractinians in the intertidal and subtidal zones respectively at Kalubhar have been identified. The corals at Kalubhar were mainly represented by genera *Montipora*, *Favia*, *Favites*, *Porites*, *Goniastrea*, *Goniopora*, *Cyphastrea*, *Platygyra*, and *Symphyllia* and *Turbinaria*. The live corals were absent at the reef edge of 50 m width due to total exposure for longer period whereas their coverage increased (90 to 100%) at the reef slope below 1 m depth.

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A rich reef associated flora and fauna was noticed at Kalubhar. The common and dominant seaweed genera were *Sargassum*, *Gelidiella*, *Acanthophora*, *Ulva*, *Caulerpa*, *Codium*, *Dictyota*, *Padina*, *Halymenia*, *Enteromorpha*, and *Gracillaria*. Varieties of sponges were associated with coral boulders. The fauna consisted of coelenterates (*Zoanthus* sp., *Discosoma* sp., *Stoichactis*, *giganteum*, *Cerianthus* sp. and variety of corals), annelids (various polychaetes), echiuroid (*Ikedella misakiensis*), crustaceans (amphipods, isopods, *Acetes* sp., shrimps and crabs), molluscs (*Octopus* sp., *Sepia* sp., *Loligo* sp., gastropods, bivalves, nudibranchs etc.) echinoderms and variety of reef fishes.

### **Fishery**

Gujarat ranks number one position in marine fish production in India. The Gulf contributes about 22% to the fish production of the state. The share of the Jamnagar District is between 5 and 14% (av 10%) to the State's total marine fish landings. The important fish landing centres in the vicinity of IOCL SPM area which falls under Khambalia zone are Vadinar, Bharana, Nana Amla and Salaya which together contributed about 6823 t, 8253 t and 5330 t of fish landings in 2006-07, 2007-08 and 2008-09 respectively to the total landings of the Jamnagar District. Similarly, the important fish landing centres in the vicinity of Sikka which falls under Jamnagar zone are Sachana, Baid, Sarmat, Bedi and Sikka which together contributed about 4768 t, 5122 t and 5848 t of fish landings in 2006-07, 2007-08 and 2008-09 respectively. Within the Jamnagar zone, the major landings (98%) were from Sachana (32%), Baid (27%), Sikka (19.7%) and Bedi (18.9%) during the last 3 years. Within the Khambalia zone, the major landings (81-89%) were at Salaya during the period 2006-09. On an average the Khambalia zone (56.5%) contributed to about 13% higher fish landings than Jamnagar zone (43.5%) for the last 3 years. However, the landings at Sikka (1.3%) and Vadinar (0.5%) to the total landings of the district were negligible during the period 2006-2009.

### **Reptiles and mammals**

The reptiles are mainly represented by marine turtles *Chelonia mydas* and *Lepidochelys olivacea* which breed and spawn on the sandy beach along the Sikka-Vadinar coast as well as on the islands.

Dolphin (*Dolphinus delphis*) and whale (*Balanoptera* sp) are common in the Gulf. Though occurrence of Dugong (*Dugong dugon*) in the Gulf particularly along the Jamnagar coast has been reported, there are no recent sightings.

The resources discussed above likely to be threatened are tidal flats, Phytoplankton, Phytopigments, Mangroves, seaweeds and seagrasses, Zooplankton, Macrobenthos, Corals and associated biota, salt works fishing activities and other vocational related to marine sensitive areas in the coast of Vadinar and Sikka.

It has been observed from the modeling study that during pre-monsoon season, the spills occurring at the APSEZL marine facilities move towards the southern / southwestern part of the Gulf of Kutch nearer to the facilities depending on tide phase.

The spills taking place at the APSEZL marine facilities move towards northern coast of Gulf of Kutch during monsoon season and affect the coast near Mundra, Kandla etc.

During post - monsoon season, the spills taking place at the APSEZL marine facilities move towards south / southwest and affect the islands /coast on southern side of the Gulf of Kutch.

### **2.7 Special local considerations**

Considering the distant proximity of various other installations with the port of Mundra, in case of a tier 1 spill, no other special considerations are deemed to be required apart from an active spill response close to the port facility itself.

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### 3 Response strategy

#### 3.1 Philosophy and objectives

This plan is intended to assist APSEZL in dealing with an accidental release or discharge of oil. Its primary purpose is to set in motion the necessary actions to stop or minimize the discharge and to mitigate its effects. Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

This plan guides the HOD– Marine and his Duty Staff through the decisions which will be required in an incident response. The tables, figures and checklists provide a visible form of information, thus reducing the chance of oversight or error during the early stages of dealing with an emergency situation.

For this plan to be effective, it must be:

- familiar to those APSEZL staff with key response functions;
- regularly exercised; and,
- Reviewed and updated on a regular basis.

This plan uses a tiered response to oil and chemical pollution incidents. The plan is designed to deal with Tier One spillage. The products handled are likely to pose a greater fire and safety, rather than an environmental risk; there may thus be additional factors involving the safety of personnel, which will take precedence over the pollution response. In this case, reference must be made to the APSEZL Emergency Procedures Manual. The salvage and casualty management of any vessel that poses a threat of pollution is priority considerations.

During oil spill response activities, account must be taken of the following:

- site hazard information
- adherence to permit procedures
- spill site pre-entry briefing
- boat safety
- APSEZL safety manual and material safety data sheets
- Personal protective equipment needs
- heat stress
- decontamination

#### 3.2 Limiting and adverse conditions

APSEZL is situated in natural protected Gulf of Kutch and there are less incidences of heavy wind or any other factor affecting operation.

#### 3.3 Oil spill response in offshore zones

SPM handles (unloading) crude oil and pumps it to shore tank farm area through sub-sea pipeline. The impact of such spills on marine environment is on the higher side. Hence, oil spill equipments are required for combating oil in case of such spills at the marine facilities at Mundra.

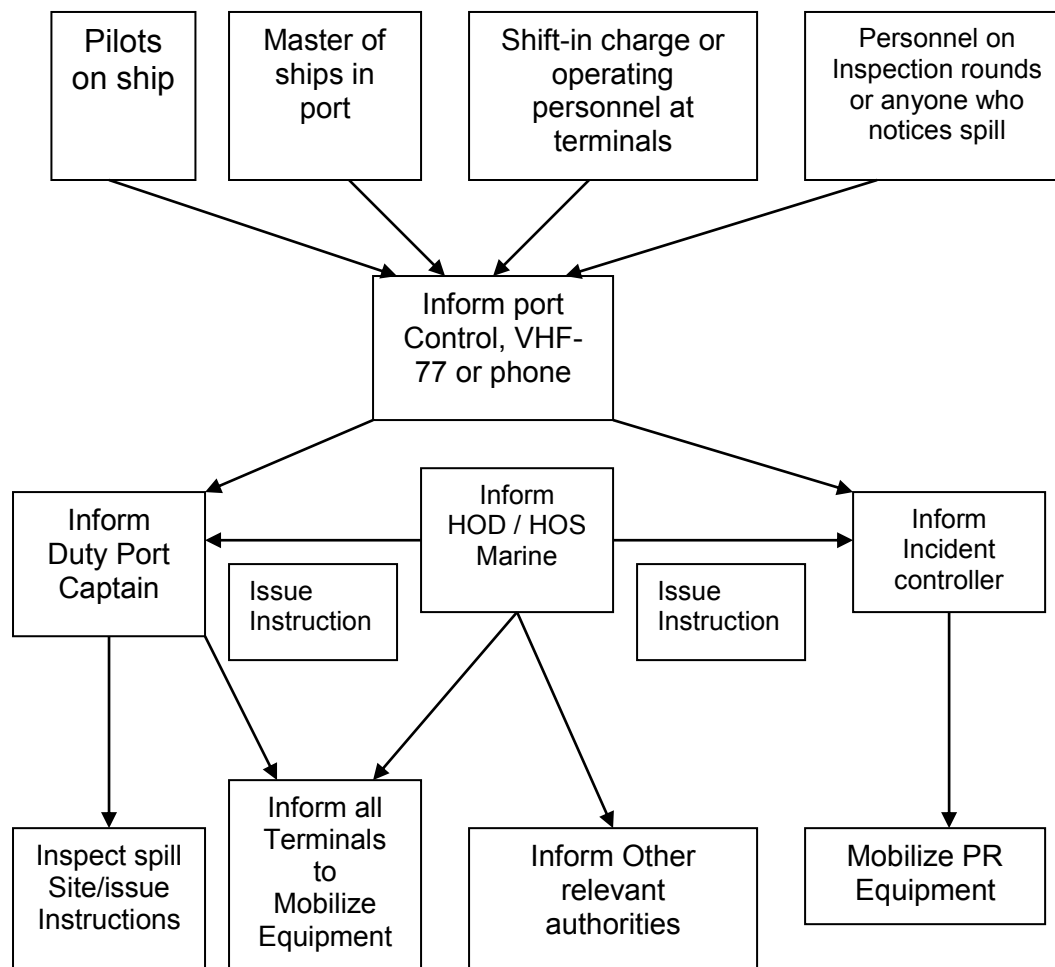
Based on the oil spill modeling study, it has been observed that crude oil spill of 700 tons (Tier-I) will spread over an area having radius of around 400 m within 4hr. APSEZL has already having facilities for combating a Tier-1 spill.

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**3.4 Oil spill response in coastal zones**

*Contingency Chart to deal with Oil Spill*



**On-site Crisis Management Group – Action Group**

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

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**Roles & Responsibilities**

**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 Defence, 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/fire fighting/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 Duty 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 on site and off site personal protection, safety and accountability
- 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

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**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 fire fighting 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
- 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 centre 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.

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

**Communications Officer – (Duty Port Captain / Duty Marine Control 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)**

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

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**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:**

- 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)

**3.5 Shoreline oil spill response**

Most oil spills reach the shorelines and cause visible oil pollution which is particularly sensitive to public opinion. The selection and correct application of clean up techniques are therefore essential. When an oil spill occurs on open water the optimal solution is to intercept and recover the oil before it reaches the shoreline. This is because:-

- The environmental damage is normally less critical in the open water environment
- The logistics of oil removal becomes more complex in the varied natural environment of coastlines compared with the open sea.
- The costs of oil recovery increases dramatically when oil reaches sensitive shorelines compared with open water operations.

Experience has shown that it is very difficult to avoid some oil reaching the shorelines. Mechanical equipment and chemical treatment at sea are often insufficient to recover all oil spilled at sea. When the oil reaches the shoreline, a number of different parameters specific for this particular situation have to be taken into consideration:-

- Quantity of oil
- Characteristics of the oil (for instance, toxicity and viscosity)
- Prevailing on-site conditions (weather, season, tides, temperature)
- Shoreline type or combination of types (cliffs, pebble, sand, marsh)
- Special Considerations

**The four main steps in a shoreline clean-up operation are:**

**Step 1: Assessment**

- Determine the need to clean, setting priorities in line with this contingency plan
- Determine required degree of clean-up for each area in accordance with priorities
- Attain agreement between clean-up team, ecological experts, government authorities

**Step 2: Select Clean-up Method**

- Choose method appropriate to type of shoreline, access, degree of oiling
- Minimize damage caused by choice of clean-up technique, degree of clean-up
- Address conflicts of interest (e.g. needs of amenity use versus environment or response speed versus aggressiveness)

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**Step 3: Clean-up Operations**

- Monitor clean-up, confirm choices made above, re-evaluate if necessary
- Minimize disturbance of shoreline features
- Minimize collection of un-oiled debris, sediments

**Step 4: Termination / Monitoring**

- Ongoing assessment of clean-up operations
- Determine when clean-up objectives have been met
- Post-spill monitoring to confirm recovery of shoreline features, biota

**The four main methods for shoreline clean-up are as follows:-**

**A. Pumping and Skimming Techniques**

- Applicable to shorelines that are heavily oiled.
- Often the first step in cleaning a heavily contaminated shoreline.
- Preferred option because it results in fluid wastes that are relatively free of sediments and debris, which are more easily dealt with in disposal.
- Pumping and skimming techniques can also be used in conjunction with flushing techniques.

**B. Flushing Techniques**

- Use water or steam to flush oil from the beach, and direct it to a recovery location.
- Applicable to heavily contaminated beaches, and substrates that are relatively impermeable (e.g., mud and saturated beaches, boulders, and man-made structures) that will not allow the flushed oil to penetrate the beach surface.
- Typically carried out in conjunction with a skimming operation. The flushed oil is directed down-slope to skimmers positioned at the water's edge, with booms deployed around the skimmers to prevent any loss of the water.
- Options of using low or high pressure water, and of using ambient temperature water versus warm water or steam.
- Low pressure, cold water is generally the least effective, particularly with sticky oils and emulsions, but is least harmful on the environment.
- High pressure water and heated water and steam are more effective, but may remove and/or kill beach-dwelling organisms.

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C. Sediment Removal Techniques

- Applicable to a variety of shoreline types, and in particular, when the shoreline is heavily contaminated, though likely to cause the greatest environmental impact
- The requirements are access for the heavy equipment required for transporting away oily debris and sediments for disposal and a surface which is able to support heavy equipment
- An important factor to consider is the depth of oil penetration
- Important to limit the depth of material removed in order to minimise disturbance to the beach, and to minimise disposal requirements
- The best option is to use manual labour to pick up the oily sediment and mechanical means to transport it away

D. Biodegradation Techniques

- Generally refers to "active" bioremediation, where nutrients and/or microorganisms are applied to enhance natural degradation
- Generally suitable for areas that are lightly oiled, especially lightly oiled salt marshes and tidal flats where the use of equipment could increase the environmental effects by forcing oil into the substrate
- It can also be used as a final clean-up step following more active efforts

The shoreline clean-up operation is normally not an emergency operation as is the case with an oil spill on open water. A clean-up project can last many weeks or months depending on the amount of oil spilled. Many wrong decisions can be made in planning and carrying out a shoreline clean-up operation. The contingency plan must be used in combination with consulting experts with experience of shoreline clean up. The agencies such as NIO, NEERI, Ports and Oil companies have experts with experience which is relevant for the specific oil spill situation and they should be consulted prior undertaking shoreline clean-up.

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### 3.6 Storage and disposal of oil and oily waste

After the natural degradation by coagulation and evaporation of oil on water, residual oil and waste material collected during a Tier 1 response will be disposed off by in-situ or terrestrial burning.

	Type of material	Separation methods	Disposal methods
LIQUIDS	Non-emulsified oils	Gravity separation of free water	Use of recovered oil as fuel or refinery feedstock
	Emulsified oils	Emulsion broken to release water by ; - Heat treatment - Emulsion breaking chemicals - Mixing with sand	Use of recovered oil as fuel or refinery feedstock. Burning Return of separated sand to source.
SOLIDS	Oil mixed with sand	Collection of liquid oil leaching from sand during temporary storage Extraction of oil from sand by washing with water or solvent Removal of solid oil by sieving	Use of recovered oil as fuel or refinery feedstock. Direct disposal Stabilization with inorganic material. Degradation through land farming or composting. Burning
	Oil mixed with cobbles, pebbles or shingle	Collection of liquid oil leaching from beach material during temporary storage Extraction of oil from beach material by washing with water or solvents	Direct disposal. Burning
	Oil mixed with wood, plastics, sea weeds, sorbents	Collection of liquids leaching from debris during temporary storage Flushing of oil from debris with water	Direct disposal. Burning. Degradation through land farming or composting for oil mixed with sea weeds or natural sorbents.
	Tar balls	Separation from sand by sieving	Direct disposal Burning

#### Location for Dug Pond for temporary storage of oily water:

To store the contaminated oily water, temporary dug pond will be excavated for storage of oily water. It is expected that 20 times volume of oil & water mixture will be generated if oil spill happen in the sea. Storage capacity of dug pond of volume 14000 m<sup>3</sup> considering spill of level 1 (Tier-1) is required.

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Location Identified for Dug Pond behind Maruti Yard (Lat. 22° 45.252'N , Long. 69° 41.093'E) is roposed.



- Size of Dug Pond to be provided : 100 mtr X 100mtr X 1.5mtr
- Total storage capacity (m3) : considering 20 times oily water @ 700 m3 = 14000 m3

Once the contaminated mixture of oil and water is stored, the same will be transferred via tanker to following location. Following are the steps require to be followed.

1. Oil Water Separator: Capacity 25 m3/hr.
2. Effluent Treatment Plant: Capacity 120 KLD
3. Parallely oil recyclers will be approached for the collection and transportation of the oily water.
4. Contaminated Soil / Sediments will be directly sent to the Treatment Storage and Disposal Facility (TSDF) site. List of Oil recyclers and TSDF sites are shown in Annexure – 15
5. Different types of equipment & manpower require for creating dug pond:

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Name of Equipment	Quantity	Primary Responsibility of Equipment & Material	Secondary Responsibility
Excavator	10 Nos.	Marine Dept.	MHS section (Dry Cargo) / Asset Department / Procurement
JCB Machines	10 Nos.	Marine Dept.	ES Civil / Asset Department / Procurement
<b>Material</b>			
HDPE Liners for dug pond	10600 Sq. mtr.	Marine Dept.	Stores & Procurement

In phase wise manner stored oily water will be treated at both the above facility to separate oil from water to the possible extent. Whereas, after recovery of oil from water, water confirming to the effluent discharge limit of oil (< 10 ppm) will be discharged in to sea.

Whereas in case oily water will not capable of treat at OWS & ETP will be dispose through sending it to registered recyclers, for which APSEZL have already done tie up with the registered recyclers as mentioned in **Annexure – 15**.

APSEZL have also done necessary tie up with various institutes/agency/NGO as mentioned in **Annexure – 16** for providing service for rescue & rehabilitation of oil soaked birds as well as restoration of mangroves, when oil reaches to the sea shore and mangrove areas during oil spill. Mobile van / vehicle require for rescue of oil soaked birds to transfer from affected area to treatment facility center.

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## 4 Equipment

### 4.1 Marine oil spill response equipment

Detailed in Annexure 3

### 4.2 Inspection, maintenance and testing

The equipments are being kept in working condition. Routine inspection, maintenance and testing performed as per the stipulated requirements.

### 4.3 Shoreline equipment, supplies and services

The shoreline clean-up equipment which are essential for the oil removal operations at beaches are as follows:-

- Protective clothing for everybody (including boots and gloves), spare clothing.
- Cleaning material, rags, soap, detergents, and 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.

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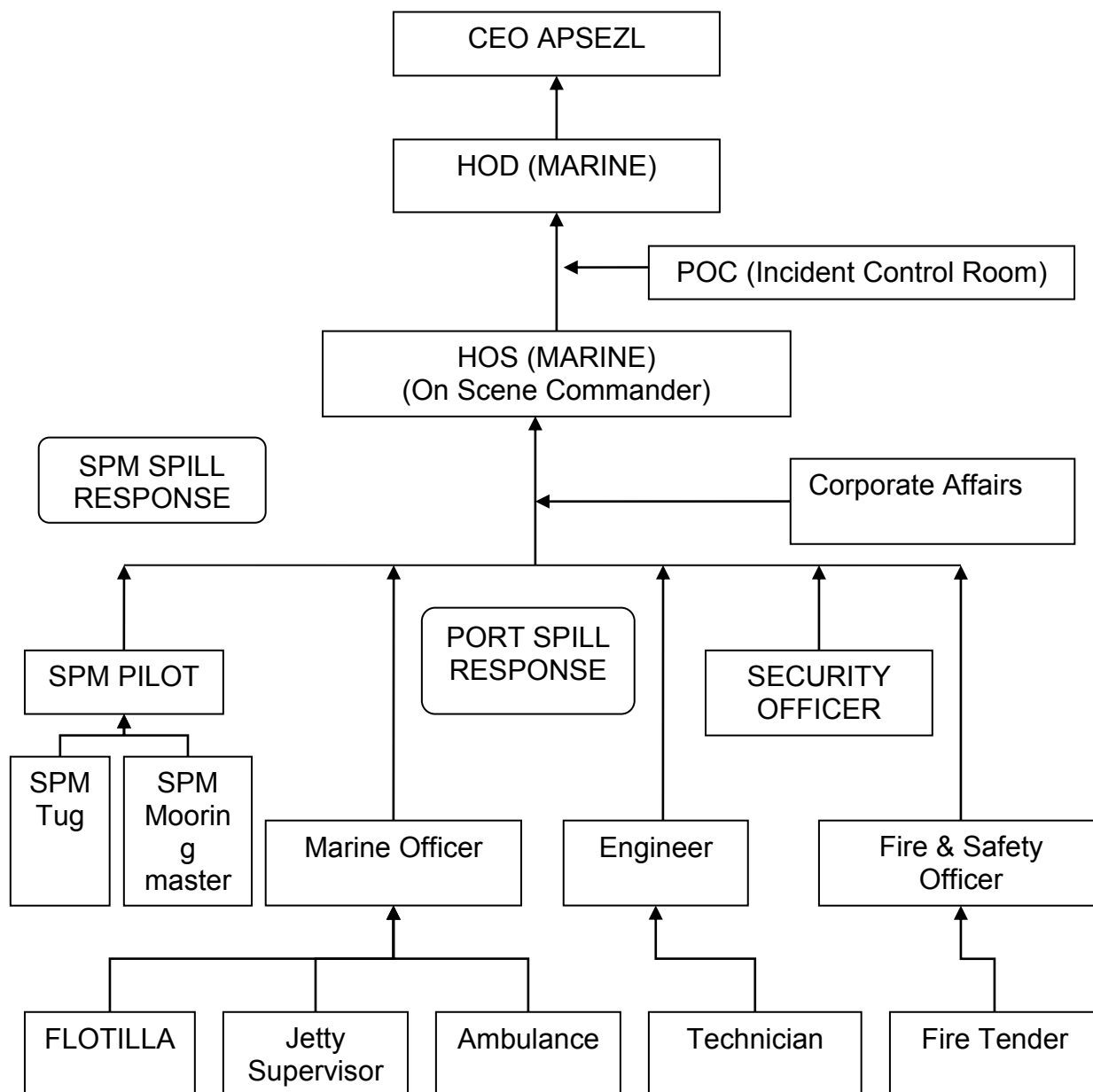
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## 5 Management

### 5.1 Crisis manager and financial authorities

The COO of APSEZL is the final authority of the oil spill response in case of a Tier 1 scenario. He is responsible for raising the level of the response if required and summoning additional help. The authority of all financial decisions rest with him.

### 5.2 Incident organization chart



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**5.3 Manpower availability (on-site, on call)**

In an event of incident Kandla Port Trust, Gujarat Maritime Board, Gulf of Kutch Ports, District and Regional plans are deemed to have been implemented. Adani Ports and Special Economic Zone Limited (APSEZL) manpower and resources will be put at the disposal and will be deployed as required, provided APSEZL is the polluter and spill is within the Port Limits.

In the event of APSEZL not being the polluter and any event outside the port limit of Adani Port, APSEZL equipment will be subject to mutual assistance plan and it will be the responsibility of the above forum.

**5.4 Availability of additional manpower**

Similarly in the event of APSEZL being the polluter, additional manpower and supplies can be requested from the resources which are part of this forum.

A numbers of private parties have their labor force working round the clock in the port and on call these can be available.

**5.5 Advisors and experts – spill response, wildlife and marine environment**

APSEZL, being the nodal agency in this LOS-DCP, will function as the main agency. In the event of the emergency getting raised to higher tier, i.e. in case the incidence becomes a national disaster, the help and advice of Indian Coast Guard will be taken.

**5.6 Training / safety schedules and drill / exercise programme**

Training of all APSEZL staff who may get involved in implementing this plan is acknowledged. In house and external facilities (of ICG) are used periodically to impart training as per matrix below. Marine Manager has been appointed as training coordinator and custodian of oil pollution equipment. He shall organize training, drills and inspection of equipment as per the plan in force.

<b>Training Module</b>	<b>Duration</b>	<b>Frequency</b>	<b>Participants</b>	<b>Remarks</b>
IMO Model Course	2-5 days	Once	Key persons	By Maritime Training Institute
Oil Spill	1-5 days	Once every 5 years	Key persons	Coast Guard
Oil spill equipment	1-5 days	Once every Year	Managers	In house
Oil spill Management course	1 day	Once every year	Managers & junior staff	In house for in-depth knowledge
Notification exercise	1-2 hours	6 months	Operational staff	Check systems & communication
Table top	2-6 hours	12 months	Managers	Interactive discussions
Incident	6-8 hours	12 months with others	All	Mock drill

**Number of IMO Level-1 and IMO Level-2 qualified staff available with Adani Ports and SEZ Ltd, Mundra:**

**IMO Level-1 - 28**

**IMO Level-2 - 04**

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## 6 Communications

### 6.1 Incident control room facilities

Detailed in Annexure 3

### 6.2 Field communication equipment

Detailed in Annexure 3

### 6.3 Reports, manuals, maps, charts and incident logs

A copy of the relevant manual is kept with HOD – Marine. Maps/ Charts of APSEZL are kept in Marine Control Tower and attached in Annexures

## Action and operations

## 7 Initial procedures

### 7.1 Notification of oil spill to concerned authorities

The emergency (due to spill) should be initiated by the first person noticing it by activating the fire alarm from the nearest call-point or by contacting the fire control room immediately on the internal telephone or through mobile phone or through VHF Channel.

The SPM Pilot or On Scene Commander will report the spill to the Marine Control Room.

### 7.2 Preliminary estimate of response tier

The first few minutes after the incident / accident are invariably the most critical period in prevention of escalation. Therefore the person available at or near the incident site (and often responsible for carrying out that particular activity) on round the clock basis play a vital role in an emergency. The SPM Pilot or On Scene Commander will report the spill to the control room along with his estimate of the response tier.

### 7.3 Notifying key team members and authorities

Statutory First Information Report (FIR - given in annexure 1) is to be communicated by fastest means possible to President, GMB port and CG at Porbandar followed by full Pollution Report (POLREP – given in annexure 2). The report is to be updated, should the oil spill not be contained and likely to increase to Tier 2

### 7.4 Manning Control Room

Auxiliary control center is located at Port Operation Centre. Escalation of emergency if any is monitored here. Statutory reporting procedures of FIR and POLREP of developing situation and action taken are also sent from this center. The detail of the contacts to whom the information is to be given is placed at Annexure 4.

### 7.5 Collecting information (oil type, sea / wind forecasts, aerial surveillance, beach reports)

Marine Manager has the responsibility of arranging the collection of the relevant information which will help in mitigating the emergency

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#### **7.6 Estimating fate of slick (24, 48, 72 hours)**

Considering the prevalent tidal stream, wind and weather conditions, section 8.3 is to be used in estimating the fate of the slick

#### **7.7 Identifying resources immediately at risk, informing parties**

Depending on the quantity of fluid spilled and the prevalent wind & weather conditions, the resources / facilities immediately at risk have to be identified by the On scene commander and the concerned parties informed.

### **8 Operations planning**

#### **8.1 Assembling full response team**

On being appraised of the spill, the duty marine officer will inform the marine manager, who will, in turn initiate the assembly of the complete response team which essentially involves relaying information to all relevant personnel, parties and authorities and informing them of the initial response requirements.

#### **8.2 Identifying immediate response priorities**

Depending on the initial estimated response tier and the prevalent weather conditions, the marine manager, in consultation with the on scene SPM pilot / marine officer will identify the immediate resources at risk and the response priorities.

#### **8.3 Mobilizing immediate response**

The Manager - Marine will initiate the mobilization procedure of the spill equipment, resources and personnel depending on the scale of emergency at hand.

#### **8.4 Media briefing**

No other person is authorized to communicate with any external party by any means whatsoever unless expressly permitted by the HOD – Marine or COO, APSEZL.

#### **8.5 Planning medium-term operations (24, 48 and 72 hour)**

The HOD – Marine will plan the subsequent action to be taken in response to the tier 1 spill after the initial response is well under way and its consequences / effectiveness are duly evaluated.

#### **8.6 Deciding to escalate response to higher tier**

After carefully assessing the scenario and appraising the efficiency of the initial response in the prevalent conditions, the HOD – Marine will decide whether or not to escalate the response.

#### **8.7 Mobilizing or placing on standby resources required**

It is recommended that in case of a doubt (as the exact estimate of the quantity of oil spilled is quite difficult and the boundaries between the tiers will inevitably be blurred) it is important to be prepared to involve the next higher tier from the earliest moments. It is easier to stand down an alerted system than to try to escalate a response by calling up unprepared reserves at a late stage.

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### **8.8 Establishing field command post communications**

Communications between the Emergency Response Center/ Marine Control room and marine personnel during the response to any oil spillage will be primarily by VHF marine band radio on Channel 73 or 77

Communications between the Marine Control Room and other vessels will be established on VHF radio Channel 16 and will thereafter be conducted on Channel 73 / 77.

Use of cellular telephones will be minimized.

Communications between the Emergency Response Center/ Marine Control Room and external authorities and organizations will be undertaken by telephone and facsimile.

## **9 Control of operations**

### **9.1 Establishing a Management team with experts and advisors**

Detailed in Annexure 4

### **9.2 Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)**

The Marine Control Room is well equipped in assimilating data on weather and its forecasts. In case of a Tier 1 response, aerial surveillance and beach reports are not deemed to be essential

### **9.3 Reviewing and planning operations**

Ongoing response and its influence in mitigating the situation will have to be constantly under review in order to contain the spill at the earliest.

### **9.4 Obtaining additional equipment, supplies, manpower**

While deciding not to elevate the tier of the response the HOD- marine may still request additional resources from nearby port facilities which are essentially members of the common forum and are obliged to assist.

### **9.5 Preparing daily incident log and management reports**

A complete report will be submitted by the Marine Manager to the HOD (Marine) every morning (in case the response extends to more than 1 day).

Format for the above report in Annexure 9

### **9.6 Preparing operations accounting and financial reports**

The Port's accounting department will assess the expenditure incurred in the ongoing operation and submit a report to the President's office.

### **9.7 Preparing releases for public and press conferences**

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite press releases from time to time and hold press conferences.

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**9.8 Briefing local and government officials**

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite reports to brief local and government officials..

**10 Termination of operations**

**10.1 Deciding final and optimal levels of beach clean-up**

If at all a distant beach is affected, the COO APSEZL office will decide the optimal levels of cleanup in consultation with the conservator of the port – Gujarat Maritime Board Port Officer.

**10.2 Standing down equipment, cleaning, maintaining, replacing**

Considering the natural disintegration of the residual oil on water after the cleanup of the bulk amount, The HOD – Marine will decide when to stand down the response. The resources which have been used will have to be re-instated to the original condition by elaborate cleanup or replacement.

**10.3 Preparing formal detailed report**

The COO's office, HOD – Marine and the Corporate communications cell will formulate the requisite reports to brief local and government officials and media.

**10.4 Reviewing plans and procedures from lessons learnt**

A complete spill response report will be produced by the Marine manager providing comprehensive and all-inclusive details of the circumstances leading to the spill, initial response and consequent affect of the same, subsequent follow up, effect of prevailing weather, adverse situations, safety issues, difficulties faced and lessons learnt.

Requisite changes will be affected to this plan on basis of such report.

Such a report will also be prepared by the marine manager after each drill or training session and requisite modification(s) incorporated to the plan in order to enhance the overall efficacy of the same.

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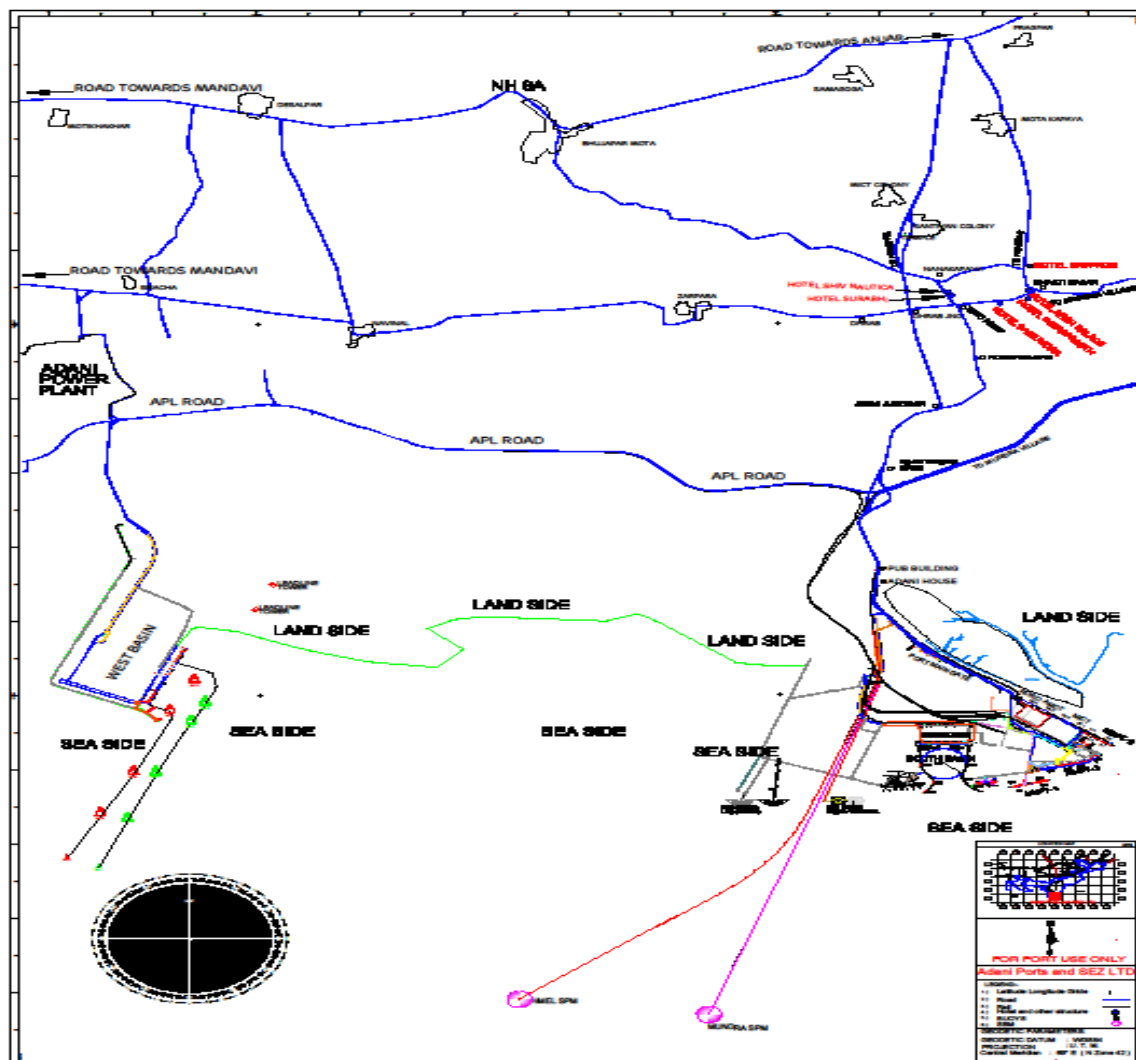


# ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD. MUNDRA OIL SPILL CONTINGENCY RESPONSE PLAN

## Data Directory

### Maps / Charts

#### 1. Coastal facilities, access roads, hotels etc.



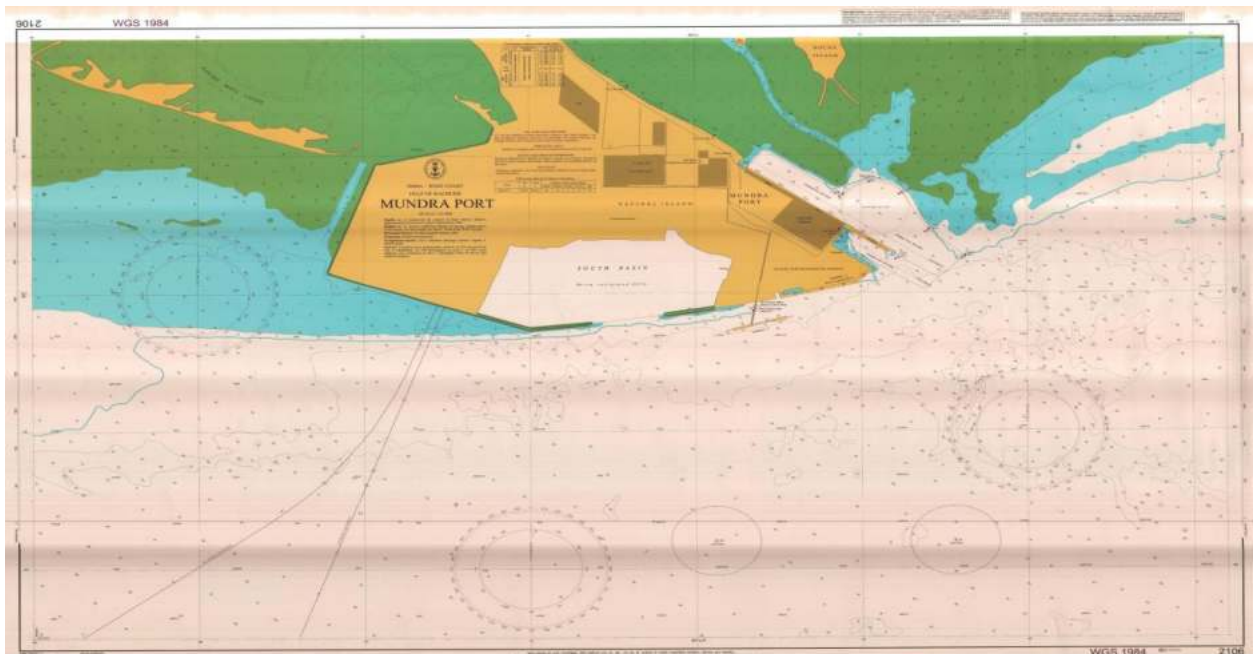
**Telephones:** Detailed in Annexure 4

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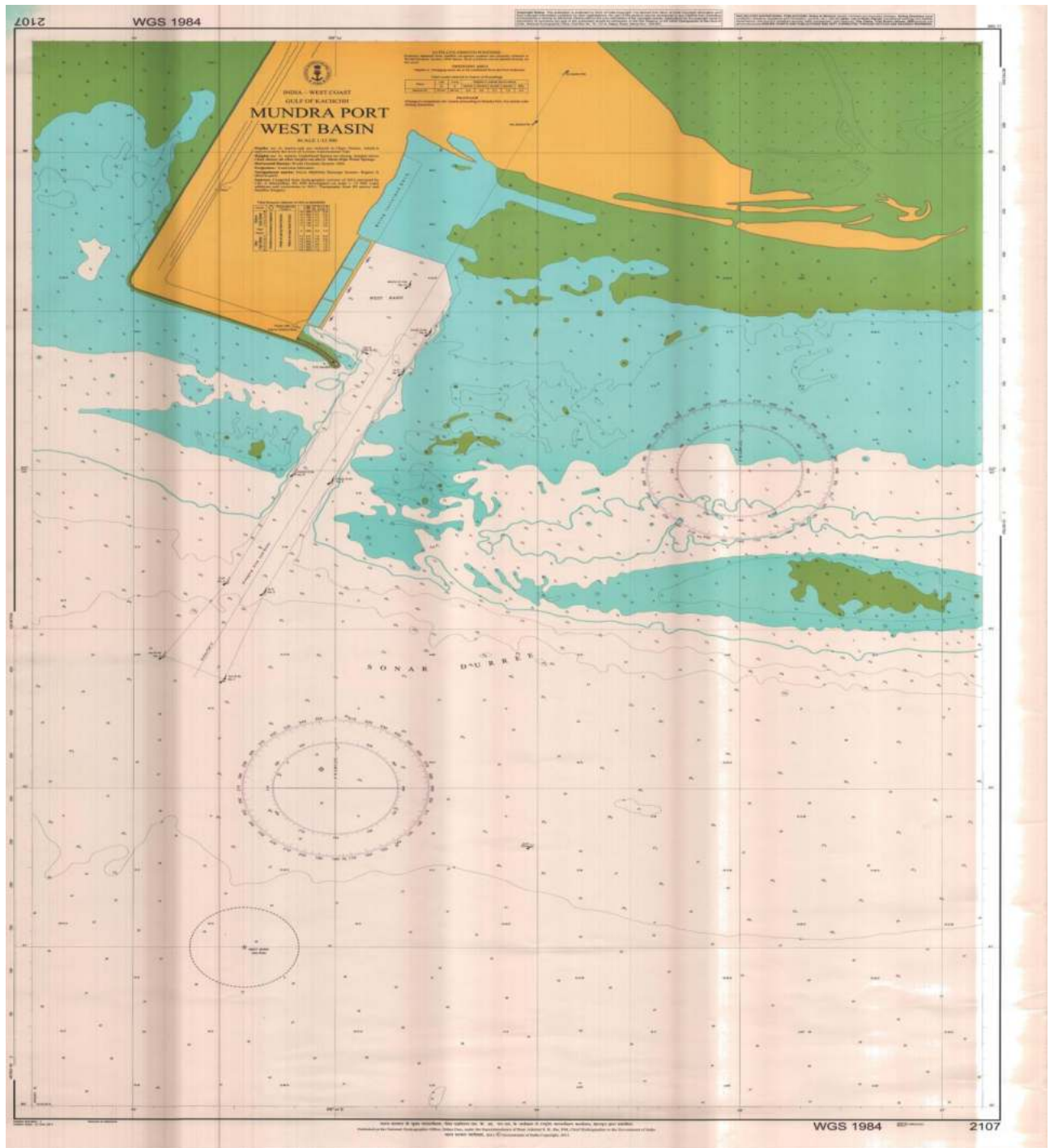
**2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds**

Currents, tidal information (ranges and streams) : Detailed in Annexure- II, Annexure- III and Annexure- IV (Volume 2) of Oil Spill Risk Assessment



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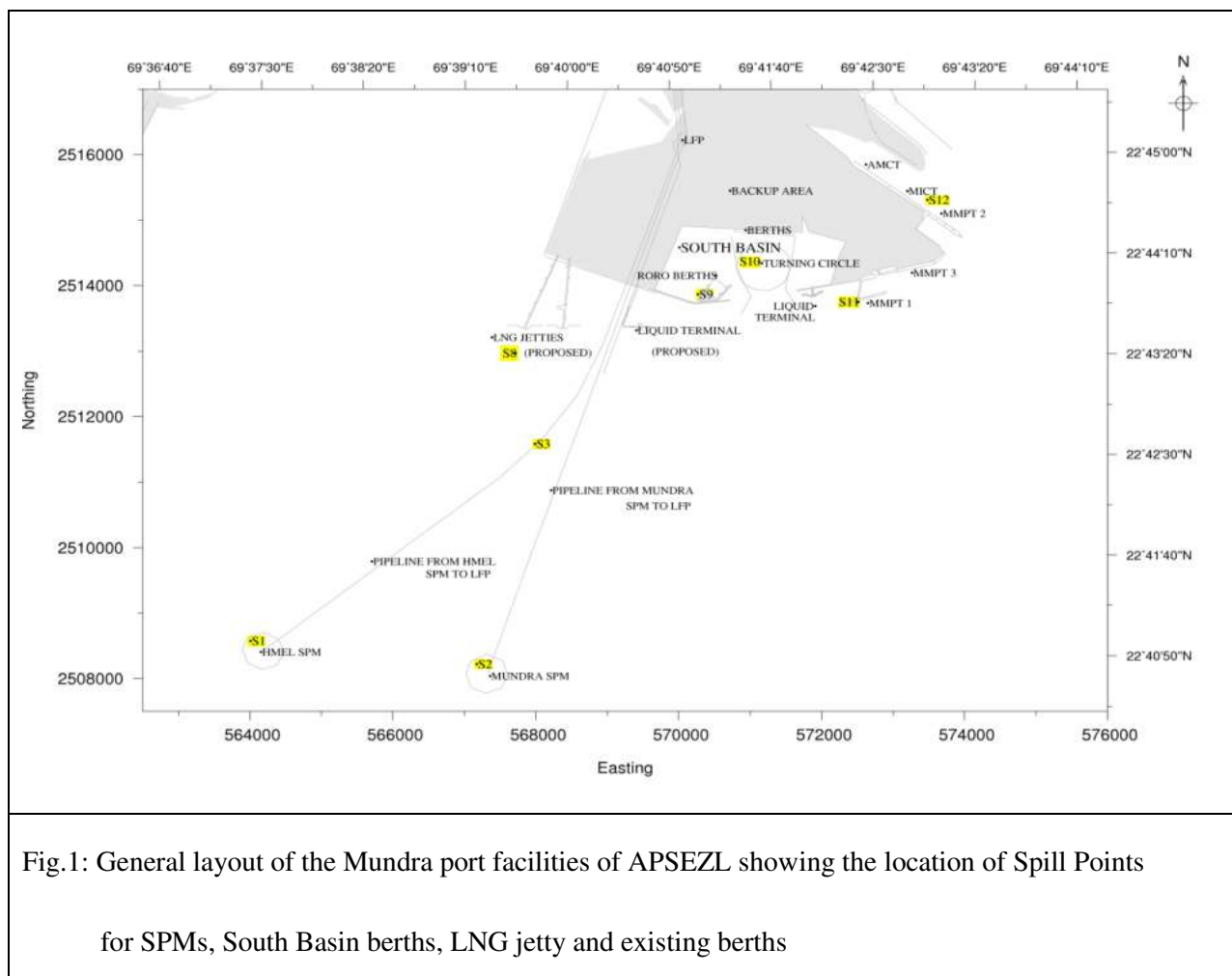
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**3. Risk locations and probable fate of oil**



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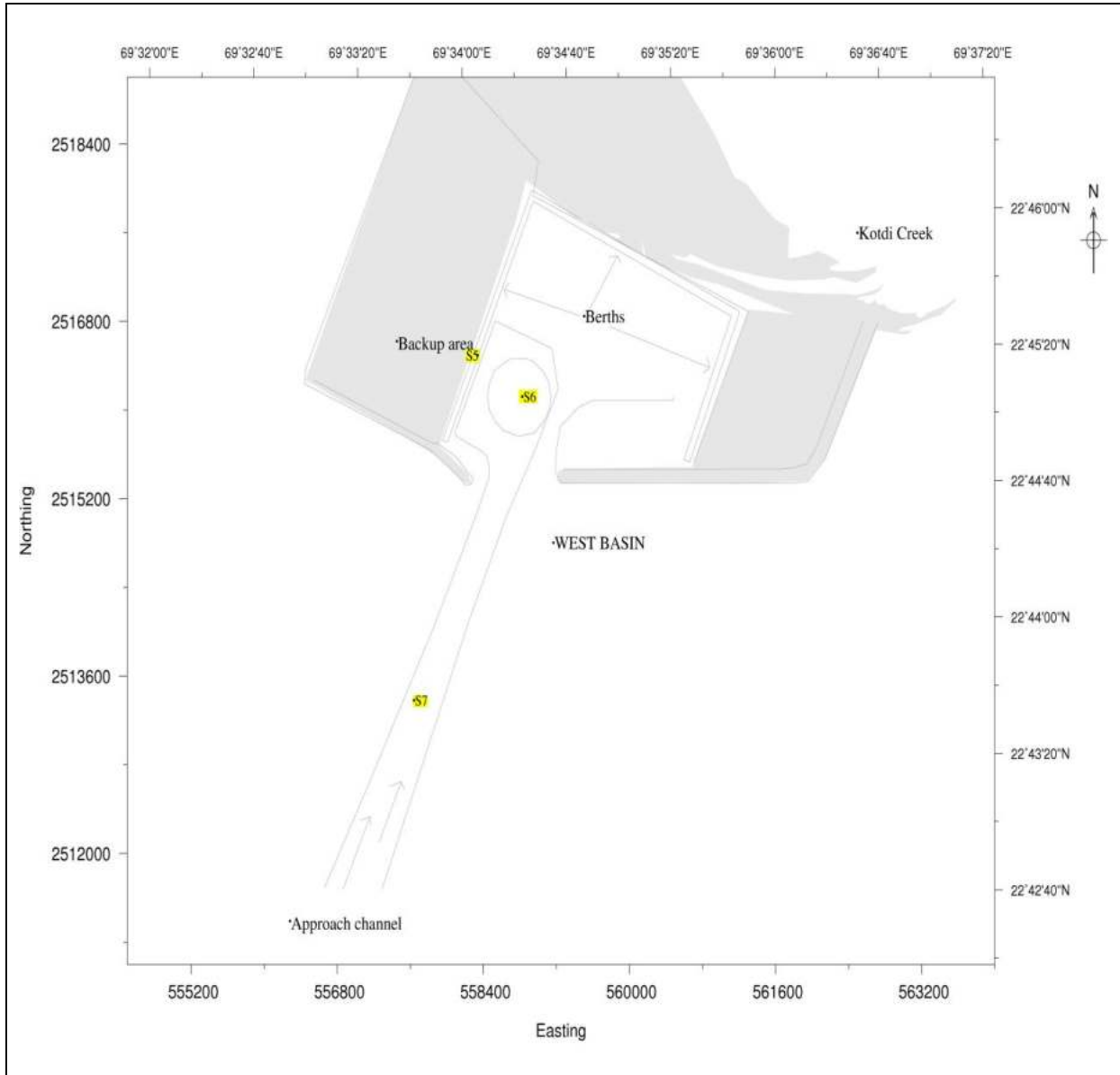


Fig.2: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for West Basin

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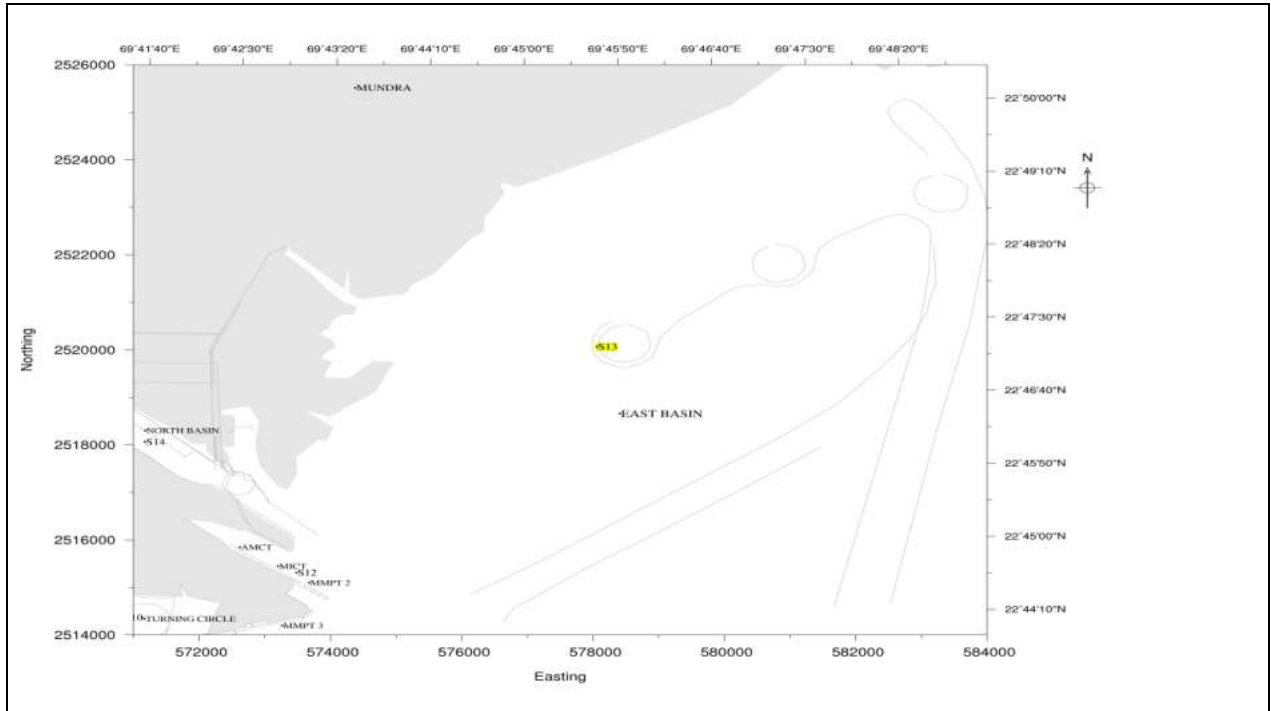
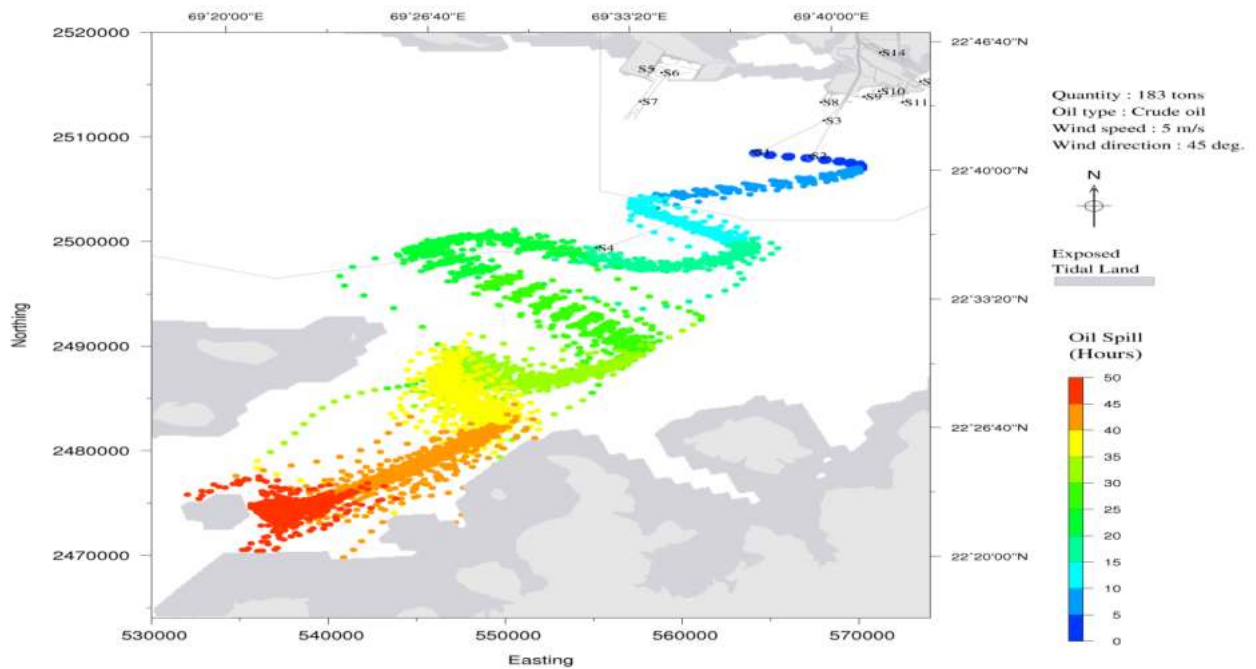


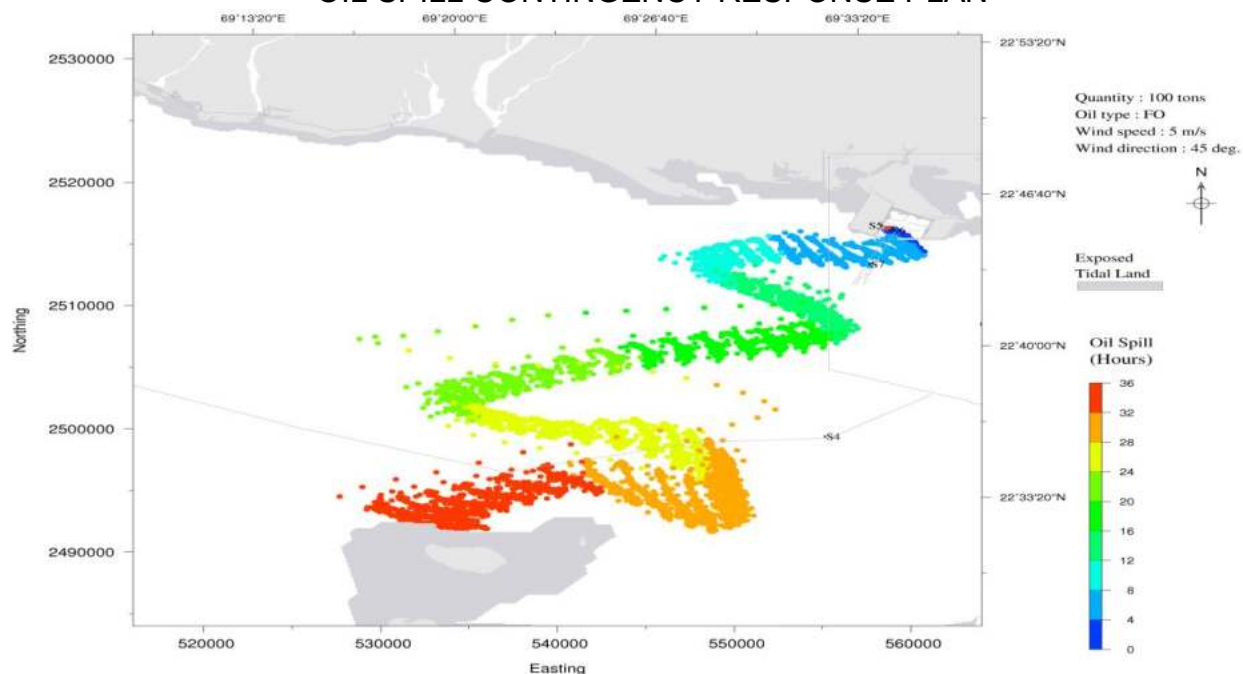
Fig.3: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for North Basin & East Basin



Oil Spill trajectory due to instantaneous crude oil leakage of 700 t (due to collision) at spill point S1 (HMEL SPM) after 50 hours during flood condition of the neap tide

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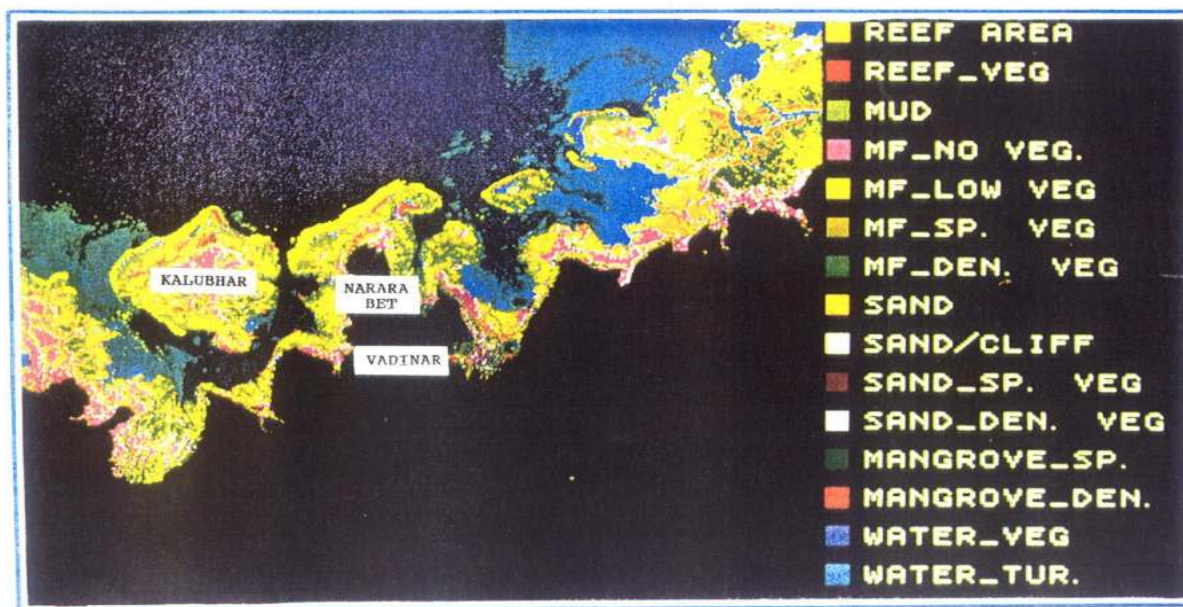
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Oil Spill trajectory due to instantaneous FO leakage of 700 t (due to hull failure/ fire / explosion) at typical berth location in the West Basin

For Risk locations and probable fate of oil refer Annexure- V (Volume 2) of Oil Spill Risk Assessment.

