o/c

adani

APSEZ/EnvCell/2017-18/036

Date: 22.11.2017

To

Additional Principal Chief Conservator of Forests (C),
Ministry of Environment, Forest and Climate Change,
Regional Office (WZ), E-5, Kendriya
Paryavaran Bhawan, Arera Colony,
Link Road No. – 3, Bhopal – 462 016.
E-mail: rowz.bpl-mef@nic.in

Sub : Half yearly Compliance report of Environment Clearance under CRZ notification for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat by M/s. Adani Ports & SEZ Limited."

Ref : Environment clearance under CRZ notification granted to M/s Adani Ports & SEZ Limited vide letter dated 20th September, 2000 bearing no. J-16011/40/99-IA.III

Dear Sir,

Please refer to the above cited reference for the said subject matter. In connection to the same, it is to state that copy of the compliance report for the Environmental and CRZ Clearance for the period of April – 2017 to September – 2017 is enclosed here for your records. The stated information is also provided in form of a CD (soft copy).

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

Ennarasu Karunesan
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 Bhavan, Sector 10 A, Gandhi Nagar – 382 010
4) Deputy Secretary, Forests & Environment Department, Block – 14, 8th floor, Sachivalaya, Gandhi Nagar – 382 010
5) Regional Officer, Regional Office GPCB (Kutch-East), Gandhidham, 370201

01 | कार्यालय / OFFICE
पर्यावरण एवं वन मंत्रालय (केन्द्रीय)
Ministry of Environment & Forests (C)
क्षेत्रीय कार्यालय (पश्चिम)
Regional Office (Western)
भोपाल (म.प्र.)

Adani Ports and Special Economic Zone Ltd
Adani House
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Mundra, Kutch 370 421
Gujarat, India

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info@adani.com
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Environmental Clearance Compliance Report

Port Expansion Project including Dry/Break Bulk Cargo Container Terminal, Railway Link and related Ancillary and Back-up facilities at Mundra Port, Dist. Kutch, Gujarat

Adani Ports and SEZ Limited

For the Period of:

April - 2017 to September - 2017

adani™

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Compliance Report

adani	Adani Ports and SEZ Limited	From : April'17 To : September'17
Status of the conditions stipulated in Environment Clearance under CRZ notification		

Half yearly Compliance report of Environment Clearance under CRZ notification for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat vide letter no. J-16011/40/99-IA.III dated 20th September, 2000"

Sr. No.	Conditions	Compliance Status as on 30-09-2017
A. Specific Condition		
i	All the conditions stipulated by the Gujarat Pollution Control Board vide their NOC No. PC/NOC/Kutch/391/18424 dated 10.6.99 and No. PC/NOC/Kutch/222(2)16880 dated 1.5.99 shall be strictly implemented.	Complied. Consent to Operate (CC&A) was granted by GPCB based on the compliance of conditions of the No Objection Certificate (CtE). This CC&A is renewed from time to time based on its validity. The last renewal was obtained vide GPCB consent no. AWH-88317 valid till 20th November, 2021. Copy of the same was submitted along with compliance submission for the period of Oct'16 to Mar'17.Consent to Operate (CtO) is obtained and renewed/amended from time to time as per the progress of the project activity. CtO-Amendment obtained vide Order No. WH-88317 dated 03.10.2017 valid up to 20.11.2021. This consent order is processed for necessary correction from state pollution control board. Copy of the same is attached as **Annexure – 1.**
ii	The conditions stipulated in the letter No ENV-1098-6477-PI dated October 28, 1999 and No. ENV-1099-2702-PI dated 27.12.99 of shall be strictly implemented.	Complied. Point wise compliance report of CRZ recommendations issued vide letter No ENV-1098-6477-PI dated October 28, 1999 and No. ENV-1099-2702-PI dated 27.12.99 is enclosed as **Annexure- A**.
iii	The turning circle should be increased from 550 m to 600 m.	Complied. Construction activities are completed and project is in operation phase
iv	A girdle canal with settlement tanks shall be provided around the coal storage area.	Not applicable at present. Coal handling is not practiced at project site.
v	All efforts shall be made for water conservation and rain water harvesting. Arrangements shall be made for roof top rain water harvesting from various structures.	Complied. Under the Water Conservation and Optimization Drive at APSEZ, various initiatives were taken for conservation of water such as, 1. Optimization & modification of tank cleaning process at Liquid Terminal 2. Total 33 Water-free urinals are installed and in