**Shoreline resources for priority protection**

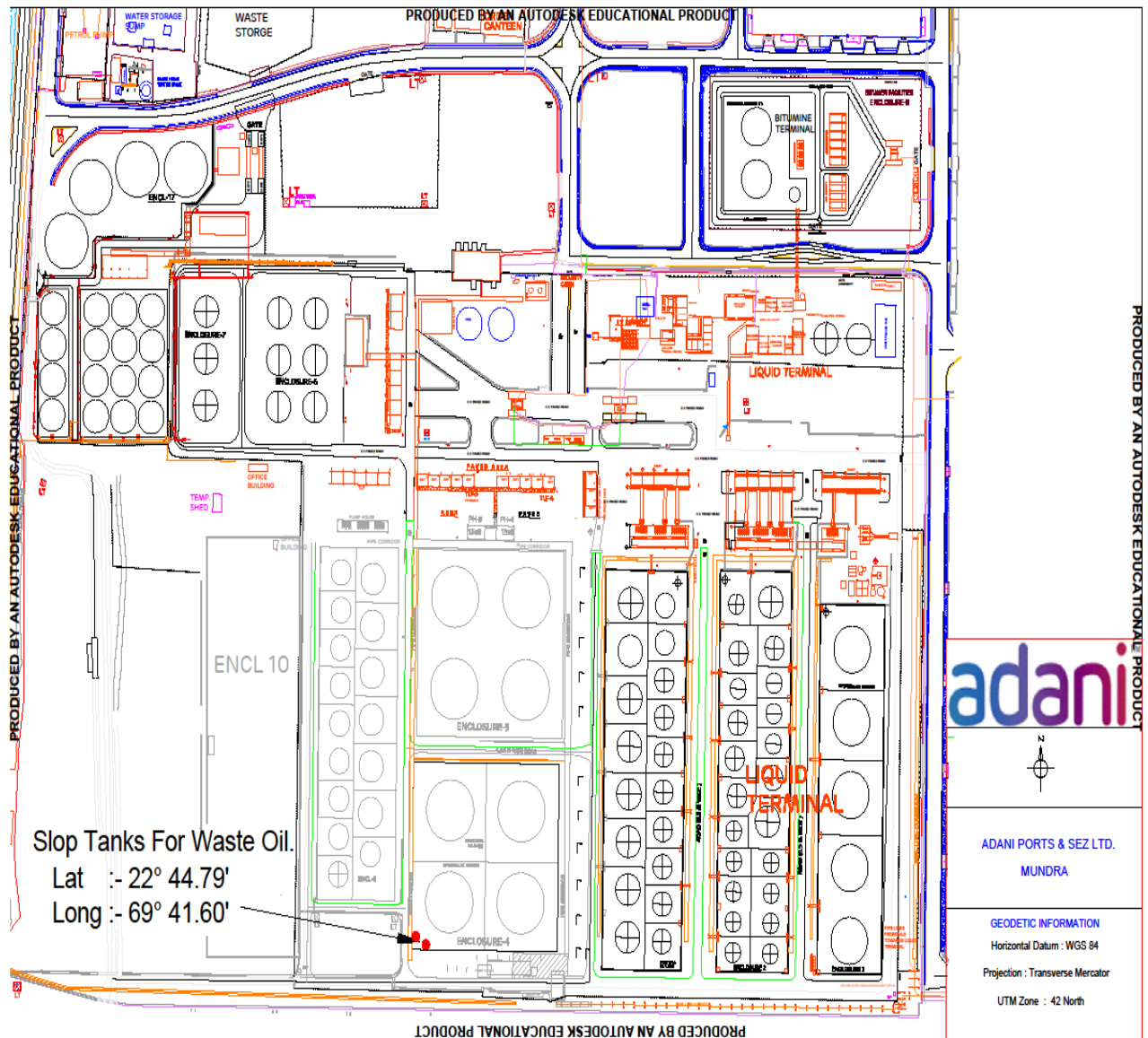


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# OIL SPILL CONTINGENCY RESPONSE PLAN

## Oil and Waste Storage / Disposal sites

**Oil and Waste storage / Disposal tank No. 46, 109 and 110 are available within Liquid Tank farm.**



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**Sensitivity Maps/ Atlas**

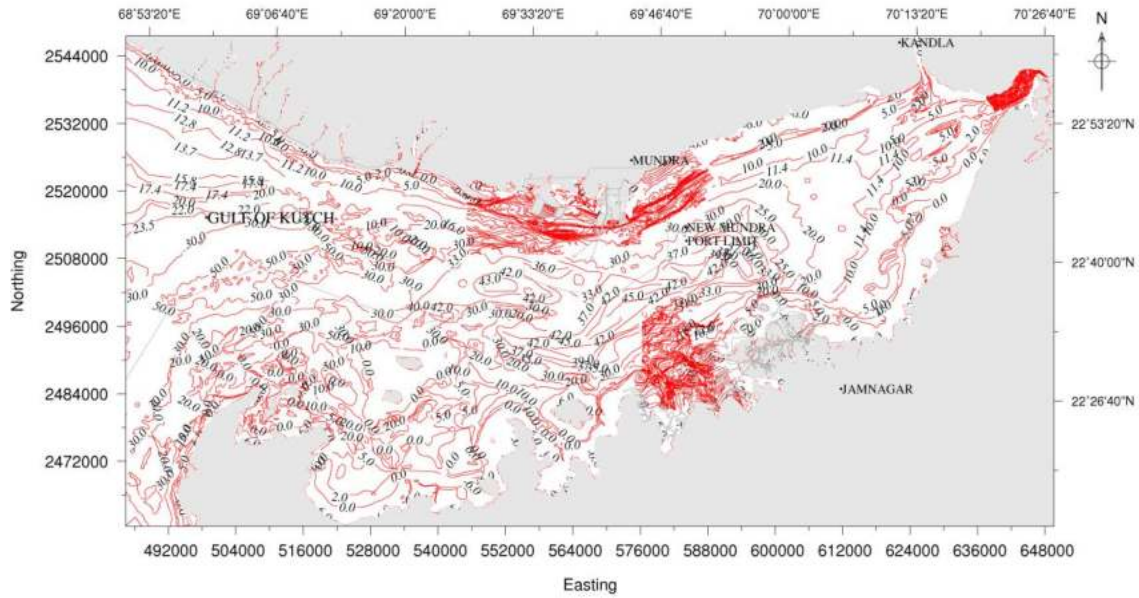


Fig.A1.1 Terrain features of study domain.

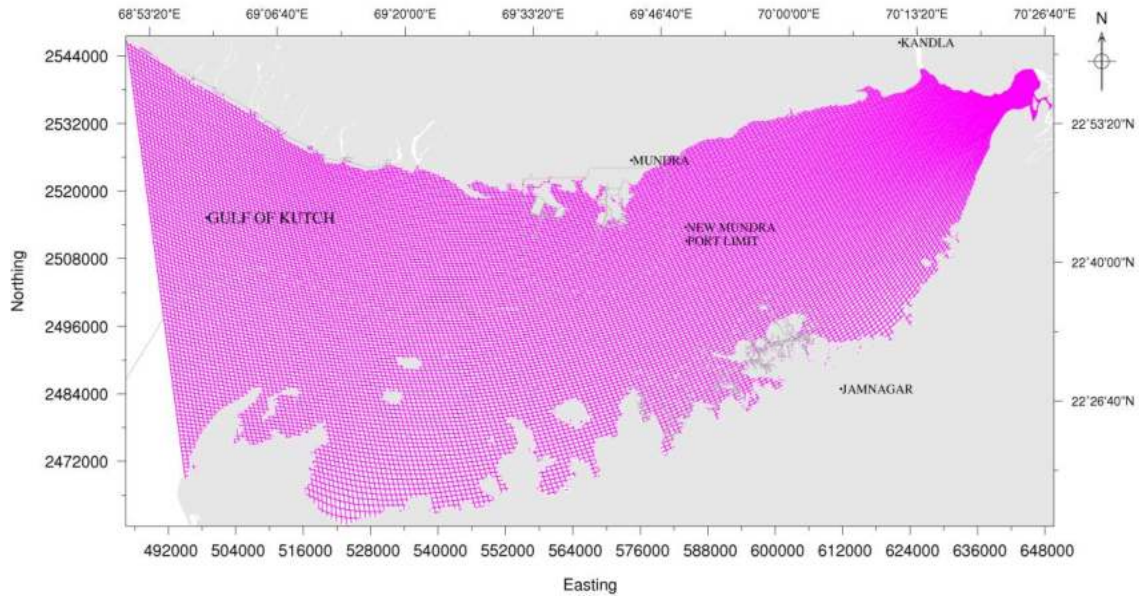


Fig.A1.2 Computational grid

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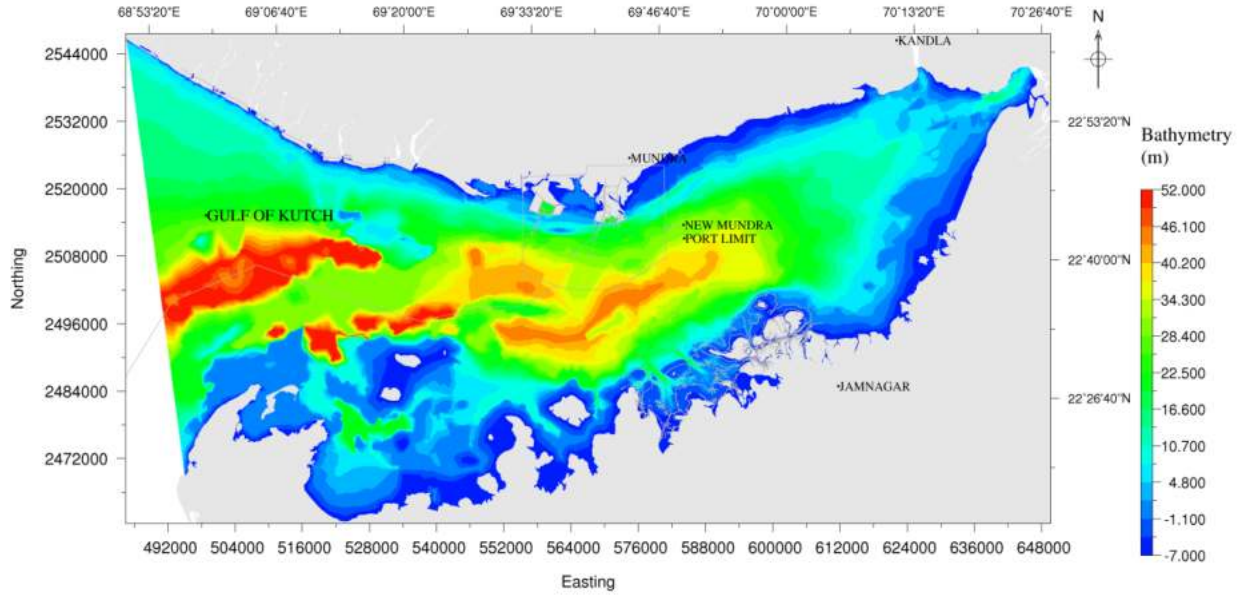


Fig.A1.3 Interpolated depth contours

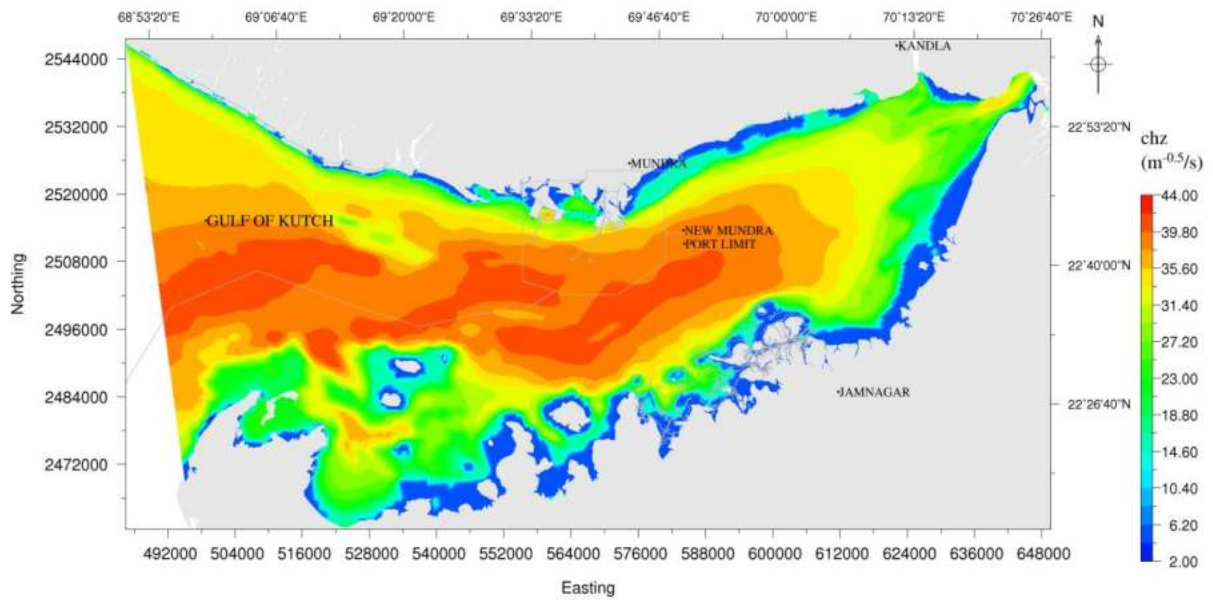


Fig.A1.4 Chezy's coefficient

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**Lists**

1. **Primary Oil spill Equipment:** booms, skimmers, spray equipment, dispersant, absorbents, oil storage, Radio communications etc.

Detailed in Annexure 3

2. **Auxiliary Equipment:** Tugs and work boats, aircraft, vacuum trucks, tanks and barges, loaders and graders, plastic bags, tools, protective clothing, communication equipment etc.

Detailed in Annexure 3

3. **Support Equipment:** Aircraft, communications, catering, housing, transport, field sanitation and shelter etc. (Availability, contact, cost and conditions)

Not applicable

4. **Sources of Manpower:** Contractors, local authorities, caterers, security firms (Availability, numbers, skills, contact, cost and conditions)

Refer Para 5.3

5. **Experts and Advisors:** Environment, safety, auditing (Availability, contact, cost and conditions)

Detailed in Annexure 4

6. **Local and National Government contacts:** Name, rank and responsibility, address, telephone, fax, telex.

Detailed in Annexure 4

**Data**

**1. Specification of Oils commonly traded**

At the liquid berth, the representative products that would be handled are petroleum products like FO/ HSD / SKO / MS / CBFS / CPO / Naphtha etc. Vessels calling at the port will be having FO and HSD for their propulsion requirements.. The products like MS, Naphtha etc are oils of non – persistent nature; they tend to evaporate fast and will not stay long on the surface of the sea waters. Hence spill studies have been carried out for FO and HSD spills at the berths.

At the SPMs, Crude oil unloading takes place.

Physical and Chemical Properties of products handled at the SPMs, Berths and of the propulsion fuels of the ships / tankers

Data on the properties for the hydrocarbons / products handled at the jetty is required for quantitative hazard identification and consequence calculations. The properties of the FO and HSD, the petroleum hydrocarbons likely to be spilled due to the operations at the jetty are given in Table-3.1.

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**Table-3.1: Properties of Crude Oil, FO and Diesel**

Sl. No	Chemical	Boiling Range (° C)	Specific Heat of Liquid (J/Kg ° K)	Heat of Evaporation (x 10 <sup>5</sup> J/Kg)	Heat of Combustion (x 10 <sup>5</sup> J/Kg)
1	Crude Oil	IBP - 700+	2385	3.4	425
2	HSD	200 - 350	2889	4.65	448
3	Fuel Oil	180 - 450	2500	3.4	452

The following characteristics of oil are used for modelling study:

**(a) Crude Oil**

Sp. Gr = 0.82 to 0.88

Surface Tension = 3.0 e-03

Molar Volume = 0.002

Viscosity: 275 CST at 37.8 deg C

Wax content: 12 – 19 %

Pour point of untreated crude: 30 deg C

Pour point of treated crude: 18 deg C

**(b) FO**

Sp. Gr = 0.92

Boiling point = > 260° C

Vapor pressure = < 0.1 psia at 21° C

**(c) HSD**

Sp. Gr = 0.86

Pour point = 6° C - 18° C

Vapor pressure = 2.12 to 26 mm Hg at 21° C

## **2. Wind and weather**

### **Meteorological and Oceanographic Conditions**

The met-ocean conditions have been previously ascertained at several stages in the course of various studies conducted in past in respect of Mundra port projects. Flow modeling for the Mundra port location has been covered in the model developed by Environ, India, who have developed the model for whole of Gulf as relevant to Mundra region. It has been observed during model studies that flow regime does not have significant changes due to the proposed developments. The following are the main hydro-meteorological parameters for planning and designing of the marine facilities described below.

### **Rainfall and Temperature**

The Kutch is a semi-arid region with weak and erratic rainfall confined largely to June-October period. With a few rainfall days, the climate is hot and humid from April till October and pleasant during brief winter from December to February. Although the monthly mean maximum temperature recorded is 37°C during 2005, it occasionally exceeds 40°C. Rainfall alone forms the ultimate source of freshwater resource to the region. The average rainfall at Mundra is about 400 mm/year.

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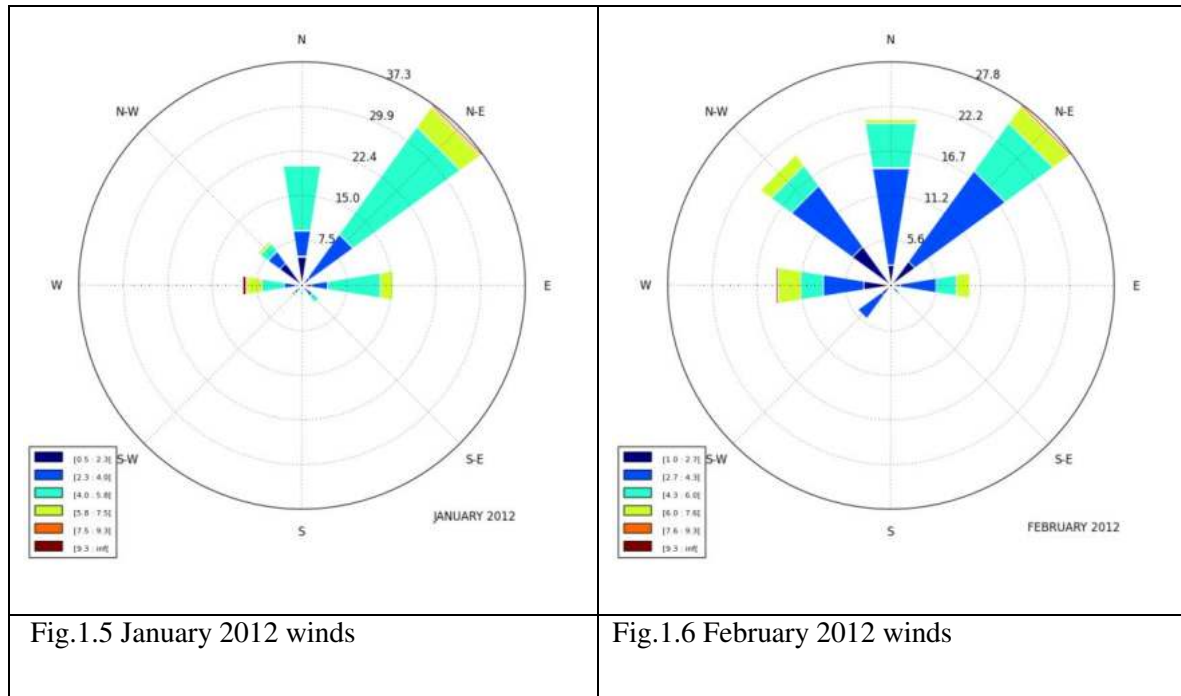
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**Cyclones**

Cyclonic disturbances strike North-Gujarat, particularly the Kachchh and Saurashtra regions, periodically. These disturbances generally originate over the Arabian Sea and sometimes the Bay of Bengal. 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 North East to strike Gujarat-North Mekran coast.

**Wind**

There are strong winds at times at Mundra Port. The month wise wind rose diagrams for the year 2012 and for the months of January and February of the year 2013 are given 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. From 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.



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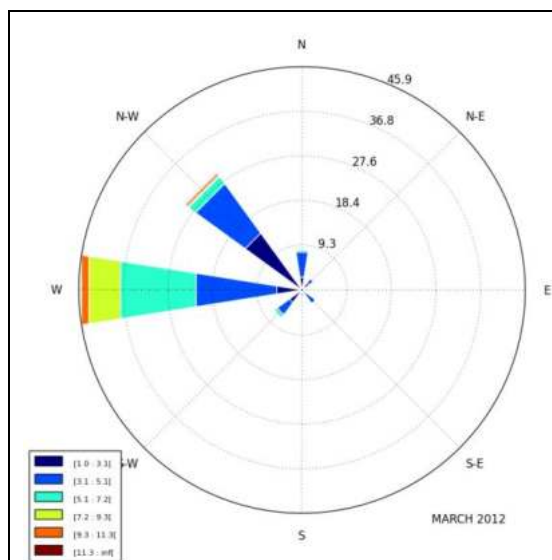


Fig.1.7 March 2012 winds

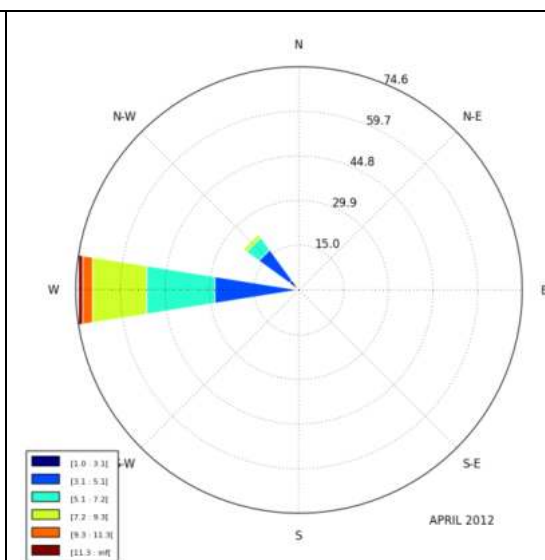


Fig.1.8 April 2012 winds

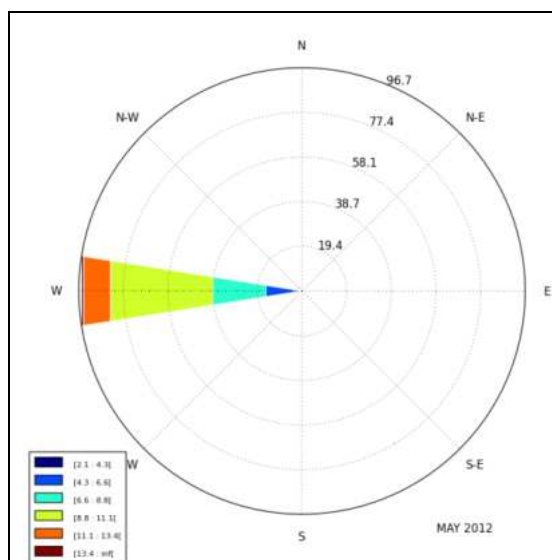


Fig.1.9 May 2012 winds

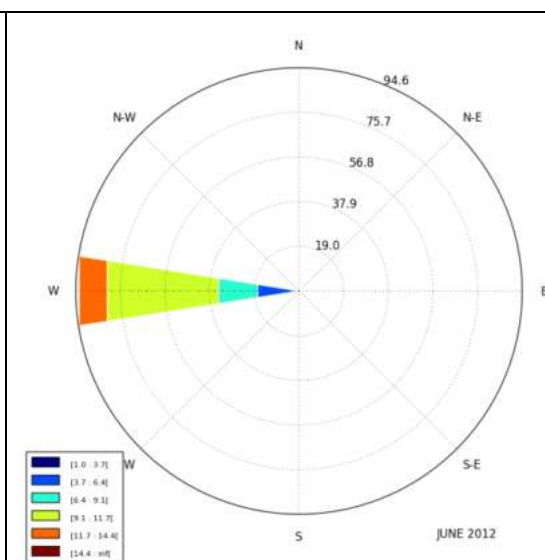
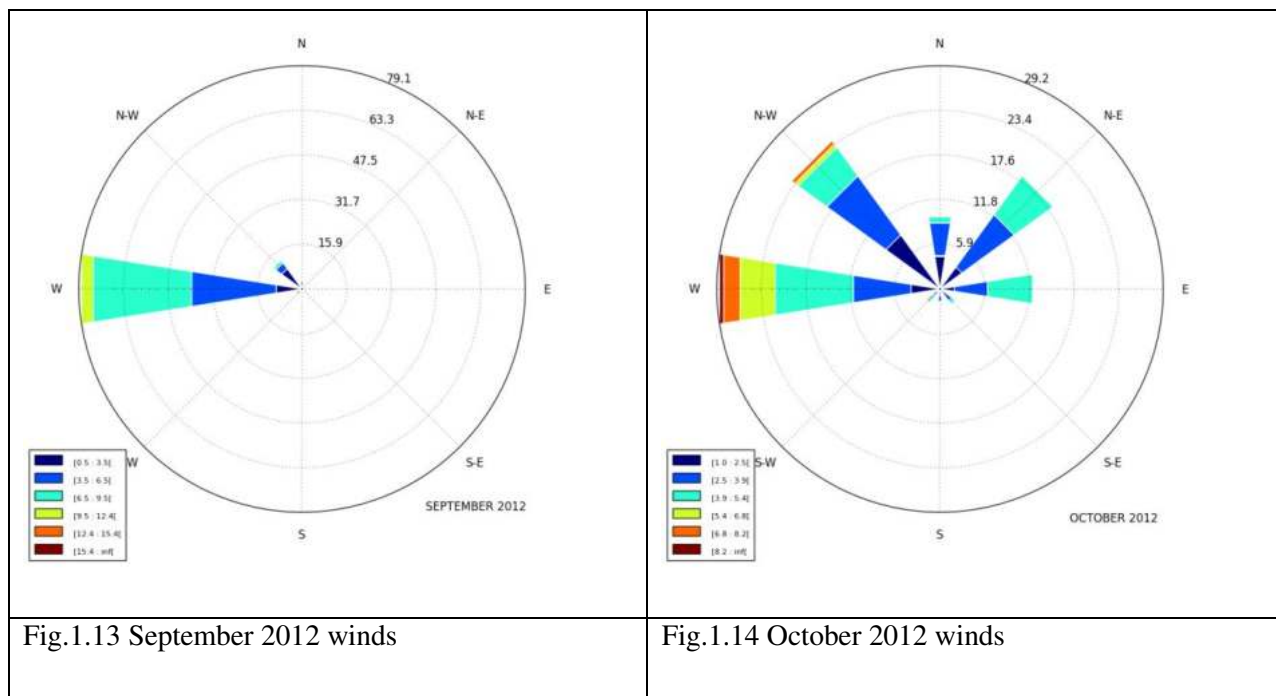
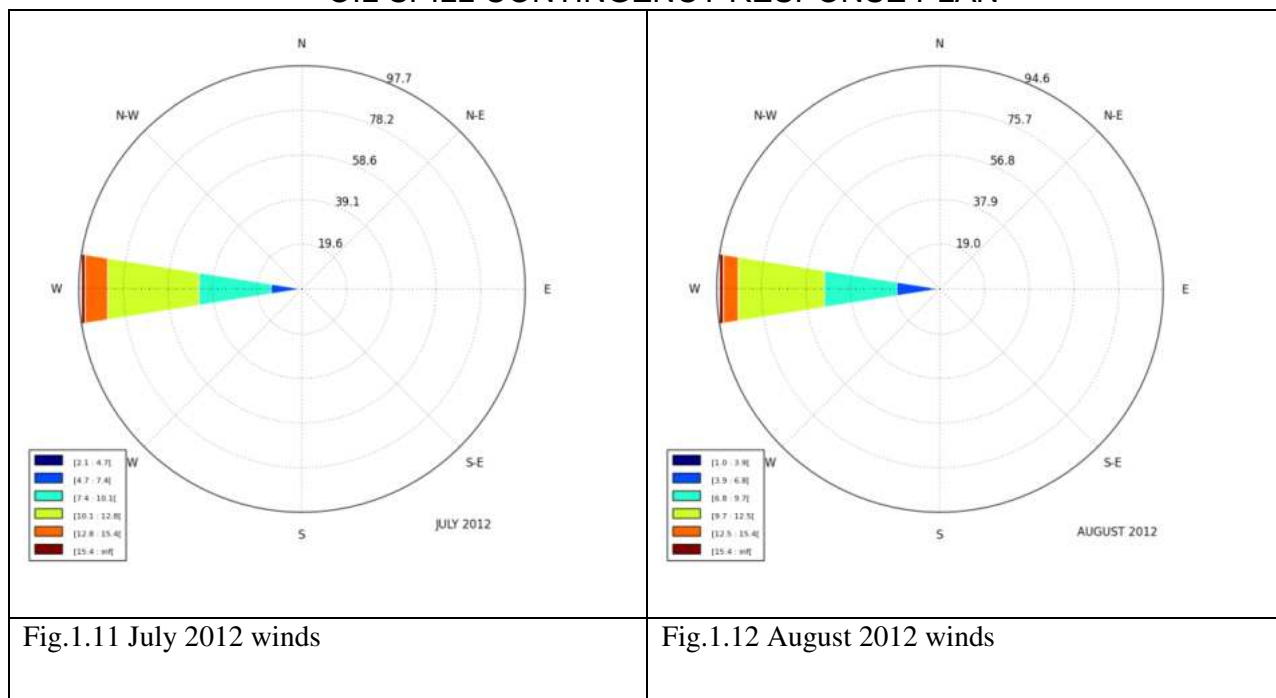


Fig.1.10 June 2012 winds

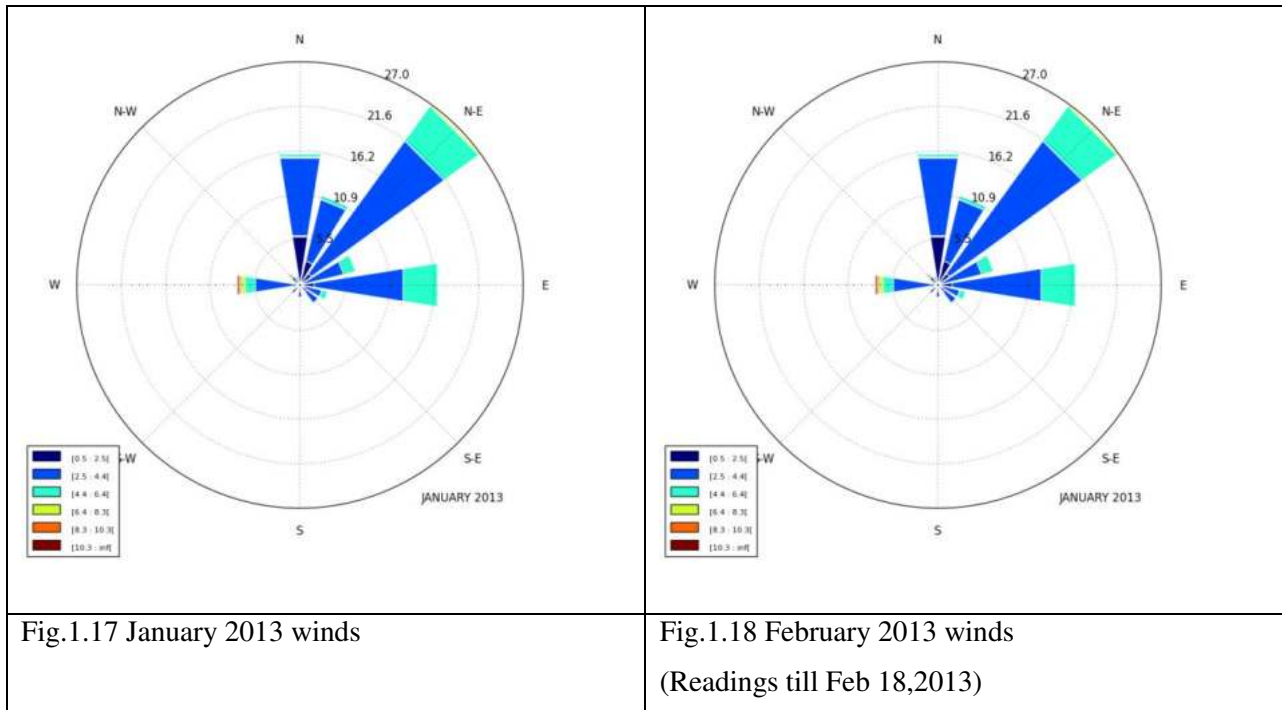
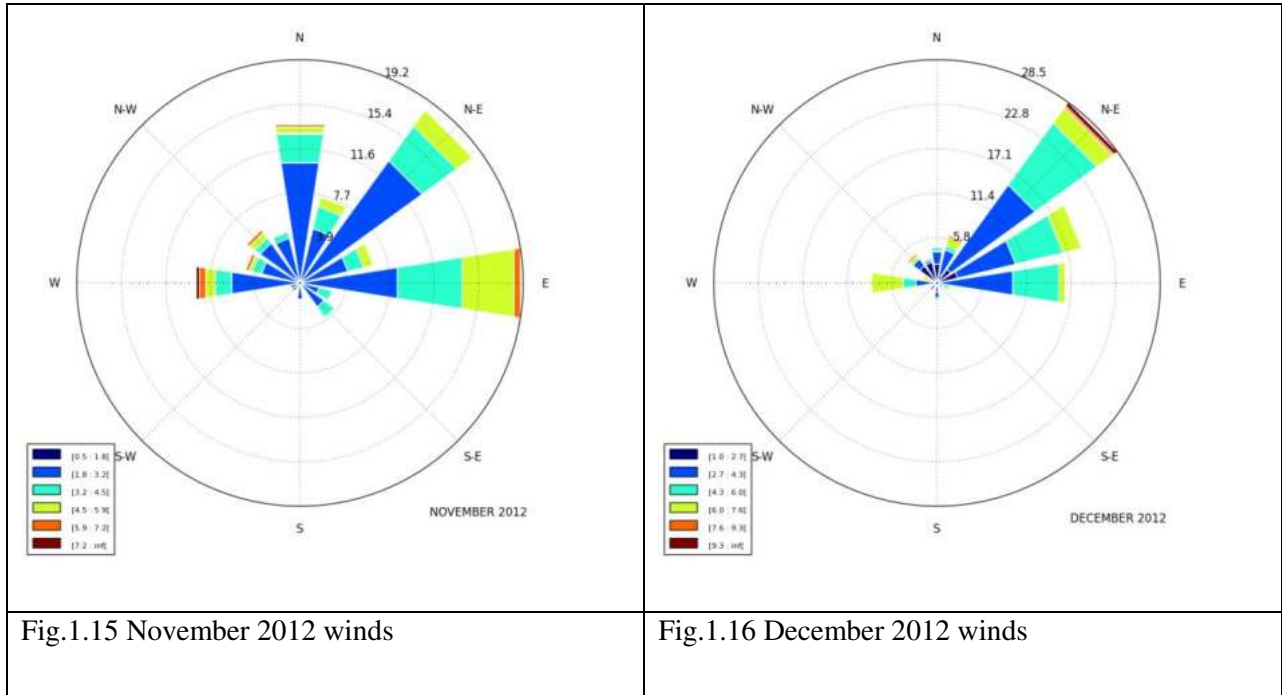
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**Tides**

The tidal planes were assessed in 1998 and are as 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.

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 Kutch 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

Atmospheric stability is an important factor for predicting the dispersion characteristics of gases/vapours into the surrounding environment. Change in atmospheric stability is a direct consequence of the vertical

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temperature structure. The stability effects are mathematically represented through Pasqual parameters. The following stability classification is employed:

Stability Class	Atmospheric Condition
A	Very Unstable
B	Unstable
C	Slightly Unstable
D	Neutral
E	Stable
F	Very Stable

Condition of atmospheric stability is estimated by a suitable method that uses dispersion parameters viz., vertical temperature gradient, profile of the winds and roughness factor. The roughness factor for the Mundra area is small since it mainly comprises of plain land.

The following meteorological information has been taken in the calculations for the Mundra area (GMB-2010):

Average ambient temperature : 30°C  
Average wind speed : Wind data for the whole year 2012 is available and is used  
Stability condition : F (Very Stable)

### 3 Information sources

This plan is prepared in accordance with:

- Marine Environmental Impact Assessment of SPMs, COTs and connecting pipelines of APSEZL at Mundra dated February 2001, prepared by National Institute of Oceanography, Mumbai.
- Report on Risk assessment study and On-site disaster management Plan for SPMs, COTs and connecting Pipelines of Adani Ports and Special Economic Zone Limited, by TATA AIG Risk Management Services Limited, dated February 2001.
- HAZOP study report of SPM Terminal pipeline project by Intec Engineering, dated 26/02/2004.
- IPIECA guide to Contingency planning for oil spills on water.
- Oil spill risk assessment and contingency plan study done by M/s Environ Software Pvt. Ltd. (Copy enclosed)

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**ANNEXURES**

INITIAL OIL SPILL REPORT		ANNEXURE 1
Particulars of person, office reporting		
Tel No.		
Date & time of incident		
Spill location		
Likely cause of spill		Witness
Initial response action		By
Any other information		
<p>This FIR is to be sent to Marine Manager by fastest means of communication possible. It is an offence not to report oil pollution incident.</p> <p>This FIR is to be followed by company's incident report also.</p> <p>Following POLREP report to the Government through nearest CG information will also be required:</p>		
Identity of informant		
Time of FIR		
Source of spill		
Cause of spill		
Type of spill		
Colour code information (from CG)		
Radius of slick		
Tail		
Volume		
Quantity		
Weather		
Tide / current		
Density		
Layer thickness		
Air / Sea temp.		
Predicted slick movement		
Size of spill classification (Tier 1, 2 or 3)		

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POLREP		ANNEXURE 2
In case of an oil spill, APSEZ will provide information to Commandant Coast Guard District 1 Porbandar COMDIS 1 and Coast Guard Station Mundra in the following format:		
SN.	Parameter	Data
1.	Identity of the informant	
2.	Time of information receipt	
3.	Source of Spill	
4.	Cause of Spill	
5.	Type of oil	
6.	Colour 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	
<b>Additional Information :</b>		

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LIST OF RESOURCES AVAILABLE						ANNEXURE 3
Tugs Available for Oil Spill Containment						
Name of Tug	Type	BHP	OSD	AFFF	Capacity (cubm/Hr)	BP
Dolphin No. 4	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 29	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
Baitarni	ASD	2000 x 2	3000 ltr	2000 ltr	1200	65
Khushboo	Fixed screw	401 X 2	-	-	-	10
<p>Dolphin No. 4, 29, 10, 11, 14, 15, 16, 17, 18, Brahmini and Baitarni 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><b>All above eleven Tugs have class notation as Harbour Tugs and are certified to work within the Harbour limits only.</b></p> <p>Reception Facility : 12" pipe line, connected to a slop tank at chemical tank farm.</p> <p>Dolphin 11 has fire fighting system of 1200 m3/hr along with 20 ton lifting "A" frame and diving support facility.</p> <p><b>Location of Oil Spill Equipment:</b> The Oil Spill Equipment stored in SPM Store.</p> <p><b>Resources / Equipment Available with APSEZL, Mundra</b></p>						

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Item	Quantity
<b>Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter</b>	1 no
Power pack with boom reel with hydraulic hoses	2 nos.
Power pack - 20 KV with boom reel with hydraulic hoses	2 nos.
<b>Lamor Side Collector system (Recovery Capacity 123 m³/ hr)</b> (Side collector LSC-3C/2300(01CO2-P536). Oil transfer pump OT A 50 with oil transfer hose set	2 nos. 2 sets
<b>Lamor Minimax 12 m³ skimmer</b>	2 sets
Power pack for skimmers with hydraulic hoses	4 nos.
Power pack - 20 KV for skimmers with hydraulic hoses	1 no.
<b>Floating tank (25 m³)</b>	1 nos.
Foot pumps for floating tank	6 nos
Oil Spill Dispersants	5000 ltr
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Two – way hydraulic maneuvering panel	2 nos
<b>Oil Containment Boom</b> -Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm	2000 mtr
<b>Current Buster Boom</b> -Fasflo -75 (for response in fast current)	2 Nos
<b>Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.</b>	4 Nos
<b>12.5T Flexible Floating Storage Tank (PUA).</b>	3 Nos
Diesel Driven Transfer Pump for Flex Barge	2 Nos
Site Hose Kit for the transfer Pump for the Flex Barge	2 Nos
3" & 2"Hose Adaptor for Transfer Pump and Hose	2 Nos
<b>Shoreline Cleanup Equipment</b>	
Mini Vac System	5 Nos
<b>OSD Applicator</b> - Oil Dispersant Spry Unit(20 Ltr) for use on Beach and Inter Tidal Zones	2 Nos
Startank with Capacity 10000 liter(10m³)	2 Nos
Sorbent Boom Pack(12.5cm x4 M)	500 mtr
Sorbent pad	2000 Nos

**Facilities in the Marine Control room:**

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

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<b>LIST OF TELEPHONE NUMBERS OF EXPERT ADVISORS ANNEXURE 4</b>			
<b>List of Important Telephone Numbers of Govt. Officials and other neighboring Organisations (Expert and Advisors) related to Spill Combating Plan</b>			
<b>SN.</b>	<b>Company</b>	<b>Name and Designation</b>	<b>Telephone Numbers</b>
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), 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

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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. Anubhav Jain, Head – Marine & Head CT-4	02838 - 255727	91 9925223674
02	Mr.–Jagdish Patel Head CT-3	91-2838 - 255998	91 9979855979
03	Capt. Aditya Gaur, HOS-Marine	02838 – 255730	91 6359981603
04	Capt. Divya Gupta. , HOS-Marine	02838- 255947	91 6359631088
05	Mr. Sanjay Kewalramani, Head-Marine Technical	02838- 255844	91 9925150056
06	Mr. Yogesh Nandaniya, Manager-SPM	02838- 2562379	91 6359775168
07	Mr. Hari Govindan V	91-2838 - 285072	91 9879104805
08	Marine control, APSEZL	02838 – 255333 / 255761	91 9825228673
09	Port Operation center, APSEZL	02838 –255762	91 9825000949
10	Port security Control, APSEZL	02838 – 289322	91 9825000933
11	Head - Security, APSEZL	02838 – 255999	91 9099991093
12	Head - Health, safety & Environment, APSEZL	02838 - 255777	91 7574894383
13	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035
14	Occupational Health Centre	02838 - 255710	91 8980015070

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Marine Officer/ SPM Mooring master ANNEXURE 5		
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>• Observe or receive report of oil or chemical spill incident</li> <li>• Initiate measures to prevent/ reduce further spillage</li> <li>• Maintain communication with other all vessels</li> </ul>	
Step	Actions	Additional Information
<b>Alert</b>	<input type="checkbox"/> (Marine Manager / On Scene Commander / SPM Pilot <input type="checkbox"/> Tugs and other support/ response craft	<i>VHF Channel 73 / 77</i>
<b>Initial Actions</b>	<input type="checkbox"/> Stop all cargo operations <input type="checkbox"/> Ensure all safety precautions taken/observed <input type="checkbox"/> Verify incident details <input type="checkbox"/> Advise all relevant information to (Marine Manager / On Scene Commander / or SPM Pilot <input type="checkbox"/> Initiate personal log <input type="checkbox"/> Place tugs/other response craft on stand-by	<i>Liaise with Terminal Shift Engineer</i>
<b>Further Actions</b>	<input type="checkbox"/> Brief (Marine Manager / On Scene Commander / SPM Pilot as necessary <input type="checkbox"/> Mobilize response equipment/ personnel as directed by (Marine Manager / On Scene Commander / <input type="checkbox"/> Maintain personal log of communications and events <input type="checkbox"/> Act as instructed by (Marine Manager / On Scene Commander / SPM Pilot	
<b>Final Actions</b>	<input type="checkbox"/> Submit personal log to HOD – Marine <input type="checkbox"/> Attend debrief	

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MARINE MANAGER / On Scene Commander ANNEXURE 6		
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>Initially assess situation</li> <li>Verify classification</li> <li>Verify fate of spill</li> <li>Verify resources immediately at risk, inform parties</li> <li>Provide accurate situation reports to Radio Room/ HOD – Marine</li> <li>Collect evidence and/ or statements</li> <li>Liaise with HOD-Health, Safety, Environment &amp; Fire</li> <li>Liaise with incident vessel regarding status of oil spill (if applicable)</li> </ul>	
Step	Actions	Additional Information
<b>Alert</b>	HOD – Marine	
<b>Initial Actions</b>	<input type="checkbox"/> Proceed to incident location, assume role of On-Scene Coordinator <input type="checkbox"/> Ensure all safety precautions have been taken <input type="checkbox"/> Initiate response / <input type="checkbox"/> Investigate cause/ source of spill <input type="checkbox"/> Communicate all information to HOD – Marine <input type="checkbox"/> Ensure samples of spilled oil taken <input type="checkbox"/> Initiate personal log <input type="checkbox"/> Take photographic evidence <input type="checkbox"/> Collect evidence and take statements	<i>Stopped or ongoing</i>
<b>Further Actions</b>	<input type="checkbox"/> Ensure resources are being deployed as required <input type="checkbox"/> Provide co-ordination at-sea response <input type="checkbox"/> Provide detailed situation reports to HOD- Marine <input type="checkbox"/> Liaise with -Health, Safety Environment & Fire Department.	
<b>Final Actions</b>	<input type="checkbox"/> Submit personal log to HOD – Marine <input type="checkbox"/> Attend debrief	

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SPM Pilot			ANNEXURE 7
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>Initially assess situation</li> <li>Verify classification</li> <li>Provide accurate situation reports to Radio Room/ OSC</li> <li>Collect evidence and/ or statements</li> <li>Liaise with incident vessel regarding status of oil spill (if applicable)</li> </ul>		
Step	Actions	Additional Information	
<b>Alert</b>	<input type="checkbox"/> Marine Control Room <input type="checkbox"/> OSC <input type="checkbox"/> Tugs and other support / response crafts	<i>VHF Channel 73 / 77</i>	
<b>Initial Actions</b>	<input type="checkbox"/> Assume role of On-Scene Coordinator <input type="checkbox"/> Investigate cause/ source of spill <input type="checkbox"/> Communicate all information to Marine Control Room <input type="checkbox"/> Ensure samples of spilled oil taken <input type="checkbox"/> Initiate personal log <input type="checkbox"/> Take photographic evidence <input type="checkbox"/> Collect evidence and take statements	<i>Stopped or ongoing</i>	
<b>Further Actions</b>	<input type="checkbox"/> Ensure resources are being deployed as required <input type="checkbox"/> Provide co-ordination of the at-sea response <input type="checkbox"/> Provide detailed situation reports to HOD – Marine		
<b>Final Actions</b>	<input type="checkbox"/> Submit personal log to HOD – Marine <input type="checkbox"/> Attend debrief		

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HOD – Marine ANNEXURE 8		
<b>Responsibilities</b>	<ul style="list-style-type: none"> <li>• Confirm/ amend initial classification</li> <li>• Manage the APSEZL response</li> <li>• Authorize expenditure after consultation with COO APSEZL</li> <li>• Brief COO, APSEZL</li> <li>• Liaise with Coast Guard</li> <li>• Approve press statements for release</li> </ul>	
Step	Actions	Additional Information
<b>Alert</b>	<input type="checkbox"/> Coast Guard <input type="checkbox"/> External organizations	
<b>Initial Actions</b>	<input type="checkbox"/> Verify/ amend spill classification <input type="checkbox"/> Ensure all safety precaution have been taken <input type="checkbox"/> Confirm external organizations have been alerted <input type="checkbox"/> Convene Emergency Response Team <input type="checkbox"/> Predict slick movement <input type="checkbox"/> Liaise with vessel Agents/ Owners as appropriate	
<b>Further Actions</b>	<input type="checkbox"/> Chair the Emergency Response Team meetings <input type="checkbox"/> Constantly review the strategy being employed and advise of changes where necessary <input type="checkbox"/> Approve all expenditure commitments <input type="checkbox"/> Brief President APSEZ <input type="checkbox"/> Agree press statements with Corporate Relations Chief <input type="checkbox"/> Confirm formal samples have been taken <input type="checkbox"/> Advise Coast Guard if oil migrates outside of Local Area	
<b>Final Actions</b>	<input type="checkbox"/> Terminate the clean-up <input type="checkbox"/> Collate personal logs. <input type="checkbox"/> Prepare the incident report. <input type="checkbox"/> Hold full de-brief involving all members.	
<b>Final</b>		

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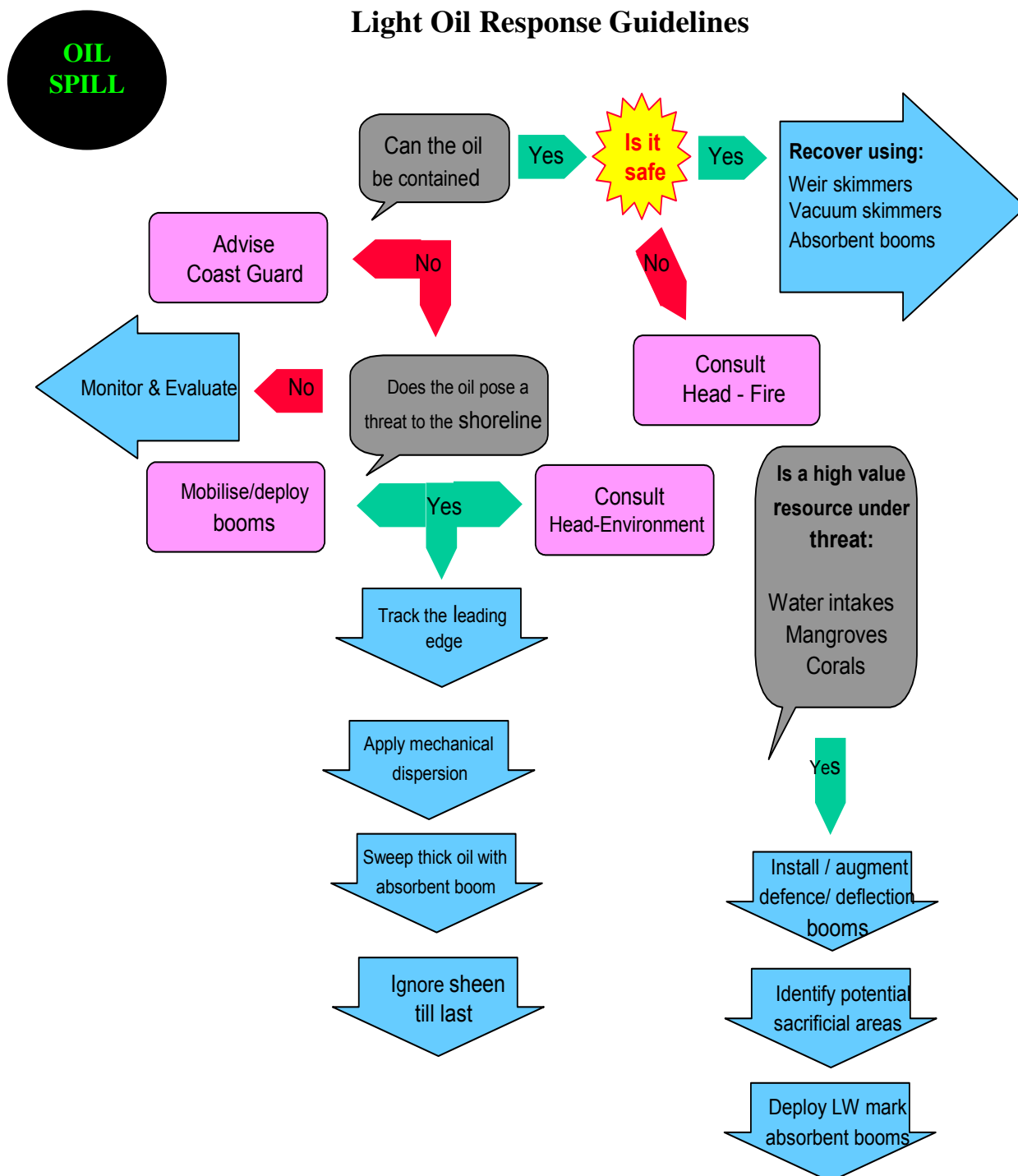
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<b>Response Guidelines</b>	<b>ANNEXURE 12</b>
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### Heavy Oil Response Guidelines



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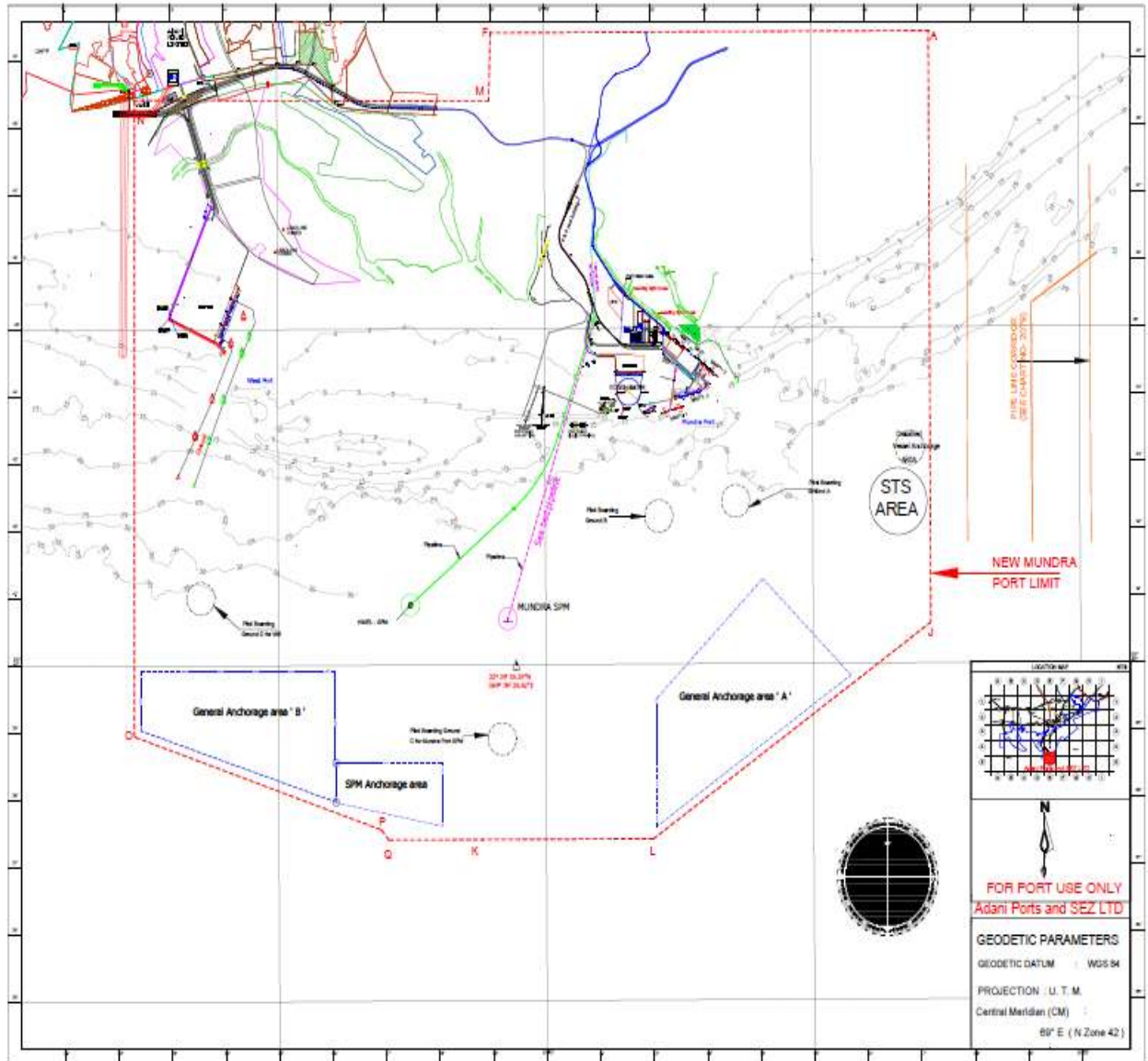
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<b>Site Specific Health and Safety Plan</b> <span style="float: right;"><b>ANNEXURE 13</b></span>									
<b>Assessment Form</b>									
<b>1. APPLIES TO SITE :</b>									
<b>2. DATE :</b>				<b>3. TIME :</b>				<b>4. INCIDENT :</b>	
<b>5. PRODUCT(S) :</b>								(Attach MSDS)	
<b>6. Site Characterization</b>									
<b>6a. Area</b>		<input type="checkbox"/> Open water	<input type="checkbox"/> Inshore water	<input type="checkbox"/> River / Creek	<input type="checkbox"/> Salt marsh	<input type="checkbox"/> Mudflats			
		<input type="checkbox"/> Shoreline	<input type="checkbox"/> Sand	<input type="checkbox"/> Shingle	<input type="checkbox"/> Intake Channel				
<b>6b. Use</b>		<input type="checkbox"/> Commercial	<input type="checkbox"/> Industrial	<input type="checkbox"/> Public	<input type="checkbox"/> Government	<input type="checkbox"/> Recreational			
		<input type="checkbox"/> Residential	<input type="checkbox"/> Other						
<b>7. Site Hazards</b>									
<input type="checkbox"/>	<input type="checkbox"/> Boat safety		<input type="checkbox"/> Fire, explosion, in-situ burn		<input type="checkbox"/> Slips, trips and falls				
<input type="checkbox"/>	<input type="checkbox"/> Chemical hazards		<input type="checkbox"/> Heat stress		<input type="checkbox"/> Steam and hot water				
<input type="checkbox"/>	<input type="checkbox"/> Drum handling		<input type="checkbox"/> Helicopter operations		<input type="checkbox"/> Tides				
<input type="checkbox"/>	<input type="checkbox"/> Equipment operations		<input type="checkbox"/> Lifting		<input type="checkbox"/> Trenches, excavations				
<input type="checkbox"/>	<input type="checkbox"/> Electrical hazards		<input type="checkbox"/> Motor vehicles		<input type="checkbox"/> Visibility				
<input type="checkbox"/>	<input type="checkbox"/> Fatigue		<input type="checkbox"/> Noise		<input type="checkbox"/> Weather				
<input type="checkbox"/>	<input type="checkbox"/> Others		<input type="checkbox"/> Overhead/buried utilities		<input type="checkbox"/> Work near water				
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Pumps and hoses						
<b>8. Air Monitoring</b>									
<input type="checkbox"/>	<input type="checkbox"/> O <sub>2</sub>	<input type="checkbox"/>	<input type="checkbox"/> LEL	<input type="checkbox"/>	<input type="checkbox"/> Benzene	<input type="checkbox"/>	<input type="checkbox"/> H <sub>2</sub> S	<input type="checkbox"/>	<input type="checkbox"/> Other
<b>9. Personal Protective Equipment</b>									
<input type="checkbox"/> Foot Protection				<input type="checkbox"/> Coveralls					
<input type="checkbox"/> Head Protection				<input type="checkbox"/> Impervious suits					
<input type="checkbox"/> Eye Protection				<input type="checkbox"/> Personal Floatation					
<input type="checkbox"/> Ear Protection				<input type="checkbox"/> Respirators					
<input type="checkbox"/> Hand Protection				<input type="checkbox"/> Other					
<b>10. Site Facilities</b>									
<input type="checkbox"/> Sanitation			<input type="checkbox"/> First Aid			<input type="checkbox"/> Decontamination			
<b>11. Contact details :</b>									
<input type="checkbox"/> Doctor				Phone					
<input type="checkbox"/> Hospital				Phone					
<input type="checkbox"/> Fire				Phone					
<input type="checkbox"/> Police				Phone					
<input type="checkbox"/> Other				Phone					
<b>12. Date Plan Completed</b>									
<b>13. Plan Completed by</b>									

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<b>List of recycler approved by state of Gujarat</b>	<b>ANNEXURE 15</b>
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**LIST OF APPROVED VENDOR FOR COLLECTION & DISPOSAL OF OIL SPILL WASTE WATER  
AND OILY SOIL**

<b>Sr No.</b>	<b>Name of the party &amp; Contact Detail</b>	<b>Date of Issue of Passbook alongwith validity</b>	<b>Capacity</b>
1	M/s Jawrawala Petroleum, Plot No: 200/33, B/H Kashiram Textile Mill, Narol, Ahmedabad – 382405 Contact Detail - (079) - 25358099 (M) +91 9824045726	18/09/2012 to 17/09/2017	1. 4800 KLPA - Used Oil 2. 9000 KLPA – Waste Oil
2	M/s Reliance Barrel Supply co., 200/34, B/H- Kashiram Mill, Narol, Ahmedabad-382405 Contact Detail - (079) - 25356629 (M) +91 9824090021	03/09/2014 to 02/09/2019	1. 8280 KLA - Used Oil 2. 9000 KLA – Waste Oil
3	M/s Western India Petrochem Industry, Plot No-50, 51, GIDC Estate, Village Gozaria, Dist- Mehsana. Contact Detail - Tel:+91- 278- 420941 Fax:+91- 278- 429503	25/07/2014 to 24/07/2019	1. 3660 KLPA – Used oil 2. 11100 KLPA – waste oil
4	M/s Saurashtra Enviro Projects Pvt. Ltd.(SEPPL) 3rd Floor,K.G.Chambers, Udhana Darwaja, Ring Road, Surat, Gujarat, India-395002 Contact Detail - +91 261 2351248	TSDf Site	3,95,000 MT (Landfilling) + 7.50 Million Kcal/Hr. (Incineration)
5	M/s Bharuch Enviro Infrastructure Ltd, Ankleshwar Contact Detail - Phone 91-2646-253135 Fax 91-2646-222849	TSDf Site	23,00,000 MT (Landfilling) + 120 MT/Day (Incineration)
6	M/s Nandesari Environment Control Ltd. Nandesari, Vadodara, Contact Detail – Phone 265 – 2840818 Fax 265 – 2841017	TSDf Site	3,00,000 MT (Landfilling) + 700 Kg/Hr. (Incineration)

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

**LIST OF AGENCY FOR SUPPORT & GUIDANCE FOR RESCUE & REHABILITATION OF OILED BIRD & MANGROVES MANAGEMENT DURING OIL SPILL**

**ANNEXURE 16**

Sr No.	Name of the party & Contact Detail	Contact Person	Contact Detail	Activity
1	Gujarat Institute of Desert Ecology P.O Box No. #83, Opp. Changleshwar Temple, Mundra Road Bhuj - 370001 Gujarat – India.	Dr. Thivakaran	EMAIL: desert_ecology@yahoo.com FAX: 02832-235027  02832-235025	Restoration of Mangroves
2	Kalapooranasuri Karunadham Karunadham Hospital, At – Shedata, Bhuj, Kutch		(M) 9925020776	Rescue of oil soaked birds / animals and medical treatment facility
3	Anchorwala Ahinshadham Bhagwan Mahavir Pashu Raksha Kendra, Pragpar, Mundra, Kutch.		Phone (02838) 22352	Rescue of oil soaked birds / animals and medical treatment facility
4	<b>ASHA Foundation</b> C/182, Ashoknagar, Opposite ISRO Satellite, Ahmedabad – 380015, Gujrat, India.	Lalubhai	Phone: 09824037521 ,09879877281 Email: ashahmedabad@yahoo.co.in Website: www.ashafoundationindia.org	Rescue of oil soaked birds / animals and medical treatment facility

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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA

OIL SPILL CONTINGENCY RESPONSE PLAN

**Terms, definitions and abbreviations used in this plan**

APSEZL	Adani Ports and Special Economic Zone Ltd.
COO	Chief Operating Officer
DGM	Deputy General Manager
DGS	Directorate General of Shipping
ENGR.	Engineer
ESD	Emergency Shut Down
FIR	First Information Report
FO	Furnace Oil
GMB	Gujarat Maritime Board
GPCB	Gujarat Pollution Control Board
HOD	Head Of Department
HQ	Head Quarters
HSD	High Speed Diesel
ICG	Indian Coast Guard
IMO	International Maritime Organization
IPMS	Integrated Port Management System
KPT	Kandla Port Trust
LWS	Low Water State
MCLS	Maximum Credible loss scenario
MMD	Mercantile Maritime Deptt.
MOEF	Ministry of Environment & Forest
MSDS	Material Safety Data Sheets
NOS DCP	National Oil Spill Disaster Contingency Plan
OSC	On Scene Commander
PLEM	Pipe line end manifold
POLREP	Pollution Report
PPE	Personal Protective Equipment
PR	Public Relations Officer
R/O	Radio Officer
SKO	Super Kerosene Oil

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**ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.**  
**MUNDRA**  
**OIL SPILL CONTINGENCY RESPONSE PLAN**  
**Certificate of Endorsement**

(To be certified personally by an officer not below the post of Deputy Conservator of a port facility or the Installation Manager of an oil installation, or offshore installation, or equivalent legally responsible authority)

**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 protection 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, where 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 arrangements 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 submission of a fresh certificate of endorsement.

Seal:

**Capt. Anubhav Jain**  
**AGM - Marine & PFSO**  
**Adani Ports & SEZ Ltd.**  
**Mundra - Kutch - Gujarat**

Signature:

Name: Capt. Anubhav Jain

Designation: Head - Marine

Organization: Adani Ports and SEZ Ltd, Mundra

Date: 01 Oct 2020

Place: Mundra

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**ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA**

**OIL SPILL CONTINGENCY RESPONSE PLAN**

Appendix E5 to NOS DCP 2015

(Para 4.5 refers)

**Contingency Planning Compliance Checklist**

<b>Name of the Port/ Oil Handling Agency</b>	<b>Adani Ports and SEZ Limited, Mundra</b>
--	--

<b>DESCRIPTION</b>		<b>Complied Yes/No</b>	<b>Remarks</b>
<b>Risk Assessment</b>			
1.	Whether the facility produces / handles / uses / imports / stores any type of petroleum product.	Yes	(Ref. OSCRP 2.2)
2.	Whether risk assessment is done	Yes	(Ref. OSCRP 2.0)
3.	Who did the risk assessment	Yes	Environ Software (P) Ltd. & APSEZ
4.	Whether maximum volume of oil spill that can occur in the worst case scenario is considered.	Yes	(Ref. OSCRP 2.4)
5.	Whether relative measures of the probability and consequences of various oil spills including worst case scenario are taken into account.	Yes	(Ref. OSCRP 2.4)
6.	Whether all types of spills possible in the facility are considered including grounding, collision, fire, explosion, Rupture of hoses.	Yes	(Ref. OSCRP 2.3 & 2.4)
7	Please specify the list of oils considered for risk assessment	Yes	(Ref. OSCRP 2.2)
8	Whether the vulnerable areas are estimated by considering maximum loss scenario and weather condition	Yes	(Ref OSCRP 2.1 Computational Scenarios)
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	(Ref. OSCRP 2.6)
10	Whether measures for reduction of identified high risk are included by reducing the consequences through spill mitigation measures	Yes	(Ref. OSCRP 1.4, 2.3, 2.6. 3 & 5)
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	NA	All facilities developed within SEZ keeping safe distances from the exposed population.
12	Whether risk levels are established for each month after considering the probability with tide and current and consequences of each such spill	Yes	(Ref. OSCRP 2.1 computational scenarios & 2.3)
13	Whether prevention and mitigation measures are included in the plan	YES	(Ref. OSCRP 4.0, 7.0, 8.0 & 9.0)
14	Whether the spill may affect the shoreline.(length of the shoreline with coordinated)	Yes	Ref. OSCRP 2.3 & 2.6)
15	Whether time taken the oil spill to reach ashore in each quantity of spill in various month are mentioned in the plan	Yes	(Ref. OSCRP 2.3)
16	Whether sensitivity mapping has been carried out	Yes	(Ref. OSCRP 2.5)
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	(Ref. OSCRP 2.5 & 2.6)

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OIL SPILL CONTINGENCY RESPONSE PLAN**

18	Do the sensitivity maps indicate area to be protected on priority	Yes	<b>(Ref. OSCRP 2.6)</b>
19	Does the maps indicate boom deployment locations	NA	Booms not deployed permanently
20	Whether any marine protected area will be affected	YES	<b>(Ref. OSCRP 2.5 &amp; 2.6)</b>
21	Whether total number of fishermen likely to affected is mentioned in the plan	Yes	<b>(Ref. OSCRP 2.6)</b>
22	Whether any saltpan in the area is going to be affected	Yes	<b>(Ref. OSCRP 2.6)</b>
23	Whether any mangroves in the area will be affected by a spill	Yes	<b>(Ref. OSCRP 2.6)</b>
<b>Preparedness</b>			
24	whether any containment equipment is available	Yes	<b>(Ref. OSCRP Annex 3)</b>
25	Whether any recovery equipment is available	Yes	<b>(Ref. OSCRP Annex 3)</b>
26	Whether the facility is having any temporary storage capacity	Yes	<b>(Ref. OSCRP Annex 3)</b>
27	Whether location of the oil spill response equipment is mentioned in the plan	Yes	Has been included in Annex 3
28	Whether suitable vessels available for deploying the boom skimmer etc.	Yes	<b>(Ref. OSCRP Annex 3)</b>
29	Whether OSD held with facility	Yes	<b>(Ref. OSCRP Annex 3)</b>
30	Whether the OSD held with the facility is approved for use in Indian waters	Yes	
31	Whether the facility has MoU with other operator for tier -1 preparedness	Yes	<b>(Ref. OSCRP 1.4)</b>
32	Whether the list of oil spill response equipment available with each agency in deliberation	Yes	MoU document
33	Whether the facility has any MoU with private OSRO	NA	Port itself is equipped to deal with oil spill emergencies
34	Whether the procedure for evoking the mutual aid is clearly described in the plan	Yes	<b>(Ref. OSCRP 1.4)</b>
35	Whether additional manpower is available	Yes	<b>(Ref. OSCRP 5.4)</b>
36	Whether list of approved recyclers is mentioned in the plan	Yes	List of recycler approved by state of Gujarat is included in Annexure 15.
37	Whether NEBA (net environmental Benefit Analysis) has been undertaken	Yes	Before commissioning of any new project, various environmental aspects with their positive or adverse impact is considered under EIA Environment Impact Assessment stage.
38	<b>Whether the areas from priority protection have identify in the plan</b>	YES	<b>(Ref. OSCRP 2.5 &amp; 2.6)</b>
39	Whether relevant authorities and stakeholder were consulted for NEBA and during the areas for property protection	Yes	Before commissioning of any new project Environment Impact Assessment & Public consultation is carried out, in which relevant authorities & stakeholders

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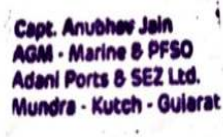

**MUNDRA**

**OIL SPILL CONTINGENCY RESPONSE PLAN**

			were consulted.
40	Whether district administration has been appraised of the risk impact of oil spills?	Yes	District Level Disaster Management Plan is prepared and regularly updated at district level by District Collector of Kutchh. Under DMP Oil spillage contingency is identified as risk. During preparation & updating of disaster management plan, District Level Authority organises & compiles information from various industries of kutchh. APSEZL is regularly participating in the same & providing necessary information to district level administration.
<b>Action Plan</b>			
41	Whether the plan outlines procedure for reporting of oil spill to coast guard	Yes	<b>(Ref. OSCRP 7.3)</b>
42	Whether the oil spill response action is clearly mentioned	Yes	<b>(Ref .OSCRP 3.1 to 3.6)</b>
43	Whether the action plan include all duties to be attended in connection with an oil spill	Yes	<b>(Ref. OSCRP 3.4)</b>
44	Whether the action plan includes key personnel by their name and designation viz. C/C, S/C	Yes	<b>Ref. OSCRP Annexure-4</b>
45	Whether alternate coverage is planned to take care of the absence of a particular person [in cases where action plan is developed basic names]	Yes	<b>(Ref. OSCRP 5)</b>
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	<b>(Ref. OSCRP 3.4)</b>
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	Yes	Ref. OSCRP Annexure-4
48	Whether approved recyclers are identified for processing recovered oil and oily debris	Yes	List of approved recycler of Gujarat state is included in annexure 15.  Membership of common disposal facility for disposal of oily debris is also attached annexure 16.
49	Whether the shoreline likely to be affected is identified	Yes	<b>(Ref. OSCRP 2.5 &amp; 2.6)</b>
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2014	NA	<b>No incident</b>
51	Whether the spill incident and its consequences	NA	<b>No incident</b>

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**ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
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OIL SPILL CONTINGENCY RESPONSE PLAN**

	are informed to fishermen and other NGOs for environment protection through media		
	<b>Training and exercises</b>		
52	Whether mock fire /emergency response drills are specified in the plan	Yes	(Ref. OSCRP 5.6)
53	Whether the mock drills cover all types of probable oil spill	Yes	
54	Whether the plan mentions list of trained manpower	Yes	(Ref. OSCRP 5.6)
55	Whether record for periodic mock drill are maintained in a well-defined format	Yes	
56	Whether the plan updated according to the finding in mock-drills and exercises	Yes	
	DESCRIPTION		
57	What is the frequency of updation /review of contingency plan?	Yes	As Per NOSDCP 2015
58	Periodicity of joint exercises with mutual aid partner	Yes	
59	Frequency of mock-drills for practice	Yes	(Ref. OSCRP 5.6)
60	Whether the records for periodic mock drills are maintained in a well-defined format	Yes	(Ref. OSCRP 5.6)
61	Whether the plan is updated according to the finding of mock-drills and exercises	Yes	
62	Frequency of updation /review of contingency plan	Yes	As Per NOSDCP 2015
<p>I, hereby ,declare that the all information appended above and true and correct to my knowledge of belief</p> <div style="text-align: center;">   </div> <p>Date: 01 Oct 2020 <span style="float: right;">Chief conservator /Installation manager</span></p>			
<b>VERIFIED</b>			
<p>Date: <span style="float: right;">(District commander ICG ) or his representative</span></p>			
<p>Date: <span style="float: right;">(Regional commander ICG) or his representative</span></p>			

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# **Annexure – 4**



**POLLUCON**

LABORATORIES PVT. LTD.

Environmental Auditors, Consultants & Analysts.  
Cleaner Production / Waste Minimization Facilitator

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

# **"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"**

**FOR**



**ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED  
TAL: MUNDRA, KUTCH, MUNDRA – 370 421**

**MONITORING PERIOD: OCTOBER 2020 TO MARCH 2021**

**PREPARED BY:**



**POLLUCON LABORATORIES PVT.LTD.**

**PLOT NO.5/6 "POLLUCON HOUSE", OPP. BALAJI INDUSTRIAL SOCIETY,  
OLD SHANTINATH SILK MILL LANE, NEAR GAYTRI FARSAN MART,  
NAVJIVAN CIRCLE, UDHANA MAGDALLA ROAD, SURAT-395007.  
PHONE/FAX – (+91 261) 2455 751, 2601 106, 2601 224.  
E-mail: [pollucon@gmail.com](mailto:pollucon@gmail.com) web: [www.polluconlab.com](http://www.polluconlab.com)**

**TC - 5945**

**ISO 9001:2015**

**ISO 14001:2015**

**ISO 45001:2018**

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## 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	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.24	8.19	8.20	8.18	8.27	8.22	8.23	8.2	8.28	8.25	8.25	8.21	IS3025(P11)83Re.02
2	Temperature	oC	30.3	30.1	30.2	30.1	30.4	30.1	29.7	29.5	30.1	29.8	30.3	30.1	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	179	198	163	180	156	138	140	157	132	151	126	110	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	2.8	Not Detected	3	Not Detected	3.6	Not Detected	3.5	Not Detected	3.4	Not Detected	3.5	Not Detected	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	6.0	5.8	5.9	5.7	5.9	5.6	5.8	5.5	6	5.8	5.9	5.7	IS3025(P38)89Re.99
6	Salinity	ppt	36.4	36.6	36.5	36.8	36.3	36.7	36.1	36.4	36.5	36.9	36.7	37	APHA (22 <sup>nd</sup> Edition) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edition)5520 D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.34	3.1	3.75	3.58	3.36	3.1	3.28	3.46	3.17	2.93	3.56	3.24	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.57	0.39	0.84	0.69	0.68	0.51	0.64	0.7	0.83	0.75	1.4	1.18	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.78	2.51	2.93	2.84	2.51	2.30	2.39	2.68	1.96	1.68	2.37	2.21	IS3025(P34)88Cla.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	1.96	1.9	2.36	2.15	2.28	2.19	1.75	1.99	2.37	2.13	2.19	1.93	APHA(22 <sup>nd</sup> Edition) 4500 C
12	Total Nitrogen	μmol/L	6.69	6.00	7.52	7.11	6.55	5.91	6.31	6.84	5.96	5.36	7.33	6.63	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	13	Not Detected	16	Not Detected	14	Not Detected	17	Not Detected	14.6	Not Detected	12	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37450	37698.0	37456	37740	37270	37639	37106	37410	37498	37834	38294	38514	IS3025(P16)84Re.02
15	COD	mg/L	24.6	19.2	23	Not Detected	25	Not Detected	30	21.0	31.4	23	32	25.0	APHA (22 <sup>nd</sup> Edition) 5520-D Open Reflux
A	<b>Phytoplankton</b>														
16.1	Chlorophyll	mg/m <sup>3</sup>	2.93	2.72	2.99	2.56	3.2	2.67	2.56	2.45	3.07	2.83	2.75	2.42	APHA (22 <sup>nd</sup> Edition) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	2.0	1.8	1.8	2.1	1.6	2.0	1.25	0.87	0.46	0.50	0.02	0.03	APHA (22 <sup>nd</sup> Edition)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

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16.3	Cell Count	No. x 10 <sup>3</sup> /L	142	98	134	94	148	102	164	104	186	118	172	104	10200-H APHA (22 <sup>nd</sup> Edi) 10200-H
16.4	Name of Group Number and name of group species of each group	--	<i>Pinnularia sp. Biddulphi a sp. Coscinodiscus sp. Skeletonema sp.</i>	<i>Fragillaria sp. Gyrodinium sp. Chaetognathes</i>	<i>Coscinodiscus sp. Pleurosigma sp. Fragillaria sp. Surirella sp. Thallasionema sp.</i>	<i>Navicula sp. Melosira sp. Cyclotella sp. Biddulphi a sp. --</i>	<i>Melosira sp. Thallasiosira sp. Rhizosolenia sp. Skeletonema sp. Pleurosigma sp.</i>	<i>Nitzschia sp. Navicula sp. Thallasiosira sp. --</i>	<i>Thallasiosira sp. Nitzschia sp. Coscinodiscus sp. Skeletonema sp. --</i>	<i>Synedra sp. Amphora sp. Navicula sp. Nitzschia sp. --</i>	<i>Triceratium sp. Cymbella sp. Cheatoceros sp. Rhizosolenia sp. Skeletonema sp.</i>	<i>Nitzschia sp. Thallasionema sp. Biddulphi a sp. Cymbella sp. --</i>	<i>Rhizosolenia sp. Synedra sp. Biddulphi a sp. Skeletonema sp.</i>	<i>Nitzschia sp. Navicula sp. Pleurosigma sp. --</i>	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>B Zooplanktons</b>															
17.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	30		26		28		39		35		30		APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Gastropods Polychaetes Ostracods Mysids		Ostracods Polychaetes Gastropods Isopods		Copepods Polychaetes Decapods Isopods		Copepods Polychaetes Gastropods --		Copepods Polychaetes Decapods Gastropods		Decapods Polychaetes Amphipods Foraminiferans		APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	3.45		3.1		3		3.4		3.45		3.25		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>C Microbiological Parameters</b>															
18.1	Total Bacterial Count	CFU/ml	2380		2350		2410		2150		2290		2370		IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present		APHA(22 <sup>nd</sup> Edi)9221-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi.2.4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present		IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



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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	OCTOBER 2020	NOVEMBER 2020	DECEMBER 2020	JANUARY 2021	FEBRUARY 2021	MARCH 2021	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.96	0.83	0.76	0.63	0.58	0.51	FCO:2007
2	Phosphorus as P	µg/g	412	390	487	514	463	576	APHA(22 <sup>nd</sup> Eti) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.46	4.38	4.7	5.16	4.92	5.24	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	150	129	163	173	168	113	AAS 3111B
5.3	Manganese as Mn	µg/g	802	786	706	724	693	758	AAS APHA 3111 B
5.4	Iron as Fe	%	4.76	4.43	4.57	4.68	4.75	4.82	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.5	Nickel as Ni	µg/g	39	51	63	56	38.9	27	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.6	Copper as Cu	µg/g	23	36	27	43	58.2	39	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.7	Zinc as Zn	µg/g	145	128	119	159	135	106	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.8	Lead as Pb	µg/g	2.6	2.1	1.75	2.13	2.39	3.26	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Amphipods Gastropods olychaetes	Polychaete worms Amphipods Gastropods	Polychaete worms Crustaceans Bivalves	Polychaete worms Crustaceans Amphipods	Polychaete worms Crustaceans Gastropods	Polychaetes Gastropods Amphipods Bivalves	APHA (22 <sup>nd</sup> Eti) 10500-C
6.2	MeioBenthos	--	--	Nematodes	Foraminiferans	Nematodes Foraminiferans	Nematodes	--	APHA (22 <sup>nd</sup> Eti) 10500-C
6.3	Population	no/m2	441	439	351	471	529	437	APHA (22 <sup>nd</sup> Eti) 10500-C



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
Lab Manager (Q)

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

**RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.21	8.23	8.20	8.27	8.24	8.23	8.18	8.17	8.14	8.15	8.13	IS3025(P11)8 3Re.02
2	Temperature	oC	30.0	29.8	30.2	30.0	30.3	30.1	29.9	29.6	30.1	29.9	30.2	30	IS3025(P9)84 Re.02
3	Total Suspended Solids	mg/L	173	187	160	187	146	163	153	139	142	163	135	114	IS3025(P17)8 4Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3.4	Not Detected	3.2	Not Detected	3.4	Not Detected	3.2	Not Detected	3.5	Not Detected	3.4	Not Detected	IS 3025 (P44)1993Re. 03Edition2.1
5	Dissolved Oxygen	mg/L	5.9	5.7	5.9	5.8	5.9	5.7	6	5.8	6.1	5.9	5.9	5.8	IS3025(P38)8 9Re.99
6	Salinity	ppt	36.4	36.6	36.3	36.7	36.5	36.8	36.2	36.5	36.4	36.7	36.6	36.9	APHA (22 <sup>nd</sup> Edition) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edition) 5520D
8	Nitrate as NO <sub>3</sub>	µmol/L	3.27	3.1	3.9	3.6	3.5	3.39	3.34	3.16	3.23	2.94	3.17	2.75	IS3025(P34)8 8
9	Nitrite as NO <sub>2</sub>	µmol/L	0.75	0.63	0.57	0.46	0.68	0.47	0.78	0.67	0.69	0.53	0.93	0.82	IS3025(P34)8 8 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	2.56	2.41	2.34	2.10	2.20	2.31	2.16	1.95	1.92	1.79	2.1	2.0	IS3025(P34)8 8 Cla.2.3
11	Phosphates as PO <sub>4</sub>	µmol/L	2.17	1.96	1.98	1.74	2.36	2.19	1.98	1.84	2.68	2.4	2.35	2.21	APHA(22 <sup>nd</sup> Edition) 4500 C
12	Total Nitrogen	µmol/L	6.58	6.14	6.78	6.16	6.37	6.17	6.28	5.78	5.84	5.26	6.24	5.54	IS3025(P34)8 8
13	Petroleum Hydrocarbon	µg/L	9.6	Not Detected	12.0	Not Detected	15.0	Not Detected	19	Not Detected	13.2	Not Detected	16	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37368	37560	37270	37694	37486	37809	37314	37498	37406	37689	38096	38374	IS3025(P16)8 4Re.02
15	COD	mg/L	25.0	19.0	21.0	Not Detected	23.0	Not Detected	25.0	18.0	28	21	29.0	23.0	APHA(22 <sup>nd</sup> Edition) 5520-D Open Reflux
<b>A Phytoplankton</b>															
16.1	Chlorophyll	mg/m <sup>3</sup>	3.04	2.77	2.93	2.72	3.36	2.61	3.09	2.56	3.28	2.75	2.83	2.67	APHA (22 <sup>nd</sup> Edition) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	1.3	2.2	1.4	2.3	3.0	2.5	0.6	0.69	0.10	0.02	0.9	0.15	APHA (22 <sup>nd</sup> Edition) 10200-H



**H. T. Shah**

**Lab Manager**




**Dr. Arun Bajpai**

**Lab Manager (Q)**

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16.3	Cell Count	No. x 10 <sup>3</sup> /L	144	102	130	90	158	118	171	90	178	114	166	114	APHA (22 <sup>nd</sup> Edi) 10200-H
16.4	Name of Group Number and name of group species of each group	--	<i>Thallasionema</i> sp. <i>Biddulphia</i> sp. <i>Skeletonema</i> sp. <i>Rhizosolenia</i> sp.	<i>Nitzschia</i> sp. <i>Cyclotella</i> sp. <i>Amphora</i> sp.	<i>Coscinodiscus</i> sp. <i>Surirella</i> sp. <i>Thallasionema</i> sp. <i>Cyclotella</i> sp. <i>Biddulphia</i> sp.	<i>Fragillaria</i> sp. <i>Cyclotella</i> sp. <i>Navicula</i> sp. <i>Nitzschia</i> sp. --	<i>Coscinodiscus</i> sp. <i>Nitzschia</i> sp. <i>Skeletonema</i> sp. <i>Rhizosolenia</i> sp. --	<i>Navicula</i> sp. <i>Thallasionema</i> sp. <i>Fragillaria</i> sp. -- --	<i>Coscinodiscus</i> sp. <i>Skeletonema</i> sp. <i>Pleurosigma</i> sp. <i>Thallasionema</i> sp. --	<i>Nitzschia</i> sp. <i>Rhizosolenia</i> sp. <i>Fragillaria</i> sp. -- --	<i>Navicula</i> sp. <i>Rhizosolenia</i> sp. <i>Biddulphia</i> sp. <i>Skeletonema</i> sp. <i>Coscinodiscus</i> sp.	<i>Cymbella</i> sp. <i>Thallasionema</i> sp. <i>Nitzschia</i> sp. <i>Amphiprotera</i> sp. --	<i>Coscinodiscus</i> sp. <i>Cheatoceus</i> sp. <i>Navicula</i> sp. <i>Thallasionema</i> sp. --	<i>Nitzschia</i> sp. <i>Pleurosigma</i> sp. <i>Thallasionema</i> sp. --	APHA (22 <sup>nd</sup> Edi) 10200-H
<b>B Zooplanktons</b>															
17.1	Abundance (Population)	noX10 <sup>3</sup> / 100 m <sup>3</sup>	35		30		36		42		34		31		APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Lamellibranches Ostracods Gastropods		Gastropods Bivalves Ostracods Isopods		Gastropods Bivalves Copepods --		Hydrozoans Polychaetes Gastropods --		Polychaetes Gastropods Bivalves		Gastropods Polychaetes Decapods Ostracods		APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	3.25		3.05		3.45		3.55		3.15		2.95		APHA (22 <sup>nd</sup> Edi) 10200-G
<b>C Microbiological Parameters</b>															
18.1	Total Bacterial Count	CFU/ml	2140		2220		2290		2380		2150		2360		IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present		APHA(22 <sup>nd</sup> Edi) 9221-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981 Edi.2.4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present		IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

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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	OCTOBER 2020	NOVEMBER 2020	DECEMBER 2020	JANUARY 2021	FEBRUARY 2021	MARCH 2021	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.38	0.7	0.68	--	--	--	FCO:2007
2	Phosphorus as P	µg/g	329	410	524	--	--	--	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	--	--	--	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	--	--	--	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.5	4.7	4.69	--	--	--	AAS APHA 3111 B
5.2	Total Chromium as Cr+3	µg/g	189	159	170	--	--	--	AAS 3111B
5.3	Manganese as Mn	µg/g	726	810	738	--	--	--	AAS APHA 3111 B
5.4	Iron as Fe	%	4.69	4.53	4.73	--	--	--	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	32	56	64	--	--	--	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	25	37	43	--	--	--	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	170	269	190	--	--	--	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2.34	2.16	1.72	--	--	--	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	--	--	--	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes Crustaceans Amphipods	Polychaete worms Crustaceans Bivalves	Polychaetes Crustaceans Gastropods	--	--	--	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Foraminiferans	--	Foraminiferans	--	--	--	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m <sup>2</sup>	471	412	382	--	--	--	APHA (22 <sup>nd</sup> Edi) 10500-C



**H. T. Shah**  
**Lab Manager**




**Dr. Arun Bajpai**  
**Lab Manager (Q)**



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**RESULTS OF MARINE WATER [M3 EAST OF BOCHAISLAND - N 22°46'530" E 069°41'690"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.27	8.24	8.23	8.20	8.28	8.24	8.21	8.17	8.19	8.23	8.23	8.2	IS3025(P11)83Re.02
2	Temperature	oC	30.1	29.8	30.2	30.0	30.4	30.1	30.1	29.8	30	30.1	30.1	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	186	203	168	178	148	169	129	143	104	123	133	106	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	3.5	Not Detected	3.3	Not Detected	3.4	Not Detected	3.7	Not Detected	3.5	Not Detected	3.4	Not Detected	IS 3025 (P44)1993Re.03 Edition 2.1
5	Dissolved Oxygen	mg/L	5.8	5.6	5.9	5.7	5.9	5.8	5.8	5.7	5.9	5.8	6	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	36.5	36.8	36.4	36.8	36.5	36.8	36.2	36.6	36.5	36.9	36.7	37	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)552 OD
8	Nitrate as NO <sub>3</sub>	μmol/L	3.14	2.96	3.87	3.61	3.43	3.27	3.26	3.41	3.18	2.9	2.8	2.7	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.63	0.54	0.73	0.53	0.61	0.53	0.75	0.86	0.63	0.56	0.89	0.72	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.37	2.25	2.64	2.46	2.41	2.28	2.27	2.56	2.57	2.35	2.3	2.1	IS3025(P34)88Cla 2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	1.72	1.65	2.1	1.9	2.37	2.24	2.19	2.27	2.39	2.17	1.93	1.75	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	6.14	5.8	7.24	6.6	6.45	6.1	6.28	6.63	6.38	5.85	5.92	5.51	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	19.4	Not Detected	17.0	Not Detected	21.6	Not Detected	15.6	Not Detected	12	Not Detected	17	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37462	37734	37380	37740	37510	37798	37140	37586	37524	37816	38184	38492	IS3025(P16)84Re.02
15	COD	mg/L	23.0	18.6	20.4	Not Detected	23.4	Not Detected	27.0	18.0	29	21.4	27	13.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Phytoplankton</b>															
16.1	Chlorophyll	mg/m <sup>3</sup>	3.09	2.99	2.88	2.72	3.2	2.93	2.67	2.13	2.79	2.42	2.68	2.42	APHA (22 <sup>nd</sup> Edi) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	2.3	1.4	2.5	1.7	2.2	1.5	1.14	2.1	0.26	0.03	0.44	0.0	APHA (22 <sup>nd</sup> Edi) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	128	104	122	96	156	112	164	90	171	106	115	91	APHA (22 <sup>nd</sup> Edi) 10200-H



**H. T. Shah**

**Lab Manager**




**Dr. Arun Bajpai**

**Lab Manager (Q)**

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16.4	Name of Group Number and name of group species of each group	--	<i>Oscillatoria</i> <i>Pinnularia</i> <i>Biddulphia</i> <i>a</i> sp. <i>Ceratium</i>	<i>Melosira</i> <i>Rhizosolenia</i> sp. <i>Gyrosigma</i> sp.	<i>Biddulphia</i> <i>a</i> sp. <i>Coscinodiscus</i> sp. <i>Fragillaria</i> <i>sp.</i> <i>Surirella</i> <i>sp.</i> <i>Thalassionema</i> sp.	<i>Navicula</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Melosira</i> <i>sp.</i> <i>Pleurosigma</i> sp. --	<i>Rhizosolenia</i> sp. <i>Thalassionema</i> sp. <i>Skeletonema</i> sp. <i>Chaetognathes</i> --	<i>Nitzschia</i> <i>sp.</i> <i>Melosira</i> <i>sp.</i> <i>Synedra</i> <i>sp.</i> <i>Gyrosigma</i> <i>a</i> sp. --	<i>Rhizosolenia</i> sp. <i>Pleurosigma</i> sp. <i>Biddulphia</i> <i>a</i> sp. <i>Melosira</i> <i>sp.</i> <i>Thalassionema</i> sp.	<i>Nitzschia</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i> <i>Chatognathes</i> sp. <i>Cyclotella</i> <i>sp.</i> --	<i>Triceratium</i> sp. <i>Cymbella</i> <i>sp.</i> <i>Thalassionema</i> sp. <i>Biddulphia</i> <i>a</i> sp.	<i>Nitzschia</i> <i>sp.</i> <i>Pleurosigma</i> sp. <i>Pinnularia</i> <i>sp.</i> <i>Cyclotella</i> <i>sp.</i> --	<i>Coscinodiscus</i> sp. <i>Thalassiosira</i> sp. <i>Rhizosolenia</i> sp. <i>Biddulphia</i> <i>a</i> sp. --	<i>Nitzschia</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i> <i>Synedra</i> <i>sp.</i> <i>Pleurosigma</i> <i>ma</i> sp. --	APHA (22 <sup>nd</sup> Edi) 10200-H	
B	Zooplanktons															
17.1	Abundance (Population)	noX10 <sup>3</sup> / 100 m <sup>3</sup>	21		24			30		43		37		33		APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Foraminiferans Ctenophores Gastropods Polychaetes		Polychaetes Chaetognathes Gastropods Ostracods			Copepods Gastropods Polychaetes Isopods		Cephalopods Polychaetes Ostracods Mysids		Copepods Polychaetes Amphipods Isopods Gastropods		Polychaetes Gastropods Decapods		APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	2.9		2.8			3.25		3.4		3.80		3.1		APHA (22 <sup>nd</sup> Edi) 10200-G
C	Microbiological Parameters															
18.1	Total Bacterial Count	CFU/ml	2190		2230			2310		2280		2250		2140		IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent			Absent		Absent		Absent		Present		APHA(22 <sup>nd</sup> Edi)922 1-D
18.3	Ecoli	/ml	Absent		Absent			Absent		Absent		Absent		Absent		IS:1622:1981Edi.2 .4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent			Absent		Absent		Absent		Present		IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent			Absent		Absent		Absent		Absent		IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent			Absent		Absent		Absent		Absent		IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent			Absent		Absent		Absent		Absent		IS : 5887 (P-5)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

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**RESULTS OF SEDIMENT ANALYSIS [M3 RIGHT SIDE OF BOCHA CREEK - N 22°46'530" E 069°41'690"]**

SR NO	TEST PARAMETERS	UNIT	OCTOBER 2020	NOVEMBER 2020	DECEMBER 2020	JANUARY 2021	FEBRUARY 2021	MARCH 2021	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.4	0.63	0.7	0.65	0.61	0.53	FCO:2007
2	Phosphorus as P	µg/g	364	318	498	510	483	519	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.62	4.46	4.74	4.98	4.69	5.12	AAS APHA 3111 B
5.2	Total Chromium as Cr+3	µg/g	174	137	169	170	158	132	AAS 3111B
5.3	Manganese as Mn	µg/g	732	790	734	756	672	740	AAS APHA 3111 B
5.4	Iron as Fe	%	4.42	4.72	4.58	4.76	4.83	4.92	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	30	59	64	53	64.5	48	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	26	37	41	47	53.2	35	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	153	206	169	138	146	118	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2.7	2.13	1.56	2.19	2.95	3.14	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Crustaceans Gastropods Polychaetes	Polychaete worms Crustaceans Bivalves	Polychaetes Crustaceans Bivalves	Crustaceans Bivalves Amphipods	Polychaetes Gastropods Bivalves	Polychaetes Crustaceans Gastropods Nematodes	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	--	--	--	Turbellarians Nematodes	Foraminiferans	--	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m <sup>2</sup>	497	439	409	460	471	412	APHA (22 <sup>nd</sup> Edi) 10500-C



**H. T. Shah**  
**Lab Manager**




**Dr. Arun Bajpai**  
**Lab Manager (Q)**

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**RESULTS OF MARINE WATER [M4 JUNA BANDAR N 22°47'57" E 069°43'620"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.20	8.23	8.20	8.29	8.24	8.23	8.2	8.17	8.14	8.21	8.19	IS3025(P11)83R e.02
2	Temperature	oC	30.2	30.0	30.1	29.9	30.3	30.1	29.8	29.7	30.2	30	30.3	30.1	IS3025(P9)84Re .02
3	Total Suspended Solids	mg/L	197	216	164	183	138	154	120	108	107	136	125	107	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	3.2	Not Detected	3.5	Not Detected	3.9	Not Detected	3.4	Not Detected	3.5	Not Detected	3.2	Not Detected	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	5.9	5.8	5.8	5.6	5.8	5.7	5.9	5.7	5.8	5.9	5.9	5.7	IS3025(P38)89R e.99
6	Salinity	ppt	36.5	36.8	36.3	36.7	36.5	36.7	36.3	36.7	36.5	36.8	36.6	36.9	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)5 520D
8	Nitrate as NO <sub>3</sub>	µmol/L	3.52	3.4	3.98	3.74	3.46	3.38	3.19	3.28	3.36	3.27	3.17	2.96	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	µmol/L	0.68	0.53	0.87	0.7	0.67	0.51	0.75	0.81	0.58	0.41	0.93	0.85	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	2.32	2.17	2.59	2.38	2.43	2.30	2.26	2.17	1.87	1.53	2.2	1.9	IS3025(P34)88C la.2.3
11	Phosphates as PO <sub>4</sub>	µmol/L	1.94	1.83	2.27	2.1	2.19	1.96	2.34	2.14	2.18	1.94	1.86	1.72	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	µmol/L	6.52	6.10	7.44	6.82	6.56	6.19	6.20	6.26	5.81	5.21	6.27	5.71	IS3025(P34)88
13	Petroleum Hydrocarbon	µg/L	12	Not Detected	16	Not Detected	20	Not Detected	17	Not Detected	15.2	Not Detected	17	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37586	37740	37294	37710	37618	37708	37318	37729	37728	37809	38098	38394	IS3025(P16)84R e.02
15	COD	mg/L	23.0	Not Detected	25	Not Detected	29	Not Detected	25.8	17	27.3	19.4	25.2	20.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Phytoplankton</b>															
16.1	Chlorophyll	mg/m <sup>3</sup>	2.99	2.56	3.09	2.61	3.2	2.88	3.15	2.72	2.75	2.4	2.71	2.38	APHA (22 <sup>nd</sup> Edi) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	2.3	2.4	2.2	2.3	2.1	2.1	1.07	2.32	0.54	0.51	0.61	0.54	APHA (22 <sup>nd</sup> Edi) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	150	102	170	103	190	120	169	97	180	109	153	89	APHA (22 <sup>nd</sup> Edi) 10200-H