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		operation at Adani House & Tug Berth building 3. Recirculation of water from fixed firefighting system to reservoir through flexible pipe during testing of firefighting system. 4. Provided wind breaking wall for dust suppression at coal stack pile reduced the water usage for dust suppression. 5. Conservation of Condensate from Air Conditioner and use for gardening 6. Water flow reducers are provided in taps of Adani House, Tug Berth, CT2, CT3 & CT4 buildings to reduce the water consumption and are in use. 7. Water Maker machine is installed near Tug Berth jetty which generates drinking water from atmospheric moisture. The capacity of this machine is 250 liters per day. All of above initiative saved approx. 1500 Million Liters of water during FY 2016-17. Data on water savings for the present financial year will be submitted along with the compliance submission for the duration of Oct'17 to Mar'18. Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage. However, APSEZ has carried out pond deepening activity at Mota Bhadiya and Bhujpur villages during the compliance period to envisage rainwater harvesting.
vi	To obviate the problem of coastal erosion due to dredging, the setback distance of at least 50 m from the Chart Datum line of Bocha island would be maintained.	Complied. During Maintenance dredging in this area, it is ensured that at least 50 m distance is maintained.
vii	The dredged material shall be disposed of only in the identified locations outside the CRZ area. While dumping the dredged material, sufficient distance should be ensured from the existing mangroves so that there is no damage to the ecology.	Complied. Capital dredging is completed and only maintenance dredging is being carried out, if required. Dredged material generated by maintenance dredging is used for level rising. The measures recommended by NIO

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 30-09-2017</th></tr>
<tr><td></td><td>During dumping of dredged material the mitigative measures as suggested by NIO shall be implemented. It shall be ensured that there is no dumping of dredged material in the CRZ.</td><td>are implemented.

In order to ensure no damage to marine ecology Marine water & sediment monitoring is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Apr'17 to Sep'17 is mentioned below.

Total Sampling Locations: 09 Nos.
<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>8.28</td><td>7.55</td><td>8.38</td><td>7.27</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>30</td><td>12</td><td>40</td><td>16</td></tr>
<tr><td>BOD (3 Days @ 27 °C)</td><td>mg/L</td><td>8</td><td>3</td><td>9</td><td>4</td></tr>
<tr><td>DO</td><td>mg/L</td><td>6</td><td>4.8</td><td>5.4</td><td>4.4</td></tr>
<tr><td>Salinity</td><td>mg/L</td><td>48.45</td><td>31.4</td><td>49</td><td>32.3</td></tr>
<tr><td>TDS</td><td>ppt</td><td>53670</td><td>30830</td><td>54820</td><td>32620</td></tr>
<tr><td>COD</td><td>mg/L</td><td>29</td><td>5</td><td>38</td><td>14</td></tr>
</table>
The results depict that there is no damage to the marine ecology. Monitoring Reports are attached as Annexure – 2 for the same.
Approximately INR 12 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18 (till Sept' 17).</td></tr>
<tr><td>viii</td><td>The mangrove afforestation shall be undertaken at the identified sites and the progress report in this regard shall be submitted to this Ministry regularly. All the recommendations suggested in the NIO report for restoration of the coastal habitat by mangrove afforestation at Navinal island shall be strictly implemented.</td><td>Complied.

All construction activities are completed and project is in operation phase since long time. 24 hectare of mangrove afforestation was carried out at identified sites in consultation with Dr Maity, (Mangrove Consultant of India)