**H. T. Shah**

**Lab Manager**




**Dr. Arun Bajpai**

**Lab Manager (Q)**



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16.4	Name of Group Number and name of group species of each group	--	<i>Oscillatoria</i> <i>a sp.</i> <i>Pinnularia</i> <i>sp.</i> <i>Ceratium</i> <i>Rhizosolenia</i> <i>sp.</i>	<i>Coscinodiscus</i> <i>sp.</i> <i>Fragillaria</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i>	<i>Biddulphia</i> <i>a sp.</i> <i>Coscinodiscus</i> <i>sp.</i> <i>Cyclotella</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Thalassiosira</i> <i>sp.</i>	<i>Nitzschia</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i> <i>Pleurosigma</i> <i>ma sp.</i> <i>Surirella</i> <i>sp.</i> --	<i>Coscinodiscus</i> <i>sp.</i> <i>Skeletonema</i> <i>ma sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Odontella</i> <i>sp.</i>	<i>Nitzschia</i> <i>sp.</i> <i>Thalassionema</i> <i>sp.</i> <i>Synedra</i> <i>sp.</i> <i>Navicula</i> <i>sp.</i>	<i>Amphiprobra</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Biddulphia</i> <i>a sp.</i>	<i>Cyclotella</i> <i>sp.</i> <i>Synedra</i> <i>sp.</i> <i>Skeletonema</i> <i>sp.</i> <i>Thalassionema</i> <i>sp.</i>	<i>Amphiprobra</i> <i>sp.</i> <i>Gyrosigma</i> <i>sp.</i> <i>Cheatoceous</i> <i>sp.</i> <i>Rhizosolenia</i> <i>sp.</i> <i>Triceratium</i> <i>m sp.</i>	<i>Nitzschia</i> <i>sp.</i> <i>Cymbella</i> <i>sp.</i> <i>Surirella</i> <i>sp.</i> <i>Pinnularia</i> <i>sp.</i> --	<i>Rhizosolenia</i> <i>sp.</i> <i>Cheatoceous</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Biddulphia</i> <i>a sp.</i> <i>Triceratium</i> <i>sp.</i>	<i>Synedra</i> <i>sp.</i> <i>Nitzschia</i> <i>sp.</i> <i>Pleurosigma</i> <i>ma sp.</i> <i>Stauroneis</i> <i>s sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H	
B	Zooplanktons															
17.1	Abundance (Population)	noX10 <sup>3</sup> / 100 m <sup>3</sup>	34		28		32		40		46		35			APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Chaetognathes Ostracods Gastropods Foraminiferans		Chaetognathes Ostracods Gastropods Polychaetes		Polychaetes Copepods Bivalves Isopods		Polychaetes Decapods Gastropods Mysids		Polychaetes Gastropods Bivalves		Bivalves Polychaetes Ostracods Amphipods			APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	3.1		2.95		3.3		3.60		3.95		3.25			APHA (22 <sup>nd</sup> Edi) 10200-G
C	Microbiological Parameters															
18.1	Total Bacterial Count	CFU/ml	2130		2150		2220		2140		2180		2270			IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present			APHA(22 <sup>nd</sup> Edi)9 221-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent			IS:1622:1981Edi .2.4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present			IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent			IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent			IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent			IS : 5887 (P-5)



**H. T. Shah**  
**Lab Manager**




**Dr. Arun Bajpai**  
**Lab Manager (Q)**

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**RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2020	NOVEMBER 2020	DECEMBER 2020	JANUARY 2021	FEBRUARY 2021	MARCH 2021	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.4	0.64	0.73	0.69	0.59	0.5	FCO:2007
2	Phosphorus as P	µg/g	379	410	568	591	532	586	APHA(22 <sup>nd</sup> Eti) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.58	4.79	4.67	4.93	4.73	4.9	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	193	206	183	208	168	138	AAS 3111B
5.3	Manganese as Mn	µg/g	756	814	710	729	623	720	AAS APHA 3111 B
5.4	Iron as Fe	%	4.3	4.8	4.59	5.1	4.81	4.97	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.5	Nickel as Ni	µg/g	39	53	65	58	63.2	45	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.6	Copper as Cu	µg/g	27	36	41	45	54.4	38	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.7	Zinc as Zn	µg/g	158	210	169	173	161	119	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.8	Lead as Pb	µg/g	2.19	2.59	1.53	2.26	2.57	2.75	AAS APHA(22 <sup>nd</sup> Eti)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes Bivalves Gastropods	Polychaete worms Crustaceans Amphipods	Polychaetes Isopods	Polychaete Amphipods Crustaceans	Polychaetes Gastropods Bivalves	Polychaetes Gastropods Amphipods	APHA (22 <sup>nd</sup> Eti) 10500-C
6.2	MeioBenthos	--		Nematodes	Foraminiferans	Nematodes Harpacticoids	Nematodes	Foraminiferans	APHA (22 <sup>nd</sup> Eti) 10500-C
6.3	Population	no/m <sup>2</sup>	499	441	471	559	439	409	APHA (22 <sup>nd</sup> Eti) 10500-C



**H. T. Shah**

**Lab Manager**





**Dr. Arun Bajpai**

**Lab Manager (Q)**


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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	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.25	8.21	8.20	8.17	8.28	8.26	8.22	8.19	8.25	8.21	8.21	8.19	IS3025(P11)83Re.02
2	Temperature	oC	30.2	29.9	30.1	29.9	30.0	29.8	29.9	29.6	30.3	30.1	30.2	30.1	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	187	215	164	173	135	149	117	128	105	119	116	104	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3.3	Not Detected	3.0	Not Detected	3.3	Not Detected	3.5	Not Detected	3.4	Not Detected	3.5	Not Detected	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.8	5.6	5.9	5.7	5.9	5.8	5.8	5.6	5.9	5.7	6	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	36.5	36.8	36.3	36.7	36.5	36.7	36.3	36.5	36.6	36.9	36.7	37.1	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)55 20D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.49	3.12	3.93	3.8	3.71	3.58	3.36	3.27	3.57	3.41	3.18	2.83	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.86	0.73	0.75	0.69	0.69	0.47	0.70	0.64	0.63	0.52	0.74	0.61	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.39	2.14	2.47	2.36	2.34	2.26	2.18	2.36	1.90	1.83	1.68	1.52	IS3025(P34)88CI a.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.13	1.91	2.6	2.41	2.26	2.11	2.39	2.21	2.17	1.95	2.39	2.17	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	6.74	5.99	7.15	6.85	6.74	6.31	6.24	6.27	6.10	5.76	5.6	4.96	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	12.3	Not Detected	17.0	Not Detected	21.6	Not Detected	18	Not Detected	13.8	Not Detected	11.3	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37562	37840	37284	37646	37664	37684	37298	37702	37704	37905	38314	38624	IS3025(P16)84Re.02
15	COD	mg/L	22.0	Not Detected	25.0	Not Detected	27.8	Not Detected	30	18	31.2	23.2	28.0	21.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
A	<b>Phytoplankton</b>														
16.1	Chlorophyll	mg/m <sup>3</sup>	3.31	2.88	2.93	2.56	3.25	2.93	2.99	2.83	2.91	2.61	2.8	2.67	APHA (22 <sup>nd</sup> Edi) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	2.0	2.1	2.3	2.4	2.0	2.0	2.69	1.58	2.0	1.08	2.17	0.99	APHA (22 <sup>nd</sup> Edi) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	164	106	138	90	166	108	158	96	164	104	150	102	APHA (22 <sup>nd</sup> Edi) 10200-H
16.4	Name of Group	--	Navicula	Fragillaria	Biddulphi	Nitzschia	Skeletone	Nitzschia	Microcysti	Biddulphi	Triceratiu	Nitzschia	Melosira	Fragillaria	APHA (22 <sup>nd</sup> Edi) 10200-H

  
**H. T. Shah**  
Lab Manager



  
**Dr. Arun Bajpai**  
Lab Manager (Q)

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	Number and name of group species of each group	<i>sp.</i> <i>Coscinodiscus sp.</i> <i>Oscillatoria sp.</i> <i>Polychaetes</i>	<i>sp.</i> <i>Pinnularia sp.</i> <i>Rhizosolenia sp.</i> <i>Melosira sp.</i>	<i>a sp.</i> <i>Melosira sp.</i> <i>Pleurosigma sp.</i> <i>Fragillaria sp.</i> <i>Cyclotella sp.</i>	<i>sp.</i> <i>Navicula sp.</i> <i>Thallasiosira sp.</i> <i>--</i> <i>--</i>	<i>ma sp.</i> <i>Thalassiosira sp.</i> <i>Coscinodiscus sp.</i> <i>Rhizosolenia sp.</i> <i>Melosira sp.</i>	<i>sp.</i> <i>Synedra sp.</i> <i>Navicula sp.</i> <i>Chaetognathes</i> <i>--</i>	<i>s sp.</i> <i>Cosmarium sp.</i> <i>Thalassiosira sp.</i> <i>Amphiproteron sp.</i> <i>Navicula sp.</i>	<i>a sp.</i> <i>Rhizosolenia sp.</i> <i>Cyclotella sp.</i> <i>Melosira sp.</i> <i>--</i>	<i>m sp.</i> <i>Skeletonema sp.</i> <i>Biddulphia sp.</i> <i>Rhizosolenia sp.</i> <i>Melosira sp.</i>	<i>sp.</i> <i>Navicula sp.</i> <i>Amphiproteron sp.</i> <i>Cyclotella sp.</i> <i>--</i>	<i>sp.</i> <i>Thalassiosira sp.</i> <i>Closterium sp.</i> <i>Biddulphia sp.</i> <i>Coscinodiscus sp.</i>	<i>sp.</i> <i>Nitzschia sp.</i> <i>Pleurosigma sp.</i> <i>Synedra sp.</i> <i>--</i>
B	Zooplanktons												
17.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	19	23	29	39	44	32	APHA (22 <sup>nd</sup> Edi) 10200-G				
17.2	Name of Group		Foraminiferans	Gastropods	Hydrozoans	Polychaetes	Polychaetes	Polychaetes	Polychaetes	Polychaetes	Polychaetes	Polychaetes	APHA (22 <sup>nd</sup> Edi) 10200-G
	Number and name of group species of each group	--	Gastropods	Ostracods	Gastropods	Gastropods	Gastropods	Gastropods	Gastropods	Gastropods	Gastropods	Gastropods	
			Polychaetes	Chaetognathes	Decapods	Mysids	Foraminiferans	Chaetognathes	Fish larvae	Decapods	Decapods	Decapods	
17.3	Total Biomass	ml/100 m <sup>3</sup>	2.4	2.65	3.25	3.45	4.0	2.85	APHA (22 <sup>nd</sup> Edi) 10200-G				
C	Microbiological Parameters												
18.1	Total Bacterial Count	CFU/ml	2180	2230	2140	2210	2230	2450	IS 5402:2002				
18.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Present	APHA(22 <sup>nd</sup> Edi)92 21-D				
18.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi. 2.4(2003-05)				
18.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Present	IS : 15186 :2002				
18.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)				
18.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)				
18.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)				



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



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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	OCTOBER 2020 SEDIMENT	NOVEMBER 2020 SEDIMENT	DECEMBER 2020 SEDIMENT	JANUARY 2021 SEDIMENT	FEBRUARY 2021 SEDIMENT	MARCH 2021 SEDIMENT	TEST METHOD
1	Organic Matter	%	0.41	0.59	0.68	0.58	0.62	0.52	FCO:2007
2	Phosphorus as P	µg/g	393	403	480	513	472	568	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.68	4.5	4.69	4.95	4.72	5.12	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	170	213	183	218	168	128	AAS 3111B
5.3	Manganese as Mn	µg/g	759	820	756	734	623	765	AAS APHA 3111 B
5.4	Iron as Fe	%	4.7	4.46	4.79	5.1	4.85	4.92	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	35	57	68	59	63.7	51	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	26	39	43	64	58.1	29	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	184	213	169	187	170	138	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2.37	1.94	1.51	2.3	2.43	2.76	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Polychaetes Gastropods Bivalves	Polychaete worms Crustaceans Amphipods	Polychaetes Crustaceans Bivalves	Polychaete Amphipods Bivalves	Polychaetes Gastropods Amphipods	Polychaetes Crustaceans Gastropods	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	Foraminiferans	Nematodes	--	Nematodes Turbellarians	Nematodes	Nematodes	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/m 2	471	440	412	528	439	380	APHA (22 <sup>nd</sup> Edi) 10500-C



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

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**RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.26	8.23	8.23	8.19	8.27	8.23	8.24	8.20	8.20	8.17	8.23	8.14	IS3025(P11)83Re.02
2	Temperature	oC	30.2	29.9	30.1	30.0	30.2	29.9	29.7	29.6	30	29.8	30.2	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	183	207	167	184	152	173	128	147	104	123	127	112	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	3	Not Detected	3.3	Not Detected	3.5	Not Detected	3.9	Not Detected	3.5	Not Detected	3.4	Not Detected	IS 3025 (P44)1993Re.03 Edition 2.1
5	Dissolved Oxygen	mg/L	5.8	5.6	5.9	5.7	5.9	5.6	5.8	5.6	5.9	5.8	6	5.8	IS3025(P38)89Re.99
6	Salinity	ppt	36.5	36.7	36.4	36.8	36.6	36.9	36.2	36.5	36.6	36.8	36.7	37.2	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)5520D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.39	3.12	3.64	3.5	3.24	3	3.36	3.59	3.15	2.97	2.97	2.83	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.78	0.53	0.99	0.84	0.73	0.56	0.69	0.73	0.52	0.41	0.68	0.59	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.81	2.69	2.57	2.36	2.30	2.17	2.47	2.60	2.18	2.06	2.37	2.16	IS3025(P34)88Cla 2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	1.76	1.58	2.13	1.94	2.48	2.28	2.39	2.17	2.1	1.93	2.58	2.23	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	6.98	6.34	7.20	6.70	6.27	5.73	6.52	6.92	5.85	5.44	6.02	5.58	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	15.0	Not Detected	12.0	Not Detected	19.0	Not Detected	15	Not Detected	12.3	Not Detected	15	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37613	37662	37362	37740	37680	37906	37208	37593	37708	37850	38192	38702	IS3025(P16)84Re.02
15	COD	mg/L	21.0	Not Detected	24	Not Detected	27	18.3	31	18.7	29.7	21.3	28	23.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
A	<b>Phytoplankton</b>														
16.1	Chlorophyll	mg/m <sup>3</sup>	3.2	2.72	2.99	2.61	3.04	2.93	3.20	2.8	2.81	2.7	2.64	2.57	APHA (22 <sup>nd</sup> Edi) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	2.5	2.1	2.7	2.2	2.6	1.9	0.72	1.28	0.10	0.11	0.39	0.27	APHA (22 <sup>nd</sup> Edi) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	172	108	163	95	180	113	178	98	168	104	142	98	APHA (22 <sup>nd</sup> Edi) 10200-H
16.4	Name of Group	--	<i>Pinnularia</i>	<i>Cymbella</i>	<i>Biddulphi</i>	<i>Coscinodi</i>	<i>Skeleton</i>	<i>Nitzschia</i>	<i>Rhizosole</i>	<i>Nitzschia</i>	<i>Thalasion</i>	<i>Nitzschia</i>	<i>Thalassiosi</i>	<i>Nitzschia</i>	APHA (22 <sup>nd</sup> Edi) 10200-H



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
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	Number and name of group species of each group		<i>sp. Ceratium Rhizosolenia sp. Pleurosigma sp. Melosira sp.</i>	<i>sp. Fragillaria sp. Amphora sp. Navicula sp.</i>	<i>a sp. Cyclotella sp. Thallasionema sp. Melosira sp. Peridinium sp.</i>	<i>scus sp. Navicula sp. Nitzschia sp. Fragillaria sp. --</i>	<i>ma sp. Amphiproteron sp. Rhizosolenia sp. --</i>	<i>sp. Fragillaria sp. Synedra sp. Surirella sp.</i>	<i>nia sp. Cosmarium sp. Stauroneis sp. Microcystis sp. Biddulphia sp.</i>	<i>sp. Navicula sp. Ceratium sp. Synedra sp. --</i>	<i>ema sp. Pleurosigma sp. Ceratium sp. Coscinodiscus sp. Biddulphia sp.</i>	<i>sp. Cymbella sp. Fragillaria sp. Navicula sp. --</i>	<i>ra sp. Melosira sp. Navicula sp. Skeletonema sp. --</i>	<i>sp. Pleurosigma sp. Synedra sp. Cyclotella sp. --</i>
B	Zooplanktons													
17.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	29		20		30		35		43		33	APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Foraminiferans Gastropods Amphipods Decapods		Polychaetes Chaetognathes Ostracods --		Gastropods Bivalves Forminifearns --		Decapods Mysids Polychaetes Bivalves Foraminiferans		Polychaetes Decapods Gastropods Copepods --		Gastropods Polychates Amphipods Copepods	APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	3.1		2.15		3.3		3.6		3.55		2.9	APHA (22 <sup>nd</sup> Edi) 10200-G
C	Microbiological Parameters													
18.1	Total Bacterial Count	CFU/ml	2200		2310		2350		2290		2140		2320	IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present	APHA(22 <sup>nd</sup> Edi)922 1-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS:1622:1981Edi.2 .4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present	IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-5)



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
Lab Manager (Q)

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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	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.24	8.19	8.21	8.17	8.29	8.25	8.23	8.19	8.19	8.15	8.24	8.23	IS3025(P11)83Re.02
2	Temperature	oC	30.2	30.0	30.2	30.0	30.1	29.8	29.9	29.6	30.2	30	30.3	30.1	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	190	235	175	187	140	162	132	158	112	138	128	114	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3.1	Not Detected	3.4	Not Detected	3.1	Not Detected	3.4	Not Detected	3.1	Not Detected	3.3	Not Detected	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.8	5.6	5.8	5.7	5.9	5.7	5.8	5.7	5.9	5.8	5.9	5.7	IS3025(P38)89Re.99
6	Salinity	ppt	36.2	36.5	36.3	36.6	36.4	36.7	36.2	36.5	36.5	36.9	36.7	37.2	APHA (22 <sup>nd</sup> E di) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> E di)552 0D
8	Nitrate as NO <sub>3</sub>	μmol/L	3.48	3.19	3.95	3.7	3.48	3.19	3.29	3.48	3.17	2.96	2.73	2.58	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.85	0.63	0.87	0.89	0.67	0.53	0.75	0.69	0.68	0.53	0.81	0.69	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.10	1.95	2.59	2.37	2.39	2.16	2.18	1.93	2.35	2.17	2.27	2.18	IS3025(P34)88Cla 2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.39	2.21	2.68	2.436	2.41	2.3	2.3	2.16	2.19	1.99	2	1.83	APHA(22 <sup>nd</sup> E di) 4500 C
12	Total Nitrogen	μmol/L	6.43	5.77	7.41	6.76	6.54	5.88	6.22	6.10	6.20	5.66	5.81	5.45	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	15.0	Not Detected	17.0	Not Detected	19.0	Not Detected	15.6	Not Detected	13.6	Not Detected	15.3	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37204	37628	37286	37628	37394	37786	37314	37718	37694	37908	38206	38703	IS3025(P16)84Re.02
15	COD	mg/L	20.0	Not Detected	23.0	Not Detected	27.5	17.4	31	19	28.4	17	29	21	APHA(22 <sup>nd</sup> E di) 5520-D Open Reflux
<b>A Phytoplankton</b>															
16.1	Chlorophyll	mg/m <sup>3</sup>	3.25	2.56	2.83	2.4	3.09	2.67	2.93	2.83	2.69	2.49	2.72	2.67	APHA (22 <sup>nd</sup> E di) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	1.3	2.2	2.7	2.3	2.5	2.0	1.3	1.73	0.22	0.42	2.55	1.74	APHA (22 <sup>nd</sup> E di) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	178	110	155	118	195	133	163	94	158	96	162	96	APHA (22 <sup>nd</sup> E di) 10200-H



**H. T. Shah**  
**Lab Manager**




**Dr. Arun Bajpai**  
**Lab Manager (Q)**



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16.4	Name of Group Number and name of group species of each group	--	<i>Skeletonema sp.</i> <i>Biddulphia sp.</i> <i>Pinnularia sp.</i> <i>Cyclotella sp.</i>	<i>Nitzschia sp.</i> <i>Gyrosigma sp.</i> <i>Amphora sp.</i> <i>Melosira sp.</i>	<i>Thalassiosira sp.</i> <i>Surirella sp.</i> <i>Coscinodiscus sp.</i> <i>Fragillaria sp.</i> --	<i>Navicula sp.</i> <i>Cyclotella sp.</i> <i>Melosira sp.</i> <i>Nitzschia sp.</i> --	<i>Rhizosolenia sp.</i> <i>Coscinodiscus sp.</i> <i>Biddulphia sp.</i> <i>Ceratium sp.</i> <i>Melosira sp.</i>	<i>Nitzschia sp.</i> <i>Chaetoceros sp.</i> <i>Synedra sp.</i> <i>Pleurosigma sp.</i> --	<i>Skeletonema sp.</i> <i>Biddulphia sp.</i> <i>Thalassiosira sp.</i> <i>Rhizosolenia sp.</i> <i>Cosmariium sp.</i>	<i>Nitzschia sp.</i> <i>Synedra sp.</i> <i>stauroneis sp.</i> <b><i>Fragillaria sp.</i></b> --	<i>Biddulphia sp.</i> <i>Rhizosolenia sp.</i> <i>Thalassionema sp.</i> <i>Gyrosigma sp.</i> <i>Skeletonema sp.</i>	<i>Nitzschia sp.</i> <i>Navicula sp.</i> <i>Amphiprotera sp.</i> <i>Cyclotella sp.</i> --	<i>Rhizosolenia sp.</i> <i>Biddulphia sp.</i> <i>Thalassiosira sp.</i> <i>Closterium sp.</i> --	<i>Nitzschia sp.</i> <i>Navicula sp.</i> <i>Pleurosigma sp.</i> <i>Synedra sp.</i> --	APHA (22 <sup>nd</sup> Edi) 10200-H
B	Zooplanktons														
17.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	23		18		24		35		39		30		APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Ostracods Chaetognathes Gastropods		Siphonophores Gastropods Polychaetes --		Siphonophores Gastropods Polychaetes --		Gastropods Bivalves Mysids Polychaetes		Gastropods Polychaetes Bivalves Decapods		Polychates Gastropods Decapods Fish larvae		APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	2.55		2.1		2.55		3.9		3.5		2.95		APHA (22 <sup>nd</sup> Edi) 10200-G
C	Microbiological Parameters														
18.1	Total Bacterial Count	CFU/ml	2290		2210		2180		2230		2180		2250		IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present		APHA(22 <sup>nd</sup> Edi)9221-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS:1622:1981Edi. 2.4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present		IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent		IS : 5887 (P-5)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

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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	OCTOBER 2020	NOVEMBER 2020	DECEMBER 2020	JANUARY 2021	FEBRUARY 2021	MARCH 2021	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.42	0.64	0.69	0.57	0.62	0.52	FCO:2007
2	Phosphorus as P	µg/g	398	428	473	528	493	568	APHA(22 <sup>nd</sup> Edi) 4500 C
3	Texture	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy	--
4	Petroleum Hydrocarbon	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	PLPL-TPH
5	<b>Heavy Metals</b>								
5.1	Aluminum as Al	%	4.63	4.43	4.61	5.14	4.78	4.95	AAS APHA 3111 B
5.2	Total Chromium as Cr <sup>+3</sup>	µg/g	170	209	179	168	153	113	AAS 3111B
5.3	Manganese as Mn	µg/g	768	804	738	701	689	712	AAS APHA 3111 B
5.4	Iron as Fe	%	4.52	4.7	4.59	4.87	4.65	4.86	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.5	Nickel as Ni	µg/g	39.4	58	63	71	69.4	53	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.6	Copper as Cu	µg/g	28.6	34	51	68	57.4	46	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.7	Zinc as Zn	µg/g	170	213	180	159	135	123	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.8	Lead as Pb	µg/g	2.14	1.9	1.59	2.3	2.49	2.75	AAS APHA(22 <sup>nd</sup> Edi)3111 B
5.9	Mercury as Hg	µg/g	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	AAS APHA- 3112 B
6	<b>Benthic Organisms</b>								
6.1	Macrobenthos	--	Gastropods Crustaceans Polychaetes	Polychaete worms Bivalves Isopods	Crustaceans Gastropods	Crustaceans Polychaetes <i>Amphipods</i>	Crustaceans Polychaetes	Crustaceans Polychaetes Bivalves	APHA (22 <sup>nd</sup> Edi) 10500-C
6.2	MeioBenthos	--	--	Nematodes	Foraminiferans	Harpacticoids Turbellarians	Nematodes Foraminiferans	Nematodes	APHA (22 <sup>nd</sup> Edi) 10500-C
6.3	Population	no/ m <sup>2</sup>	439	409	352	559	471	469	APHA (22 <sup>nd</sup> Edi) 10500-C



**H. T. Shah**  
Lab Manager




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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	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.27	8.24	8.24	8.19	8.27	8.23	8.23	8.20	8.29	8.27	8.25	8.23	IS3025(P11)83Re.02
2	Temperature	oC	30.2	29.9	30.2	30.0	30.1	29.9	29.9	29.7	30.1	30	30.3	30.1	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	197	228	180	199	167	181	150	173	132	146	127	106	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3	Not Detected	3.2	Not Detected	3.5	Not Detected	3.4	Not Detected	3.0	Not Detected	3.2	Not Detected	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.9	5.7	5.9	5.6	5.8	5.6	5.9	5.6	6.1	5.9	5.9	5.7	IS3025(P38)89Re.99
6	Salinity	ppt	36.5	36.9	36.2	36.6	36.3	36.7	36.1	36.5	36.9	37.3	36.7	37.2	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)552 OD
8	Nitrate as NO <sub>3</sub>	μmol/L	3.28	2.94	3.86	3.64	3.56	3.23	3.19	3.27	3.32	3.17	2.81	2.56	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.93	0.82	0.74	0.59	0.43	0.38	0.73	0.86	0.58	0.43	0.67	0.48	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.24	2.13	2.36	2.20	2.16	2.10	2.28	2.34	2.63	2.51	2.41	2.36	IS3025(P34)88Cla.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	2.18	2.1	2.58	2.31	2.49	2.37	2.34	2.56	2.56	2.37	2.13	1.92	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	6.45	5.89	6.96	6.43	6.15	5.71	6.20	6.47	6.53	6.11	5.89	5.4	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	11.2	Not Detected	16.0	Not Detected	20.0	Not Detected	17	Not Detected	10.6	Not Detected	14.3	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37456	37824	37192	37566	37306	37716	36994	37538	37894	38740	38174	38658	IS3025(P16)84Re.02
15	COD	mg/L	21.0	Not Detected	23	Not Detected	26	Not Detected	28	19	25	18	28	22.0	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
A	<b>Phytoplankton</b>														
16.1	Chlorophyll	mg/m <sup>3</sup>	3.15	2.67	2.67	2.35	3.15	2.99	3.04	2.72	3.25	2.83	2.88	2.72	APHA (22 <sup>nd</sup> Edi) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	1.5	2.1	2.1	2.3	1.3	1.8	1.89	1.91	1.53	1.84	2.16	2.02	APHA (22 <sup>nd</sup> Edi) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	158	106	136	98	152	106	172	98	186	106	166	96	APHA (22 <sup>nd</sup> Edi) 10200-H
16.4	Name of Group	--	<i>Pinnularia</i>	<i>Cyclotella</i>	<i>Melosira</i>	<i>Navicula</i>	<i>Skeleton</i>	<i>Nitzschia</i>	<i>Rhizosole</i>	<i>Navicula</i>	<i>Cyclotella</i>	<i>Nitzschia</i>	<i>Rhizosole</i>	<i>Synedra</i>	APHA (22 <sup>nd</sup> Edi) 10200-H



**H. T. Shah**  
Lab Manager




**Dr. Arun Bajpai**  
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	Number and name of group species of each group		<i>Biddulphia a sp.</i> <i>Skeletonema ma sp.</i> <i>Coscinodiscus sp.</i> <i>Gyrosigma sp.</i>	<i>sp.</i> <i>Nitzschia sp.</i> <i>Synedra sp.</i> <i>Fragillaria sp.</i>	<i>sp.</i> <i>Nitzschia sp.</i> <i>Coscinodiscus sp.</i> <i>Thalassionema sp.</i> --	<i>sp.</i> <i>Pleurosigma sp.</i> <i>Peridinium sp.</i> --	<i>ma sp.</i> <i>Coscinodiscus sp.</i> <i>Thalassionema sp.</i> <i>Ceratium sp.</i> <i>Biddulphia a sp.</i>	<i>sp.</i> <i>Navicula sp.</i> <i>Pleurosigma sp.</i> <i>Synedra sp.</i> --	<i>nia sp.</i> <i>Thalassiosira sp.</i> <i>Biddulphia a sp.</i> <i>Amphiprotera sp.</i> <b><i>Coscino discus sp.</i></b>	<i>sp.</i> <i>Synedra sp.</i> <i>Surirella sp.</i> <b><i>Nitzschia sp.</i></b> --	<i>sp.</i> <i>Skeletonema sp.</i> <i>Gyrosigma sp.</i> <i>Rhizosolenia sp.</i> --	<i>sp.</i> <i>Cheatoceous sp.</i> <i>Cymbella sp.</i> <i>Navicula sp.</i> --	<i>nia sp.</i> <i>Skeletonema sp.</i> <i>Coscinodiscus sp.</i> <i>Biddulphia a sp.</i> <i>Navicula sp.</i>	<i>sp.</i> <i>Pleurosigma sp.</i> <i>Thalassiosira sp.</i> --
B	Zooplanktons													
17.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	23		19		27		35		39		30	APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group Number and name of group species of each group	--	Decapods Foraminiferans Gastropods		Chaetognathes Ostracods Gastropods --		Polychaetes Gastropods Decapods Ostracods Mysids		Polychaetes Bivalves Isopods Cephalopods		Polychaetes Gastropods Bivalves Ostracods		Amphipods Polychates Decapods Gastropods	APHA (22 <sup>nd</sup> Edi) 10200-G
17.3	Total Biomass	ml/100 m <sup>3</sup>	2.65		2.4		2.95		3.40		3.6		2.85	APHA (22 <sup>nd</sup> Edi) 10200-G
C	Microbiological Parameters													
18.1	Total Bacterial Count	CFU/ml	2360		2280		2150		2250		2280		2350	IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present	APHA(22 <sup>nd</sup> Edi)922 19.21-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS:1622:1981Edi. 2.4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present	IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-5)



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**RESULTS OF MARINE WATER [M12 SPM N 22°40'938" E 069°39'191"]**

SR. NO.	TEST PARAMETERS	UNIT	OCTOBER 2020		NOVEMBER 2020		DECEMBER 2020		JANUARY 2021		FEBRUARY 2021		MARCH 2021		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.26	8.23	8.25	8.20	8.27	8.18	8.26	8.21	8.31	8.27	8.25	8.21	IS3025(P11)83Re.02
2	Temperature	oC	30.2	30.1	30.3	30.0	30.1	29.9	29.9	29.8	30	30.1	30.2	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	187	209	157	179	168	180	137	158	120	143	138	115	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3.2	Not Detected	3.4	Not Detected	3.1	Not Detected	3.3	Not Detected	3.1	Not Detected	3.2	Not Detected	IS 3025 (P44)1993Re.03E dition2.1
5	Dissolved Oxygen	mg/L	5.8	5.6	5.9	5.7	5.9	5.8	5.9	5.7	6.1	5.9	5.9	5.7	IS3025(P38)89Re.99
6	Salinity	ppt	36.6	36.9	36.5	36.8	36.4	36.9	36.1	36.6	36.8	37.3	36.7	37.1	APHA (22 <sup>nd</sup> Edi) 2550 B
7	Oil & Grease	mg/L	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	APHA(22 <sup>nd</sup> Edi)552 OD
8	Nitrate as NO <sub>3</sub>	μmol/L	3.28	2.97	4.13	3.86	3.64	3.49	3.34	3.53	3.25	3.19	2.93	2.75	IS3025(P34)88
9	Nitrite as NO <sub>2</sub>	μmol/L	0.74	0.56	0.94	0.73	0.78	0.63	0.71	0.86	0.56	0.43	0.61	0.58	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH <sub>3</sub>	μmol/L	2.10	1.87	2.18	1.96	2.10	1.70	2.26	2.41	2.73	2.56	2.49	2.3	IS3025(P34)88Cla.2.3
11	Phosphates as PO <sub>4</sub>	μmol/L	1.8	1.56	2.36	2.14	2.34	1.9	2.17	2.06	2.5	2.39	2.16	1.95	APHA(22 <sup>nd</sup> Edi) 4500 C
12	Total Nitrogen	μmol/L	6.12	5.40	7.25	6.55	6.52	5.82	6.31	6.80	6.54	6.18	6.03	5.63	IS3025(P34)88
13	Petroleum Hydrocarbon	μg/L	15.0	Not Detected	20.0	Not Detected	22.0	Not Detected	13	Not Detected	11.8	Not Detected	12.9	Not Detected	PLPL-TPH
14	Total Dissolved Solids	mg/L	37568	37834	37456	37746	37416	37906	37118	37706	37803	38714	38209	38604	IS3025(P16)84Re.02
15	COD	mg/L	23.0	Not Detected	25	Not Detected	24	19.0	28	17	26	17.3	27	21	APHA(22 <sup>nd</sup> Edi) 5520-D Open Reflux
<b>A Phytoplankton</b>															
16.1	Chlorophyll	mg/m <sup>3</sup>	2.99	2.83	2.72	2.61	2.93	2.77	3.15	2.83	3.20	2.99	2.86	2.61	APHA (22 <sup>nd</sup> Edi) 10200-H
16.2	Phaeophytin	mg/m <sup>3</sup>	2.1	2.0	2.1	2.5	2.2	2.1	1.75	2.22	1.73	1.20	2.3	1.83	APHA (22 <sup>nd</sup> Edi) 10200-H
16.3	Cell Count	No. x 10 <sup>3</sup> /L	150	106	158	102	166	108	196	104	198	104	152	127	APHA (22 <sup>nd</sup> Edi) 10200-H
16.4	Name of Group Number	--	<i>Pinnularia sp.</i>	<i>Cymbella sp.</i>	<i>Amphipro ra sp.</i>	<i>Navicula sp.</i>	<i>Cyclotella sp.</i>	<i>Nitzschia sp.</i>	<i>Nitzschia sp.</i>	<i>Navicula sp.</i>	<i>Skeletonema sp.</i>	<i>Cymbella sp.</i>	<i>Coscinodi scus sp.</i>	<i>Nitzschia sp.</i>	APHA (22 <sup>nd</sup> Edi) 10200-H

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	and name of group species of each group		<i>Melosira sp.</i>	<i>Amphora sp.</i>	<i>Biddulphi a sp.</i>	<i>Rhizosole nia sp.</i>	<i>Biddulphi a sp.</i>	<i>Navicula sp.</i>	<i>Skeletonema sp.</i>	<i>Synedra sp.</i>	<i>Rhizosole nia sp.</i>	<i>Nitzschia sp.</i>	<i>Rhizosole nia sp.</i>	<i>Synedra sp.</i>
			<i>Skeletonema sp.</i>	<i>Fragillaria sp.</i>	<i>Coscinodiscus sp.</i>	<i>Synedra sp.</i>	<i>Skeletonema sp.</i>	<i>Coscinodiscus sp.</i>	<i>Thalassiosira sp.</i>	<i>Biddulphi a sp.</i>	<i>Biddulphi a sp.</i>	<i>Pinnularia sp.</i>	<i>Thalassiosira sp.</i>	<i>Pleurosigma sp.</i>
			<i>Ceratium</i>	<i>Navicula sp.</i>	<i>Gyro sigma sp.</i>	<i>Cyclotella sp.</i>	<i>Thalassion ema sp.</i>	<i>Synedra sp.</i>	<i>Pleurosigma sp.</i>	--	<i>Coscinodiscus sp.</i>	<i>Cyclotella sp.</i>	<i>Cheatoceous sp.</i>	<i>Navicula sp.</i>
			<i>Nitzschia sp.</i>		<i>Nitzschia sp.</i>	--	<i>Pleurosigma ma sp.</i>	--			<i>Pleurosigma ma sp.</i>	--	--	--
B	Zooplanktons													
17.1	Abundance (Population)	noX10 <sup>3</sup> /100 m <sup>3</sup>	25		21		24		39		34		27	APHA (22 <sup>nd</sup> Edi) 10200-G
17.2	Name of Group		Amphipods		Siphonophores		Gastropods		Gastropods		Gastropods		Ostracods	APHA (22 <sup>nd</sup> Edi) 10200-G
	Number	--	Mysids		Gastropods		Polychaetes		Polychaetes		Polychaetes		Decapods	
	and name of group species of each group		Gastropods		Ostracods		Decapods		Decapods		Decapods		Polychates	
			Chaetognaths		Isopods		Forminiferans		Mysids		Copepods		Foraminiferans	
17.3	Total Biomass	ml/100 m <sup>3</sup>	3.1		2.9		2.75		3.55		3.60		2.7	APHA (22 <sup>nd</sup> Edi) 10200-G
C	Microbiological Parameters													
18.1	Total Bacterial Count	CFU/ml	2300		2410		2360		2270		2340		2410	IS 5402:2002
18.2	Total Coliform	/ml	Absent		Absent		Absent		Absent		Absent		Present	APHA(22 <sup>nd</sup> Edi)922 19.21-D
18.3	Ecoli	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS:1622:1981Edi. 2.4(2003-05)
18.4	Enterococcus	/ml	Absent		Absent		Absent		Absent		Absent		Present	IS : 15186 :2002
18.5	Salmonella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-3)
18.6	Shigella	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 1887 (P-7)
18.7	Vibrio	/ml	Absent		Absent		Absent		Absent		Absent		Absent	IS : 5887 (P-5)



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)

### RESULTS OF ETP OUTLET

SR. NO.	TEST PARAMETERS	UNIT	Liquid Terminal ETP Outlet						GPCB Permissible Limit
			Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	
1	Colour	Co-pt	--	--	--	30	20	25	100
2	pH	--	--	--	--	7.28	7.56	7.13	6.5 to 8.5
3	Temperature	°C	--	--	--	29.9	30.1	30.3	40
4	Total Suspended Solids	mg/L	--	--	--	43	37	25	100
5	Total Dissolved Solids	mg/L	--	--	--	1703	1823	2070	2100
6	COD	mg/L	--	--	--	68	61	78	100
7	BOD (3 Days @ 27 °C)	mg/L	--	--	--	11	12	15	30
8	Chloride as Cl	mg/L	--	--	--	498	453	432	600
9	Oil & Grease	mg/L	--	--	--	3.6	4.1	3.1	10
10	Sulphate as SO <sub>4</sub>	mg/L	--	--	--	472	428	398	1000
11	Ammonical Nitrogen as NH <sub>3</sub>	mg/L	--	--	--	3.69	2.78	3.1	50
12	Phenolic Compound	mg/L	--	--	--	Not Detected	Not Detected	Not Detected	1
13	Copper as Cu	mg/L	--	--	--	Not Detected	Not Detected	Not Detected	3
14	Lead as Pb	mg/L	--	--	--	Not Detected	Not Detected	Not Detected	0.1
15	Sulphide as S	mg/L	--	--	--	1.24	1.68	1.4	2
16	Cadmium as Cd	mg/L	--	--	--	Not Detected	Not Detected	Not Detected	2
17	Fluoride as F	mg/L	--	--	--	0.36	0.27	0.24	2
18	Residual Chlorine	mg/L	--	--	--	0.60	0.6	0.7	0.5 min



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Lab Manager




Dr. Arun Bajpai  
Lab Manager (Q)

**POLLUCON****LABORATORIES PVT. LTD.**Environmental Auditors, Consultants & Analysts.  
Cleaner Production / Waste Minimization Facilitator

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**RESULT OF AMBIENT AIR QUALITY MONITORING****ADANI PORT – TUG BERTH 600 KL PUMP HOUSE**

Sr. No.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2020	72.68	31.57	24.24	40.20	0.74	ND*	ND*
2	06/10/2020	91.22	48.65	18.64	34.23	0.93	ND*	ND*
3	09/10/2020	84.27	45.69	22.43	42.56	0.50	ND*	ND*
4	13/10/2020	79.56	36.28	15.25	38.29	0.64	ND*	ND*
5	16/10/2020	87.23	44.19	19.82	41.26	0.88	ND*	ND*
6	20/10/2020	92.46	51.27	23.46	44.20	0.70	ND*	ND*
7	23/10/2020	85.63	40.57	21.58	35.75	0.57	ND*	ND*
8	27/10/2020	74.23	42.57	12.64	30.23	0.73	ND*	ND*
9	30/10/2020	82.46	37.28	17.38	33.29	0.80	ND*	ND*
10	03/11/2020	68.36	29.37	21.54	38.67	0.53	ND*	ND*
11	06/11/2020	76.35	47.22	17.52	33.31	0.78	ND*	ND*
12	10/11/2020	80.22	44.56	11.24	28.44	0.32	ND*	ND*
13	13/11/2020	74.55	49.26	23.50	39.52	0.54	ND*	ND*
14	17/11/2020	83.42	41.35	14.23	21.57	0.76	ND*	ND*
15	20/11/2020	78.37	37.57	18.57	34.28	0.52	ND*	ND*
16	24/11/2020	84.25	50.22	20.59	40.22	0.71	ND*	ND*
17	27/11/2020	62.46	26.46	8.59	31.63	0.61	ND*	ND*
18	01/12/2020	85.37	49.34	11.22	23.49	0.65	ND*	ND*
19	04/12/2020	61.52	28.62	21.62	41.30	0.57	ND*	ND*
20	08/12/2020	82.63	50.22	19.64	37.58	0.88	ND*	ND*
21	11/12/2020	75.35	39.57	12.81	28.50	0.46	ND*	ND*
22	15/12/2020	88.21	46.35	18.63	25.68	0.96	ND*	ND*
23	18/12/2020	70.31	33.62	20.24	35.36	0.73	ND*	ND*
24	22/12/2020	86.27	48.34	14.57	30.25	0.63	ND*	ND*
25	25/12/2020	93.53	54.34	22.21	39.56	0.72	ND*	ND*
26	29/12/2020	83.64	42.64	17.26	42.32	1.01	ND*	ND*
27	01/01/2021	75.62	48.39	18.32	22.69	0.42	ND*	ND*
28	05/01/2021	81.76	44.31	13.59	26.26	0.70	ND*	ND*
29	08/01/2021	79.34	52.34	11.70	23.24	0.62	ND*	ND*
30	12/01/2021	73.58	32.53	20.25	25.55	0.73	ND*	ND*

Continue ...

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Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)



## RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI PORT – TUG BERTH 600 KL PUMP HOUSE								
Sr.N o.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) µg/m <sup>3</sup>	Particulate Matter (PM <sub>2.5</sub> ) µg/m <sup>3</sup>	Sulphur Dioxide (SO <sub>2</sub> ) µg/m <sup>3</sup>	Oxides of Nitrogen (NO <sub>2</sub> ) µg/m <sup>3</sup>	Carbon Monoxide as CO mg/m <sup>3</sup>	Hydrocarbon as CH <sub>4</sub> mg/m <sup>3</sup>	Benzene as C <sub>6</sub> H <sub>6</sub> µg/m <sup>3</sup>
31	15/01/2021	41.42	35.61	12.56	28.51	0.31	ND*	ND*
32	19/01/2021	70.65	47.55	14.28	19.62	0.54	ND*	ND*
33	22/01/2021	60.51	24.59	19.64	33.49	0.53	ND*	ND*
34	26/01/2021	80.64	43.77	21.30	38.42	0.80	ND*	ND*
35	29/01/2021	88.51	51.26	15.54	31.81	0.64	ND*	ND*
36	02/02/2021	62.53	29.54	10.31	24.29	0.31	ND*	ND*
37	05/02/2021	78.33	25.42	12.57	21.19	0.66	ND*	ND*
38	09/02/2021	68.34	39.40	9.29	22.62	0.34	ND*	ND*
39	12/02/2021	70.36	36.53	14.53	26.48	0.17	ND*	ND*
40	16/02/2021	50.52	23.42	16.24	19.60	0.48	ND*	ND*
41	19/02/2021	65.34	33.57	13.51	30.18	0.65	ND*	ND*
42	23/02/2021	58.31	28.37	15.45	34.19	0.60	ND*	ND*
43	26/02/2021	86.32	44.27	8.60	17.54	0.49	ND*	ND*
44	02/03/2021	68.26	26.34	18.65	35.68	0.49	ND*	ND*
45	05/03/2021	95.37	49.59	14.59	28.55	0.16	ND*	ND*
46	09/03/2021	73.57	23.59	22.69	38.44	0.17	ND*	ND*
47	12/03/2021	84.63	52.63	12.72	30.24	0.27	ND*	ND*
48	16/03/2021	72.62	37.36	11.56	24.49	0.62	ND*	ND*
49	19/03/2021	92.42	51.63	15.82	29.57	0.29	ND*	ND*
50	23/03/2021	86.26	47.55	13.42	32.67	0.47	ND*	ND*
51	26/03/2021	78.25	43.56	17.22	31.57	0.11	ND*	ND*
52	30/03/2021	82.43	33.41	9.46	23.62	0.42	ND*	ND*
LIMIT <sup>#</sup>		100	60	80	80	4	Not Specified	5
TEST METHOD		IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob & Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Not Detected

#: Industrial, Residential, Rural and other Area Notification Dated 16<sup>th</sup> Nov.2009 as per national Ambient Air Quality Standards, CPCB New Delhi.



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)



### RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr. No.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2020	62.55	24.56	10.67	19.55	0.57	ND*	ND*
2	06/10/2020	50.21	27.22	14.25	25.65	0.77	ND*	ND*
3	09/10/2020	71.58	41.63	17.33	31.75	0.30	ND*	ND*
4	13/10/2020	68.55	28.43	6.56	34.52	0.72	ND*	ND*
5	16/10/2020	73.53	38.42	13.53	24.59	0.61	ND*	ND*
6	20/10/2020	67.56	33.59	15.19	18.54	0.74	ND*	ND*
7	23/10/2020	70.25	36.55	11.25	29.69	0.47	ND*	ND*
8	27/10/2020	52.61	23.43	20.29	22.80	0.39	ND*	ND*
9	30/10/2020	66.37	29.39	8.88	15.68	0.46	ND*	ND*
10	03/11/2020	55.64	23.38	14.51	29.56	0.60	ND*	ND*
11	06/11/2020	63.21	31.58	8.58	16.26	0.46	ND*	ND*
12	10/11/2020	72.64	40.23	15.66	24.68	0.66	ND*	ND*
13	13/11/2020	66.22	29.61	17.22	36.26	0.48	ND*	ND*
14	17/11/2020	70.55	26.43	23.40	33.43	0.58	ND*	ND*
15	20/11/2020	62.75	30.40	20.45	38.67	0.84	ND*	ND*
16	24/11/2020	79.31	47.34	18.86	18.98	0.79	ND*	ND*
17	27/11/2020	68.44	28.61	12.60	23.89	0.47	ND*	ND*
18	01/12/2020	65.32	34.54	13.61	26.37	0.55	ND*	ND*
19	04/12/2020	50.35	39.27	19.30	33.66	0.64	ND*	ND*
20	08/12/2020	67.70	36.51	17.49	29.61	0.78	ND*	ND*
21	11/12/2020	53.44	22.67	14.31	32.36	0.24	ND*	ND*
22	15/12/2020	73.66	29.32	11.57	21.83	0.76	ND*	ND*
23	18/12/2020	78.76	49.77	9.58	18.72	0.40	ND*	ND*
24	22/12/2020	89.62	35.51	12.64	25.81	0.80	ND*	ND*
25	25/12/2020	71.62	31.53	10.88	22.61	0.61	ND*	ND*
26	29/12/2020	64.27	30.40	15.59	28.60	0.70	ND*	ND*
27	01/01/2021	80.36	38.43	14.57	18.61	0.60	ND*	ND*
28	05/01/2021	63.67	33.46	11.53	15.62	0.52	ND*	ND*
29	08/01/2021	72.51	35.67	9.63	20.61	0.46	ND*	ND*
30	12/01/2021	69.42	40.36	16.40	33.28	0.50	ND*	ND*

Continue ...

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

**POLLUCON****LABORATORIES PVT. LTD.**Environmental Auditors, Consultants & Analysts.  
Cleaner Production / Waste Minimization Facilitator

Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

**RESULT OF AMBIENT AIR QUALITY MONITORING**

NEAR FIRE STATION								
Sr.N o.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2021	75.62	43.83	6.66	14.22	0.16	ND*	ND*
32	19/01/2021	86.30	52.74	10.61	25.67	0.23	ND*	ND*
33	22/01/2021	49.36	21.62	17.67	36.53	0.63	ND*	ND*
34	26/01/2021	68.62	47.55	18.64	29.49	0.56	ND*	ND*
35	29/01/2021	43.76	27.69	13.98	27.62	0.24	ND*	ND*
36	02/02/2021	56.28	25.43	17.23	20.59	0.16	ND*	ND*
37	05/02/2021	84.38	40.36	15.65	18.42	0.45	ND*	ND*
38	09/02/2021	89.75	50.35	12.45	26.41	0.22	ND*	ND*
39	12/02/2021	80.46	45.63	18.43	21.49	0.38	ND*	ND*
40	16/02/2021	69.36	39.27	21.30	39.49	0.36	ND*	ND*
41	19/02/2021	73.60	28.44	11.27	23.58	0.41	ND*	ND*
42	23/02/2021	82.63	46.34	13.23	29.30	0.26	ND*	ND*
43	26/02/2021	43.52	25.43	16.23	24.52	0.63	ND*	ND*
44	02/03/2021	70.63	23.59	15.30	24.28	0.46	ND*	ND*
45	05/03/2021	76.86	26.47	10.57	21.37	0.31	ND*	ND*
46	09/03/2021	87.82	42.41	16.53	25.64	0.37	ND*	ND*
47	12/03/2021	73.46	36.22	20.33	34.35	0.13	ND*	ND*
48	16/03/2021	65.62	34.59	17.64	23.46	0.22	ND*	ND*
49	19/03/2021	77.12	43.41	13.36	33.33	0.15	ND*	ND*
50	23/03/2021	68.62	40.36	19.21	30.57	0.36	ND*	ND*
51	26/03/2021	58.76	48.64	12.49	26.38	0.53	ND*	ND*
52	30/03/2021	78.12	20.58	11.24	29.35	0.40	ND*	ND*
<b>LIMIT<sup>#</sup></b>		<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>	<b>4</b>	<b>Not Specified</b>	<b>5</b>
<b>TEST METHOD</b>		IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob &Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Not Detected

#: Industrial, Residential, Rural and other Area Notification Dated 16<sup>th</sup> Nov.2009 as per national Ambient Air Quality Standards, CPCB New Delhi.**H. T. Shah****Lab Manager****Dr. Arun Bajpai****Lab Manager (Q)**

**RESULT OF AMBIENT AIR QUALITY MONITORING**

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2020	57.56	18.58	20.55	35.61	0.49	ND*	ND*
2	06/10/2020	65.61	37.61	8.30	17.52	0.37	ND*	ND*
3	09/10/2020	60.37	30.24	22.30	27.54	0.44	ND*	ND*
4	13/10/2020	55.22	25.36	11.23	30.80	0.55	ND*	ND*
5	16/10/2020	62.65	32.57	15.39	37.25	0.31	ND*	ND*
6	20/10/2020	78.25	43.57	19.21	32.50	0.41	ND*	ND*
7	23/10/2020	64.27	29.57	12.55	33.56	0.76	ND*	ND*
8	27/10/2020	59.24	33.57	21.24	34.54	0.62	ND*	ND*
9	30/10/2020	71.24	31.49	13.90	20.69	0.53	ND*	ND*
10	03/11/2020	62.58	26.20	8.70	19.58	0.79	ND*	ND*
11	06/11/2020	70.67	41.22	12.36	22.76	0.62	ND*	ND*
12	10/11/2020	66.23	32.49	19.87	32.43	0.36	ND*	ND*
13	13/11/2020	58.68	27.55	9.60	20.45	0.60	ND*	ND*
14	17/11/2020	65.47	23.45	20.23	28.61	0.44	ND*	ND*
15	20/11/2020	72.53	34.62	16.42	25.64	0.70	ND*	ND*
16	24/11/2020	68.36	36.29	13.44	36.48	0.87	ND*	ND*
17	27/11/2020	55.21	20.53	6.90	15.61	0.72	ND*	ND*
18	01/12/2020	60.51	30.23	17.51	34.51	0.46	ND*	ND*
19	04/12/2020	72.38	35.66	15.35	38.34	0.39	ND*	ND*
20	08/12/2020	55.66	43.56	13.67	23.52	0.69	ND*	ND*
21	11/12/2020	66.27	26.34	16.34	35.67	0.38	ND*	ND*
22	15/12/2020	78.68	34.53	9.54	18.66	0.71	ND*	ND*
23	18/12/2020	62.86	45.53	7.55	26.19	0.27	ND*	ND*
24	22/12/2020	96.75	52.76	10.23	22.32	0.56	ND*	ND*
25	25/12/2020	76.48	44.53	12.51	19.55	0.42	ND*	ND*
26	29/12/2020	58.66	24.37	8.66	27.56	0.77	ND*	ND*
27	01/01/2021	69.36	32.69	11.53	25.88	0.29	ND*	ND*
28	05/01/2021	52.42	38.76	8.63	19.32	0.47	ND*	ND*
29	08/01/2021	85.76	49.63	16.46	31.50	0.33	ND*	ND*
30	12/01/2021	90.60	51.63	12.68	21.07	0.45	ND*	ND*

Continue ...

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)



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ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2021	63.52	37.67	15.25	28.24	0.40	ND*	ND*
32	19/01/2021	95.84	43.52	17.53	32.57	0.17	ND*	ND*
33	22/01/2021	38.42	18.77	13.83	30.48	0.39	ND*	ND*
34	26/01/2021	70.36	31.61	14.57	35.38	0.60	ND*	ND*
35	29/01/2021	77.54	39.43	9.21	24.56	0.69	ND*	ND*
36	02/02/2021	76.34	36.25	19.45	28.28	0.19	ND*	ND*
37	05/02/2021	71.52	24.31	17.22	25.37	0.31	ND*	ND*
38	09/02/2021	58.63	26.84	15.34	30.39	0.57	ND*	ND*
39	12/02/2021	66.22	29.48	7.71	18.61	0.27	ND*	ND*
40	16/02/2021	57.33	33.49	10.24	15.40	0.64	ND*	ND*
41	19/02/2021	60.36	30.44	8.66	21.51	0.53	ND*	ND*
42	23/02/2021	52.42	21.24	11.54	31.20	0.44	ND*	ND*
43	26/02/2021	69.32	34.20	13.53	22.38	0.21	ND*	ND*
44	02/03/2021	57.28	19.65	12.66	20.34	0.52	ND*	ND*
45	05/03/2021	69.24	41.27	18.30	36.88	0.44	ND*	ND*
46	09/03/2021	77.55	33.66	8.68	21.56	0.48	ND*	ND*
47	12/03/2021	63.56	26.51	11.51	23.62	0.41	ND*	ND*
48	16/03/2021	79.22	31.52	13.85	29.67	0.25	ND*	ND*
49	19/03/2021	55.64	20.28	9.63	25.49	0.39	ND*	ND*
50	23/03/2021	67.52	37.59	16.41	28.44	0.14	ND*	ND*
51	26/03/2021	62.66	32.65	10.61	18.66	0.56	ND*	ND*
52	30/03/2021	74.31	27.51	6.81	22.32	0.23	ND*	ND*
<b>LIMIT<sup>#</sup></b>		<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>	<b>4</b>	<b>Not Specified</b>	<b>5</b>
<b>TEST METHOD</b>		IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob &Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Not Detected

#: Industrial, Residential, Rural and other Area Notification Dated 16<sup>th</sup> Nov.2009 as per national Ambient Air Quality Standards, CPCB New Delhi.**H. T. Shah****Lab Manager****Dr. Arun Bajpai****Lab Manager (Q)**

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**RESULT OF AMBIENT AIR QUALITY MONITORING**

CT-3 RMU-2								
Sr.N o.	Date of Sampling	Particulate Matter (PM10) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM 2.5) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO2) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO2) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
1	02/10/2020	66.32	28.47	14.22	22.61	0.86	ND*	ND*
2	06/10/2020	81.24	45.36	11.84	29.34	0.60	ND*	ND*
3	09/10/2020	76.67	40.27	20.65	35.61	0.81	ND*	ND*
4	13/10/2020	83.58	36.43	8.42	15.64	0.79	ND*	ND*
5	16/10/2020	78.66	41.23	21.26	34.67	0.48	ND*	ND*
6	20/10/2020	82.65	46.31	17.84	28.64	0.63	ND*	ND*
7	23/10/2020	75.65	34.23	19.54	25.34	0.52	ND*	ND*
8	27/10/2020	84.21	47.57	23.43	39.45	0.68	ND*	ND*
9	30/10/2020	77.55	33.73	15.89	30.40	0.40	ND*	ND*
10	03/11/2020	85.76	44.37	18.58	26.33	0.64	ND*	ND*
11	06/11/2020	79.36	36.51	16.21	30.42	0.26	ND*	ND*
12	10/11/2020	92.68	54.27	24.26	40.86	0.55	ND*	ND*
13	13/11/2020	80.78	46.25	11.20	24.64	0.30	ND*	ND*
14	17/11/2020	75.67	37.22	20.42	31.60	0.38	ND*	ND*
15	20/11/2020	83.68	45.58	14.84	23.42	0.80	ND*	ND*
16	24/11/2020	90.44	53.44	9.53	22.66	0.45	ND*	ND*
17	27/11/2020	72.64	32.48	17.59	37.56	0.41	ND*	ND*
18	01/12/2020	78.62	46.33	20.89	39.48	0.74	ND*	ND*
19	04/12/2020	65.65	31.57	11.36	26.36	0.65	ND*	ND*
20	08/12/2020	88.36	55.39	15.67	32.46	0.86	ND*	ND*
21	11/12/2020	79.68	43.38	9.62	27.50	0.41	ND*	ND*
22	15/12/2020	82.41	40.34	16.29	33.52	0.58	ND*	ND*
23	18/12/2020	90.62	42.63	13.80	29.32	0.92	ND*	ND*
24	22/12/2020	80.34	45.62	17.79	34.26	0.66	ND*	ND*
25	25/12/2020	87.36	48.74	14.36	36.21	0.52	ND*	ND*
26	29/12/2020	76.35	32.65	10.71	30.62	0.37	ND*	ND*
27	01/01/2021	85.62	43.67	16.29	31.52	0.53	ND*	ND*
28	05/01/2021	76.62	24.83	21.63	35.63	0.57	ND*	ND*
29	08/01/2021	92.76	44.67	18.59	29.66	0.42	ND*	ND*
30	12/01/2021	86.50	33.77	14.60	30.69	0.61	ND*	ND*

Continue ...

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

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**RESULT OF AMBIENT AIR QUALITY MONITORING**

CT-3 RMU-2								
Sr.N o.	Date of Sampling	Particulate Matter (PM <sub>10</sub> ) $\mu\text{g}/\text{m}^3$	Particulate Matter (PM <sub>2.5</sub> ) $\mu\text{g}/\text{m}^3$	Sulphur Dioxide (SO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Oxides of Nitrogen (NO <sub>2</sub> ) $\mu\text{g}/\text{m}^3$	Carbon Monoxide as CO $\text{mg}/\text{m}^3$	Hydrocarbon as CH <sub>4</sub> $\text{mg}/\text{m}^3$	Benzene as C <sub>6</sub> H <sub>6</sub> $\mu\text{g}/\text{m}^3$
31	15/01/2021	80.34	41.67	8.82	22.66	0.25	ND*	ND*
32	19/01/2021	90.62	39.63	19.55	36.81	0.37	ND*	ND*
33	22/01/2021	55.76	36.51	15.71	40.26	0.71	ND*	ND*
34	26/01/2021	87.62	51.57	10.86	25.65	0.65	ND*	ND*
35	29/01/2021	82.62	46.58	17.24	34.59	0.58	ND*	ND*
36	02/02/2021	82.65	44.33	21.64	36.60	0.27	ND*	ND*
37	05/02/2021	89.35	48.53	19.41	28.60	0.39	ND*	ND*
38	09/02/2021	94.36	55.39	16.48	33.47	0.32	ND*	ND*
39	12/02/2021	85.76	51.28	22.43	29.43	0.42	ND*	ND*
40	16/02/2021	78.84	45.33	12.62	26.28	0.52	ND*	ND*
41	19/02/2021	92.52	54.36	17.53	38.65	0.62	ND*	ND*
42	23/02/2021	87.56	49.82	20.31	20.43	0.40	ND*	ND*
43	26/02/2021	91.76	52.40	18.57	27.63	0.37	ND*	ND*
44	02/03/2021	80.36	35.64	23.69	44.53	0.57	ND*	ND*
45	05/03/2021	70.42	30.40	21.20	40.26	0.66	ND*	ND*
46	09/03/2021	93.42	47.62	18.41	29.46	0.74	ND*	ND*
47	12/03/2021	78.62	55.39	10.51	38.63	0.54	ND*	ND*
48	16/03/2021	60.24	43.63	19.39	34.51	0.68	ND*	ND*
49	19/03/2021	87.62	56.35	16.36	39.53	0.50	ND*	ND*
50	23/03/2021	94.36	50.32	25.41	42.45	0.71	ND*	ND*
51	26/03/2021	72.52	40.34	15.52	33.43	0.60	ND*	ND*
52	30/03/2021	88.62	53.44	20.25	36.28	0.33	ND*	ND*
<b>LIMIT<sup>#</sup></b>		<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>	<b>4</b>	<b>Not Specified</b>	<b>5</b>
<b>TEST METHOD</b>		IS:5182(Part 23):Gravimetric CPCB - Method (Vol.I,May-2011)	Gravimetric-CPCB - Method (Vol.I,May-2011)	IS:5182(Part II):Improved West and Gaeke	IS:5182(Part VI):Modified Jacob &Hochheiser (NaOH-NaAsO <sub>2</sub> )	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

\*Not Detected

#: Industrial, Residential, Rural and other Area Notification Dated 16<sup>th</sup> Nov.2009 as per national Ambient Air Quality Standards, CPCB New Delhi.**H. T. Shah****Lab Manager****Dr. Arun Bajpai****Lab Manager (Q)**

## **RESULTS OF NOISE LEVEL MONITORING**

### **Result of Noise level monitoring [Day Time]**

SR. NO.	Name of Location	ADANI PORT – TUG BERTH 600 KL PUPM HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	23/10/2020	17/11/2020	09/12/2020	20/01/2021	20/02/2021	11/03/2021
1	6:00-7:00	59.1	60.4	58.6	53.7	58.8	62.4
2	7:00-8:00	62.4	65.4	64.1	51.8	60.2	67.4
3	8:00-9:00	68.4	68.1	65.7	56.9	62.4	67.2
4	9:00-10:00	64.4	61.8	63.8	59.7	63.8	69.2
5	10:00-11:00	62.1	70.6	68.5	47.3	65.6	61.4
6	11:00-12:00	61.8	65.2	66.6	61.7	58.4	60.4
7	12:00-13:00	67.4	68.4	65.1	63.4	69.4	68.4
8	13:00-14:00	69.8	62.9	63.6	64.4	65.2	72.4
9	14:00-15:00	62.1	66.7	67.2	63.2	66.1	69.4
10	15:00-16:00	61.5	63.1	64.5	62.8	68.1	70.5
11	16:00-17:00	68.4	63.4	62.9	62.4	61.4	65.4
12	17:00-18:00	65.1	62.2	64.3	58.3	67.8	63.4
13	18:00-19:00	62.8	68.8	66.2	64.3	72.1	61.5
14	19:00-20:00	61.0	68.4	65.8	54.8	70.6	62.8
15	20:00-21:00	62.8	65.5	64.6	58.7	65.5	68.1
16	21:00-22:00	61.8	61.7	63.2	53.5	68.8	63.8
Day Time Limit*		75 Leq dB(A)					

### **Result of Noise level monitoring [Night Time]**

SR. NO.	Name of Location	ADANI PORT – TUG BERTH 600 KL PUPM HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	23/10/2020	17/11/2020	09/12/2020	20/01/2021	20/02/2021	11/03/2021
1	22:00-23:00	62.4	65.3	64.5	63.7	62.2	60.1
2	23:00-00:00	68.4	65.2	67.3	56.4	61.2	62.5
3	00:00-01:00	62.1	61.5	64.9	51.2	63.8	68.4
4	01:00-02:00	63.1	62.5	61.5	56.7	67.4	69.1
5	02:00-03:00	65.8	68.4	66.2	59.4	62.4	62.4
6	03:00-04:00	62.8	63.4	64.8	45.4	63.9	65.2
7	04:00-05:00	61.4	62.8	65.1	46.9	62.8	63.1
8	05:00-06:00	62.8	60.4	61.4	47.8	61.8	60.8
Night Time Limit*		70 Leq dB(A)					



H. T. Shah

Lab Manager




Dr. Arun Bajpai

Lab Manager (Q)





**RESULTS OF NOISE LEVEL MONITORING**

**Result of Noise level monitoring [Day Time]**

SR. NO.	Name of Location	NEAR FIRE STATION					
		Result [Leq dB(A)]					
	Sampling Date & Time	09/10/2020	20/11/2020	08/12/2020	06/01/2021	10/02/2021	25/03/2021
1	6:00-7:00	60.8	60.4	61.7	56.8	60.1	68.4
2	7:00-8:00	65.2	68.5	67.2	62.4	64.8	62.1
3	8:00-9:00	62.1	65.4	64.6	53.7	62.5	66.8
4	9:00-10:00	61.4	63.8	62.8	61.4	69.3	69.5
5	10:00-11:00	64.1	72.4	70.2	65.7	70.2	64.1
6	11:00-12:00	63.2	62.5	61.1	67.4	63.2	60.2
7	12:00-13:00	68.4	61.5	60.3	69.8	69.4	65.3
8	13:00-14:00	62.5	63.4	64.5	63.4	70.5	63.4
9	14:00-15:00	61.2	65.4	63.9	71.4	65.4	69.7
10	15:00-16:00	69.4	68.5	65.8	67.8	72.8	60.1
11	16:00-17:00	65.1	69.4	66.2	68.5	63.5	63.1
12	17:00-18:00	66.8	62.1	71.3	70.3	62.4	65.5
13	18:00-19:00	70.2	62.8	68.7	66.5	65.1	60.4
14	19:00-20:00	68.5	62.8	65.2	68.8	62.8	61.8
15	20:00-21:00	64.1	64.8	62.4	61.8	68.4	65.8
16	21:00-22:00	62.1	68.7	65.1	55.8	63.8	62.7
Day Time Limit*		75 Leq dB(A)					

**Result of Noise level monitoring [Night Time]**

SR. NO.	Name of Location	NEAR FIRE STATION					
		Result [Leq dB(A)]					
	Sampling Date & Time	09/10/2020	20/11/2020	08/12/2020	06/01/2021	10/02/2021	25/03/2021
1	22:00-23:00	69.5	65.5	64.2	61.4	66.5	65.5
2	23:00-00:00	65.2	62.4	63.8	52.4	65.1	62.1
3	00:00-01:00	67.4	64.2	66.1	48.3	62.5	60.1
4	01:00-02:00	62.5	63.5	65.9	47.3	63.4	63.8
5	02:00-03:00	66.9	65.8	63.4	44.2	59.1	59.4
6	03:00-04:00	62.4	62.5	60.3	43.1	62.8	61.5
7	04:00-05:00	61.8	68.4	63.2	49.2	60.2	65.1
8	05:00-06:00	63.4	63.8	61.6	51.3	68.1	62.4
Night Time Limit*		70 Leq dB(A)					

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

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**RESULTS OF NOISE LEVEL MONITORING****Result of Noise level monitoring [Day Time]**

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
		20/10/2020	10/11/2020	15/12/2020	14/01/2021	11/02/2021	04/03/2021
1	6:00-7:00	63.1	63.8	62.4	46.8	62.4	60.1
2	7:00-8:00	68.8	65.1	66.1	47.3	60.5	65.1
3	8:00-9:00	72.1	68.4	70.9	49.3	68.4	66.8
4	9:00-10:00	69.5	62.5	68.8	42.7	71.4	70.1
5	10:00-11:00	64.2	63.4	66.6	55.8	62.5	68.5
6	11:00-12:00	61.5	68.4	65.4	59.7	72.5	66.1
7	12:00-13:00	62.8	66.1	71.3	54.9	70.1	62.5
8	13:00-14:00	69.5	62.8	68.2	57.3	62.1	64.5
9	14:00-15:00	63.1	69.8	62.8	55.2	69.7	69.5
10	15:00-16:00	62.4	62.4	64.7	54.4	66.1	71.4
11	16:00-17:00	66.1	69.5	68.1	56.7	67.4	68.3
12	17:00-18:00	68.4	62.1	65.9	53.8	69.3	63.4
13	18:00-19:00	65.2	61.5	64.3	58.3	63.5	68.2
14	19:00-20:00	63.1	63.4	65.2	51.8	61.4	62.2
15	20:00-21:00	69.5	68.4	67.4	53.7	60.4	63.1
16	21:00-22:00	66.4	62.8	65.1	49.7	65.4	61.5
Day Time Limit*		75 Leq dB(A)					

**Result of Noise level monitoring [Night Time]**

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
		20/10/2020	10/11/2020	15/12/2020	15/01/2021	11/02/2021	04/03/2021
1	Sampling Date & Time						
2	22:00-23:00	65.8	67.4	66.8	58.7	63.8	60.1
3	23:00-00:00	68.4	65.2	67.2	69.7	68.4	62.5
4	00:00-01:00	61.2	62.5	63.1	41.2	60.1	67.4
5	01:00-02:00	62.3	68.4	65.4	46.8	59.4	60.3
6	02:00-03:00	68.1	61.5	65.3	45.2	55.1	60.2
7	03:00-04:00	60.4	66.2	64.7	46.1	53.8	65.4
8	04:00-05:00	63.2	62.7	63.2	44.8	62.1	61.2
9	05:00-06:00	62.8	68.4	61.6	42.8	60.5	63.8
Night Time Limit*		70 Leq dB(A)					

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)



### RESULTS OF NOISE LEVEL MONITORING

#### Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	CT-3 RMU-2					
		Result [Leq dB(A)]					
	Sampling Date & Time	10/06/2020	06/11/2020	16/12/2020	25/01/2021	17/02/2021	10/03/2021
1	6:00-7:00	58.8	59.2	60.2	52.4	57.4	58.4
2	7:00-8:00	60.4	63.1	61.7	56.8	56.4	65.6
3	8:00-9:00	68.4	61.8	62.8	49.7	60.4	60.1
4	9:00-10:00	65.2	61.4	63.8	51.5	67.9	62.5
5	10:00-11:00	62.4	69.7	64.3	55.8	65.2	65.3
6	11:00-12:00	63.8	71.5	70.6	53.8	63.8	62.3
7	12:00-13:00	67.4	63.8	68.2	59.2	68.4	65.1
8	13:00-14:00	62.8	65.4	66.1	61.7	62.8	68.5
9	14:00-15:00	64.5	69.1	67.9	68.7	69.9	64.2
10	15:00-16:00	66.1	68.4	65.8	63.7	62.3	61.7
11	16:00-17:00	62.1	68.7	67.2	69.8	70.4	63.4
12	17:00-18:00	61.5	64.1	64.6	57.8	66.7	66.1
13	18:00-19:00	68.4	62.8	65.1	56.9	62.4	68.4
14	19:00-20:00	63.2	61.7	66.3	61.4	62.5	69.4
15	20:00-21:00	62.8	60.1	64.2	52.7	66.8	62.4
16	21:00-22:00	63.4	62.7	63.1	48.7	68.1	62.8
Day Time Limit*		75 Leq dB(A)					

#### Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	CT-3 RMU-2					
		Result [Leq dB(A)]					
	Sampling Date & Time	06/10/2020	06/11/2020	16/12/2020	25/01/2021	17/02/2021	10/03/2021
1	22:00-23:00	68.4	65.8	67.1	68.2	64.4	63.8
2	23:00-00:00	65.2	65.4	64.4	61.8	61.2	58.4
3	00:00-01:00	63.4	62.4	65.3	48.9	63.4	55.1
4	01:00-02:00	65.8	68.4	66.2	41.8	61.4	62.1
5	02:00-03:00	62.4	63.4	64.6	43.7	62.5	60.4
6	03:00-04:00	61.4	61.4	62.3	43.2	68.4	58.1
7	04:00-05:00	62.3	62.8	63.2	47.1	64.2	62.4
8	05:00-06:00	63.7	62.7	61.9	49.2	62.8	59.2
Night Time Limit*		70 Leq dB(A)					

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

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**RESULT OF STACK MONITORING**

SR NO	TEST PARAMETERS	UNIT	STD. LIMIT	THERMIC FLUID HEATER (BITUMEN-01)	THERMIC FLUID HEATER (BITUMEN-02)	HOT WATER SYSTEM-1	HOT WATER SYSTEM-2	TEST METHOD
<b>OCTOBER 2020</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	19.36	--	28.38	30.61	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	4.74	--	6.57	7.45	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	25.37	--	34.22	38.62	IS:11255 (Part-VII):2005
<b>NOVEMBER 2020</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	26.41	--	32.41	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	6.27	--	5.73	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	28.78	--	30.73	--	IS:11255 (Part-VII):2005
<b>DECEMBER 2020</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	--	--	37.62	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	--	--	7.63	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	--	--	35.52	--	IS:11255 (Part-VII):2005
<b>JANUARY 2021</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	--	--	--	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	--	--	--	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	--	--	--	--	IS:11255 (Part-VII):2005
<b>FEBRUARY 2021</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	--	--	32.42	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	--	--	5.71	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	--	--	33.54	--	IS:11255 (Part-VII):2005
<b>MARCH 2021</b>								
1	Particulate Matter	mg/Nm <sup>3</sup>	<b>150</b>	21.29	--	35.71	--	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	<b>100</b>	5.76	--	7.76	--	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	<b>50</b>	30.71	--	37.56	--	IS:11255 (Part-VII):2005

\*Below detection limit

Results on 11 % O<sub>2</sub> Correction when Oxygen is greater than 11 %. And 12% CO<sub>2</sub> correction when CO<sub>2</sub> is less than 12%**H. T. Shah****Lab Manager****Dr. Arun Bajpai****Lab Manager (Q)**



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**RESULTS OF D.G. STACK MONITORING**

31/01/2021							
SR. NO.	TEST PARAMETERS	Unit	Adani Port			GPCB Limit	Test Method
			D.G. Set-1 (500 KVA)	D.G. Set-2 (500 KVA)	D.G. Set-3 (500 KVA)		
1	Particulate Matter	mg/Nm <sup>3</sup>	25.36	17.53	22.31	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	5.05	4.49	7.52	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	34.55	37.57	31.52	50	IS:11255 (Part-VII):2005

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O<sub>2</sub> Correction when Oxygen is greater than 15 %

31/01/2021				25/03/2021			
SR. NO.	TEST PARAMETERS	Unit	Adani Port			GPCB Limit	Test Method
			D.G. Set-4 (500 KVA)	D.G. Set-5 (500 KVA)	D.G. Set -6, 7 & 8 (1250 KVA, each)		
1	Particulate Matter	mg/Nm <sup>3</sup>	18.50	22.64	22.61	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	6.49	5.29	6.76	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	36.24	31.29	35.42	50	IS:11255 (Part-VII):2005

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O<sub>2</sub> Correction when Oxygen is greater than 15 %

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

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30/01/2021

SR. NO.	TEST PARAMETERS	Unit	CT-4			GPCB Limit	Test Method
			D.G. Set-1 (1500 KVA)	D.G. Set-2 (1500 KVA)	D.G. Set-3 (1500 KVA)		
1	Particulate Matter	mg/Nm <sup>3</sup>	21.25	25.65	23.85	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	4.20	7.32	5.65	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	29.58	36.35	34.26	50	IS:11255 (Part-VII):2005

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O2 Correction when Oxygen is greater than 15 %

12/02/2021

SR. NO.	TEST PARAMETERS	Unit	CT-3 (South Basin)			GPCB Limit	Test Method
			D.G. Set-1 (1500 KVA)	D.G. Set-2 (1500 KVA)	D.G. Set-3 (1500 KVA)		
1	Particulate Matter	mg/Nm <sup>3</sup>	30.86	24.55	22.40	150	IS:11255 (Part-I):1985
2	Sulphur Dioxide	ppm	6.28	5.58	3.59	100	IS:11255 (Part-II):1985
3	Oxide of Nitrogen	ppm	35.71	32.41	30.86	50	IS:11255 (Part-VII):2005

\*DG sets are used as standby, so stack monitoring is done on quarterly basis. Results on 15 % O2 Correction when Oxygen is greater than 15 %

H. T. Shah

Lab Manager



Dr. Arun Bajpai

Lab Manager (Q)

**Minimum Detection Limit [MDL]**

Ambient Air Parameters		
Sr. No.	Test Parameter	MDL
1	Particulate Matter (PM <sub>10</sub> ) (µg/m <sup>3</sup> )	10
2	Particulate Matter (PM 2.5) (µg/m <sup>3</sup> )	10
3	Sulphur Dioxide (SO <sub>2</sub> ) (µg/m <sup>3</sup> )	5
4	Oxides of Nitrogen (µg/m <sup>3</sup> )	5
5	Hydrogen Sulphide as H <sub>2</sub> S (µg/m <sup>3</sup> )	6

Stack Parameters		
Sr.No.	Test Parameter	MDL
1	Particulate Matter (mg/Nm <sup>3</sup> )	10
2	Sulphur Dioxide (ppm)	1.52
3	Oxides of Nitrogen (ppm)	2.65
4	Carbon Monoxide (mg/Nm <sup>3</sup> )	0.1
5	Hydro Carbon NMHC (ppm)	1.0

Sea Water Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	pH	--	2
2	Temperature	°C	2
3	Total Suspended Solids	mg/L	2
4	BOD (3 Days @ 27 °C)	mg/L	1
5	Dissolved Oxygen	mg/L	0.1
6	Salinity	ppt	1
7	Oil & Grease	mg/L	2
8	Nitrate as NO <sub>3</sub>	µmol/L	0.5
9	Nitrite as NO <sub>2</sub>	µmol/L	0.01
10	Ammonical Nitrogen as NH <sub>3</sub>	µmol/L	0.2
11	Phosphates as PO <sub>4</sub>	µmol/L	0.5
12	Petroleum Hydrocarbon	µg/L	1
13	Total Dissolved Solids	mg/L	10
14	COD	mg/L	3
15	Primary productivity	mgC/L/day	0.1
16	Chlorophyll	mg/m <sup>3</sup>	0.1
17	Phaeophytin	mg/m <sup>3</sup>	0.1
18	Cell Count	No. x 10 <sup>3</sup> /L	1

Sea Sediment Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	Organic Matter	%	0.1
2	Phosphorus as P	µg/g	1
3	Petroleum Hydrocarbon	µg/g	1
4	Aluminum as Al	%	0.1
5	Manganese as Mn	µg/g	1
6	Mercury as Hg	µg/g	0.1

**H. T. Shah****Lab Manager****Dr. Arun Bajpai****Lab Manager (Q)**



STP Water parameter(mg/L)		
Sr. No.	Test parameter	MDL
1	pH	2
2	Total Suspended Solids (mg/L)	2
3	BOD (3 days @ 270 C) (mg/L)	1
4	Residual Chlorine (mg/L)	0.2
5	Fecal Coliform (MPN INDEX/100 mL)	1.8

ETP Water Parameters			
SR. NO.	TEST PARAMETERS	UNIT	MDL
1	Colour	Co-pt	2
2	pH	--	2
3	Temperature	°C	2
4	Total Suspended Solids	mg/L	2
5	Total Dissolved Solids	mg/L	10
6	COD	mg/L	3
7	BOD (3 Days @ 27 °C)	mg/L	1
8	Chloride as Cl	mg/L	1
9	Oil & Grease	mg/L	2
10	Sulphate as SO <sub>4</sub>	mg/L	1
11	Ammonical Nitrogen as NH <sub>3</sub>	mg/L	0.2
12	Phenolic Compound	mg/L	0.005
13	Copper as Cu	mg/L	0.01
14	Lead as Pb	mg/L	0.01
15	Sulphide as S	mg/L	0.1
16	Cadmium as Cd	mg/L	0.002
17	Fluoride as F	mg/L	0.05

**H. T. Shah****Lab Manager****Dr. Arun Bajpai****Lab Manager (Q)**



# **Annexure – 5**

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

## ANNEXURES

<b>ANNEXURE 1</b>			<b>INITIAL OIL SPILL REPORT</b>	
Particulars of person, office reporting	Capt. Anubhav Jain - HOD Marine/ Capt. Aditya Gaur - HOS marine, APSEZ			
Tel No.	8980015245	6359981603		
Date & time of incident	08.10.2020 / 10:50 hrs			
Spill location	Near SPM			
Likely cause of spill	SPM Marine coupling leak		Witness – Boat Arcadia Krishna	
Initial response action	Informed Port Control		By- Boat Arcadia Krishna	
Any other information	OSR action plan initiated			
Identity of informant	Boat Arcadia Krishna (Hired by APSEZ)			
Time of FIR	10:50 HRS			
Source of spill	SPM marine coupling leak			
Cause of spill	SPM marine coupling leak			
Type of spill	Crude Oil			
Color code information (from CG)	Black			
Radius of slick	20 to 30 m			
Tail	25 m			
Volume	0.5 to 0.7 cubic meter approx.			
Quantity	750 to 850 L			
Weather	NE' Ly x 8 - 10 knots.			
Tide / current	Flooding / 0.1 to 0.3 knots.			
Density	0.7 to 0.8 specific gravity			
Layer thickness	0.6 to 0.8 mm approx.			
Air / Sea temp.	35 deg C / 26 deg C			
Predicted slick movement	Towards T-1			
Size of spill classification (Tier 1, 2 or 3)	Tier 1			

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

**ANNEXURE 2**

**POLREP**

In case of an oil spill, MPSEZ will provide information to Commandant Coast Guard District 1 Porbandar COMDIS 1 and Coast Guard Station Vadinar CGS Vadinar in the following format:

SN.	Parameter	Data
1.	Identity of the informant	Boat Arcadia Krishna
2.	Time of information receipt	10:50 hrs
3.	Source of Spill	SPM marine coupling leak
4.	Cause of Spill	SPM marine coupling flange bolt loosened
5.	Type of oil	Crude oil
6.	Colour code information	black
7.	Configuration	-
8.	Radius	20 to 30 m
9.	Tail	25 m
10.	Volume	0.5 to 0.7 cubic meter approx.
11.	Quantity	750 to 850 L
12.	Weathered or Fresh	Weathered
13.	Density	0.7 to 0.8 specific gravity
14.	Viscosity	-
15.	Wind	NE' Ly x 8 - 10 knots.
16.	Wave Height	0.1 to 0.2 m
17.	Current	0.1 to 0.3 knots.
18.	Layer Thickness	0.6 to 0.8 mm approx.
19.	Ambient air temperature	35 deg C
20.	Ambient sea temperature	26 deg C
21.	Predicted slick movement	Towards T-1
22.	Confirm Classification of spill size	Tier 1

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

**Log Sheet of Drill**

<b>Page Number:</b> 1 of 1		<b>Date:</b> 08.10.2020	
<b>Name:</b> Arpan Kumar Chowdhury		<b>Position:</b> Radio Officer	
<b>Contact Number:</b> 9825228673		<b>Signature:</b>	
<b>Time</b>	<b>Activity Completed:</b>		
10:50	Boat Arcadia Krishna information that there is a minor oil leaking from marine coupling of SPM floating hose string.		
10:52	HOD, HOS, SPM Manager informed.		
10:57	Informed Dolphin 11 to cast off from Anchorage and proceed to SPM for Oil Spill Response.		
11:45	Dolphin 11 reached near SPM and started deployment of Oil Spill Response equipment's.		
12:50	Deployment of Oil spill containment boom of 250 m completed and skimmer also deployed & oil recovery commenced.		
14:00	Oil spillage recovery drill completed. Boom and other oil spill response equipment recovered onboard. Mock Drill Called Off.		



ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

PHOTOS TAKEN DURING DRILL



## Personnel & Boats Participated in Drill

- 01 Mr. M P Choudhary
- 02 Mr. Yogesh Nandaniya
- 03 Mr. Vatsal Mistry
- 04 Mr. Ramdas Pawale
- 05 Mr. Bharmal Bishnoi
- 06 Mr. Upinder Samkaria
- 07 Mr. Sashikant Padave
- 08 Mr. Santosh Rasam
- 09 Mr. Dharamveer Yadav
- 10 Mr. Vijay Deep Singh
- 11 Mr. Ajay Goliyan
- 12 Mr. Neeraj Singh
- 10 Mr. Vishnu Mishra
- 11 Mr. Hiralal Maurya
- 12 Mr. Anil Kumar
- 13 Crew of Dolphin 11
- 14 Crew of Boat Arcadia Krishna
- 15 Crew of Boat Khusboo

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

## ANNEXURES

<b>ANNEXURE 1</b>			<b>INITIAL OIL SPILL REPORT</b>
Particulars of person, office reporting	Capt. Sachin Srivastava - HOD Marine/ Capt. Aditya Gaur - HOS marine, APSEZ		
Tel No.	6359981603		
Date & time of incident	24.03.2021 / 1112 hrs		
Spill location	B-3 Tanker		
Likely cause of spill	Spill from vessel manifold	Witness – Boat Arcadia Krishna	
Initial response action	Initiated OSCRP		
Any other information	NO		
Identity of informant	Liquid Control		
Time of FIR	1112		
Source of spill	Vessel manifold		
Cause of spill	Spill from vessel manifold		
Type of spill	HSD		
Color code information (from CG)	Yellow		
Radius of slick	20 to 30 m		
Tail	25 m		
Volume	0.5 to 0.7 cubic meter approx.		
Quantity	750 to 850 L		
Weather	E' Ly x 3-4 knots.		
Tide / current	Ebbing / 0.1 to 0.3 knots.		
Density	0.2 to 0.86 kg/m cube approx.		
Layer thickness	0.02 mm approx.		
Air / Sea temp.	31 deg C / 30 deg C		
Predicted slick movement	Wly		
Size of spill classification (Tier 1, 2 or 3)	Tier 1		

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD.  
MUNDRA  
OIL SPILL CONTINGENCY RESPONSE PLAN

**ANNEXURE 2**

**POLREP**

In case of an oil spill, MPSEZ will provide information to Commandant Coast Guard District 1 Porbandar COMDIS 1 and Coast Guard Station Vadinar CGS Vadinar in the following format:

SN.	Parameter	Data
1.	Identity of the informant	Liquid Control
2.	Time of information receipt	112 hrs
3.	Source of Spill	Vessel Manifold
4.	Cause of Spill	Spill from vessel manifold
5.	Type of oil	HSD
6.	Colour code information	Yellow
7.	Configuration	-
8.	Radius	20 to 30 m
9.	Tail	25 m
10.	Volume	0.5 to 0.7 cubic meter approx.
11.	Quantity	750 to 850 L
12.	Weathered or Fresh	Fresh
13.	Density	0.2 to 0.86 kg/m cube approx.
14.	Viscosity	-2-4.5 CST@40 deg centigrade
15.	Wind	E' Ly x 3 - 4 knots.
16.	Wave Height	0.1 to 0.2 m
17.	Current	0.1 to 0.3 knots.
18.	Layer Thickness	0.2 to 0.4 mm approx.
19.	Ambient air temperature	31 deg C
20.	Ambient sea temperature	30 deg C
21.	Predicted slick movement	W'ly
22.	Confirm Classification of spill size	Tier 1

### Log Sheet of Drill

<b>Page Number:</b> 1 of 1	<b>Date:</b> 23-03-2021
<b>Name:</b> Yogesh Nandaniya/Sudhakar Singh	<b>Position:</b> Radio Officer
<b>Contact Number:</b> 9825228673	<b>Signature:</b>
<b>Activity Timeline:</b>	
<p>1112- Message received from liquid oil leakage (HSD) at B3.  1112- Informed to POC &amp; tug Dol 11 &amp; (Dol 10 for Stndby)  1113- Informed to HOD &amp; HOS  1113-POC confirmed that cargo stopped  1114- Informed to Dol-11 at 10 to keep ready OSD boom.  1114- POC informed all concern (Safety/Security/Medical/Fire)  1115- Informed to executive  1117- Informed to movement aborted SB7 out  1118- Informed to HOD Environment  1119- Dol-10 informed for castoff  1126- Dol-10 underway  1127- Informed to all tugs for prepare OSD boom and sby for emergency cast off  1130- Informed CB2 in pilot  1132- All concern arrived  1133- Informed vessel to activate vsl's OSCP  1137- Liquid Department started cleaning at berth  - Dol 11 started lowering Boom  1138- Dol -10 started spraying OSD  1139- Checked berth 1, 2, 4 are clear  1140- Dol 11 lowered skimmer and started collected oil  1149- All persons evacuated from T1  1230- Drill called off  1230-1240 – De-briefing meeting carried out with Liquid, safety, fire, security and contractor team</p>	



**Observations:**

1. Communication between Marine Control and Jetty was weak.
2. The Siren from MCP (Manual calling point) is activated only in LPG Control Room. Recommended that the siren should also be activated in Liquid Control Room.
3. Emergency Assembly Point presently marked at T-Junction recommended to shift near security cabin after consultation with safety.
4. Windsocks to be placed at conspicuous point at T-1.
5. Non spark shovels to be kept in the oil spill contingency trailer maintained by liquid team.
6. Tyre pressure was found de-flatted in trailer which can hamper mobility. Tyre pressure of trailer for equipment needs to be checked regularly.




**Personnel & Boats Participated in Drill****Off Shore**

- 01 Mr. M P Choudhary
- 02 Mr. Yogesh Nandaniya
- 03 Mr. Vatsal Mistry
- 04 Mr. Ramdas Pawale
- 05 Mr. Bharmal Bishnoi
- 06 Mr. Upinder Samkaria
- 07 Mr. Sashikant Padave
- 08 Mr. Santosh Rasam
- 09 Mr. Dharamveer Yadav
- 10 Mr. Vijay Deep Singh
- 11 Mr. Ajay Goliyan
- 12 Mr. Neeraj Singh
- 13 Mr. Vishnu Mishra
- 14 Mr. Hiralal Maurya
- 15 Mr. Ashok Tiwari - HMEL
- 16 Mr. Anil Kumar
- 17 Crew of Dolphin 11
- 18 Crew of Boat Arcadia Krishna
- 19 Crew of Boat Khusboo

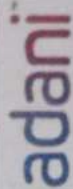
**Onshore:**

1. Capt Tushar Kinikar
2. Chandrashekhar
3. Diwana Thapa
4. Satendra Nishad
5. Rupesh Pandey
6. Mehul Makwana
7. Representatives from Fire Department
8. Representatives from Liquid Department
9. Representatives from Safety Department
10. Representatives from Security Department

## Drill snap

Boom laying from Dol 11	OSD Spraying from Dol 10
	
Lowering of Skimmer	Collection of spilled oil by Skimmer
	
De-briefing	
	

# **Annexure – 6**



# ADANI Ports And Special Economic Zone Ltd

## Mundra -Kutchh P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 28/10/2020

Criteria for PSP as per OISD 226 / 12.3.5 A or NACE SP0109-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wet Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	DN PSP (-ve volt)	CASING PSP (-ve Volt)	AC V	Un Protected PSP(-V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.210		0.012	0.68	
2	2	D	After Railway Crossing	0.425	1.280	0.69	0.042		
3	3	A	field	1.400	1.280		0.52		
4	4	A	field	2.400	1.280		0.031		
5	5	A	field	3.000	1.270		0.035		
6	6	D	Road crossing	3.440	1.260	0.71	0.032		
7	7	A	field	4.300	1.280		0.011		
8	8	A	field	5.2	1.290		0.016		
9	9	A	IOCL Boundary wall	5.900	1.290		0.023		
10	10	E	Inside IOCL	6.200	1.280		0.041	0.6	
B)									
Feeding TRUnit/ CPPSM Locations >>					TP2				
Feed Voltage (DC volt) :					3.4				
Feed Current (DC amp) :					3.5				
AC voltage (50Hz) at input of TRU/CPPSM:					251V				

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

Pipeline is well protected

Reviewed by (APSEZL)  
Signature :  
Name :  
Designation :

Monitored by  
Signature :  
Name :  
Designation :



DESCRIPTION OF PL:

MAINT BASE:

CP CONTRACTOR:

AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Mundra

N R ENTERPRISE

GRAPHICAL REPRESENTATION OF ON PSP MEASURED

MONTH: Oct-20

-▲- ON PSP (-ve volt)      - UNDER PROTECTED LEVEL OFF PSP(-0.85 VOLTS)      - OVER PROTECTED LEVEL OF PSP(-1.5 VOLTS)      - CASING PSP (-Ve Volt)



LEGENDS

OBSERVED ON PSP (VOLT)

UNDER PROTECTED LEVEL OF PSP (-0.85 VOLTS)

OVER PROTECTED LEVEL OF PSP (-1.5 VOLTS)

..... (GREEN DOTTED)

--- (BROWN BROKEN)

--- (DARK RED DASHED)

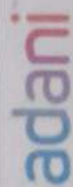
(CRITERIA AS PER OISD 226 / 12.3.5 A OR NACE SP0169-2013/6.2)

(CRITERIA AS PER OISD 226 / 12.3.5 A)

NOTE: PSP VALUE MEASURED WRT CU-CUSO<sub>4</sub> PORTABLE REFERENCE







**ADANI Ports And Special Economic Zone Ltd**  
**Mundra -Kutchh**  
**P.S.P. MONITORING REPORT OF ICCP SYSTEM**

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Criteria for PSP as per QISD 225 / 12.3.5 A or NACE SP0169-2013/ 6.2. underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

Date : 26/11/2020

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	ON PSP (-ve volt)	CASING PSP (-ve Volt)	AC V	Un Protected V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.340		0.038	1.06	
2	2	D	After Railway Crossing	0.425	1.340	0.69	0.37		
3	3	A	field	1.400	1.340		0.29		
4	4	A	field	2.400	1.310		0.01		
5	5	A	field	3.000	1.290		0.003		
6	6	D	Road crossing	3.440	1.260	0.65	0.005		
7	7	A	field	4.300	1.280		0.019		
8	8	A	field	5.2	1.280		0.017		
9	9	A	IOCL Boundry wall	5.900	1.280		0.029		
10	10	E	Inside IOCL	6.200	1.280		0.031	0.89	
B)									
Feeding TRUnit/ CPPSM Locations >>					TP2				
Feed Voltage (DC volt) :					3.6				
Feed Current (DC amp) :					5.0				
AC voltage (50Hz) at input of TRU/CPPSM:					249 V				

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

Pipeline is well protected.

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by

Signature :

Name :

Designation :

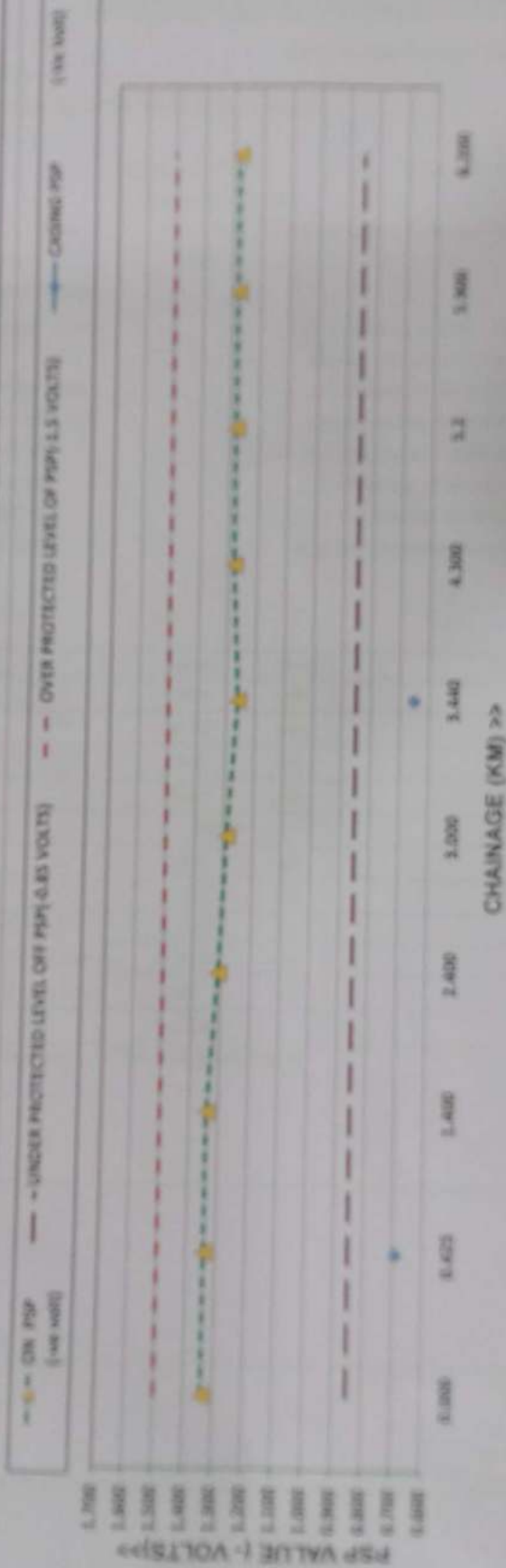


DESCRIPTION OF PL.  
MAINT BASE.  
CP CONTRACTOR.

GRAPHICAL REPRESENTATION OF ON PSP MEASURED

AME OF CATHODIC PROTECTION FOR SPM DOCK PIPELINE  
Mumbai  
N R ENTERPRISE

MONTH: Nov-20



CHAINAGE (KM) >>

LEGEND

ON PSP MEASURED (BLUE DOT)

UNDER PROTECTED LEVEL OF PSP (-0.85 VOLTS)

OVER PROTECTED LEVEL OF PSP (-0.75 VOLTS)

NOTE: PSP VALUE MEASURED WRT CRITERIA FOR ABILITY REFERENCE

CRITERIA AS PER IS 228 (12.13 A CH RATE SPREAD-200/12.13)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

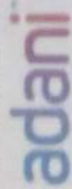
CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)

CRITERIA AS PER IS 228 (12.13 A)



# ADANI Ports And Special Economic Zone Ltd

Mundra - Kutchh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Criteria for PSP as per IS 276 / 22.3.5 A or NACE SP0169-2011/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

Date : 26/12/2020

Sr. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	ON PSP (-ve volt)	Casing PSP (-ve Volt)	AC V	Un Protected PSP (-V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.300		0.034	0.96	
2	2	D	After Railway Crossing	0.425	1.310	0.69	0.049		
3	3	A	field	1.400	1.290		0.032		
4	4	A	field	2.400	1.290		0.008		
5	5	A	field	3.000	1.250		0.001		
6	6	D	Road crossing	3.440	1.260	0.64	0.009		
7	7	A	field	4.300	1.260		0.018		
8	8	A	field	5.2	1.260		0.026		
9	9	A	IOCL Boundary well	5.900	1.260		0.03		
10	10	E	Inside IOCL	6.200	1.270		0.028	0.84	
B)									
Feeding TLPs/CPPSM Locations >>					TP2				
Feed Voltage (DC, volt) :					1.09				
Feed Current (DC, amp) :					3.5				
AC voltage (50Hz) at input of TLP/CPPSM :					243V				

Graphical Representation (Annexure) : **Included**

Any other observational discrepancy :

Pipeline is well protected.

Reviewed by (APPEZL)

Signature :

Name :

Designation :

Monitored by

Signature :

Name :

Designation :





## GRAPHICAL REPRESENTATION OF ON PSP MEASURED

MONTH: Dec-20

AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Mundra

N R ENTERPRISE

DESCRIPTION OF PL:

MAINT BASE:

CP CONTRACTOR:



### LEGENDS

OBSERVED ON PSP (VOLT)

UNDER PROTECTED LEVEL OF PSP (-0.85 VOLTS)

OVER PROTECTED LEVEL OF PSP (-1.5 VOLTS)

..... (GREEN DOTTED)

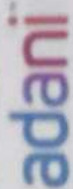
--- (BROWN BROKEN)

--- (DARK RED DASHED)

(CRITERIA AS PER OISD 226 / 12.3.5 A OR NACE SP0169-2013/6.2)

(CRITERIA AS PER OISD 226 / 12.3.5 A)

NOTE: PSP VALUE MEASURED WRT CU-CUSO<sub>4</sub> PORTABLE REFERENCE



# ADANI Ports And Special Economic Zone Ltd

Mundra -Kutchh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

PLANT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Criteria for PSP as per IS 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt), Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

Date : 28/01/2021

Sr. No.	TLP No.	TYPE	Location (detail description)	Chalnage (km)	ON PSP (-ve volt)	CASING PSP (-ve Volt)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.340		0.053	0.86	
2	2	D	After Railway Crossing	0.425	1.350	0.64	0.053		
3	3	A	Field	1.400	1.320		0.005		
4	4	A	Field	2.400	1.310		0.018		
5	5	A	Field	3.000	1.290		0.004		
6	6	D	Road crossing	3.440	1.290	0.61	0.005		
7	7	A	Field	4.300	1.280		0.011		
8	8	A	Field	5.2	1.290		0.006		
9	9	A	EOC, Boundary wall	5.900	1.300		0.05		
10	10	E	Inside IOCL	6.200	1.280		0.043	0.83	
(5)									
Feeding Terminal/ CPSPM Locations >>					TP2				
Feed Voltage (DC, volts) :					2.82				
Feed Current (DC, amp) :					4.0				
AC voltage (50Hz) at input of TRU/CPSPM:					252 V				

Graphical Representation (Reference) : Included

Any other observational discrepancy :

Pipeline is well protected.