It may be noted that to enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2800 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 782 lakh. So, far APSEZ have developed more than 400 ha. area as greenbelt with plantation more than 8.0 Lacs</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		saplings within the APSEZ area. Details of mangrove plantation and green belt development carried out by APSEZ till date is annexed as **Annexure – 3.**
ix	No ground water shall be withdrawn for this project.	Complied. Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited. Average water consumption for entire APSEZ area is 5.6 MLD out of which 2.8 MLD is obtained from Desalination plant whereas remaining 2.8 MLD is obtained from GWIL.
x	The project proponent shall ensure that the construction workers do not cut the Mangroves for fuel wood etc.	Complied. All construction activities are completed and project is in operation phase since long time.
xi	The project proponent shall ensure that no creeks are blocked and the natural drainage of the area is not affected due to project activities.	Complied. Prominent creek system (main creeks and small branches of creeks) in the study region are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river) All above creeks are in existence allowing free flow of water and there is no filling or reclamation of any creek area. APSEZ has so far constructed 19 culverts having total length of approx. 1100 m with total cost of INR 20 Crores. Apart from that three RCC Bridges have been constructed over Kotdi creek with total length of 230 m at the cost of INR 10 Crores. Photographs of the same are attached as **Annexure – 4**.
xii	The project proponent shall ensure that there will be no disposal of sullage and sewage generated from construction camps, surface run-off from construction sites, and oil and grease spillage from the construction equipment's in the creeks.	Complied. Project is in operation phase. Sewage generated from port is being treated in designated STP and treated sewage is used for horticulture purposes. **Location** / **Capacity** / **Quantity of Wastewater** / **Type of ETP / STP** LT / 265 KLD / 150 KLD / Activated Sludge

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 30-09-2017</th></tr>
<tr><td></td><td></td><td>Third party analysis of the treated water is being carried out twice in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for the duration from Apr'17 to Sep'17 is mentioned below. The results of the same are attached as Annexure – 2.
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Min</th><th>Perm. Limit$</th></tr>
<tr><td>pH</td><td>--</td><td>7.55</td><td>6.78</td><td>6.5 – 8.5</td></tr>
<tr><td>TSS</td><td>mg/L</td><td>62</td><td>22</td><td>100</td></tr>
<tr><td>TDS</td><td>mg/L</td><td>1528</td><td>950</td><td>2100</td></tr>
<tr><td>COD</td><td>mg/L</td><td>144</td><td>28</td><td>100</td></tr>
<tr><td>BOD
(3 Days @ 27 °C)</td><td>mg/L</td><td>32</td><td>8</td><td>30</td></tr>
<tr><td>Ammonicle Nitrogen as NH3</td><td>mg/L</td><td>12.6</td><td>1.74</td><td>50</td></tr>
</table>
$ as per CC&A granted by GPCB
Approximately INR 12 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18 (till Sept' 17).</td></tr>
<tr><td>xiii</td><td>The project proponent shall stick to the time bound program submitted to the Department of Environment, Government of Gujarat for the proposed activities including installation of desalination plant for meeting the entire water requirement. They shall coordinate their construction/operations schedule with the installation schedule of desalination plant.</td><td>Complied.

Desalination plant has already been installed as per time bound program and is in use. Details regarding water consumption are mentioned in Sr. no. ix above.</td></tr>
<tr><td>xiv</td><td>The project proponent shall ensure that the commercial fisheries are not hampered due to presence of barges, vessels and other activities in the region. Necessary plan in this regard shall be prepared in consultation with the NIO and submitted within 3</td><td>Complied.

No commercial fisheries are prevailing in this area except Pagadia and fishermen with small boats. Unhindered access is provided to the fishing boats.

During project proposal, APSEZ proposed to provide four (4) dedicated accesses at Juna Bandar, Luni, Bavdi Bandar and Zarpara for the fishermen to approach the</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	months.	sea for fishing activity. However, during construction as well as operation, through fishermen consultative process, APSEZ has provided seven (7) access roads. Total length of all the approach roads is approx. 23 Kms and expenditure involved was Rs. 637 Lacs. There is no hindrance to the movement of fisherman boats.
xv	The project proponent shall bear the cost of the external agency that may be appointed by the Department of Environment, Government of Gujarat for carrying out the supervision and/or the monitoring of the construction activities.	Complied. Construction activities are completed and project is in operation phase. However few studies were proposed by the FED and MOEF&CC and the status is as provided below. • Bathymetry & Topography study of Mundra is being carried out by National Center for Sustainable Coastal Management (NCSCM), Chennai. The study being carried out by NCSCM covers preparation of plan for protection of creeks/ mangrove area including buffer zone, mapping of co-ordinates, running length, HTL, CRZ boundary. The cost of the study as per the NCSCM proposal is 315.5 Lakh and 90% of the payment against the same is already made as an advance. • A Regional Impact Assessment study to identify the regional impacts of all the existing as well as proposed project activities is being carried out by NABET accredited consultant namely MS Cholamandamam. The cost of the study is 130 Lakh and majority of the payment for the same is also done.
Xvi	The project proponent shall carry out the post-project monitoring of various environmental parameters in consultation with the Department of Environment, Government of Gujarat and Gujarat Pollution Control Board.	Being complied. Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments along with the parameters mentioned in the consent order issued by GPCB is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd.. Monitoring reports for the period from Apr'17 to Sep'17 are enclosed as **Annexure-2.**
xvii	The project proponent shall prepare the detailed traffic control management plan for	Complied. APSEZ is practicing well defined traffic control

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	the port and shall participate in the VTMS to be developed for the Gulf of Kachchh.	procedure. A VTS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt. of India. Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77. Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTS information cell through agent or by directly sending mail to vtsmanagergulfofkutch@yahoo.com and vtsgok@yahoo.com.
xviii	Action plan shall be prepared by the project proponents to prevent damage to marine life and also to the coastline in case of any oil spillage and the same shall be strictly implemented. Regular mock drills shall be carried out to ensure fitness of the equipment in place.	Complied. Oil spill contingency response plan updated on 29.08.2017 is in place and implemented. An acknowledgement letter on updates in OSCRP by coast guard along with a copy of the updated plan is attached as **Annexure -5.** Mock drills are conducted regularly. Detail on drill conducted on 19.04.2017 is attached as **Annexure – 6.**
xix	The project proponents shall work out the maximum quantity of spilled material, which can find its way into the coastal waters, under different accident scenarios, and their impact on aquatic life shall be studied after clearly demarcating the impact zones. On the basis of such studies, the necessary action plan to mitigate the likely impacts shall be prepared before commencement of the operations. Action taken report in this regard shall be submitted to the Ministry.	Complied. 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. A copy of the updated plan & acknowledgement letter on same by coast guard is attached as **Annexure -5**. 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. Recommendations of Marine EIA by NIO with respect to pollution emergency contingency plan for Multipurpose Terminal, Container, Dry & Break Bulk Terminal as well as associated facilities are addressed in Oil Spill Response Plan.

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		This action plan prepared by APSEZ to combat the oil spill (LOS-DCP) is in accordance with the NOS DCP, International Petroleum Industry Environmental Conservation Association (IPIECA).
B. General Condition		
i	Construction of the proposed structures should be undertaken meticulously conforming to the existing Central / local rules and regulations. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments / Agencies.	Already complied. Not applicable at present. All construction activities are carried out confirming to the existing rules and regulation and as per the CRZ notification. Approval under the preview of GMB, PESO and Factories act were taken prior to start of construction.
ii	The proponent shall ensure that as a result of the proposed constructions ingress of the saline water into the ground water does not take place. Piezometers shall be installed for regular monitoring for this purpose at appropriate locations on the project site.	Complied. To monitor the ground water quality, bore wells are provided at various location in the port and SEZ areas. Third party analysis of the ground water is being carried out twice a year by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Apr'17 to Sep'17 is mentioned below. Monitoring Reports are attached as **Annexure – 2** for the same.

Parameter	Unit	Minimum	Maximum
pH	-	7.43	7.68
Salinity	mg/L	0.55	12.73
Oil & Grease	mg/L	1.2	5.3
Hydrocarbon	mg/L	BDL	BDL
Lead as Pb	mg/L	0.06	0.53
Arsenic as As	mg/L	BDL	BDL
Nickel as Ni	mg/L	0.2	0.2
Total Cromium as Cr	mg/L	0.004	0.008
Cadmium as Cd	mg/L	0.008	0.13
Mercury as Hg	mg/L	BDL	BDL
Zinc as Zn	mg/L	0.043	1.81

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>Compliance Status as on 30-09-2017</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Copper as Cu</td><td>mg/L</td><td>0.04</td><td>0.755</td></tr>
<tr><td>Iron as Fe</td><td>mg/L</td><td>0.67</td><td>17.05</td></tr>
<tr><td>Insecticides/Pesticides</td><td>mg/L</td><td>BDL</td><td>BDL</td></tr>
</table>
*BDL = Below Detectable Limit
Approximately INR 12 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18 (till Sept' 17).
</td></tr>
<tr><td>iii</td><td>A comprehensive contingency plan in collaboration with the concerned authorities must be formulated to contain in case of any oil spills. Appropriate devices such as oil skimmer, oil monitor, oil water separator must be acquired for strengthening the contingency plan. All the service vessels that required for oil spill operations must be equipped with booms and dispersants. The personal onboard of these vessels must be properly trained in operation of these booms and dispersants.</td><td>
Complied.