Reviewed by (APR/21)  
Signature :  
Name :  
Designation :

Monitored by  
Signature :  
Name :  
Designation :





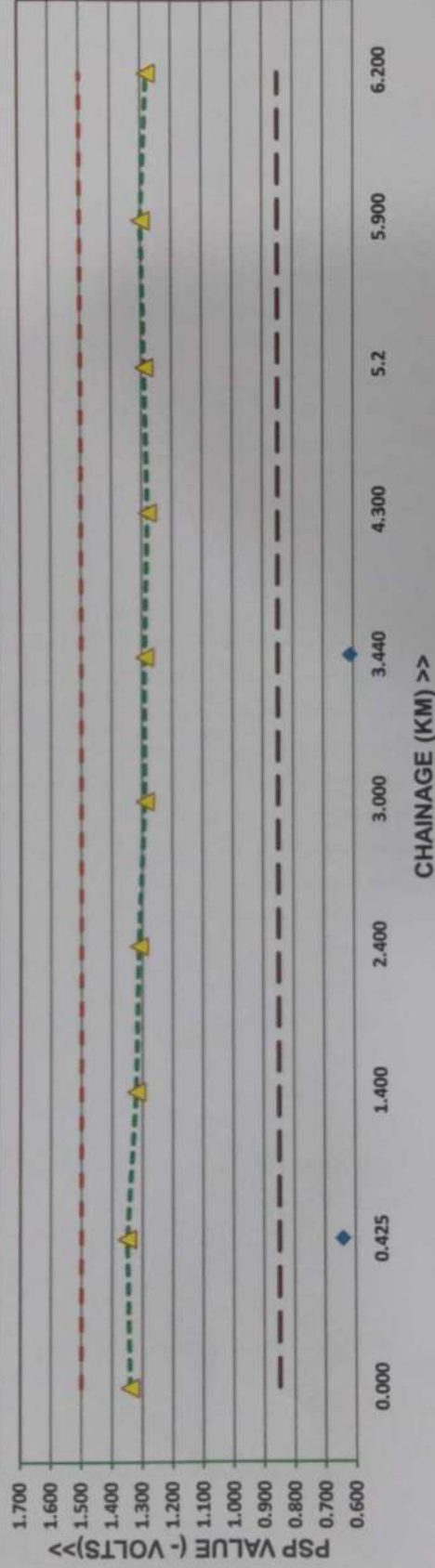
GRAPHICAL REPRESENTATION OF ON PSP MEASURED

DESCRIPTION OF PL:  
MAINT BASE:  
CP CONTRACTOR:

AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE  
Mundra  
N R ENTERPRISE

MONTH: Jan-21

ON PSP (-ve volt) UNDER PROTECTED LEVEL OFF PSP (-0.85 VOLTS) OVER PROTECTED LEVEL OF PSP (-1.5 VOLTS) CASING PSP (-Ve Volt)



LEGENDS

OBSERVED ON PSP (VOLT)  
UNDER PROTECTED LEVEL OF PSP (-0.85 VOLTS)  
OVER PROTECTED LEVEL OF PSP (-1.5 VOLTS)

..... (GREEN DOTTED)  
--- (BROWN BROKEN)  
--- (DARK RED DASHED)

(CRITERIA AS PER OISD 226 / 12.3.5 A OR NACE SP0169-2013/6.2)  
(CRITERIA AS PER OISD 226 / 12.3.5 A)

NOTE: PSP VALUE MEASURED WRT CU-CUSO<sub>4</sub> PORTABLE REFERENCE





# ADANI Ports And Special Economic Zone Ltd

Mundra - Kutchhh

## P.S.P. MONITORING REPORT OF ICCP SYSTEM

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 26/02/2021

Criteria for PSP as per OISD 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	PSP (-ve volt)	Casing PSP(-V)	AC V	Un Protected PSP(-V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.300		0.047	0.84	
2	2	D	After Railway Crossing	0.425	1.340	0.73	0.045		
3	3	A	field	1.400	1.330		0.03		
4	4	A	field	2.400	1.310		0.021		
5	5	A	field	3.000	1.290		0.003		
6	6	D	Road crossing	3.440	1.280	0.64	0.004		
7	7	A	field	4.300	1.280		0.019		
8	8	A	field	5.2	1.270		0.016		
9	9	A	IOCL Boundary wall	5.900	1.270		0.025		
10	10	E	Inside IOCL	6.200	1.260		0.031	0.64	
(B)									
Feeding TRUnit/ CPPSM Locations >>				TP2					
Feed Voltage (DC volt) :				2.6					
Feed Current (DC amp) :				2.1					
AC voltage (50Hz) at input of TRU/CPPSM:				245V					

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy :

Pipeline is well protected

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by

Signature :

Name :

Designation :

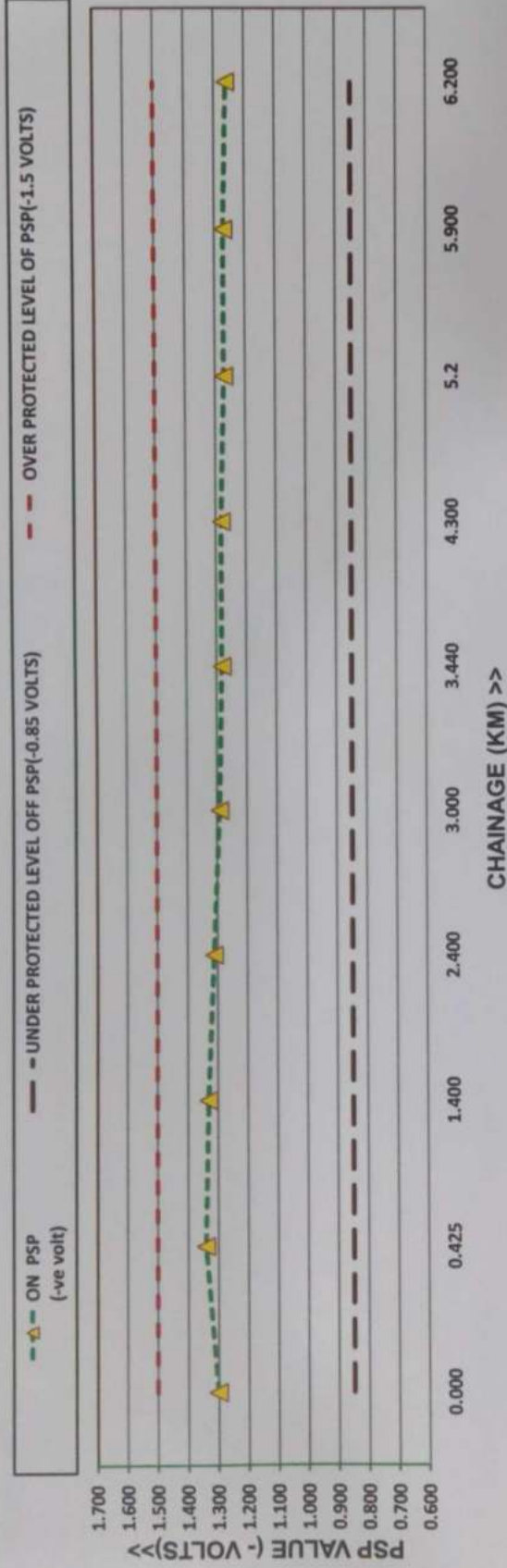


## GRAPHICAL REPRESENTATION OF ON PSP MEASURED

DESCRIPTION OF PL:  
MAINT BASE:  
CP CONTRACTOR:

AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE  
Mundra  
N R ENTERPRISE

MONTH: Feb-21



### LEGENDS

OBSERVED ON PSP (VOLT)

UNDER PROTECTED LEVEL OF PSP (-0.85 VOLTS)

OVER PROTECTED LEVEL OF PSP (-1.5 VOLTS)

..... (GREEN DOTTED)

--- (BROWN BROKEN)

--- (DARK RED DASHED)

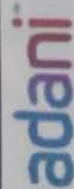
(CRITERIA AS PER OISD 226 / 12.3.5 A OR NACE SP0169-2013/6.2)

(CRITERIA AS PER OISD 226 / 12.3.5 A)

NOTE: PSP VALUE MEASURED WRT CU-CUSO<sub>4</sub> PORTABLE REFERENCE







**ADANI Ports And Special Economic Zone Ltd**  
**Mundra -Kutchh**  
**P.S.P. MONITORING REPORT OF ICCP SYSTEM**

MAINT. BASE : Mundra

PIPELINE SECTION : AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE

Date : 25/03/2021

Criteria for PSP as per QISD 226 / 12.3.5 A or NACE SP0169-2013/ 6.2 underprotected level (-0.85 volt); Overprotected level (-1.2 volt) wrt Cu-CuSO4 reference Electrode

SR. No.	TLP No.	TYPE	Location (detail description)	Chainage (km)	ON PSP (-ve volt)	Casing PSP (-ve Volt)	AC V	Un Protected PSP(- V)	Remarks
1	1	E	Nr. Insulating Joint	0.000	1.400		0.044	0.92	
2	2	D	After Railway Crossing	0.425	1.430	0.73	0.044		
3	3	A	field	1.400	1.410		0.022		
4	4	A	field	2.400	1.350		0.021		
5	5	A	field	3.000	1.320		0.031		
6	6	D	Road crossing	3.440	1.330	0.63	0.022		
7	7	A	field	4.300	1.340		0.005		
8	8	A	field	5.2	1.370		0.02		
9	9	A	IOCL Boundry wall	5.900	1.360		0.025		
10	10	E	Inside IOCL	6.200	1.350		0.032	0.65	
(B)									
Feeding TRU/ CPPSM Locations >>					TP2				
Feed Voltage (DC volt) :					1.19				
Feed Current (DC amp) :					2.98				
AC voltage (50Hz) at Input of TRU/CPPSM:					231V				

Graphical Representation (Annexure) : **Included**

Any other observation/ discrepancy : Pipeline is well protected.

Reviewed by (APSEZL)

Signature :

Name :

Designation :

Monitored by

Signature :

Name :

Designation :



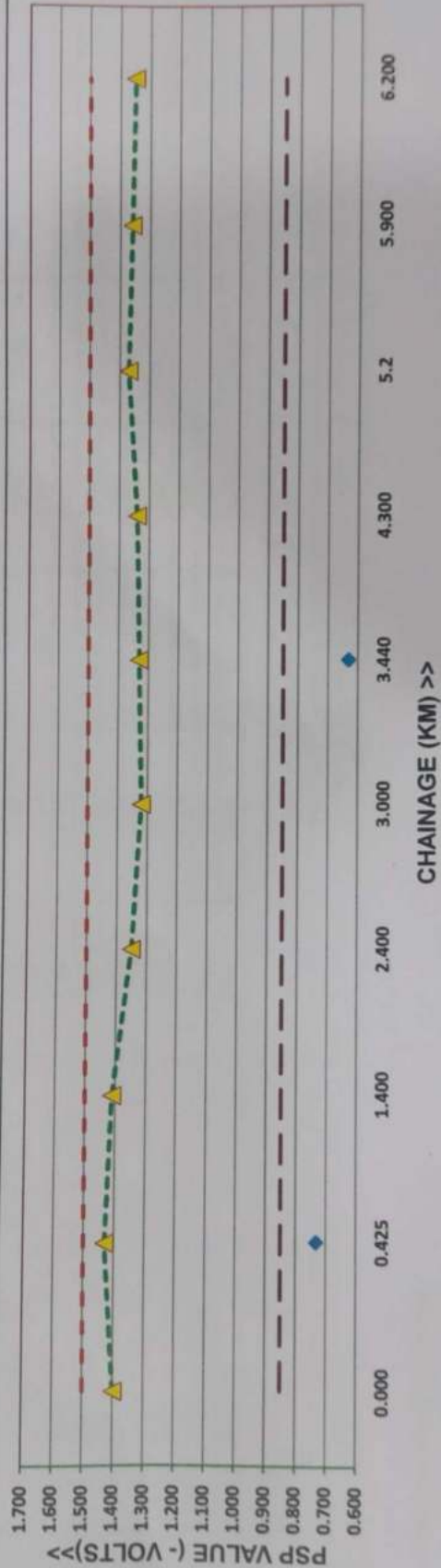
**GRAPHICAL REPRESENTATION OF ON PSP MEASURED**

DESCRIPTION OF PL:  
MAINT BASE:  
CP CONTRACTOR:

AMC OF CATHODIC PROTECTION FOR SPM-IOCL PIPELINE  
Mundra  
N R ENTERPRISE

MONTH: Mar-21

ON PSP (-ve volt)      UNDER PROTECTED LEVEL OFF PSP(-0.85 VOLTS)      OVER PROTECTED LEVEL OF PSP(-1.5 VOLTS)      Casing PSP (-ve Volt)



**LEGENDS**

OBSERVED ON PSP (VOLT)  
UNDER PROTECTED LEVEL OF PSP (-0.85 VOLTS)  
OVER PROTECTED LEVEL OF PSP (-1.5 VOLTS)

..... (GREEN DOTTED)  
--- (BROWN BROKEN)  
--- (DARK RED DASHED)

(CRITERIA AS PER OISD 226 / 12.3.5 A OR NACE SP0169-2013/6.2)  
(CRITERIA AS PER OISD 226 / 12.3.5 A)

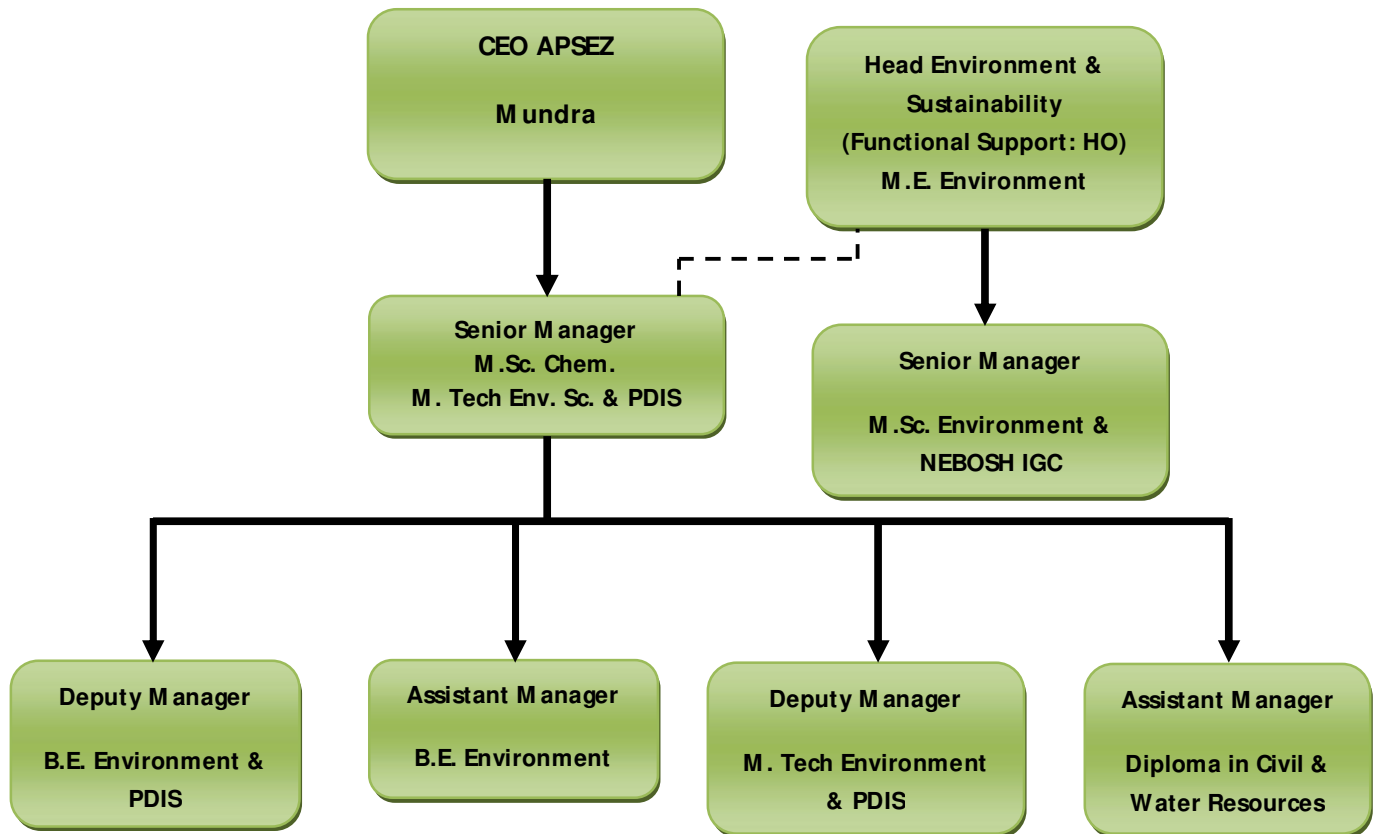
NOTE: PSP VALUE MEASURED WRT CU-CUSO<sub>4</sub> PORTABLE REFERENCE





# **Annexure – 7**

**Organogram of Environment Management Cell, APSEZ, Mundra**



# **Annexure – 8**

### **Cost of Environmental Protection Measures**

Sr. No.	Activity	Cost incurred (INR in Lacs)			Budgeted Cost (INR in Lacs)
		20 18 – 19	20 19 – 20	2020 – 21	2020 – 21
1.	Environmental Study / Audit and Consultancy	6.7	0.33	6.2	51.0
2.	Legal & Statutory Expenses	4.42	0.84	10.58	11.0
3.	Environmental Monitoring Services	20.36	21.74	19.17	30.0
4.	Hazardous / Non Hazardous Waste Management & Disposal	95.72	108.43	83.55	119.8
5.	Environment Days Celebration and Advertisement / Business development	0.28	1.5	5.3	10.0
6.	Treatment and Disposal of Bio-Medical Waste	1.21	1.62	2.09	1.68
7.	Mangrove Plantation, Monitoring & Conservation	47.0	Nil	32.59	32.59
8.	Other Horticulture Expenses	579.32	734.18	689	733
9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	144.29	110.18	148.49	160.08
10.	Expenditure of Environment Dept. (Apart from above head)	109.28	105.13	89.11	107.44
<b>Total</b>		<b>1008.58</b>	<b>1083.95</b>	<b>1086.08</b>	<b>1256.59</b>

# **Annexure – 9**



7<sup>th</sup> September 2020

To

**Director (Environment) & Member Secretary  
Gujarat Coastal Zone Management Authority  
Sachivalaya  
Gandhinagar**

**Subject:** Cumulative Impact Assessment (CIA) report for Mundra

**Reference:**

- (1) APSEZ submission of final CIA report to GCZMA vide letter dtd 30.04.2018
- (2) GCZMA Minutes of meeting of 45<sup>th</sup> GCZMA, held on 04.10.2019

Dear Sir

Inline to the ToR issued by GCZMA vide dtd. 19.12.2014, APSEZ had prepared CIA report, through NABET accredited consultant and submitted to GCZMA on 30.04.2018. Report was presented to GCZMA during 45<sup>th</sup> GCZMA meeting, held on 4<sup>th</sup> October 2019 and based on the discussion during the meeting and minutes of meeting published on GCZMA website, it was decided to constitute a subcommittee, who will further verify the report in detail.

In view of above, we are waiting for the further directives from GCZMA, to permit us to present the findings of the CIA report in detail, to the subcommittee, as appointed by GCZMA.

Thank you

Yours sincerely



**Shalin Shah**

**Head - Environment**

Adani Ports and Special Economic Zone Ltd  
Adani House,  
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Mundra, Kutch 370 421  
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10<sup>th</sup> March 2021**To****Director (Environment) & Member Secretary  
Gujarat Coastal Zone Management Authority  
Sachivalaya  
Gandhinagar****Subject:** Cumulative Impact Assessment (CIA) report for Mundra**Reference:**

- (1) APSEZ submission of final CIA report to GCZMA vide letter dtd 30.04.2018
- (2) GCZMA Minutes of meeting of 45<sup>th</sup> GCZMA, held on 04.10.2019
- (3) APSEZ reminder letter vide dtd. 7<sup>th</sup> Sept 2020

Dear Sir

Inline to the ToR issued by GCZMA vide dtd. 19.12.2014, APSEZ had prepared CIA report, through NABET accredited consultant and submitted to GCZMA on 30.04.2018. Report was presented to GCZMA during 45<sup>th</sup> GCZMA meeting, held on 4<sup>th</sup> October 2019 and based on the discussion during the meeting and minutes of meeting published on GCZMA website, it was directed to constitute a subcommittee to verify the report in detail. A reminder letter for the same, has already been submitted vide dtd. 7<sup>th</sup> September 2020.

In view of above, we are waiting for the further directives from GCZMA, to permit us to present the findings of the CIA report in detail, to the GCZMA subcommittee.

Thank you

Yours sincerely

**Shalin Shah****Head – Environment & Sustainability**

11-02/3/2021

Ea (21/3/21)

Clerk.

Forests & Environment Dept  
Block No. 14, 8th Floor,  
New Sachivalaya, Gandhinagar

# **Annexure – 10**

## 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	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
<b>1</b>	<b>Land Use Change</b>						
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</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 2180 households and associated infrastructure facilities. Accommodation is made available for all interested employees working within Adani group &amp; SEZ industries. Out of which 89% Occupancies are accommodated within the townships and rest are available for employees working within APSEZ.</p> <p>At present 45 nos. of industries (processing &amp; non-processing) are operating within the SEZ. 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 township 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 expanded as per requirement.</p> <p>APSEZ has also been granted permission for receiving domestic sewage @ 2.5 MLD from Mundra village (which was earlier discharged in to open area within Mundra region) in to wastewater treatment plant for treatment and disposal. APSEZ has already started receiving of domestic sewage from Mundra, which will abate the poor sanitation and unhygienic condition</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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
	proliferation of vectors and disease.						within Mundra region. Total project cost for laying domestic sewage underground pipeline with other associated facilities from Mundra to APSEZ is <b>362 Lacs</b> .
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 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.	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	<p>Presently, 42% of the total SEZ area (Total Notified SEZ Area 8434.5890 Ha) is developed as per data submitted to the Govt. of India, however on ground level the actual development with infrastructure facilities is only 20%. Based on technical studies, APSEZ has developed adequate storm water facilities that meets with daily demand as per recorded highest rainfall.</p> <p>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. Photographs of showing the drain and dump pond has been submitted in along with EC compliance report (Oct 19 to March 20). Analysis of said water discharging in to sea during monsoon season is being carried out (twice in a year during monsoon) through NABL / MoEF&amp;CC accredited laboratory. Analysis report is attached herewith as <b>Annexure – A</b>.</p> <p>During period April 2020 to Sept 2020, the maximum recorded rain fall was <b>46 mm/hr.</b>, however during this compliance period (Oct'20 to Mar'21) there was only <b>0.8 mm/hr.</b> rainfall 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.</p>
			As per the directions	The	APSEZ,	As and When	Presently there is no Desalination plant, sea water intake and



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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
			given in the environmental clearance issued for the proposed Multi-Product SEZ and CRZ clearance for Desalination, sea water intake, outfall 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.	channel depth in all the natural streams shall be maintained to accommodate peak flood flow during the monsoon and periodical de-silting activities in the natural streams passing through the APSEZ area	District Administration* and Irrigation department	Required	outfall facility developed as part of EC & CRZ clearance of Multiproduct SEZ. The project will be designed and 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	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 mangrove afforestation	APSEZ will continue mangrove afforestation as per the commitment made with	APSEZ	Short Term	<p>APSEZ has carried out mangrove afforestation in 2890 ha. area across the coast of Gujarat till date.</p> <p>No further mangrove afforestation is pending w.r.t. commitment made with concerned regulatory authority for APSEZ, Mundra project.</p> <p>As per study conducted by NCSCM in 2017, mangrove cover in and around APSEZ, Mundra has increased from 2094 Ha to</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						
	conservation area, it has been predicted 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 eco-system.		activities in an area of more than 2800 ha at various locations across the coast of Gujarat state in consultation with various organizations	concerned regulatory authority			<p>2340 ha (as compared between 2011 to 2017). The analysis has shown an overall growth of 246 ha. The cost for said study was INR 3.15 Cr.</p> <p>As a part of GCZMA recommendations and NCSCM mangrove conservation action plan, APSEZ has undertaken following activities.</p> <table><tr><th>Sr. No.</th><th>Recommendations</th><th>Compliance</th></tr><tr><td>1.</td><td>Mangrove mapping and monitoring in and around APSEZ</td><td><ul style="list-style-type: none"><li>APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</li><li>As a part of this study, overall growth of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 &amp; 2019 and it is observed that there was increase in mangrove cover between March 2017 and September 2019 to the extent of 256 Ha, which is about 10.7%.</li><li>This suggests that the mangroves and the tidal system in the creeks remain undisturbed over this period. Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse which also shows that the growth of mangroves in a progressive direction.</li><li>NCSCM Report of the same is attached as <b>Annexure – 12</b>.</li></ul></td></tr></table>	Sr. No.	Recommendations	Compliance	1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"><li>APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</li><li>As a part of this study, overall growth of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 &amp; 2019 and it is observed that there was increase in mangrove cover between March 2017 and September 2019 to the extent of 256 Ha, which is about 10.7%.</li><li>This suggests that the mangroves and the tidal system in the creeks remain undisturbed over this period. Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse which also shows that the growth of mangroves in a progressive direction.</li><li>NCSCM Report of the same is attached as <b>Annexure – 12</b>.</li></ul>
Sr. No.	Recommendations	Compliance											
1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"><li>APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</li><li>As a part of this study, overall growth of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 &amp; 2019 and it is observed that there was increase in mangrove cover between March 2017 and September 2019 to the extent of 256 Ha, which is about 10.7%.</li><li>This suggests that the mangroves and the tidal system in the creeks remain undisturbed over this period. Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse which also shows that the growth of mangroves in a progressive direction.</li><li>NCSCM Report of the same is attached as <b>Annexure – 12</b>.</li></ul>											

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/ E SMP	Responsible agency	Timeframe for implementation	Compliance		
									<ul style="list-style-type: none"> <li>The cost of the said study was INR 23.56 Lacs incurred by APSEZ.</li> </ul>
							2.	Tidal observation in creeks in and around APSEZ	<ul style="list-style-type: none"> <li>APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM.</li> <li>The observed tidal ranges indicate that the creeks experience normal tidal ranges, adequate for the growth of mangroves.</li> <li>Report of the same is incorporated in NCSCM report attached as <b>Annexure – 12</b>.</li> <li>The cost of the said activity was INR 1.0 Lacs.</li> </ul>
							3.	Removal of Algal and Prosopis growth from mangrove areas	<ul style="list-style-type: none"> <li>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.</li> <li>Report of the same is attached as <b>Annexure – 13</b>.</li> <li>The cost of the said activity was INR 1.2 Lacs.</li> </ul>
							4.	Awareness of mangroves importance in surrounding communities	<ul style="list-style-type: none"> <li>Adani Foundation – CSR Arm of Adani group has done awareness camps/activities created in the community regarding importance of mangroves during the year 2020-21.</li> <li>Adani Foundation has also provided 6.7 lacs kg Dry Fodder and 11.6 lacs kg Green fodder in 20 villages of Mundra and Anjar Block to support the resource dependent villagers, to avoid their dependency on</li> </ul>

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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
							<div> <div></div> <div> <p>mangroves. The expenditure for fodder supporting activities was approx. 120.86 Lacs during last FY 2020-21.</p> <ul style="list-style-type: none"> <li>Village Gauchar land development for the fodder cultivation to made fodder sustain village &amp; Avail green fodder in scarcity phase. With the support of Gauchar Seva Samiti Grassland development in Siracha – 85 Acre &amp; Zarpara – 25 Acre done which resulted in total production of 82 ton.</li> <li>The brief details of the said activities are incorporated in attached CSR Report for the FY 2020-21 attached as <b>Annexure – 2</b>.</li> <li>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.</li> </ul> </div> </div> <div> <ul style="list-style-type: none"> <li>The overall cost incurred by APSEZ is INR 146.62 Lacs as a part of mangrove conservation plan.</li> </ul> </div> <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 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.</p>
1. 4	Development activities along the		Detailed hydro-dynamic modelling and shoreline change prediction	It is recommended to map the	APSEZ	Continual Process	<p>Shoreline assessment study will be conducted in FY 2021-22.</p> <p>However, shore line change study was carried out by M/s. Chola MS, Chennai (NABET accredited consultant) as a part of Water</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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
	coast might cause certain changes in hydro-dynamic characteristics along the shoreline. Shoreline of any area also can be influenced by storm surges and other natural processes.		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 $\pm 0.5$ m/year. which reconfirms that the waterfront development activities of APSEZ would pose insignificant impact on the Mundra shoreline.	coastal morphology (Shoreline) at least once in three years			<p>Front 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>10km 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 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>



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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
2	<b>Regional Traffic Management Plan</b>						
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 and colony) could be in the order of	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 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.  Out of eight artillery roads considered in APSEZ master plan, seven roads were	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.	APSEZ	As and When Required	<p>Presently, 42% of the total SEZ area (Total Notified SEZ Area 8434.5890 Ha) is developed as per data submitted to the Govt. of India, however on ground level the actual development with infrastructure facilities is only 20%</p> <p>Existing road/rail/conveyer infrastructure facilities are adequate to evacuate the existing cargo. Further, APSEZ's cargo evacuation through rail / conveyer has increased to 56 %, thereby reducing the usage of road.</p> <p>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>

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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
	18,300 and 10,400 vehicles per day respectively.  There could be a possible increase in traffic congestions on village-highway intersections and road accidents.		already developed and functional.	This will further reduce the traffic volumes on the regional road network.			
			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 classroom and on-job training to the all drivers and employees on below topics:</p> <ul style="list-style-type: none"> <li>• Basic induction Training for drivers</li> <li>• ITV Driver Training</li> <li>• ITV Driver Induction for Supervisor</li> <li>• Defensive Driving for LMV &amp; HMV</li> <li>• Defensive Driving &amp; BBS</li> <li>• Traffic Management &amp; Road Signage</li> <li>• Driving safety training</li> <li>• RORO Driver training</li> <li>• Road Safety</li> <li>• Defensive Driving &amp; Emergency Action Plan</li> <li>• Drivers Responsibilities &amp; Safe driving</li> <li>• Emergency Rescue (Vehicle) Training</li> </ul> <p>Approx. 3552 Participants (On roll and contractual manpower) were benefitted from above trainings in FY 2020-21. 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</p>

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							<p>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"> <li>✓ Installation of approx. 100 Nos. of cameras which is being operated at ISCR (Integrated security control room) to monitor &amp; manage the traffic system in APSEZ on real time basis.</li> <li>✓ Installation of 05 Nos. RTMS - Remote traffic management system (having combination of Radar + OCR camera + LED display board - showing speed limit) to recognize the over speeded vehicles, so that timely capture the same and avoid any road accidents.</li> </ul>
<b>3</b>	<b>Water resources Management and sewage treatment &amp; disposal Plan</b>						
3.1	For a fully developed APSEZ facility, water demand will be in the order of 4,30,000 m3/day (430 MLD). APSEZ will be sourcing majority of the water	No-Impact	APSEZ is meeting the 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.	As per the master plan and permissions granted under EC, APSEZ will be developing progressively 4,50,000 m3/day (450 MLD) of desalination plants	APSEZ	As and When Required	<p>Currently there are two fresh water sources available with APSEZ.</p> <p><b>Desalination Plant – 47 MLD</b> <b>Narmada water through GWIL – 11 MLD</b> (sanctioned capacity).</p> <p>Current water demand for APSEZ along with SEZ industries including Adani Power Plant is around 30 MLD.</p> <p>So presently, these sources are adequate to fulfill the current fresh water requirement of APSEZ.</p> <p>The desalination plant of additional capacities will be installed on modular basis considering future requirement of APSEZ.</p>

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	from the captive desalination plants, which will be developed in progressive manner.			to meet the future demand. Hence stress on regional water resources due to these developmental projects will be less significant.			
3.2	Existing water demand in the Mundra taluk is estimated as 8500 m <sup>3</sup> /day (@55 lpcd) and the potable and sanitation water	Level-2	Adani 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.	Adani Foundation is planning to implement the various water resource conservation programs in next ten years under	APSEZ and CGWB*	Long Term	<p>Water needs of APSEZ is being met through existing Desalination Plant of APSEZ and Narmada canal supplied by the GWIL which may be further enhanced on modular basis, At present Ground water is not utilized for any activities of 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.</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>

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	needs would increase to 37,000 m <sup>3</sup> /day (@125 lpcd) in future when the area is fully grown into larger municipality due to induced economic growth. Water demand of the local communities is met through Narmada water supply system to some extent, but			various schemes.			<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 Government Figures.</p> <p><b>Our water conservation work is as below.</b></p> <ul style="list-style-type: none"> <li>A large number of water harvesting structure (18 Nos. of check dams in coordination with salinity department)</li> <li>Ground recharge activities (pond deepening work for more than 52 ponds) individually and 26 ponds under Sujlam Suflam Jal Abhiyan were built leading to a significant increase in water table and higher returns to the farmers</li> <li>Roof Top Rain Water Harvesting 54 Nos. which is having 10,000 liter storage which is sufficient for one year drinking water purpose for 5 people family.</li> <li>Recharge Bore well 75 Nos which is best ever option to</li> <li>Bund construction on way of Nagmati River could save more than 575 MCFT water quantity which recharged in ground due to which bore well depth decreased by 50-100 Ft in Zarpara, Bhujpur and Navinal Vadi Vistar.</li> <li>AF has covered 295 farmers and 1422 acre drip irrigation area in last two years which is remarkable for water conservation in first phase—in this phase we have covered 66 farmers and 360 Acre land for the same. Total 968 Farmers and 5626 Acre Drip since 2011-12 to 2020-21.</li> </ul> <p>Adani foundation has spent approx. INR 4554.45 lakhs from April – 2018 to Mar – 2021 for CSR activities which also includes water conservation projects as mentioned above.</p>



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	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 due to the economic development, there could be some stress on the ground water resources						

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	in future.						
3.3	It is estimated that about 60,000 m <sup>3</sup> /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 into either seasonal natural streams or marine environment.	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 existing practices, treated sewage will be	APSEZ	As and When Required	<p>Current installed capacity of wastewater treatment plants is 6.1 MLD (ETP, STPs &amp; CETP) for treatment of effluent &amp; sewage generated at various locations. Out of 45 only 4 industries within the SEZ are sending their partially treated industrial as well as domestic effluent to the CETP confirming 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 sewage generated from Mundra village through CETP and STP. Presently avg. 2.3 MLD of wastewater (in to ETP, STPs &amp; CETP) is treated and being utilized on land for horticulture purpose within APSEZ premises during Oct'20 to Mar'21 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>

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				utilized for greenbelt development.																							
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 from the study area would increase.	Level-2	APSEZ and other thermal power plants have obtained valid consent to operate and have been operating the facilities as per the 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 within the study area have installed continuous emission	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 time.	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&amp;CC authorized agency namely M/s. Pollucon Laboratory Pvt. Ltd. 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 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 (Oct'20 to Mar'21) are as below. Locations: 17 Nos. (APSEZ – 12 + APL – 5 including 3 villages) Frequency: Twice in a week</p> <table><tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit<sup>s</sup></th></tr><tr><td>PM<sub>10</sub></td><td>µg/m<sup>3</sup></td><td>96.75</td><td>24.36</td><td>100</td></tr><tr><td>PM<sub>2.5</sub></td><td>µg/m<sup>3</sup></td><td>56.35</td><td>14.61</td><td>60</td></tr><tr><td>SO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>26.59</td><td>6.22</td><td>80</td></tr></table>	Parameter	Unit	Max	Min	Perm. Limit <sup>s</sup>	PM <sub>10</sub>	µg/m <sup>3</sup>	96.75	24.36	100	PM <sub>2.5</sub>	µg/m <sup>3</sup>	56.35	14.61	60	SO <sub>2</sub>	µg/m <sup>3</sup>	26.59	6.22	80
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			and air quality monitoring instruments as per CPCB directive.				<table><tr><td>NO<sub>2</sub></td><td>µg/m<sup>3</sup></td><td>46.36</td><td>11.70</td><td>80</td></tr></table> <p>\$ as per NAAQ standards, 2009 Values recorded confirms to the stipulated standards.</p> <p>Approx. INR 19.17 Lakh is spent by APSEZ for environmental monitoring activities during the FY 2020-21, 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 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 Feb &amp; Mar' 2021 for EMS &amp; 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>	NO <sub>2</sub>	µg/m <sup>3</sup>	46.36	11.70	80
NO <sub>2</sub>	µg/m <sup>3</sup>	46.36	11.70	80								
				A common air quality management committee may be framed under the guidance	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 member units with following role and responsibilities:.</p> <ul style="list-style-type: none"><li>• Identification of sources of air &amp; noise emission and its dispersion in surrounding villages</li></ul>					

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				of the State Pollution Control Board and district administration to manage regional level emission inventory data that can help to manage regional level air quality management goals.			<ul style="list-style-type: none"> <li>Remedial measures to eliminate, control, reduce or capture air &amp; noise emission</li> <li>Identify available resource to abate the air and noise emission</li> <li>Required additional resources for control of air and noise emission</li> <li>Drinking water and its testing of all the available fresh water sources in surrounding villages</li> <li>Identify any surrounding villages affected by organization's improper waste disposal mechanism.</li> </ul> <p>Last committee meeting was conducted on dated 29<sup>th</sup> Sept 2020, and below were the point of discussion for way forward.</p> <ul style="list-style-type: none"> <li>Maintain the existing practice to control the emission in terms of Air, Water and Noise.</li> <li>Ensure for proper covering of trucks / vehicles carrying coal / cargo to reduce spillages on road</li> <li>Carry out study about impact on ground water quality due to continuous extraction or any other factors.</li> <li>Inclusion of Ambient Air Quality and Noise Monitoring station covering surrounding villages by APSEZ considering further development and statutory clearances.</li> </ul> <p>Details submitted along with last half yearly compliance report for the period Apr'20 to Sep'20.</p> <p>APSEZ and all the industries within SEZ are in compliance 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>
	Release of particulate		APSEZ has been implementing the	All	APSEZ and		Following safeguard measures are taken by APSEZ for abatement of dust emissions.



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4.2	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 some health impacts such as asthma and COPD etc. among the local communities.	Health Impact	following management plan to control emissions as per the applicable regulations and similar practices will be adopted in future: Entire bulk material handling 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,	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.	Other Industries	Continual Process	<ul style="list-style-type: none"><li>Adequate stack heights to the Boilers, D.G. Sets, TFHs &amp; HWGs for proper dispersion of pollutants within APSEZ</li><li>Using of liquid &amp; Gaseous fuels instead of solid fuels in Boilers, Thermic fluid heaters and hot water generators.</li><li>Regular sprinkling on road and other open area</li><li>Regular cleaning of roads</li><li>Dry fog Dust Suppression System (DSS) in hopper, transfer towers and conveyor belts</li><li>Use of water mist canon</li><li>Closed type conveyor belts</li><li>Regular sprinkling on coal heaps</li><li>Covering other types of dry bulk cargo heaps</li><li>Installation of wind breaking wall</li><li>Development of greenbelt along the periphery of the storage yards/back up area</li><li>Mechanized handling system for coal and other dry bulk cargo</li><li>Wagon loading and truck loading through closed silo</li></ul> <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>The stack monitoring summary for last six months (Oct'20 to Mar'21) are as below. Total Nos. of Stacks: 22 Nos. Frequency: Monthly / Half Yearly</p> <table><tr><th>Parameter</th><th>Unit</th><th>GPCB Limit</th><th>Min</th><th>Max</th></tr><tr><td>PM</td><td>mg/nm<sup>3</sup></td><td>150</td><td>15.29</td><td>37.62</td></tr><tr><td>SO<sub>2</sub></td><td>Ppm</td><td>100</td><td>3.59</td><td>7.76</td></tr></table>	Parameter	Unit	GPCB Limit	Min	Max	PM	mg/nm <sup>3</sup>	150	15.29	37.62	SO <sub>2</sub>	Ppm	100	3.59	7.76
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							<table><tr><td>NO<sub>x</sub></td><td>ppm</td><td>50</td><td>24.27</td><td>38.62</td></tr></table> <p>Values recorded confirms to the stipulated standards.</p> <p>Approx. INR 19.17 Lakh is spent by APSEZ on environmental monitoring activities during the FY 2020-21, which also includes stack monitoring.</p> <p>All other industries located within SEZ are adhere to provide adequate stack height and pollution control measures for proper dispersion of pollutants as per respective permissions granted by the board. The same is being inspected and ensured by APSEZ as well as SPCB officials on regular basis.</p>	NO <sub>x</sub>	ppm	50	24.27	38.62
NO <sub>x</sub>		ppm	50	24.27	38.62							
		covering of other types of dry bulk cargo heaps by protective materials, installation of wind breaking wall, development 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	An internal Coal Dust Management Working Group shall be formed by APSEZ to effectively co-ordinate the approach to coal dust	APSEZ and Other Industries, Concerned Stake holders, District Administration*	Long Term	<p>As mentioned above, presently, APSEZ has formed Internal Environment Monitoring Committee, involving Officials of APSEZ, Adani Power Limited &amp; 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. 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, 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 29<sup>th</sup> Sept 2020, and below were the point of discussion for way forward.</p>						

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			area have installed electrostatic precipitators on the boilers and are meeting the emission 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.	management and monitoring			<ul style="list-style-type: none"> <li>Maintain the existing practice to control the emission in terms of Air, Water and Noise.</li> <li>Ensure for proper covering of trucks / vehicles carrying coal / cargo to reduce spillages on road</li> <li>Carry out study about impact on ground water quality due to continuous extraction or any other factors.</li> <li>Inclusion of Ambient Air Quality and Noise Monitoring station covering surrounding villages by APSEZ considering further development and statutory clearances.</li> </ul> <p>Details submitted along with half yearly compliance report for the period Apr'20 to Sep'20.</p>
4.3	Ships are one of the significant sources of SO <sub>2</sub> and NO <sub>x</sub> emissions in the study area. Marine diesel engines on the	Level-2	A Standard Operating Procedure (SOP) has 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	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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	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 of engine. Due to lower		MARPOL4 regulations.	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.			

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	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 implemen			Presently, cargo evacuation through rail & conveyer has increased to 56 %, thereby reducing the usage of road.



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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	tation of Bharat VI fuels (MoEF&C C)6 in 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	APSEZ and All Industries	Short Term	Vehicles having valid PUC certificate are only being allowed to enter within APSEZ area.  In future, APSEZ will also explore the feasibility of using Electric Vehicles for internal cargo movement.

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				norms are adopted by all their contractors and sub-contractors.																																																					
5	Noise emissions																																																								
5.1	Noise emissions are envisaged from port operations, industrial operations and power plants in the study area. Any increase in noise levels beyond three decibels	Level-1	Due to adoption of various mechanized operations at the 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. Predicted noise levels were found to be well	APSEZ, all the tenant industries and facilities within APSEZ are required to undertake noise monitoring at their facilities to demonstrate the compliance with the Noise level standards.	APSEZ	Continual Process	<p>Below Safeguard measures are already taken for abatement of noise emissions.</p> <ul style="list-style-type: none"><li>• Development of greenbelt along the periphery of the operational area.</li><li>• D.G. Sets having Acoustic enclosures.</li><li>• Maintenance of plant machineries and equipments on regular frequency.</li></ul> <p>Noise monitoring is being carried out by NABL accredited and MoEF&amp;CC authorized agency namely M/s. Pollucon Laboratory Pvt. Ltd. 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 (Oct'20 to Mar'21) are as below.</p> <p>Locations: 12 Nos. Frequency: Once in a month (24 hourly)</p> <table><tr><th>Noise</th><th>Unit</th><th>Leq Max</th><th>Leq Min</th><th>Leq Perm. Limit<sup>\$</sup></th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	Noise	Unit	Leq Max	Leq Min	Leq Perm. Limit <sup>\$</sup>																																													
Noise	Unit	Leq Max	Leq Min	Leq Perm. Limit <sup>\$</sup>																																																					

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	from the background levels would be perceived as noise nuisance (USEPA)7.		within the designated noise standards for Industrial facilities.	Continuous noise recording units can be installed by APSEZ at facility boundary to address the community grievances, whenever required. To assess the overall site wide compliance and also to address any community grievances related to noise issues due to operation			<table><tr><td>Day Time</td><td>dB(A)</td><td>73.8</td><td>41.2</td><td>75</td></tr><tr><td>Night Time</td><td>dB(A)</td><td>69.7</td><td>40.3</td><td>70</td></tr></table>	Day Time	dB(A)	73.8	41.2	75	Night Time	dB(A)	69.7	40.3	70	\$ as per GPCB standards			
Day Time	dB(A)	73.8	41.2	75																	
Night Time	dB(A)	69.7	40.3	70																	
Approx. INR 19.17 Lakh is spent by APSEZ on environmental monitoring activities during the FY 2020-21, which includes noise monitoring.																					
All the results are well within the standards. From this it can be inferred that there are no impacts on the surrounding community.																					
All other industries located in the APSEZ area 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.																					
Further, till date APSEZ has not received any grievances/notice for noise issues from any of the stakeholders.																					

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				of APSEZ facilities.			
				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 in the specific zones.	APSEZ	Continual Process	<p>As mentioned above, presently, APSEZ has formed Internal Environment Monitoring Committee, involving Officials of APSEZ, Adani Power Limited &amp; other member units, having role and responsibilities as defined above.</p> <p>Last committee meeting was conducted on dated 29<sup>th</sup> Sept 2020, and below were the point of discussion for way forward.</p> <ul style="list-style-type: none"> <li>• Maintain the existing practice to control the emission in terms of Air, Water and Noise.</li> <li>• Ensure for proper covering of trucks / vehicles carrying coal / cargo to reduce spillages on road</li> <li>• Carry out study about impact on ground water quality due to continuous extraction or any other factors.</li> <li>• Inclusion of Ambient Air Quality and Noise Monitoring station covering surrounding villages by APSEZ considering further development and statutory clearances.</li> </ul> <p>No grievance received for noise related issues and it is observed that ambient noise level are well within the permissible standards.</p>
6	<b>Surface water quality (Terrestrial and Marine )</b>						
			As per the master	As per the			APSEZ has installed Common Effluent Treatment Plant (CETP)

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6.1	In general, release of untreated wastewater from industrial facilities would pose threat to water quality of streams, estuaries and marine water bodies.	Level - 1	plan of APSEZ, 67 MLD of wastewater is expected to be generated from the fully developed 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 wastewater from CETP meets the stipulated discharge norms for utilization for greenbelt development within the APSEZ areas.	master plan of APSEZ, the existing CETP shall be augmented to 67 MLD in progressive manner based on the future demand. The facility should limit the marine discharge of treated industrial wastewater to 16 MLD as per the permits. Remaining treated wastewater shall be	APSEZ	As and When Required	<p>having 2.5 MLD capacities for treatment of partially treated effluent and sewage generated from industries within SEZ.</p> <p>Currently, CETP receives 907 KLD 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> <p>Out of 45 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. 2.3 MLD (from CETP, ETP &amp; STPs) of treated water is being utilized on land for horticulture purpose within APSEZ premises during period Oct'20 to Mar'21 and no discharge is made to any other source.</p>



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				utilized for horticulture purpose.			
			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 discharged into natural bodies as on date..	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	Online continuous effluent monitoring system installed at the discharge point of CETP to track any deviation from discharge norms.  Presently entire quantity of treated water from CETP is used for gardening / horticulture purpose within APSEZ premises.
			Runoff during monsoon from coal storage yards is collected in sedimentation ponds (dump pond) to	Storm water runoff from the facility during the	APSEZ	Continual	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.  Presently Marine monitoring is being carried out once in a month

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			remove any residual dust particulates for further disposal into sea	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			<p>by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. 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 (Oct'20 to Mar'21) is as per below.</p> <p>Locations: 14 Nos. (APSEZ – 9 + APL – 5) Frequency: Once in a Month / Half Yearly</p> <table><tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">Surface</th><th colspan="2">Bottom</th></tr><tr><th>Max</th><th>Min</th><th>Max</th><th>Min</th></tr><tr><td>pH</td><td>--</td><td>8.31</td><td>7.91</td><td>8.27</td><td>7.90</td></tr><tr><td>TSS</td><td>mg/L</td><td>197</td><td>34</td><td>235</td><td>31</td></tr><tr><td>BOD (3 Days @27 °C)</td><td>mg/L</td><td>5.4</td><td>3.3</td><td>7.6</td><td>4.7</td></tr><tr><td>DO</td><td>mg/L</td><td>6.1</td><td>5.2</td><td>5.9</td><td>5.1</td></tr><tr><td>Salinity</td><td>ppt</td><td>39.5</td><td>36.1</td><td>39.7</td><td>36.4</td></tr><tr><td>TDS</td><td>mg/L</td><td>38314</td><td>37294</td><td>38740</td><td>37708</td></tr></table> <p>Approx. INR 19.17 Lakh is spent by APSEZ for environmental monitoring activities during the FY 2020-21, which includes marine water monitoring.</p>	Parameter	Unit	Surface		Bottom		Max	Min	Max	Min	pH	--	8.31	7.91	8.27	7.90	TSS	mg/L	197	34	235	31	BOD (3 Days @27 °C)	mg/L	5.4	3.3	7.6	4.7	DO	mg/L	6.1	5.2	5.9	5.1	Salinity	ppt	39.5	36.1	39.7	36.4	TDS	mg/L	38314	37294	38740	37708
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				control program and no effluents shall be discharged into storm water-drains.			
			Detailed marine hydrodynamic modelling studies revealed that the current and proposed 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	Good dredging practices shall be adopted by APSEZ: (i).Improving the dredging accuracy (ii).Improving onboard automation and monitoring, (iii). Reduce spill and loss, (iv). evaluating the need	APSEZ	Long Term	<p>No capital dredging has been done, since Apr 2015. 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. (2 Nos. Cutter suction + 1 No. Trailer suction) of dredgers are in operation for dredging.</p> <p>Marine monitoring is being carried out once in a month by NABL and MoEF&amp;CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. 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&amp;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.	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			

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				100 NTU or 200 mg/l of TSS (10% lethal level of fish) Existing marine monitoring program shall be continued as per the directions of MoEF&CC and GPCB.			
<b>7</b>	<b>Groundwater quality and salinity ingress</b>						
7.1	While Mundra block is enjoying safe ground water status as on date (based on the data published by CGWB),	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 <sup>3</sup> /day (450 MLD) will be developed in	APSEZ	As and When Required	<p>Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited and same is sufficient to meet the present water demand.</p> <p>APSEZ does not draw any ground water.</p> <p>The desalination plant of additional capacities will be installed on modular basis considering future development and requirement.</p>



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	due to induced economic and population growth, use of ground water resources by the local people might increase in Mundra region. This might increase the TDS and chloride levels in the ground water in future.			progressive manner to meet the APSEZ requirements.			
7.2	Due to induced growth in the region,	Level-2	Ground water is not drawn by APSEZ for its operations. Natural streams (seasonal rivers)	The Govt. of Gujarat, Narmada, Water Resources	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.

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	pressure on the available ground water source would increase and this could pose some threat to salinity ingress.		passing through the APSEZ area will not be disturbed, the micro-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 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.	, Water Supply & Kalpsar Dept., (WRD)12 has been implementing various salinity ingress prevention projects			<p>However, Adani Foundation – CSR arm of Adani Group has carried out rainwater harvesting activities in the nearby villages for benefit of the locals.</p> <p>Water conservation Projects i.e. Roof Top Rain Water 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. Including this a big recharge operation by bunding was taken up for Zarpara village as rainfall was very good last FY 2020-21.</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 Government Figures.</p> <p><b>Our water conservation work is as below.</b></p> <ul style="list-style-type: none"> <li>A large number of water harvesting structure (18 Nos. of check dams in coordination with salinity department)</li> <li>Ground recharge activities (pond deepening work for more than 52 ponds) individually and 26 ponds under Sujlam Suflam Jal Abhiyan were built leading to a significant increase in water table and higher returns to the farmers</li> <li>Roof Top Rain Water Harvesting 54 Nos. which is having 10,000 liter storage which is sufficient for one year drinking water purpose for 5 people family.</li> </ul>

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							<ul style="list-style-type: none"> <li>Recharge Bore well 75 Nos which is best ever option to</li> <li>Bund construction on way of Nagmati River could save more than 575 MCFT water quantity which recharged in ground due to which bore well depth decreased by 50-100 Ft in Zarpara, Bhujpur and Navinal Vadi Vistar.</li> <li>AF has covered 295 farmers and 1422 acre drip irrigation area in last two years which is remarkable for water conservation in first phase—in this phase we have covered 66 farmers and 360 Acre land for the same. Total 968 Farmers and 5626 Acre Drip since 2011-12 to 2020-21.</li> </ul> <p>With the objective of to preserve the rain water 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 &amp; Kalpsar Dept., (WRD) 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.</p>
				While the individual industries in the study area will	All Concerned Stakeholders, District	Continual Process	<p>APSEZ (7 Locations – half yearly) &amp; 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</p>

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				continue to undertake ground water quality monitoring as per the environmental clearances issued for the respective projects, a regional level ground water conservation action committee can be formed under the guidance of state ground water board and district	Administration and CGWB*		<div>six months (Oct'20 to Mar'21) are as below.</div> <div>Nos. of Location: 07</div> <table><tr><th>Sr. No.</th><th>Parameter</th><th>Unit</th><th>Min</th><th>Max</th></tr><tr><td>1</td><td>pH</td><td>--</td><td>7.64</td><td>8.32</td></tr><tr><td>2</td><td>Salinity</td><td>ppt</td><td>1.44</td><td>28</td></tr><tr><td>3</td><td>Oil &amp; Grease</td><td>mg/L</td><td>2.6</td><td>2.6</td></tr><tr><td>4</td><td>Hydrocarbon</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>5</td><td>Lead as Pb</td><td>mg/L</td><td>0.037</td><td>0.28</td></tr><tr><td>6</td><td>Arsenic as As</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>7</td><td>Nickel as Ni</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>8</td><td>Total Chromium as Cr</td><td>mg/L</td><td>0.027</td><td>0.033</td></tr><tr><td>9</td><td>Cadmium as Cd</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>10</td><td>Mercury as Hg</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>11</td><td>Zinc as Zn</td><td>mg/L</td><td>0.15</td><td>0.71</td></tr><tr><td>12</td><td>Copper as Cu</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>13</td><td>Iron as Fe</td><td>mg/L</td><td>0.2</td><td>4.2</td></tr><tr><td>14</td><td>Insecticides/Pesticides</td><td>mg/L</td><td>ND*</td><td>ND*</td></tr><tr><td>15</td><td>Depth of Water Level from Ground Level</td><td>meter</td><td>1.65</td><td>2.3</td></tr></table> <div>* ND – Not Detectable</div> <div>Approx. INR 19.17 Lakh is spent by APSEZ for environmental monitoring activities during the FY 2020-21, which includes ground water monitoring.</div> <div>The fresh water requirement of all the industries within SEZ are being satisfied through APSEZ. All the industries are encouraged to monitor ground water quality as per the permissions granted by competent authorities.</div>	Sr. No.	Parameter	Unit	Min	Max	1	pH	--	7.64	8.32	2	Salinity	ppt	1.44	28	3	Oil & Grease	mg/L	2.6	2.6	4	Hydrocarbon	mg/L	ND*	ND*	5	Lead as Pb	mg/L	0.037	0.28	6	Arsenic as As	mg/L	ND*	ND*	7	Nickel as Ni	mg/L	ND*	ND*	8	Total Chromium as Cr	mg/L	0.027	0.033	9	Cadmium as Cd	mg/L	ND*	ND*	10	Mercury as Hg	mg/L	ND*	ND*	11	Zinc as Zn	mg/L	0.15	0.71	12	Copper as Cu	mg/L	ND*	ND*	13	Iron as Fe	mg/L	0.2	4.2	14	Insecticides/Pesticides	mg/L	ND*	ND*	15	Depth of Water Level from Ground Level	meter	1.65	2.3
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				Administration.			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.  APSEZ will co-operate and comply with the directions from concerned regulatory authorities for ground water management.
<b>8</b>	<b>Waste Management</b>						
8.1	Solid waste will be generated from industrial activities of APSEZ and other permitted facilities in the study area including Mundra town. These wastes would contain recyclable material, construction debris,	Level-2	APSEZ has been adopting Zero waste Initiatives and the entire waste generated from existing operations is segregated and disposed to recycling vendors, thereby APSEZ has achieved zero landfill status as on date.	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. This initiative	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 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. Copy of certificate has been submitted in earlier EC compliance report (Oct 19 to March 20).  APSEZ will continue proper solid waste management in his operational area.



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	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 wastes will enter into environment and would pose long term health			helps not only to reduce the waste to landfill significantly, but also to recycle the materials there by avoiding ecological impacts.			

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	impacts.						
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	APSEZ	Continual Process	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.

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				Management Rules 2016 and Construction 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	<b>Ecological aspects (terrestrial and marine)</b>						
				APSEZ has approach			Stage – 1 forest Clearance for about 1576.81 Ha Forest land has been obtained. Presently APSEZ is in the process of compliance

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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	It is noted 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 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.	ed concerned 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	APSEZ/State Forest Department*	Long Term	to the stage – 1 Forest Clearance conditions, for further submitting to Govt. authorities for issuance of Stage-2 Forest Clearance.

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				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 development, the overall biodiversity of the region will increase considerably when the project is fully			



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				developed									
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	No 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 Foundation introduced 'Mangrove Nursery Development and Plantation' scheme in the area as an alternative income generating activity for the people of the region.	Mangrove footprint and health status shall be monitored annually	APSEZ	Continual Process	<div>As per study conducted by NCSCM in 2017, mangrove cover in and around APSEZ, Mundra has increased from 2094 Ha to 2340 ha (as compared between 2011 to 2017). The analysis has shown an overall growth of 246 ha. The cost for said study was INR 3.15 Cr.</div> <div>As a part of GCZMA recommendations and NCSCM mangrove conservation action plan, APSEZ has undertaken following activities.</div> <table><tr><th>Sr. No.</th><th>Recommendations</th><th>Compliance</th></tr><tr><td>1.</td><td>Mangrove mapping and monitoring in and around APSEZ</td><td><ul style="list-style-type: none"><li>APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</li><li>As a part of this study, overall growth of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 &amp; 2019 and it is observed that there was increase in mangrove cover between March 2017 and September 2019 to the extent of 256 Ha, which is about 10.7%.</li><li>This suggests that the mangroves and the tidal system in the creeks remain undisturbed over this period. Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse</li></ul></td></tr></table>	Sr. No.	Recommendations	Compliance	1.	Mangrove mapping and monitoring in and around APSEZ	<ul style="list-style-type: none"><li>APSEZ entrusted NCSCM, Chennai to carry out Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island.</li><li>As a part of this study, overall growth of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 &amp; 2019 and it is observed that there was increase in mangrove cover between March 2017 and September 2019 to the extent of 256 Ha, which is about 10.7%.</li><li>This suggests that the mangroves and the tidal system in the creeks remain undisturbed over this period. Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse</li></ul>
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									<p>which also shows that the growth of mangroves in a progressive direction.</p> <ul style="list-style-type: none"> <li>NCSCM Report of the same is attached as <b>Annexure – 12</b>.</li> <li>The cost of the said study was INR 23.56 Lacs incurred by APSEZ.</li> </ul>
							2.	Tidal observation in creeks in and around APSEZ	<ul style="list-style-type: none"> <li>APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM.</li> <li>The observed tidal ranges indicate that the creeks experience normal tidal ranges, adequate for the growth of mangroves.</li> <li>Report of the same is incorporated in NCSCM report attached as <b>Annexure – 12</b>.</li> <li>The cost of the said activity was INR 1.0 Lacs.</li> </ul>
							3.	Removal of Algal and Prosopis growth from mangrove areas	<ul style="list-style-type: none"> <li>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.</li> <li>Report of the same is attached as <b>Annexure – 13</b>.</li> <li>The cost of the said activity was INR 1.2 Lacs.</li> </ul>
							4.	Awareness of mangroves importance in surrounding communities	<ul style="list-style-type: none"> <li>Adani Foundation – CSR Arm of Adani group has done awareness camps/activities created in the community regarding importance of mangroves during the year 2020-21.</li> </ul>

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								<ul style="list-style-type: none"> <li>Adani Foundation has also provided 6.7 lacs kg Dry Fodder and 11.6 lacs kg Green fodder in 20 villages of Mundra and Anjar Block to support the resource dependent villagers, to avoid their dependency on mangroves. The expenditure for fodder supporting activities was approx. 120.86 Lacs during last FY 2020-21.</li> <li>Village Gauchar land development for the fodder cultivation to made fodder sustain village &amp; Avail green fodder in scarcity phase. With the support of Gauchar Seva Samiti Grassland development in Siracha – 85 Acre &amp; Zarpara – 25 Acre done which resulted in total production of 82 ton.</li> <li>The brief details of the said activities are incorporated in attached CSR Report for the FY 2020-21 attached as <b>Annexure – 2</b>.</li> <li>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.</li> </ul>
								<ul style="list-style-type: none"> <li>The overall cost incurred by APSEZ is INR 146.62 Lacs as a part of mangrove conservation plan.</li> </ul> <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 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</p>

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							<p>ha and during Phase III (2020-2021) it is 01 ha.</p> <p>Mangrove plantation done at Luni sea coast with fisher folk community during World Environment Day Celebration. Web talk show was organized on the occasion of "World Mangrove days On Multi species Mangrove bio diversity with Joint effort of GUIDE and Adani Foundation, Mundra. 8th June is celebrated as world ocean day. Adani foundation had celebrated the world ocean day by coastal cleaning activity at Juna Bandar, Luni Bandar and Bavadi Bandar.</p> <p>Mangroves nursery is developed in a Khari creek behind IOCL &amp; 50,000 Nos. of new saplings are planted in creek area by APSEZ.</p>
9.3	Outfall from the thermal power plants desalination and CETP would pose certain level of impact on the marine environment	Level-1	<p>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.</p> <p>APSEZ and respective power plants in the study area have been monitoring the</p>	All approved marine outfalls shall be monitored for salinity, temperature and other designated parameters as per consent to establish issued by	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&amp;CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. 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&amp;CC accredited agency namely M/s. Unistar Environment &amp; 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>

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	ent.		marine water quality status on monthly basis for the stipulated environmental and ecological parameters.	GPCB. Existing marine environmental monitoring program shall be continued.			<table><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><tr><td>Temp.</td><td>°C</td><td>30.2</td><td>30.4</td><td>28</td><td>29</td></tr><tr><td>Salinity</td><td>ppt</td><td>41.8</td><td>39.7</td><td>34.9</td><td>36.1</td></tr></table> <p>As per above results, it can be seen that there is no major deviation in the concentration of parameters and thus indicates that impacts are insignificant.</p>	Parameter	Unit	Max		Min		CIA	Present	CIA	Present	Temp.	°C	30.2	30.4	28	29	Salinity	ppt	41.8	39.7	34.9	36.1
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9.4	<b>Terrestrial Ecology:</b> Study area doesn't have any notified national parks or ecological sanctuaries. Since the area falls under dry deciduous shrubs.	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 plantation. APSEZ have undertaken a plantation with about 9.6 Lakh fully grown trees.	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 more than 700 Ha. area as greenbelt with plantation more than 10 Lacs saplings within the APSEZ area including SEZ industries &amp; 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>Total expenditures of the horticulture dept. of APSEZ during the FY 2020-21 within APSEZ is INR 689 lakh.</p>																						



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	Due to scanty rains in the area, the overall natural green-cover/vegetation in the area is very small.						
10	<b>Socio-economic aspects</b>						
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 area could be possible due to	Level-1	Dedicated townships are developed within APSEZ area with necessary community infrastructures such as hospital, school, recreational facilities, 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	The existing townships will be expanded to accommodate about 4 lakh people when the project activity is fully developed.	APSEZ	As and When Required	<p>APSEZ has developed two townships (Shantivan and Samudra) accommodating 2180 households and associated infrastructure facilities. Accommodation is made available for all interested employees working within Adani group &amp; SEZ industries. Out of which 89% Occupancies are accommodated within the townships and rest are available for employees working within APSEZ.</p> <p>At present 45 nos. of industries (processing &amp; non-processing) are operating within the SEZ. Township facilities are also made by SEZ industries within 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. The existing social infrastructure facilities are adequate to accommodate the people considering present APSEZ development. The existing townships with associated facilities</p>

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	induced economic growth in the region. Increase in population will have a additional need for public infrastructure in the region.		Rs. 97 Cr has been spent on various CSR activities in the Mundra region since 2010. Similar community development programs (based on need based assessment) will be continued in future as well with allocation of appropriate budget.				<p>will be expanded as per requirement. Other infrastructure facilities have been developed for people are as follows.</p> <ul style="list-style-type: none"> <li>• Multi-Specialty Hospital</li> <li>• School</li> <li>• Commercial complex</li> <li>• Religious place</li> </ul> <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"> <li>• Community Health</li> <li>• Sustainability Livelihood – Fisher Folk</li> <li>• Education</li> <li>• Rural Infrastructures</li> </ul> <p>Adani foundation has spent approx. INR 4554.45 lakhs from April – 2018 to Sep – 2020 for CSR activities including cost of rural infrastructure projects development.</p> <p>Major works carried out since April 2018 as a part of CSR activities are as below.</p> <ul style="list-style-type: none"> <li>• Pond Deepening work at Vadala &amp; Mota Bhadiya</li> <li>• Artificial recharge borewell in Borana, Mangara &amp; Dhrub village.</li> <li>• Under Dignity of Drivers Project, Adani Foundation has constructed Resting Shed for Drivers entering in SEZ Premises. Total 50 beds are constructed, drinking water and sanitation plus recreational – TV Facilities.</li> <li>• Construction of 45 Toilet block and proper bathing place for labours.</li> <li>• RO Plant – Samaghogha, Siracha village &amp; Vallabh Vidyalaya at Mundra</li> </ul>

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							<ul style="list-style-type: none"> <li>Basic sanitation facility (18 Nos) at Balvadi, medical centre and retiring places at labour settlements</li> <li>Ground recharge activities (pond deepening work for more than 52 ponds) individually and 26 ponds under Sujlam Suflam Jal Abhiyan were built leading to a significant increase in water table and higher returns to the farmers.</li> <li>Roof Top Rain Water Harvesting 54 Nos. and Recharge Bore well 75 Nos.</li> <li>Drip Irrigation 823 Farmers benefitted in coordination with Gujrat Green Revolution Company</li> <li>Participatory Ground Water Management in ten villages with holistic approach for Kankavati Sandstone Aquifer Programme.</li> <li>Bund construction on way of Nagmati River could save more than 575 MCFT water quantity which recharged in ground due to which bore well depth decreased by 50-100 Ft in Zarpara, Bhujpur and Navinal Vadi Vistar.</li> <li>Development of Prisha Park at Mundra.</li> <li>Pond Bund strengthening at Zarpara Village</li> <li>Approach Road Restoration at all Fisher folk vasahat.</li> <li>Garden Development at Primary School Rampar village</li> <li>Shed Development at Shukhpurvah Mundra</li> <li>Under Gram Utthan Project, Adani Foundation is supporting home biogas to farmers to Uthhan Villages phase wise. Current year supported <b>117 home biogas</b> in Dhrub, Zarpara and Navinal Villages.</li> <li>Adani Foundation at Mundra-Kachchh has initiated multi-species plantation of mangroves in Kachchh in association with GUIDE. 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.</li> <li>Sea Weed Culture - A pilot cultivation facility (5 KL tanks in 6 nos) for the farming of different economically important seaweeds in the tanks on the onshore has been established and commenced the cultivation trials with red sea weeds Kappaphycus alvarezii, Gracilaria dura and green sea weed Ulva. The initial trials have given</li> </ul>

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							<p>very promising results and harvested 6-7 times the seeded material in a 40-45 days cultivation period.</p> <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) 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	Level-2	Adani foundation is taking up several girl child education programs as part of CSR activities to create awareness about girl child protection.	Suitable regional level awareness programs on the girl child protection and encouragement programs in line with state and national policies shall be adopted under Corporate Social Responsibility programs in association with district authorities.	APSEZ, Other development projects and District Administration*	Long Term	<p>Major works carried out since April 2018 as a part of CSR activities to create awareness about girl child protection are as below.</p> <ul style="list-style-type: none"> <li>The Adani Foundation provided scholarship support to motivation and encouragement of fishermen boys and girls for higher education under this program. APSEZ provide 100% fees support to girls as a scholarship. This year total 59 students are being facilitated by Adani foundation.</li> <li>Separate sanitation facilities for girl child in schools.</li> <li>Total 8770 haemoglobin screenings of RPA woman and adolescent girls was carried out in year 2017-18. Which helps in controlling anaemia in women and indirectly malnutrition.</li> <li>Beti Vadhavo Programme was organized in 32 Villages in the presence of Village Sarpanch and other leaders in year 2017-18. We explained people about the various topics i.e. importance of girl child, Sex Ratio, Gender Equality and laws regarding Child abortion. This initiative was well accepted by community and we have observed a visible change in their mindset. We have facilitated 560 daughters with Kit (Small Bed sheet, Mosquito net, Soap and Cream with nutritious food for mother) To create awareness about health, personal hygiene, child education and nutritional diet in fishermen community, various awareness programs have been organized.</li> <li>During the year various activity like, Covid-19 awareness in village &amp; Slum Area, Menstrual Hygiene Day, Breastfeeding</li> </ul>

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	growth in the region.						<p>Week, National Deworming Day, National Nutrition Month had been celebrated.</p> <ul style="list-style-type: none"> <li>Project Suposhan is initiated with the Motive ... Curb malnutrition amongst Children, Adolescent girls and Women in our CSR villages. <ul style="list-style-type: none"> <li>✓ 100 beneficiaries covered in Menstrual Hygiene Day - with slogan called "RED-ACHHA HAI"</li> <li>✓ 204 beneficiaries covered in Breastfeeding Week</li> <li>✓ 320 beneficiaries covered in National Deworming Day</li> <li>✓ 20 villages covered in celebration of NATIONAL NUTRITION MONTH</li> <li>✓ 42 FAMILY COUNSELLING</li> </ul> </li> <li>To reduce malnutrition and anemia amongst Children 95 % &amp; adolescent girls and pregnant &amp; lactating women by 70 % in three years</li> <li>Reduction IMR and MMR</li> <li>Support Awareness &amp; Cover 100 % Vaccination taken by Child &amp; women.</li> <li>SuPoshan Thanksgiving program was organized. In this webinar DDO, CDPO Mundra and other dignitaries remained present and appreciated the efforts to overcome malnourishment in Mundra and Bitta.</li> <li>The National girl child day was celebrated with ICDC Department with Vahli Dikri Yojna form filling, paediatric health camp and Baby health kit distribution at Mundra. Mrs. Ashaben-CDPO Mundra was remain present in this event. Total 61 forms has received approval letter from GOG and 15 forms filled upon the same day.</li> </ul> <p>About Rs. 45.54 Cr has been spent on various CSR activities in the Mundra region since April 2018 till Mar 2021 including cost of community health and education for woman and girl child.</p>



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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 Lakh from induced growth by the year by 2030 (fully developed scenario), total hospitals facilities with about 540 beds	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 hospital at Mundra has been catering the services ranging from wellness and preventative care.	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 last year are as below.</p> <p><b><u>Community Health – Mundra</u></b> <b><u>Community Health – Mundra</u></b></p> <table border="1"><thead><tr><th colspan="4">Community Health All Project Patient Details</th></tr><tr><th>Project</th><th>Direct Beneficiary</th><th>In-Direct Beneficiary</th><th>No. of Villages</th></tr></thead><tbody><tr><td>Medical Mobile van</td><td>16611</td><td>66476</td><td>33</td></tr><tr><td>Rural Clinic</td><td>15797</td><td>63192</td><td>11</td></tr><tr><td>Medical Supports</td><td>1008</td><td>5040</td><td>63</td></tr><tr><td>Dialysis Supports</td><td>474</td><td>2370</td><td>63</td></tr><tr><td>Senior citizen</td><td>5836</td><td>17508</td><td>63</td></tr><tr><td>Health camp</td><td>19461</td><td>58383</td><td>11</td></tr><tr><td><b>TOTAL</b></td><td><b>59187</b></td><td><b>212979</b></td><td></td></tr></tbody></table> <ul style="list-style-type: none"><li>• 11 Rural Clinic – 8 from Mundra &amp; 3 from Anjar block treated; <b>8196 patients.</b></li><li>• The mobile health care unit cover <b>25 villages and 07 fishermen settlements.</b> Around 90 types of general life saving medicines are available in these units.</li><li>• Rural Dispensaries are established where there is a gap in the healthcare services. The Adani Foundation operates Rural Dispensaries in 7 villages of <b>Mundra block, 03 villages of Anjar block and 1 in Mandvi Block.</b> Mobile dispensary and rural clinics provide</li></ul>	Community Health All Project Patient Details				Project	Direct Beneficiary	In-Direct Beneficiary	No. of Villages	Medical Mobile van	16611	66476	33	Rural Clinic	15797	63192	11	Medical Supports	1008	5040	63	Dialysis Supports	474	2370	63	Senior citizen	5836	17508	63	Health camp	19461	58383	11	<b>TOTAL</b>	<b>59187</b>	<b>212979</b>	
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<b>TOTAL</b>	<b>59187</b>	<b>212979</b>																																									

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
	would be required.						<p>health services with token charge of <b>10/- rupees per patient</b> daily by a doctor and a volunteer.</p> <ul style="list-style-type: none"> <li>During the year 2020-21, total <b>5836</b> transactions were done by <b>8711 card holders of 68 villages</b> of Mundra Taluka. They received cash less medical services under Health Card to Senior Citizen project.</li> <li>In the year of 2020-21 total <b>97 people</b> had been benefitted by various kind of speciality camp and needy and screened patients are treated in Adani Hospital.</li> <li>Total <b>20959 patients</b> benefited in year 2020-21 from 55 different villages in Adani Hospital, Mundra.</li> <li>The TDO, THO, Flying Foundation, Ayurved Dept. has support in UKADO and Vitamin-C tablets distribution activities. Total <b>18240 people</b> had get benefits of UKADO and Vitamin-C tablets.</li> </ul> <p>Adani foundation has spent approx. INR 4554.45 lakhs from April – 2018 to Mar – 2021 for CSR activities cost including cost of community health.</p> <p>Present Hospital facilities are adequate to avail the medical treatment for Mundra region considering present development. Other Occupational Health centres, primary health centres and community health centres are also in place in Mundra to take care the people residing in Mundra. Adani group is also operating high quality health care services to the people of Kutch at G. K. General Hospital, Bhuj having 750 beds facilities on public private partnership (PPP) model, which is 60 km far from Mundra.</p> <p>APSEZ will explore other possibilities to augment the primary and secondary healthcare facilities in future depending on the future development at APSEZ.</p>
	Due to rapid economic		APSEZ has been giving preferences to people from Gujarat				<p><b>4830 Man-days</b> work was provided over <b>236 Fishermen family</b> during this six months by Adani Hospital. The Foundation has also supported Pagadiya fishermen as painting laborers by providing them with employment and job in various fields.</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/ E SMP	Responsible agency	Timeframe for implementation	Compliance
10.5	<p>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, which will be 45% of the total envisaged population</p>		<p>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 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.</p> <p>An industrial Training Institute is set up at APSEZ, Mundra, to enhance the skill levels of the local youth to maximum possible extent.</p>	<p>APSEZ is committed to provide support for fishermen livelihood activities and has submitted a detailed 5 years plan to MoEF&amp;CC with a total budget of Rs.13.5 Cr.</p>	APSEZ	Short Term	<p>Adani Skill Development Centre (ASDC) is playing a pivotal role in implementing sustainable development in the state. The objective of this Centre is to impart different kinds of training to the students of 10<sup>th</sup>, 12<sup>th</sup>, college or ITI from surrounding areas.</p> <ul style="list-style-type: none"> <li>During this year Total 606 (Soft Skill Training: 330 &amp; Technical Training: 276) people trained in various trainings to enhance socio economic development. Till date we admitted <b>221 candidates in domain courses and 263 candidates in non-domain courses</b>. Now we started offline training with following all Covid-19 related guidelines.</li> <li>Online mud work training has been organized by ASDC Mundra, after training <b>28 students</b> became self-employed.</li> <li>Beneficiaries of fisherman communities till date               <ol style="list-style-type: none"> <li>444 Book Support</li> <li>733 Vehicle transportation from Bandar to AVMB</li> <li>86 Cycle Support</li> <li>481 Scholarship Support</li> <li>280 15 Potable water provision</li> <li>370 Youth Employment</li> <li>2561 Fishing Net &amp; Equipment Support</li> <li>195 Linkages with Fisheries Scheme</li> <li>3504 Ramaotsav Community Engagement</li> <li>17 Fisherman Sea Weed Culture.</li> </ol> </li> </ul> <p>APSEZ is carrying out various initiatives specific to the Fisherfolk community which includes:</p> <ul style="list-style-type: none"> <li>Vidya Deep Yojana</li> <li>Vidya Sahay Yojana – Scholarship Support</li> <li>Adani Vidya Mandir</li> <li>Fisherman Approach in SEZ</li> <li>Machhimar Arogya Yojana</li> </ul>

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
	in Mundra Taluk by the end of 2030.						<ul style="list-style-type: none"> <li>• Machhimar Kaushalya Vardhan Yojana</li> <li>• Machhimar Sadhan Sahay Yojana</li> <li>• Machhimar Awas Yojana</li> <li>• Machhimar Shudhh Jal Yojana</li> <li>• Sughad Yojana</li> <li>• Machhimar Akshay kiran Yojana</li> <li>• Machhimar Suraksha Yojana</li> <li>• Machhimar Ajivika Uparjan Yojana</li> <li>• Bandar Svachhata Yojana</li> </ul> <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, Mar'21 approx. 9.42 Cr. INR, has already been spent in support for fishermen livelihood activities.</p>

**ANNEXURE – A**



**POLLUCON** LABORATORIES PVT. LTD.

**TEST REPORT FOR WATER SAMPLE**

QF/7.8/19-WT

Page: 1 of 1

Customer's Name and Address :

**M/s. ADANI PORT AND SPECIAL ECONOMIC ZONE LIMITED**  
**C/O. ENVIRONMENT CELL, 3<sup>rd</sup> FLOOR,**  
**ADANI HOUSE NAVINAL ISLAND, VILLAGE-MUNDRA,**  
**TALUKA-MUNDRA, DIST-KUTCH-370421**

Test Report No. : **PL/AM 0451**

Issue Date : **10/09/2020**

Customer's Ref. : **As Per W.O.**

Description of Sample : **W.B. Dump Pond Water**

Sampling Date : **21/08/2020**

Quantity/No. of Samples : **05 Lit/One**

Sampling By : **Pollucon Laboratories Pvt. Ltd.**

Sampling Procedure : **Grab**

Sample Receipt Date : **22/08/2020**

Lab ID : **AM/2008/137Q**

Packing/ Seal : **Sealed**

Test Parameters : **As per table**

Date of Starting of Test : **22/08/2020**

Date of Completion : **31/09/2020**

**RESULT TABLE**

SR NO	TEST PARAMETERS	UNIT	RESULT	TEST METHOD
			W.B. Dump Pond Water	
1	Colour	Co-pt	5.0	IS 3025 (Part – 4) 2017
2	Odour	--	Agreeable	IS 3025 (Part – 5) 2018
3	Total Suspended Solids	mg/L	14	IS 3025 (PART – 17) 2017
4	pH	--	2.84	IS 3025 (Part – 11) 2017 Electrometric Method
5	Temperature	°C	30.2	IS 3025 (PART-9) 2017
6	Oil & Grease	mg/L	Not Detected	IS 3025 (Part-39) 2019
7	Total Residual Chlorine	mg/L	Not Detected	APHA(23 <sup>rd</sup> Edition 2017) 4500 Cl G-DPD colorimetric method
8	Ammonical Nitrogen	mg/L	1.65	IS 3025 (Part-34) 2019 Nesslerization Method
9	BOD	mg/L	5.0	IS 3025 (PART-44) 2019
10	COD	mg/L	52	APHA (23rd Edition 2017) 5220 B Open Reflux Method
11	Arsenic as As	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3114 B
11	Mercury as Hg	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3112 B
12	Lead as Pb	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3111 B
13	Cadmium as Cd	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3111 B

Continue...

*Mack*

**MackySuraliwala**  
**Sr. Scientist**

*Arun*

**Dr. ArunBajpai**  
**Lab Manager (Q)**

Note: This report is subject to terms & conditions mentioned overleaf.

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Navjivan Circle,Udhana Magdalla Road, Surat-395007, Gujarat, India.

Phone : 0261-2635750, 0261-2635751, 0261-2635775, 07016605174, WEB: www.polluconlab.com, E. mail: pollucon@gmail.com, info@polluconlab.com





**POLLUCON** LABORATORIES PVT. LTD.

### TEST REPORT FOR WATER SAMPLE

QF/7.8/19-WT

Page: 1 of 1

Customer's Name and Address :

**M/s. ADANI PORT AND SPECIAL ECONOMIC ZONE LIMITED**  
**C/O. ENVIRONMENT CELL, 3<sup>rd</sup> FLOOR,**  
**ADANI HOUSE NAVINAL ISLAND, VILLAGE-MUNDRA,**  
**TALUKA-MUNDRA, DIST-KUTCH-370421**

Test Report No. : **PL/AM 0451**

Issue Date : **10/09/2020**

Customer's Ref. : **As Per W.O.**

#### RESULT TABLE

SR NO	TEST PARAMETERS	UNIT	RESULT	TEST METHOD
			W.B. DUMP Pond Water	
14	Hexavalent Chromium as Cr <sup>+6</sup>	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3500 Cr B Colorimetric method
15	Total Chromium	mg/L	Not Detected	APHA(22nd Edi)3500Cr B Colorimetric method
16	Copper as Cu	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3111 B
17	Zinc as Zn	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3111 B
18	Selenium as Se	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3114 B
19	Nickel as Ni	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3111 B
20	Cyanide as CN	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 4500 CN E Colorimetric Method
21	Fluorides as F	mg/L	0.55	APHA (23 <sup>rd</sup> Edition 2017) 4500 F D SPANDS Method
22	Dissolved Phosphate as P	mg/L	0.015	IS 3025 (Part-16) 2017
23	Sulphides as S	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 4500 S2 F Iodometric method
24	Phenolic Compound as C <sub>6</sub> H <sub>5</sub> OH	mg/L	Not Detected	IS 3025 (Part - 43) 2019 Aminoantipyrine Method
25	Bio-assay Test	%	95%	OECD 203 B/IS: 6582-2001
26	Manganese as Mn	mg/L	0.06	IS 3025 (Part - 46) 2019 EDTA Method
27	Iron as Fe	mg/L	0.11	APHA (23 <sup>rd</sup> Edition 2017) 3111 B
28	Vanadium as V	mg/L	Not Detected	APHA (23 <sup>rd</sup> Edition 2017) 3111 B
29	Nitrate Nitrogen as N	mg/L	0.15	IS 3025 (Part-34) 2019 Spectrophotometry

Not Detection Limit: Oil & Grease :1.0 mg/L, Total Residual Chlorine:0.1mg/L, Arsenic as As : 0.1 mg/L, Mercury as Hg:0.001 mg/L, Lead as Pb : 0.005 mg/L, Cadmium as Cd : 0.004 mg/L, Total Chromium : 0.025 mg/L, Copper as Cu : 0.02, Zinc : 0.06 mg/L, Selenium as Se:0.5mg/L, Hexavalent Chromium as Cr+6:0.05mg/L, Nickel as Ni:0.02 mg/L, Cyanides as CN: 0.001 mg/L, Sulphides as S:0.1, Phenolic Compound as C<sub>6</sub>H<sub>5</sub>OH:0.01mg/L, Vanadium as V:0.01

*Mack*  
**MackySuraliwala**  
**Sr. Scientist**

*Arun*  
**Dr. ArunBajpai**  
**Lab Manager (Q)**

Note: This report is subject to terms & conditions mentioned overleaf.

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Navjivan Circle,Udhana Magdalla Road, Surat-395007, Gujarat, India.

Phone : 0261-2635750, 0261-2635751, 0261-2635775, 07016605174, WEB: www.polluconlab.com, E. mail: pollucon@gmail.com, info@polluconlab.com

# **Annexure – 11**

## Chiragsing Rajput

---

**From:** Azharuddin Kazi  
**Sent:** Tuesday, September 22, 2020 1:11 PM  
**To:** Chiragsing Rajput  
**Subject:** FW: Mangrove conservation plan

---

**From:** Shalin Shah  
**Sent:** Tuesday, September 22, 2020 1:00 PM  
**To:** Azharuddin Kazi <Azharuddin.Kazi@adani.com>  
**Cc:** Haresh Bhatt <Haresh.Bhatt@adani.com>  
**Subject:** FW: Mangrove conservation plan

For necessary record and compliance.

Shalin

---

**From:** S. M. Saiyad, IFS ( Director, Env.) [ <mailto:direnv@gujarat.gov.in> ]  
**Sent:** 22 September 2020 12:51  
**To:** Shalin Shah  
**Cc:** [ashokchauhan1971@gmail.com](mailto:ashokchauhan1971@gmail.com); gaurangbhatt22  
**Subject:** Mangrove conservation plan

**\*CAUTION:** This mail has originated from outside Adani. Please exercise caution with links and attachments.\*

*Respected Sir,*

As decided in 45<sup>th</sup> meeting of the Gujarat Coastal Zone Management Authority (GCZMA) was held on 04-10-2019 under chairmanship of Dr. Rajiv Kumar Gupta, IAS, Additional Chief Secretary, Forests & Environment Department and Chairman, GCZMA in the Committee Room, Forests and Environment Department, Gandhinagar .

The Authority has approved Adani Port and SEZ Ltd. mangrove conservation plan with following conditions:

1. The APSEZL shall carry out annual compliance monitoring of the mangrove conservation area.
2. The APSEZL shall explore the possibility for taking necessary adequate measures to reduce the erosion near Bocha island.
3. The approval of mangrove conservation plan shall not be considered as any permission under CRZ Notification for dredging activity.
4. There should not be blockage of any drainage line and free flow of water is to be maintained, as flushing of mangrove areas is very essential.
5. The APSEZL shall carry out mangrove monitoring every two years and submit the data to Forest Department/GCZMA and MOEF&CC, GOI

You are directed to comply the above mentioned conditions.

Thanking You,

With regards,

**S. M . Saiyad, IFS**

**Director (Environment) & Member Secretary**

**Gujarat Coastal Zone Management Authority**

Forest & Environment Department

Sachivalaya, Gandhinagar

Tel: 079-23252660

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# **Annexure – 12**



**Report on Comprehensive and Integrated plan for  
preservation and conservation of mangroves and associated  
creeks in and around the Adani Ports and Special Economic  
Zone Ltd., Mundra, Gujarat**



**Submitted to**

**M/s Adani Ports and Special Economic Zone Ltd  
Mundra**

**Prepared by**

**National Centre for Sustainable Coastal Management  
Ministry of Environment, Forest and Climate Change  
Chennai**

**March, 2021**

## Progress report on Monitoring of mangrove distribution in creeks in and around APSEZ and shoreline changes in Bocha island

### 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. 15<sup>th</sup> July, 2014 & 12<sup>th</sup> 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 18<sup>th</sup> Sept. 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 Baradimata and others.*

*(v) NCSCM will prepare the plan in consultation with NIOT, 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.*

### 2. Compliance to the EC conditions

Accordingly, Adani Ports and Special Economic Zone Limited (APSEZ) had requested the National Centre for Sustainable Coastal Management (NCSCM) for preparation of Comprehensive and Integrated plan for preservation and conservation of mangroves and associated creeks. The components of plan are analysis of mangrove health by comparing the coverage between 2011 and 2016, bathymetry of creeks, socio-economics of villages adjoining creeks of APSEZ. One of the key recommendations is monitoring of coverage of mangrove in the late 2019 and comparing its extent of distribution with the data reported

in 2016-17. As per reported in the Conservation plan there has been overall increase in mangrove area by 246 ha in 2016-17 in the creeks in and around APSEZ compared to 2011 indicating existence of near healthy conditions for growth of the mangroves. It was recommended that the trend of mangrove cover needs to be studied in Jan/March 2020 using satellite images of late 2019 and if the trend continues, only monitoring is needed. The Conservation plan was 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 22<sup>nd</sup> Sept 2020. The major recommendation relating to mangroves that were specified in the conservation plan are as follows:

2.1. There has been overall increase in mangrove area by 246 ha in 2016-17 in the creeks in and around APSEZ compared to 2011 indicating existence of near healthy conditions for growth of the mangroves. No action is needed at present except at Navinal creek, Bocha island and off Bocha creek. The trend of mangrove cover needs to be studied in Jan/March 2020 using satellite images of late 2019 and if the trend continues, only monitoring needed. The tidal range in the mangroves is also to be observed annually using tide poles to ensure that the flow of tidal water remains same as observed in April 2017 during the field study.

If degradation of mangroves to the extent of 10% due to inadequate seawater is observed in Kotdi and Baradimata creeks, initially the mouth areas need to be made free from silt. If tidal flow does not improve after one year and if the extended banks are noticed which might be due to siltation, silt need to be removed on the banks where there are no mangrove roots. If the tidal conditions still do not improve after one year, the interior parts of the creeks need to be dredged in a phased manner from 0.5 m to 1 m. Otherwise, the monitoring of mangrove needs to be carried out once in two years and whenever, degradation is noticed the above strategy needs to be implemented.

2.2. In the Navinal creek, if degradation of mangroves or reduction of mangrove cover by even 10% is noticed in 2020 due to decrease in tide water flow, dredging of Navinal creek from beyond port operation areas up to 4.5 km to increase the depth by 1 m in a phased manner must be taken up to facilitate increased tidal water flow into the mangrove areas of Bocha island. Otherwise, the monitoring of mangrove needs to be carried out once in two years and whenever, degradation is noticed the above strategy needs to be implemented.

The authority suggested to undertake compliance monitoring of the mangrove conservation area to comply the above recommendations and study the health of mangroves in creeks. Accordingly, APSEZ has requested NCSCM to monitor the mangrove coverage using the satellite images of 2019 and also to check the extent of shoreline changes in the eroding areas of Bocha Island which led to loss of about 5.33 ha of dense mangroves between 2011 and 2016-17.

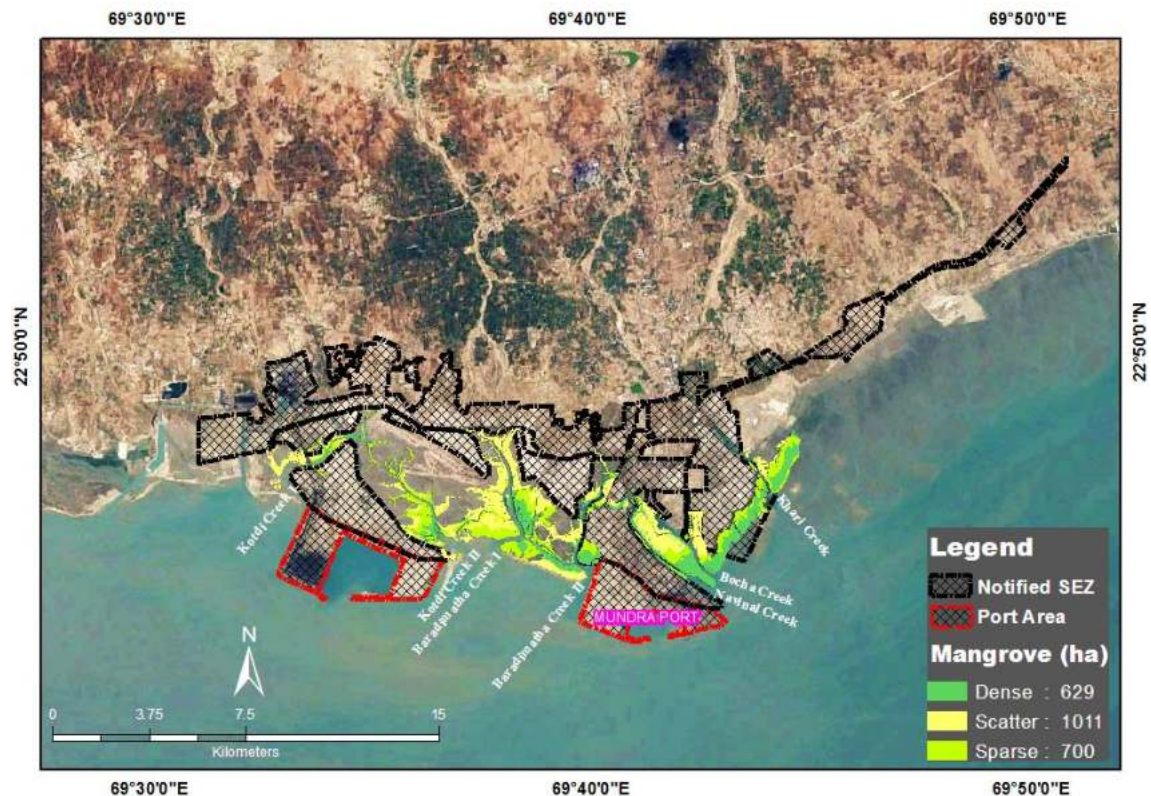
### 3. Scope of work

In order to comply with above recommendations relating to assessment of health of mangroves and also to assess the coastal erosion following activities are proposed:

- Procurement of high-resolution satellite images of late 2019/Jan 2020 and prepare GIS based maps on distribution of mangroves in creeks of APSEZ. Field validation of mangrove data collected (subject to COVID-19 conditions prevailing in the country)
- Comparative analysis on variation of mangrove coverage between 2016/17 and late 2019 using GIS techniques and drawl of inference on health of mangroves.
- Determination of shoreline changes at the reported eroding shoreline of Bocha island by comparing shoreline of 2016/17 with 2019.

### 4. Proposed Tasks

- In the Conservation plan prepared for creeks and mangroves of APSEZ, it was observed that there has been overall increase in mangrove area by 246 ha in 2016-17 in the creeks in and around APSEZ compared to 2011 indicating existence of near healthy conditions for growth of the mangroves. The extent of mangrove cover will be mapped in the creeks Kotdi (I & II), Baradimatha (I & II), Navinal, Bocha and Khari creeks using High resolution satellite images of late 2019. These creeks have been indicated in Fig.1.





**Fig.1. APSEZ area, creeks and mangrove formation along the creeks**

- ii. Change detection analysis using GIS tool will be carried out for Bocha Island to determine and mangroves will be categorized as scattered, sparse and dense. *{While categorizing mangroves in terms of their density, they have been classified as dense (mangrove plants both tall and stunted with gap between one tree and another being 2 m and less), sparse (shrubs with distance between patches being more than 2 m but less than 5 m) and scattered (shrubs with distance between patches being more than 5 m)}*. The changes from one category to other will be indicated as quantitative data along with locations in the GIS map.
- iii. Determination of shoreline changes in eroding areas of Bocha Island by comparing the shoreline of March, 2017 with shoreline as found in the satellite images of Sept. 2019 to understand the extent of increase/decrease of erosion and corroborating with underlying oceanographic parameters that cause erosion.

## 5. Tasks Completed

### 5.1. Tidal observations in the creeks in and around APSEZ

The technical personnel of APSEZ carried out the tidal observations at locations similar to 2017 in Kotdi, Baradimata, Navinal, Bocha and Khari creeks under the guidance of NCSCM. A Google earth image showing the locations where tidal observations made in December 2020 is placed in Fig.2. These observations made in a 24 hrs tide cycle using tide poles in December, 2020.

The observed tide levels are given in Annex 1. A comparison of tide levels recorded between April, 2017 and December, 2020 is given in Table 1.

**Table 1. Comparison of tide levels between April, 2017 and December, 2020 in creeks in and around APSEZ**

Creek	2017 (values in meters)			2020 (values in meters)		
	Max	Min	Range	Max	Min	Range
Kotdi I L 1	5.63	3.16	2.47	5.84	2.94	2.90
Kotdi I L 2	5.45	2.17	3.28	5.81	2.81	3.00
Kotdi II	5.60	2.98	2.62	6.08	1.38	4.70
Baradimata I L 1	4.83	3.59	1.24	6.08	2.88	3.20
Baradimata II L 1	5.55	4.01	1.54	5.90	0.50	5.40
Baradimata II L 2	4.89	0.53	4.36	6.11	3.41	2.70
Navinal L 1	5.21	3.42	1.79	6.01	3.41	2.60
Navinal L 2	5.20	3.76	1.44	6.18	1.98	4.20
Navinal L 3	5.18	3.54	1.64	6.10	1.14	4.96
Bocha L 1	5.81	2.99	2.82	6.16	1.06	5.10
Bocha L 2	5.75	3.87	1.88	6.03	2.53	3.50
Bocha L 3	5.75	3.44	2.31	5.88	1.48	4.40
Khari L 1	6.15	4.07	2.08	6.01	1.71	4.30





Figure 2: Google image showing locations of tide observations

As the tides primarily follow lunar cycle of the year, there are natural variations in tidal ranges among months in a year. An analysis tide values at selected locations (indicated as L in table 1) reveals existence of higher tidal ranges at most of the locations in 2020 compared to the year 2017. Though such variations are attributed year to year variation in high tide levels in a 19 year lunch cycle, it also indicates prevalence of good tidal ranges in the observed locations revealing normal flow of tides around the observed locations. A comparison of mangrove health with tidal observations through a general inference of availability of tidal water all along the creeks leading to presence of mangroves in categories mostly to the level of 2017, a few locational changes in mangrove categories were observed viz., from dense to sparse and scatter and vice versa. These changes have been described in the respective sections below.

## 5.2. Procurement of High Resolution satellite imagery

Enquiries were made with National Remote Sensing Centre (NRSC) who are the only authorized distributor of satellite images in India, for availability of high resolution satellite imagery especially multi-spectral images similar to the images used to study the mangrove distribution i.e., 0.6m PAN and 2.0 m multispectral data from World view 2 foreign satellite. NRSC has intimated that a procurement procedure for e-purchase of images acquired by foreign satellite is being evolved and it would take considerable time to finalise the procedure. Further, NRSC also informed that no Indian satellite has facility for capturing 2.5m multi-spectral image data. As there are uncertainties in the acquisition of the images from World view 2 satellites during the period of progress report preparation, an effort has been made to use freely available open source Google earth images which is a merged product of 0.65 PAN and 2.5m Multi-spectral data. It has limitations as it is not a digital data and the mangroves details are obtained from Google earth images by directly digitizing from the computer screen. There could be possible error of less than 10 % in mangrove categorization (as dense, sparse and scatter) and also extent of total coverage in terms of hectare. The methodology adopted to map the distribution of mangroves is similar to the method mentioned in the Conservation plan report except the source of satellite image. The present report on mangrove distribution is based on Google images of March, 2017 and Sep 2019, as cloud free images are available only for these dates.

## 5.3. Monitoring on distribution of mangroves in creeks in and around APSEZ to assess their health conditions

### 5.3.1. Overall assessment

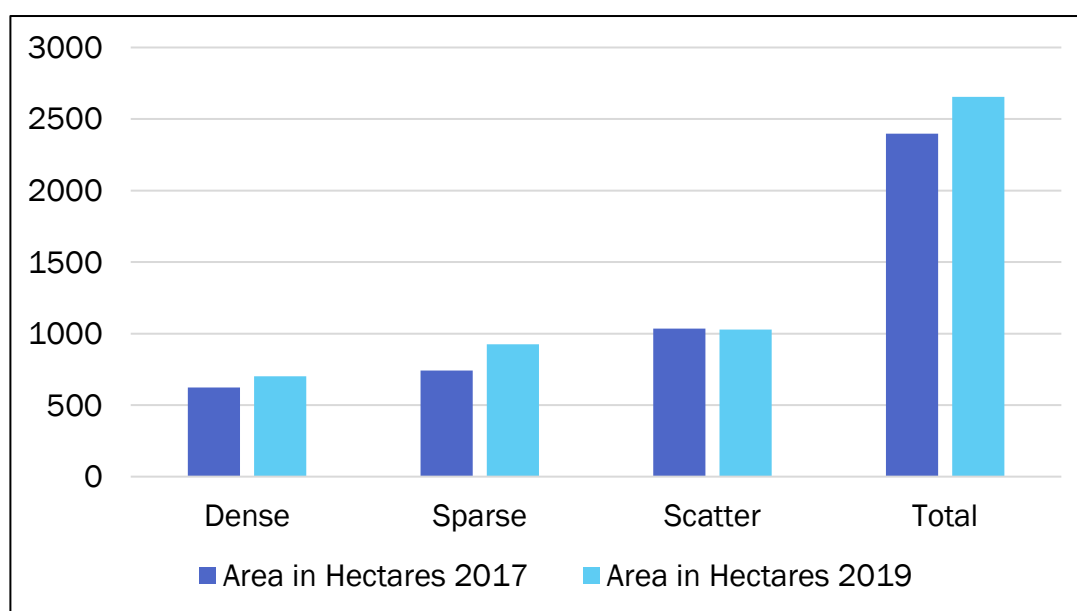
The Kotdi, Baradimata, Navinal, Bocha and Khari creeks experience high tidal ranges up to 6m and with average tidal range of 2 to 4.5m which varies annually. The creeks have mangrove formation due to muddy substratum and the mangroves are tide fed and tidal flow in to the mangroves occurs only during high tide. This makes the mangroves as inter-tidal one and any change of tidal conditions in the creeks affect the growth and distribution of mangroves.

Distribution of mangroves in Kotdi, Baradimata, Navinal, Bocha and Khari creeks and also in Bocha island was studied using Google earth images (2017 March and 2019 Sep). The data obtained for 2017 i.e., 2398 ha was compared with data reported for 2016 (Dec) - 2017 (Jan & Feb) i.e., 2340 ha in the Conservation plan submitted earlier. The Google earth showed a marginal difference of + 58 ha (compared to earlier 2016-17 data) which shows 2.4% higher and the difference can be considered as insignificant.

Further for both the start year (2017 March) and the end year (Sep.2019) Google earth image was used as a source and therefore, the results will be quite acceptable for assessment. With regard to overall health of mangroves in the creeks in and around APSEZ, it was found that there was an increase of mangrove cover between March 2017 and Sep 2019 to an extent of 256 ha which is about 10.7% increase in mangroves. It reveals that the mangrove and the tidal system in the creeks remained undisturbed over this period (Table 1 and Figs.1 to 3). Analysis of data between categories indicated that there was an increase in dense mangroves and also conversion of scattered to sparse which also shows that the growth of mangroves in a progressive direction (Table 2 and Figs 3 to 5).

**Table 2: Data on distribution of various categories of mangroves in the creeks in and around APSEZ in 2017 and 2019**

Category	Area in Hectares	
	2017	2019
Dense	623	701
Sparse	741	925
Scatter	1034	1028
<b>Total</b>	<b>2398</b>	<b>2654</b>



**Figure 3: Comparison of various categories of mangroves in creeks of APSEZ between 2017 and 2019**





Figure.4. Google earth image showing GIS output on distribution of various categories of mangroves in March 2017



Figure 5: Google earth image showing GIS output on distribution of various categories of mangroves in March 2019

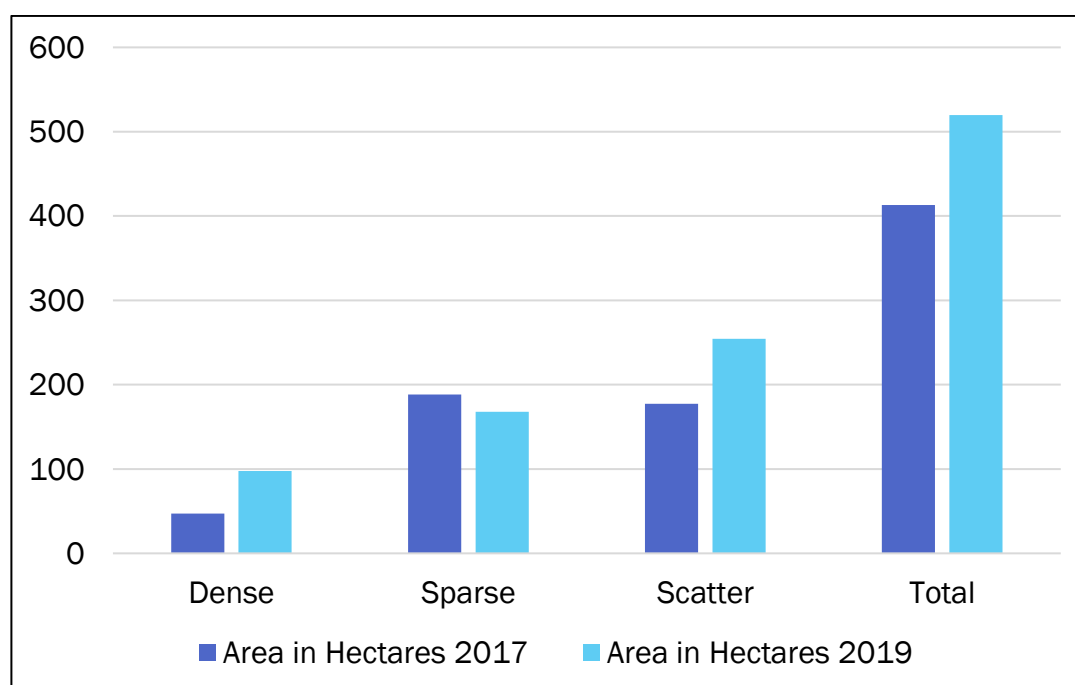
### 5.3.2. Creek wise assessment

#### a. Kotdi creek

The Kotdi creek with two mouths, named as Kotdi I on the western end of South Port of Adani and Kotdi II east of Kotdi I experience tidal flow up to 4.5 km in Kotdi I and up to 7.4 km in Kotdi II during high tide periods. The tidal range observed in 2020 is 2.9 to 4.7m. During the period of study, the creek showed significant growth of all categories of mangroves and the overall increase in Sep 2019 compared to March, 2017 was to the extent of 106.86 ha which is about 25.9%. It is also worth noting that dense mangroves have increased by 106.5% (Table 3 and Fig.6 to 8). While the sparse category marginally decreased to the extent of 20.8 ha, the scatter ones increased by 77.3 ha. (Table 3 Figs 6 to 8). The results reveal good tidal flow in the creeks of Kotdi during the period of investigation and the mangroves are generally in good health condition. Marginal decrease of sparse category and increase of area of scatter are mainly due to transitional changes which are natural in mangrove distribution.

**Table 3. Distribution of mangroves in Kotdi creek system in 2017 and 2019**

Category	Area in Hectares	
	2017	2019
Dense	47.25	97.59
Sparse	188.50	167.70
Scatter	177.20	254.52
Total	412.95	519.81



**Figure 6: Comparison of mangrove distribution between 2017 and 2019 in Kotdi creek system.**



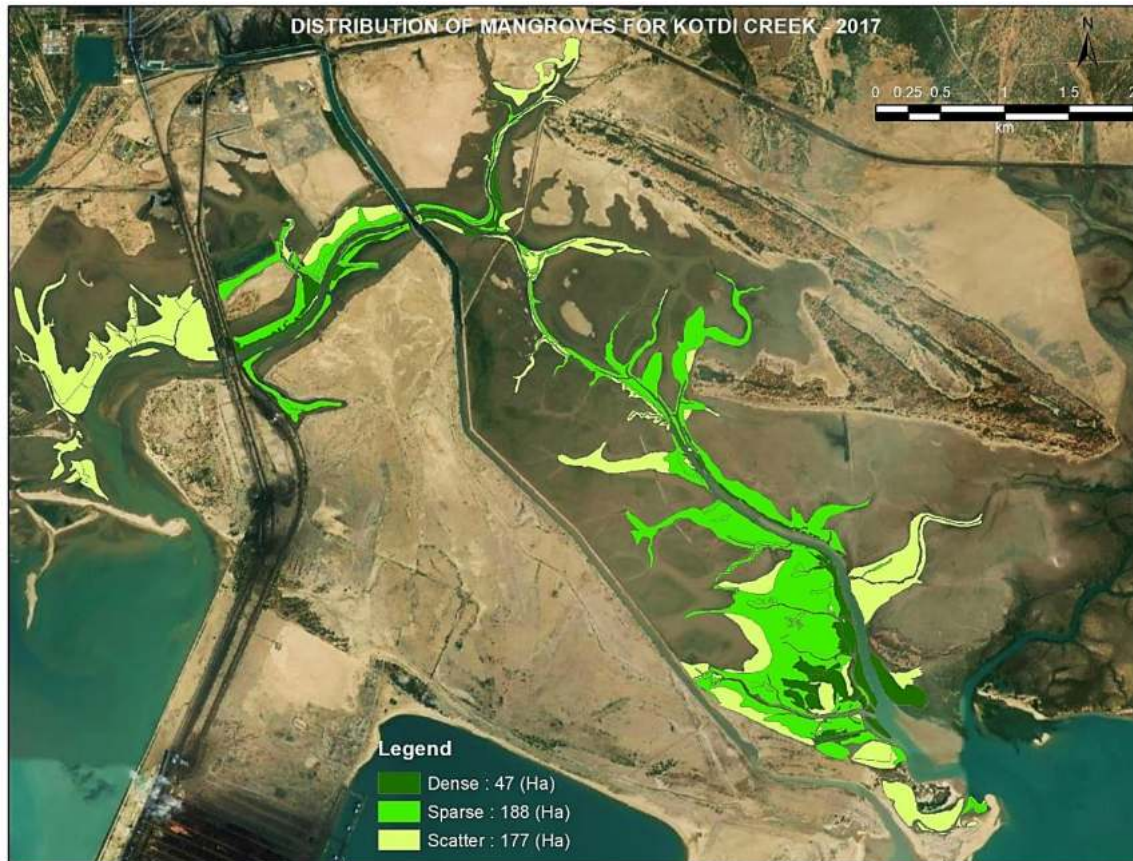


Figure 7: Distribution of mangroves in 2017 in Kotdi creek system.

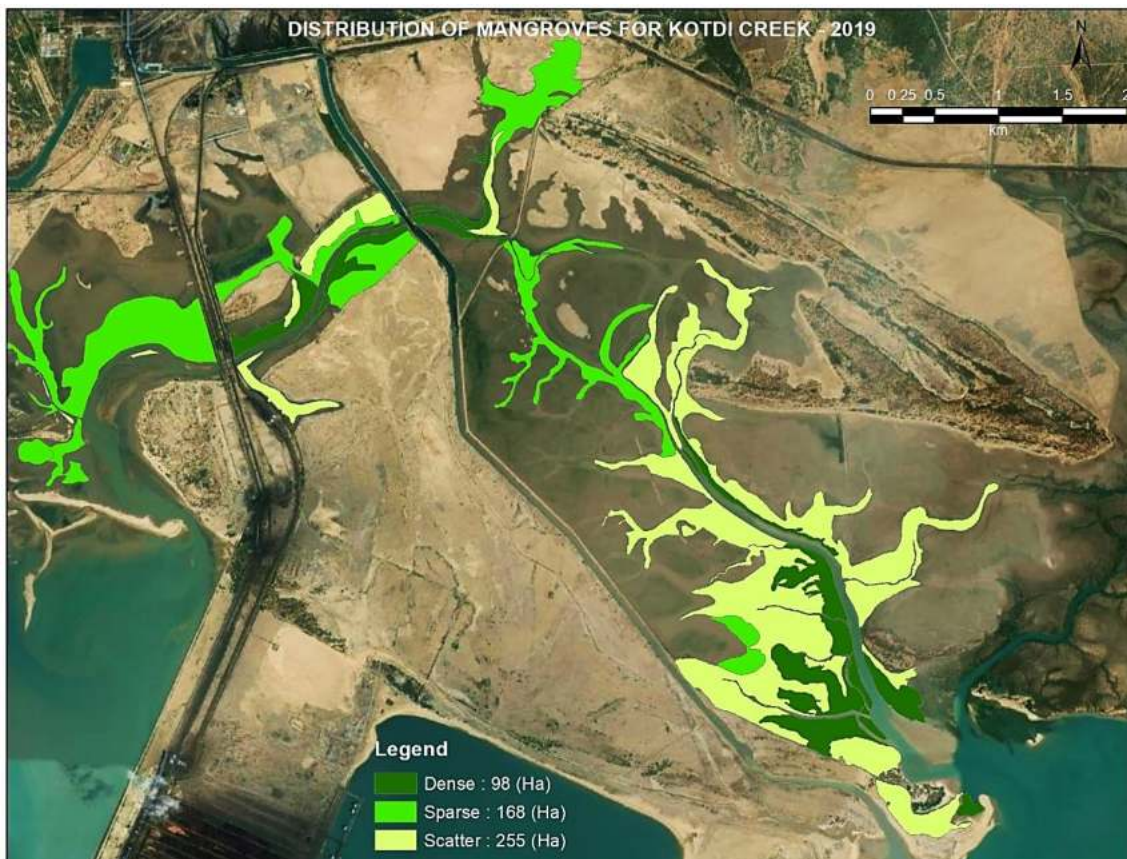


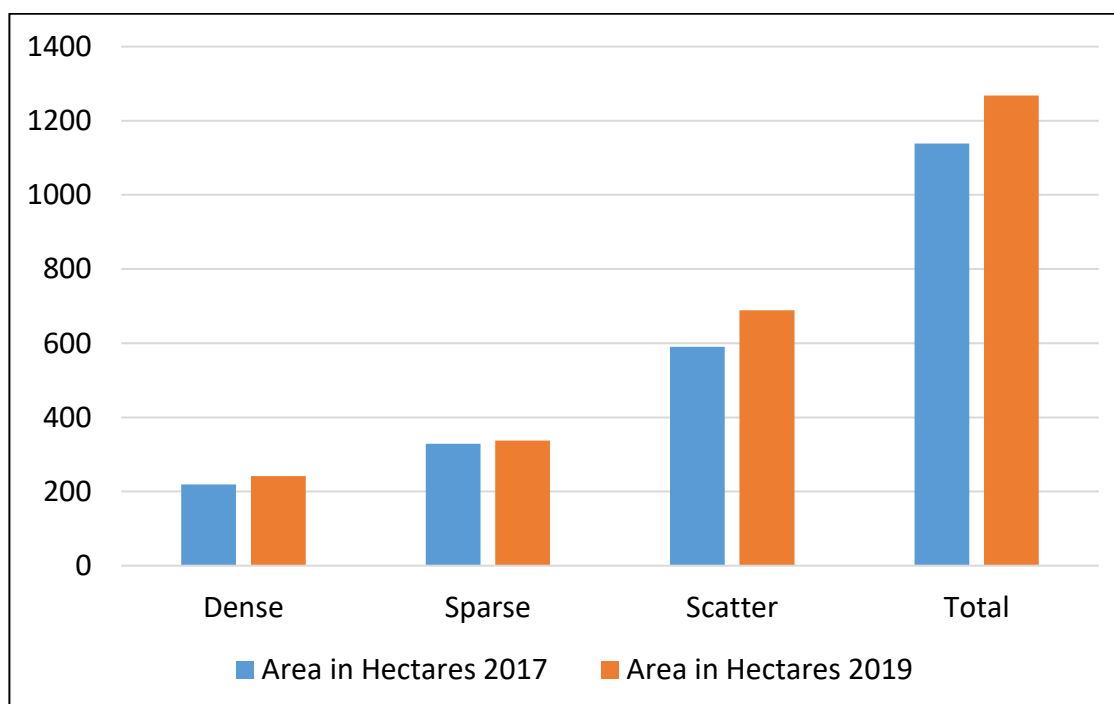
Figure 8. Distribution of mangroves in 2019 in Kotdi creek system.

## b. Baradimata Creek

The creek has been one of the well tide influenced creeks and as of 2020, the creek experienced a tidal range of 2.7 to 5m and the high tide penetrates approximately up to 6.15 km from its mouth. The creek too remains uninfluenced by human interventions except navigation by fishing community from the nearby villages. The health of the mangroves was assessed between 2017 and 2019 and the results are shown in Table 4 and Figs.9 to 11. It has showed overall improvement in mangrove coverage to the extent of 129.47 ha (11.3% increase) mostly with formation of new mangroves in the form of sparse mangroves with minor inter-conversion in categories of sparse to dense (Table 4 and Figs.9 to 11).

**Table 4: Data on various categories of mangroves in the years 2017 and 2019 in Baradimatha creek system**

Category	Area in Hectares	
	2017	2019
Dense	218.90	241.41
Sparse	328.83	337
Scatter	590.60	689.01
Total	1138.33	1267.80



**Figure 9: Comparative data on various categories of mangroves in 2017 and 2019 at Baradimata creek.**



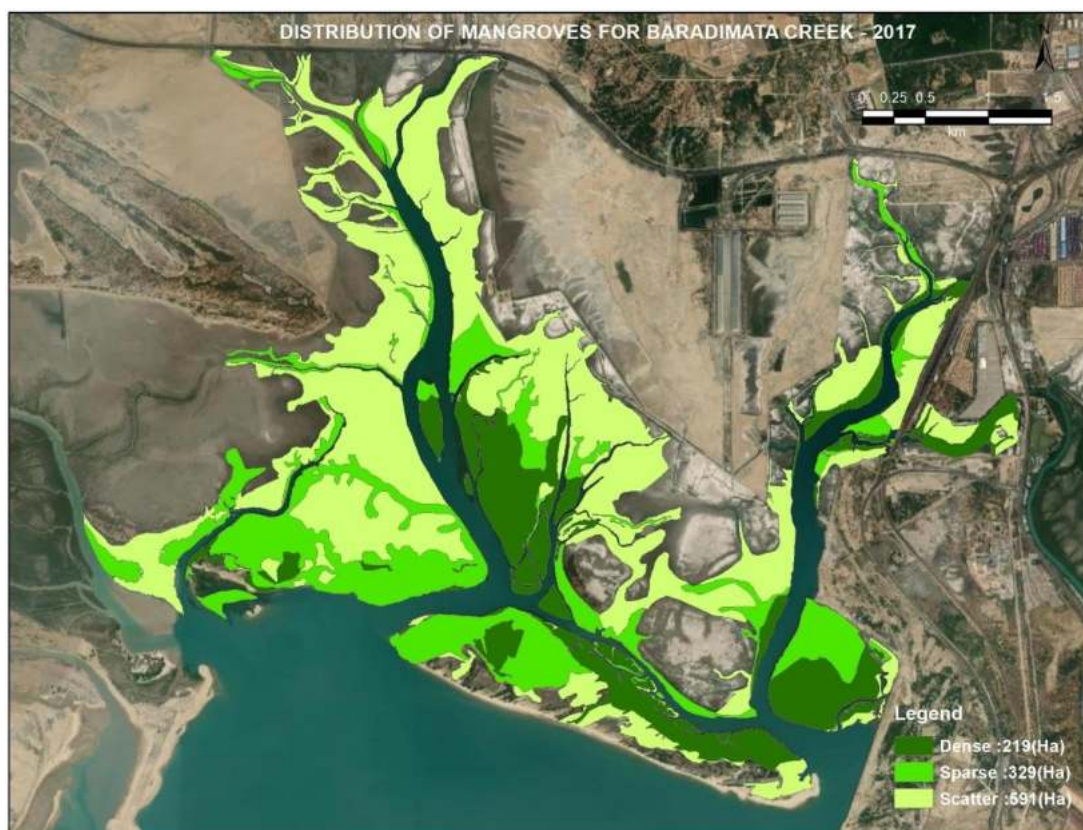


Figure 10: Distribution of mangroves at Baradimata creek in 2017 shown in Google earth image



Figure 11: Distribution of mangroves at Baradimata creek in 2019 shown in Google earth image

As the data on mangrove distribution has shown in increased trend between the years especially improvement to higher categories (i.e., from scattered to sparse and further to dense) and also formation of new mangroves, it could be inferred that the mangroves in the creek are in healthy conditions with normal tidal flow.

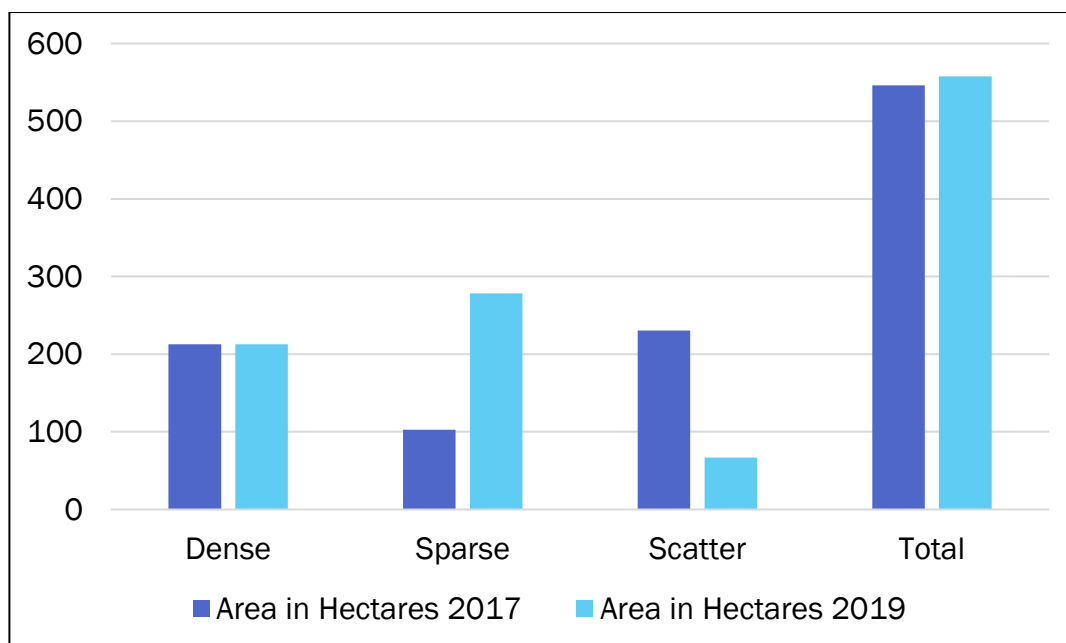
### c. Navinal and Bocha creeks including Bocha island

The creek system is complex with Navinal creek situated abetting to Adani Port and the eastern Bocha creek connecting to Navinal creek in the north leading to formation of Bocha island which has substantial dense mangroves. The mouth of creeks has good tidal inflow especially in Navinal creek as its mouth forms entry to the Port. The Navinal creek becomes narrow towards north and flow eastward to connect with Bocha creek (Fig.1). The creeks have fair to good growth of mangroves on their bank with dense mangroves in the Bocha island and the Figs.12 to 14 shows distribution of mangroves in 2017 and 2019 respectively.

The data on distribution of various categories of mangroves have been shown in Table 5 and Fig.12. The mangroves of the creek system have almost remained at 2017 level with marginal increase of 11.43 ha which is an increase of 2.1%. At pre-pages the recommendation made in the conservation plan has been mentioned. Accordingly, if there has been decrease in mangroves less than 10% to the 2017 level, then the tidal flow in the creeks needs to be studied to check reduction in tidal flow, as the tidal flow is the key parameters for survival and growth of mangroves. As the present data has shown increase of 2.1% cover of mangroves in the Navinal-Bocha island and Bocha creek system, in general, overall mangrove health is normal with usual tidal flow.

**Table 5: Data on distribution of mangroves in 2017 and 2019 in Navinal Bocha creek system**

	Area in Hectares	
	2017	2019
Dense	212.90	212.6
Sparse	102.75	278.4
Scatter	230.44	66.2
Total	546.09	557.52



**Figure 12: Comparison on distribution of mangroves between 2017 and 2019 in Navinal Bocha creek system**

Though, 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 recommendations 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 in Jan/Mar 2020. If the health of the mangroves either remains at the current condition or improves, the situation should be monitored once in every two years using high resolution satellite images. If there are signs of degradation of mangroves due to decrease of flow of tidal waters in the interior parts of the Navinal creek, Bocha island that are fed by tidal waters of Navinal creek, then it would be necessary to deepen the Navinal creek to facilitate movement of tidal water"*

As there was a specific recommendation on Navinal creek, comparison of mangrove categories between 2017 and 2019 was made using mangrove distribution depicted in Figs 13 and 14. It was observed that while the southern side of Navinal bank adjoining Adani port where tidal range is high (~5 m) the scattered mangroves of 2017 grew well to become dense. However, in the northern side, the dense mangroves at the landward side of creek bank, few patches of dense mangroves have turned to sparse and scatter. On analysis of tidal values in the deeper northern part of the creek, it was found that the location which is a junction of a branch of Bocha creek showed in a tidal range of 2.6m



(6.01 m during peak high tide and 3.4 m during peak low tide) in 2020 compared to 1.8m in 2017 at same location (measured in 2017 while preparing the Conservation plan) which indicates a good tidal flow in the creek. Conversion of mangrove from dense to sparse in Navinal from 2017 to 2019 despite such good tidal flow is not clear.

In order to understand the causes, it is necessary to measure tide at closer intervals (every 300m) in this mangrove change section of Navinal creek till the meeting point of Bocha creek during the next monitoring cycle. This may indicate locational change of tidal range and also influence of tide from Bocha creek at the meeting point.

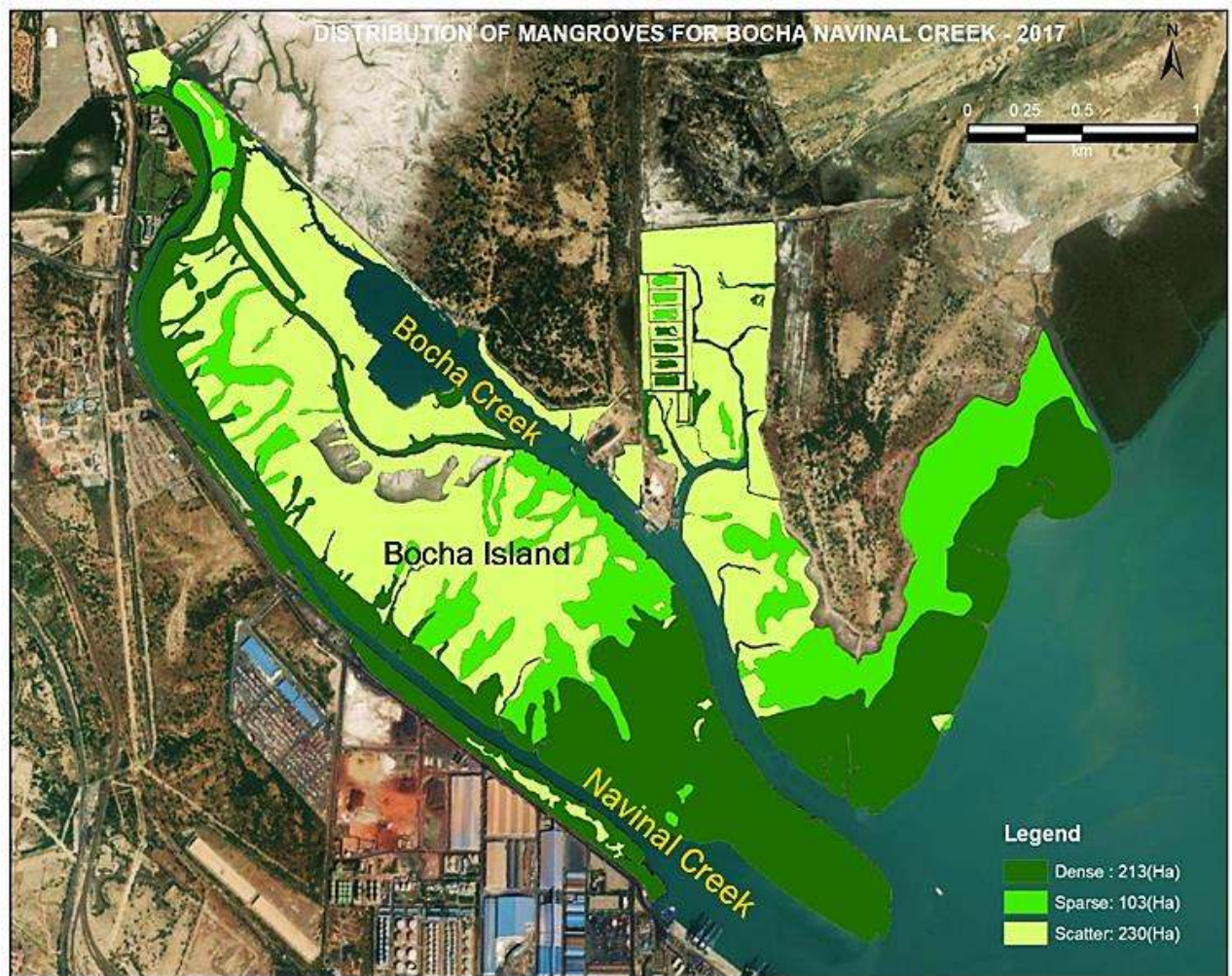
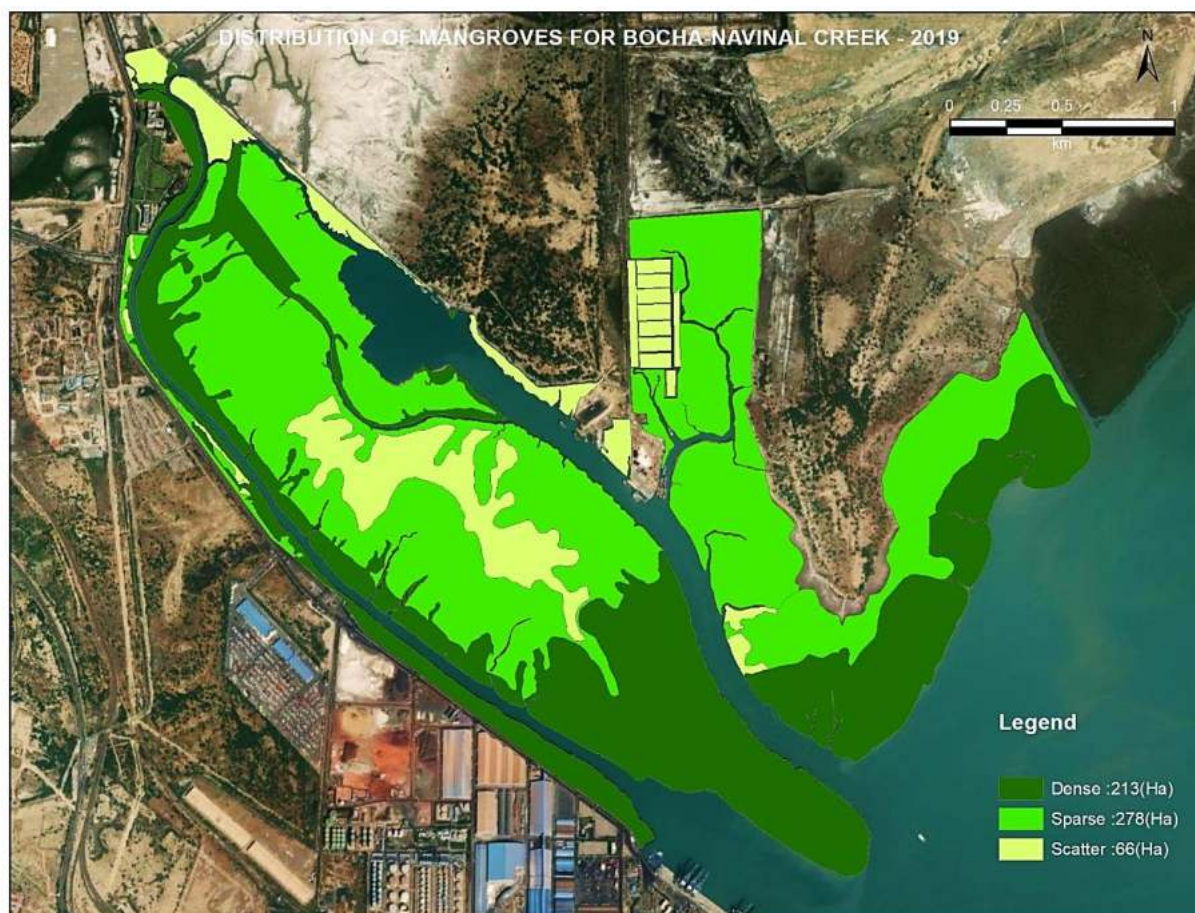


Figure 13: Distribution of various categories of mangroves overlayed in Google earth image of Navinal and Bocha creek system for the year 2017





**Figure 14: Distribution of various categories of mangroves overlaid in Google earth image of Navinal and Bocha creek system for the year 2019**

The change analysis performed using GIS overlay techniques to understand inter-conversion among Dense, Sparse and Scattered indicates there is a net loss of dense mangroves to the extent of 2.83 ha which has mostly occurred at the tip of the Bocha island and also along the coast east of Bocha creek (Table 6 and Figs 15 and 16). Loss of dense mangroves around the tip of Bocha island to the extent of 5.33 ha between 2011 and 2016-17 was reported in the Conservation plan. From the present results, it is evident that the erosion has been continuing around the tip of the Bocha island resulting in the loss of dense mangroves.

**Table 6: Data on inter-conversion of mangrove categories from 2017 to 2019**

Category	Area in Hectares				
	Dense in 2019	Sparse in 2019	Scatter in 2019	Gain/Loss	Total 2017
Dense in 2017	206.06	1.94	2.06	2.83	212.90
Sparse in 2017	0.74	52.42	49.69	-0.10	102.75
Scatter in 2017	5.56	89.31	135.59	-0.01	230.44
Gain/Loss	0.19	134.73	-120.72		
Total 2019	212.55	278.40	66.62		

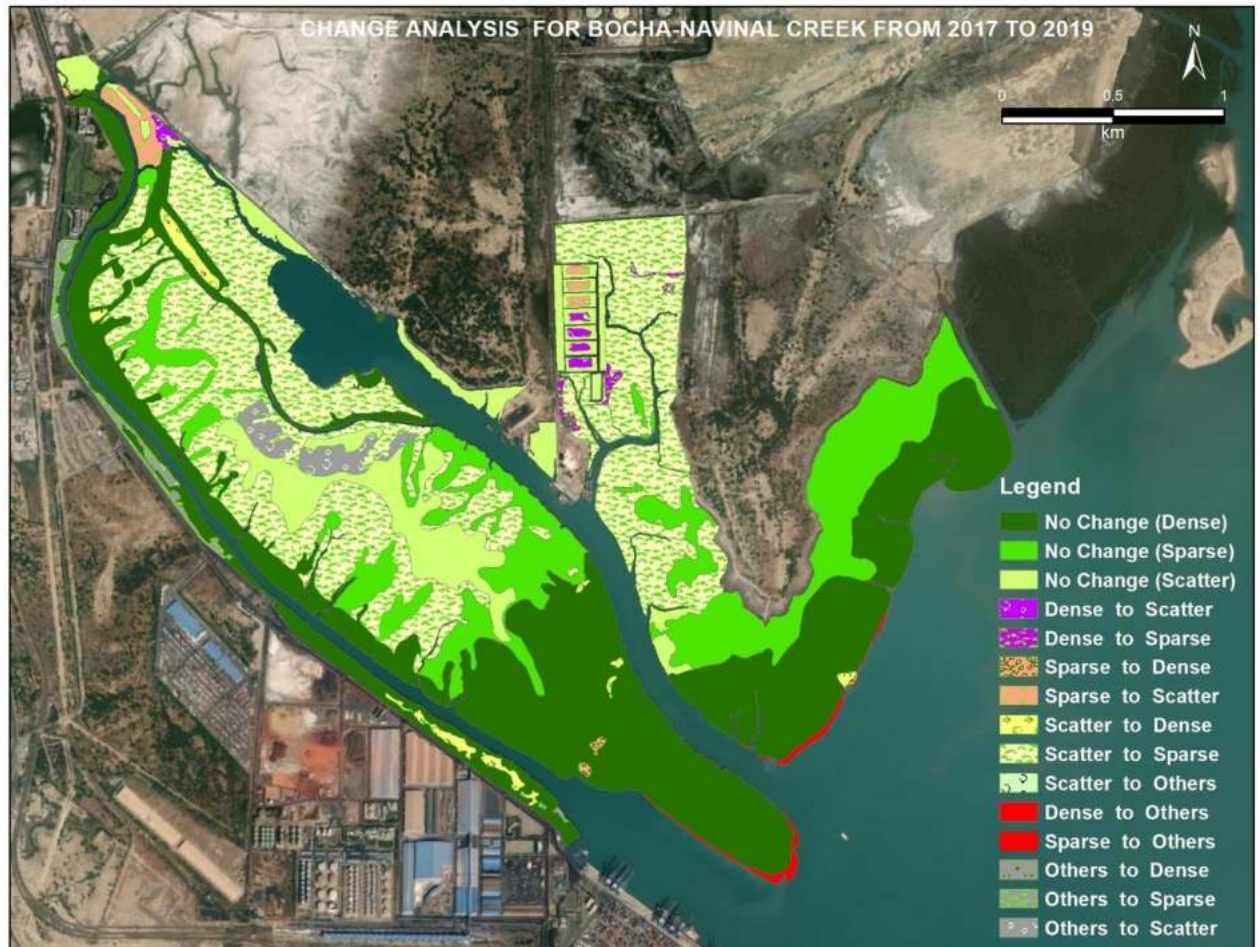


Figure 15: Result of change analysis from 2017 to 2019 on categories of mangroves in Navinal-Bocha creek system overlaid on Google earth image



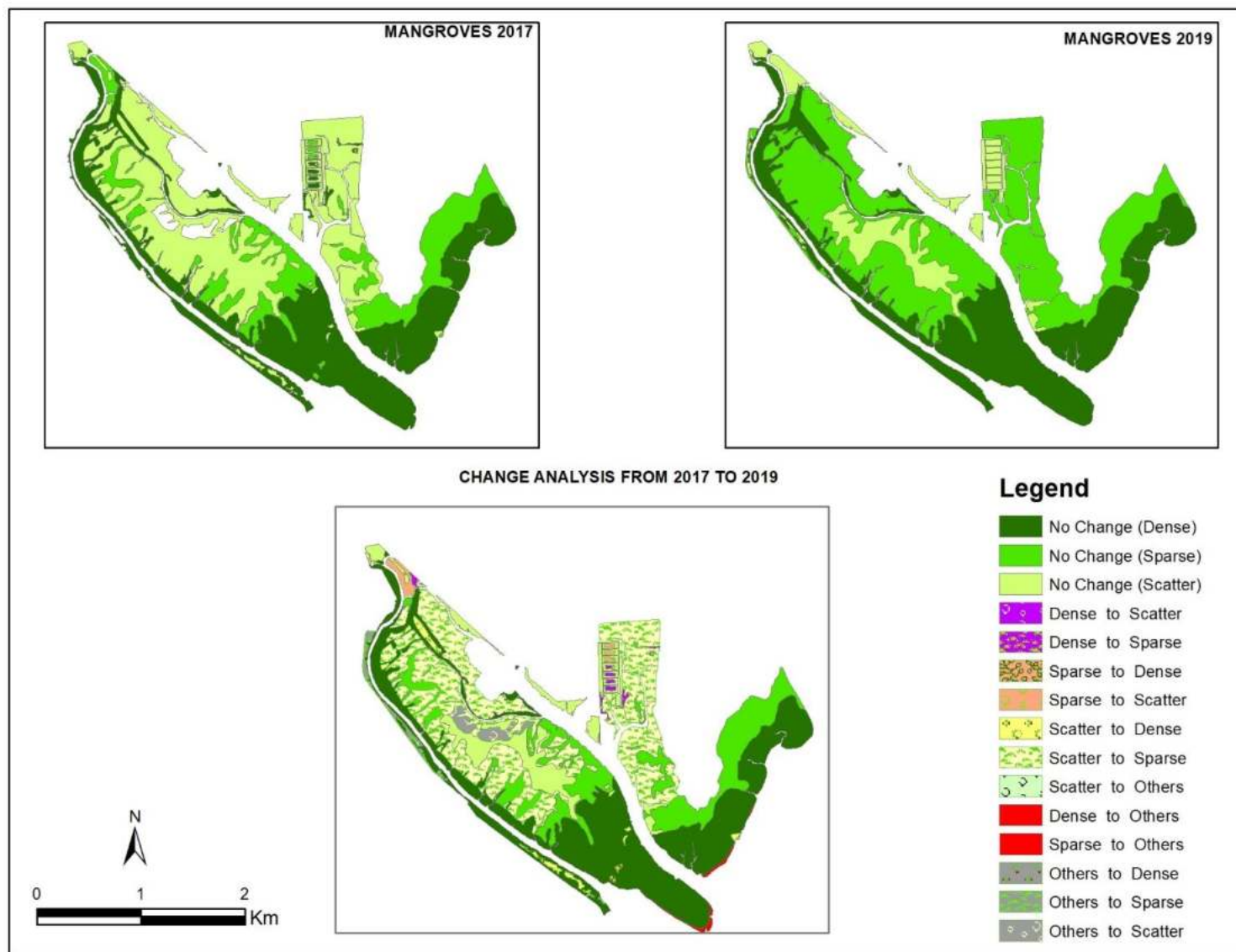


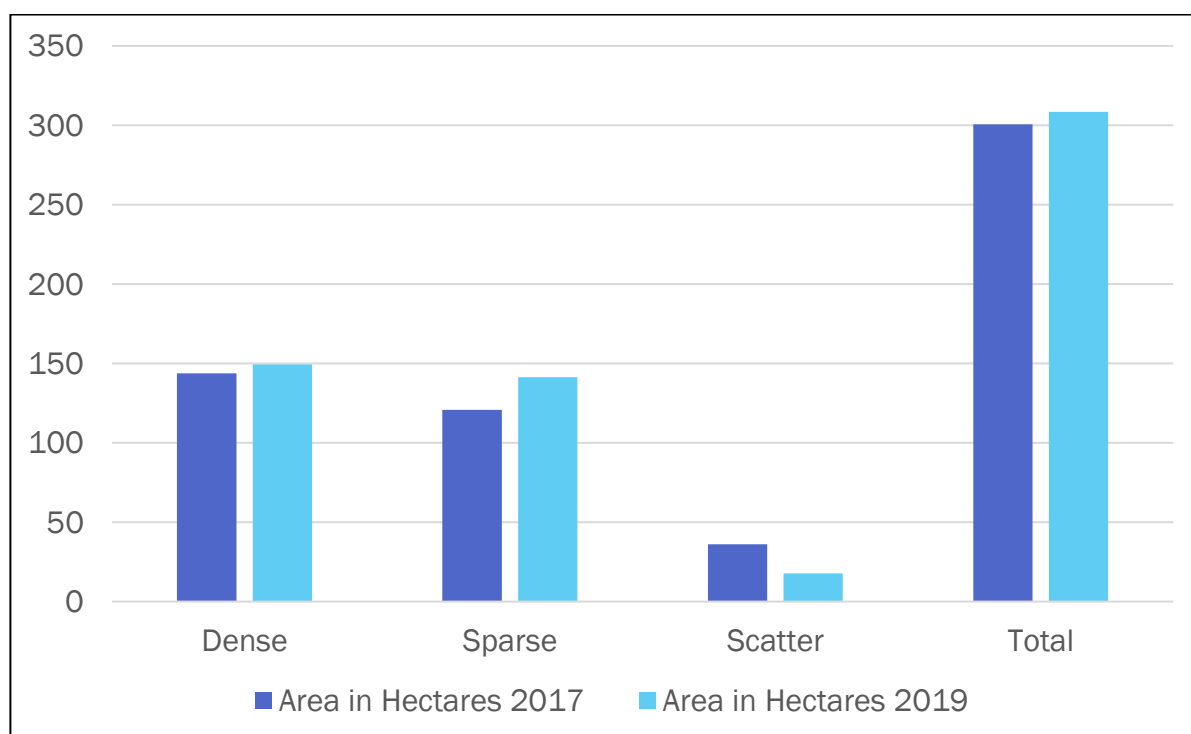
Figure 16: Mangrove layers of 2017 and 2019 and the overlaid results

### Khari creek

The creek experiences normal tidal flow with settlements located in the northern part of the creek (Junabunder village). Distribution of mangroves between March, 2017 and Sep 2019 has been studied and the data is given in Table.7 and Fig.17. and categories of mangroves are indicated in Figs18 & 19. The data indicates there is a marginal increase of mangroves to the extent of 7.87 ha which 2.62% compared to 2017 level. The minor decrease in scatter category is due to its conversion to both dense and sparse. This is a normal process of changes in mangroves due to annual variation in tidal regimes. Since there has been an increase of 2.62% of mangroves compared to 2017 level, the mangroves are in normal conditions and the decrease in scatter may be due to conversion to higher category namely sparse.

**Table 7: Distribution of various categories of mangroves in 2017 and 2019 in Khari creek**

Category	Area in Hectares	
	2017	2019
Dense	143.71	149.46
Sparse	120.83	141.28
Scatter	36.14	17.80
Total	300.68	308.55



**Figure 17: Comparison of mangroves in 2017 and 2019 in Khari creek**



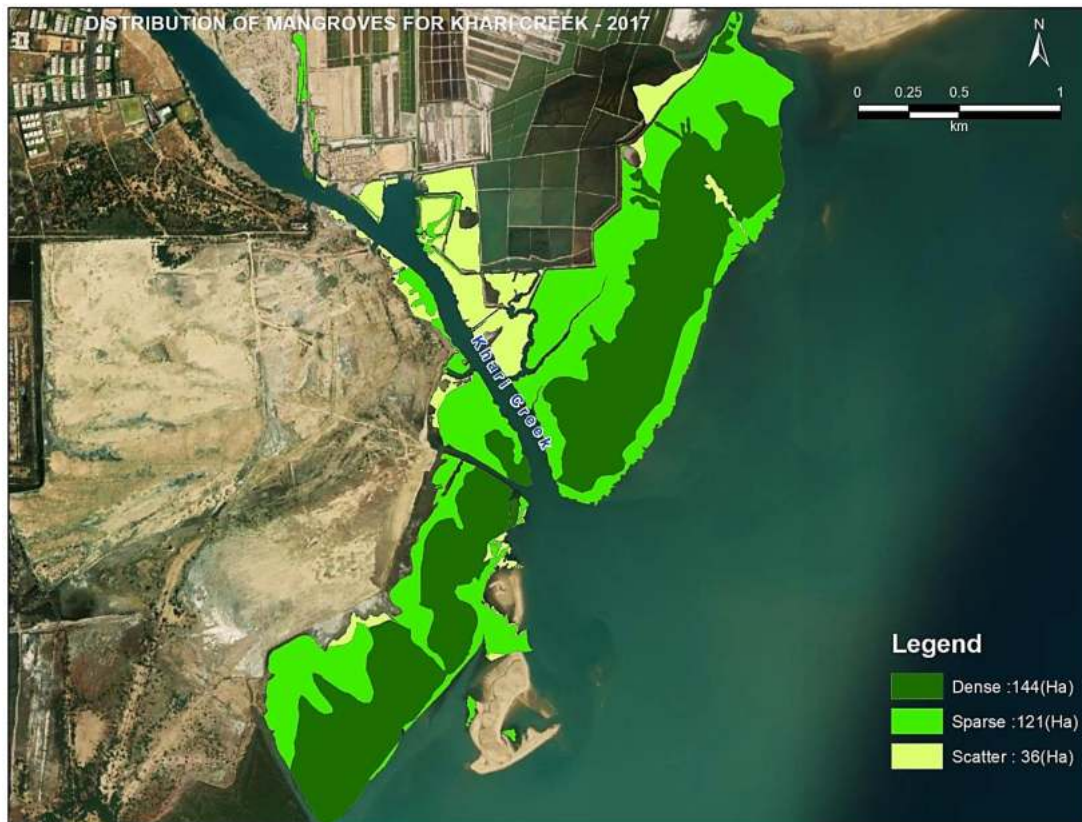


Figure 18: GIS based map showing distribution of mangroves in March, 2017 in Khari creek.

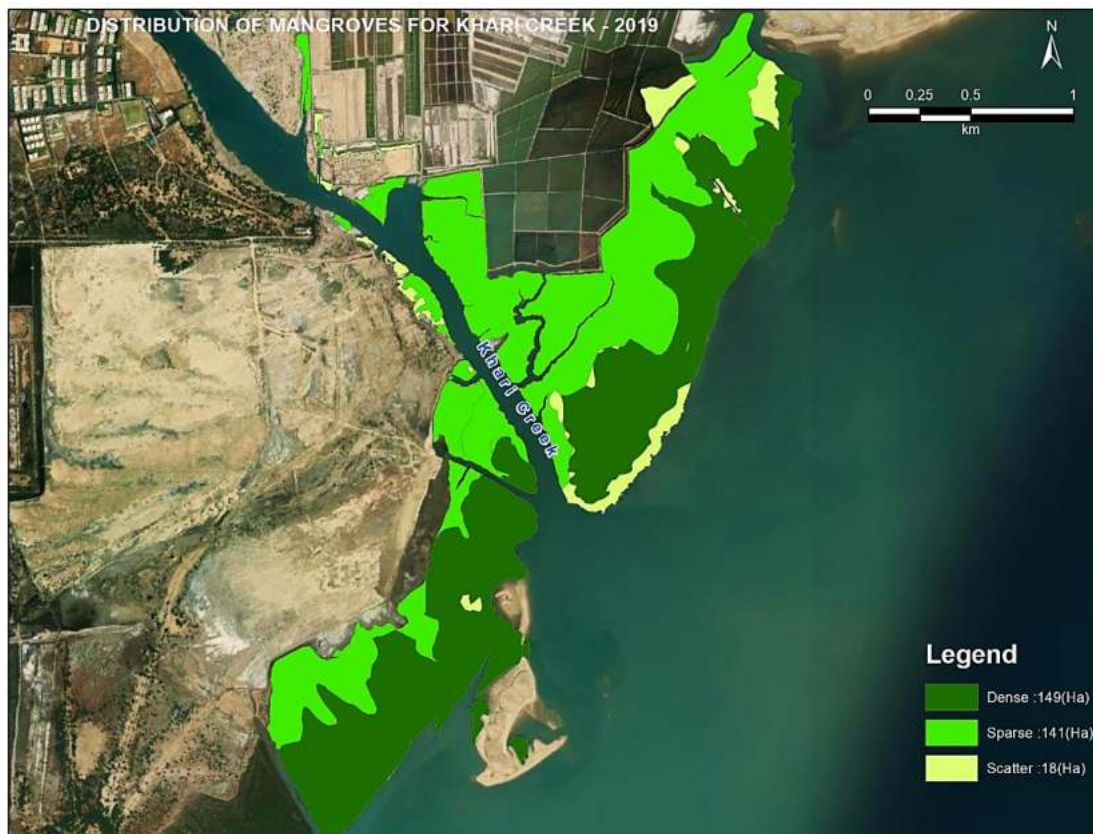


Figure 19: GIS based map showing distribution of mangroves in Sep. 2019 in Khari creek

## 6. Erosion at Bocha Island

In the Conservation plan prepared in 2017, it was indicated that erosion is prevalent around the Bocha island leading loss of about 30m of coastline along with 5.33 ha of dense mangroves between 2011 and 2017 (Feb). A solution with alternative was also suggested in the Conservation plan to control the erosion. One of the main reasons attributed for the cause of erosion occurrence of strong tidal currents along the Bocha creek side of the island. Prevalence of high current was due to shallowness of the mouth of Bocha creek, which acts as barrier and deflects the tidal current to the island shore.

However, in order to check whether any natural process has nullified erosion around the Bocha island, attempt has been made to study the erosion rate from 2017 March and 2020 March using the Google image. The results have been shown in Fig.19 which indicates continued erosion at the site rate of 10 to 16 m/yr with loss of about 2 ha of dense mangroves. This re-emphasizes the need to implement the solution of deepening the submerged portion of the mouth of Bocha island to dampen the current.

The Conservation plan had already suggested two solutions to mitigate the erosion, which will be carried out after taking approvals from the concerned authorities. APSEZ has already initiated the process of obtaining required approvals to execute the first solution of deepening the mouth of Bocha creek and same will be implemented and monitored for erosion to decide the future course of actions required, if any.

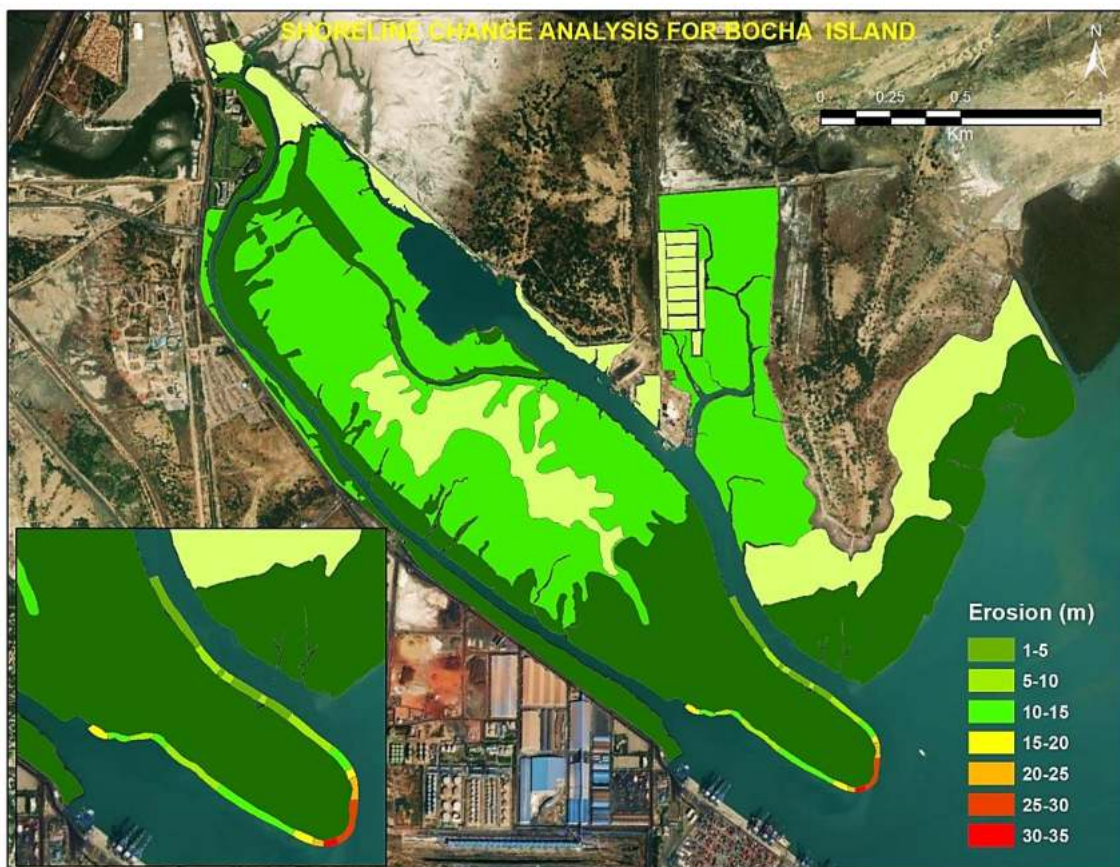


Figure 19: Rate of erosion around the mouth of Bocha island between 2017 and 2019



## 7. Summary

Based on the results obtained by comparing distribution of mangroves between 2017 (March) and Sep 2019 using Google earth images, following inferences could be drawn:

- (a) Overall health of mangroves in the creeks in and around APSEZ was assessed comparing Google earth images of 2017 with 2019 and it is observed that there was an increase in mangrove cover between March 2017 and September 2019 to the extent of 256 ha, which is about 10.7%. This suggests that the mangrove and the tidal system in the creeks remain undisturbed over this period.
- (b) The observed tidal ranges indicate that the creeks experience normal tidal ranges, adequate for the growth of mangroves.
- (c) While Kotdi creeks have shown significant increase in dense mangrove cover, it remained unchanged/ marginal increase in Baradimata creek, Navinal-Bocha island - Bocha creek system and Khari creek.
- (d) At Navinal creek, which had shown formation of sand spits from western bank to east, has shown good growth of mangroves in the southern sector. However, in the northern sector, the dense mangroves on the landward edge of western part of the creek was observed to be converted to sparse mangroves, occurring in patches. However, good tidal flow at the far end of the creek is noticed, it is recommended to measure tide at closer intervals (every 300m) in the sections of Navinal Creek upto the meeting point at Bocha creek during the next monitoring period. This may indicate locational change of tidal range and also impact of sand spits on the tidal regime from the middle to the northern end of the creek. Alternatively Drone survey with appropriate speed and elevation may also be considered in the subsequent survey(s) at both high and low tides to determine the extent of tidal water reaching along this part of bank of the creek along with the residence time.
- (e) Erosion around the Bocha island has been continuing at the rate of 10 – 16m/yr requiring urgent action. The Conservation plan had already suggested two solutions to mitigate erosion, which will be undertaken after taking approvals from the concerned authorities. APSEZ has already initiated the process of obtaining required approvals to execute the deepening the mouth of Bocha creek, as a first step and same will be implemented and monitored for erosion to decide the future course of actions required, if any.

Table 8. Observations of tide levels in the creeks in and around APSEZ

Location - 1 KOTADI CREEK 1-L2	2020	2017
LATITUDE / LONGITUDE	22° 47' 29.66"N 69° 33' 44.84"E	22° 47' 28.99" 69° 33' 42.20"
Max.	5.81	5.45
Min.	2.81	2.17
Mean	4.51	4.18

Location - 2 KOTADI CREEK 1-L1	2020	2017
LATITUDE / LONGITUDE	22° 48' 0.57"N 69° 34' 25.23"E	22° 48' 04.43" 69° 34' 28.97"
Max.	5.84	5.63
Min.	2.94	3.16
Mean	4.33	4.59

Location - 3 KOTADI CREEK-2	2020	2017
LATITUDE / LONGITUDE	22° 46' 36.45"N 69° 36' 26.25"E	22° 46' 36.77" 69° 36' 27.59"
Max.	6.08	5.60
Min.	1.38	2.98
Mean	3.24	4.78

Location - 4 BARADIMATA CREEK 1	2020	2017
LATITUDE / LONGITUDE	22° 48' 3.76"N 69° 38' 8.78"E	22° 48' 14.54" 69° 38' 22.09"
Max.	6.08	4.83
Min.	2.88	3.59
Mean	4.42	4.24

Location - 5 BARADIMATA CREEK2-L1	2020	2017
LATITUDE / LONGITUDE	22° 46' 2.65"N 69° 39' 56.80"E	22° 46' 01.30" 69° 39' 57.24"
Max.	5.90	5.50
Min.	0.50	4.01
Mean	3.46	5.01

Location - 6 BARADIMATA CREEK2-L2	2020	2017
LATITUDE / LONGITUDE	22° 47' 29.85"N 69° 40' 21.45"E	22° 47' 30.01" 69° 40' 21.83"
Max.	6.11	4.89
Min.	3.41	0.53
Mean	4.86	3.05

Location – 7 NAVINAL CREEK-L1	2020	2017
LATITUDE / LONGITUDE	22° 46' 47.51"N 69° 40' 59.09"E	22° 46' 47.49" 69° 40' 57.78"
Max.	6.01	5.21
Min.	3.41	3.42
Mean	4.58	4.52

Location – 8 NAVINAL CREEK-L2	2020	2017
LATITUDE / LONGITUDE	22° 45' 44.89"N 69° 41' 19.88"E	22° 45' 43.39" 69° 41' 20.61"
Max.	6.18	5.20
Min.	1.98	3.76
Mean	3.80	4.74

Location – 9 BOCHA CREEK-L2	2020	2017
LATITUDE / LONGITUDE	22° 45' 58.52"N 69° 41' 36.13"E	22° 46' 47.49" 69° 40' 57.78"
Max.	6.03	5.75
Min.	2.53	3.87
Mean	4.33	4.97

Location – 10 BOCHA CREEK-L1	2020	2017
LATITUDE / LONGITUDE	22° 45' 43.20"N 69° 42' 22.22"E	22° 45' 47.21" 69° 42' 16.87"
Max.	6.16	5.81
Min.	1.06	2.99
Mean	3.58	4.91

Location – 11 BOCHA CREEK-L3	2020	2017
LATITUDE / LONGITUDE	22° 45' 12.33"N 69° 42' 41.88"E	22° 44' 09.38" 69° 43' 02.58"
Max.	5.88	5.75
Min.	1.48	3.44
Mean	3.62	4.89

Location – 12 KHARI CREEK	2020	2017
LATITUDE / LONGITUDE	22° 47' 39.13"N 69° 43' 27.00"E	22° 47' 46.53" 69° 43' 26.82"
Max.	6.01	6.15
Min.	1.71	4.07
Mean	3.77	5.43

Location – 13: NAVINAL CREEK-L3	2020	2017
LATITUDE / LONGITUDE	22° 43' 57.58"N 69° 42' 30.60"E	22° 44' 09.38" 69° 43' 02.58"
Max.	6.10	5.18
Min.	1.14	3.54
Mean	3.66	4.63



# **Annexure – 13**

## **ALGAL REMOVAL WORK FROM MANGROVE AREAS**

Creek area is regularly observed for checking algal encrustations. On the mangrove recruits & where the algal encrustation is found to be substantial, it is removed manually by deployment with required manpower. This operation is performed during the low tide conditions. The main object is to provide better growing condition for the growth of mangroves. Periodically, spread of *Prosopis* sp towards the mangrove areas is also observed as this species will compete with mangrove plants for growth.

Mangroves nursery is developed in a creek behind IOCL & 50,000 Nos. of new saplings are planted in creek area.

Reference photographs of activities undertaken as per given guidelines,

### **A) Removal of algal encrustations & preventing the spread of *Prosopis*:**



**B) Latitude & Longitude details of the location for removal of algal encrustations:**





**C) Development of Nursery & Plantation of Mangroves:**