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. A copy of the updated plan & acknowledgement letter on same by coast guard is attached as Annexure -5.

Shoreline Resources available with APSEZ, for deployment during shoreline cleanup/ emergent situation:
<table>
<tr><th>Item</th><th>Quantity</th></tr>
<tr><td>Oil Spill Dispersants</td><td>40250 ltr.</td></tr>
<tr><td>Absorbent pads</td><td>1000</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 discharge hose, 3", 2 x 10 m</td><td>1 set</td></tr>
<tr><td>Rachet belt (Eco make)</td><td>10 nos.</td></tr>
<tr><td>Tool box (Eco)</td><td>6 nos.</td></tr>
<tr><td>Tanker Trucks</td><td>04 nos.</td></tr>
<tr><td>Mini Vacuum Pump (30 m3 / hr)</td><td>02 nos.</td></tr>
<tr><td>Slurry Pump (60 m3 / hr)</td><td>01 no.</td></tr>
</table>

11 Dolphin tugs are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 10 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors.

IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification exercise, Incident are conducted at different frequency.
</td></tr>
</table>

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		Detail of resource available at APSEZL is provided in annexure 3 of Oil Spill Contingency Plan attached as **Annexure 5.**
iv	The operation plan for responding to an oil spill must include clear procedures for notification of a spill, response decision, clean up operations, communications, and termination of cleanup operations, cleanup cost, oil pollution, damage control and disaster management plan.	Complied. 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. A copy of the updated plan & acknowledgement letter on same by coast guard is attached as **Annexure -5**. Oil Spill Contingency Plan includes procedures for notification of a spill as point no 7.1, response strategy as Point no. 3.0, cleanup operations, Cleanup cost and termination of cleanup in point no. 3.5, communications in point no. 6.0.
v	A well-equipped laboratory with suitable instruments to monitor the quality of air and water shall be set up so as to ensure that the quality of ambient air and water conforms to the prescribed standards. The laboratory will also be equipped with qualified manpower including a marine biologist so that the marine water quality is regularly monitored in order to ensure that the marine life is not adversely affected as a result of implementation of the said project. The quality of ambient air and water shall be monitored periodically in all the seasons and the results should be properly maintained for inspection of the concerned pollution Control agencies. The periodic monitoring reports at least once in 6 months must be sent to this	Being complied Site is provided with environment monitoring equipment with sufficient & competent staff of Third Party laboratory accredited by NABL & MoEF&CC. Ambient Air Quality (twice in a week) and Noise (once in a month) monitoring are being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Apr'17 to Sep'17 is mentioned below. **Total Sampling Locations: 4 Nos** **Total Ambient Air Sampling Locations: 4 Nos.** **Total Noise Monitoring Locations: 4 Nos.**

Parameter	Unit	Max	Min	Perm. Limit$
PM_{10}	$\mu g/m^3$	96.62	37.59	100
$PM_{2.5}$	$\mu g/m^3$	55.40	15.39	60
SO_2	$\mu g/m^3$	27.56	5.26	80
NO_2	$\mu g/m^3$	45.40	14.25	80

$ as per NAAQ standards, 2009

Noise	Unit	Average	Perm. Limit
Day Time	dB(A)	65.9	75
Night Time	dB(A)	63.8	70

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	Ministry as well as its Regional Office at Bhopal.	Sewage generated from port is being treated in designated STPs and treated sewage is used for horticulture purposes. Third party analysis of the treated water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of the same for duration from Apr'17 to Oct'17 is provided above in point No. xii (specific conditions). Marine Monitoring: Summary of the marine water monitoring for duration from Apr'17 to Oct'17 is provided above in point No. vii (specific conditions) Adani group has appointed a marine biologist Mr Shivanagouda Sanagoudra to monitor marine water quality. Also the third party monitoring of the Marine water is being carried out once in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. who has marine biologist to ensure that the marine water quality do not adversely affects the marine life. Monitoring Reports are attached as **Annexure – 2** for the same. Approximately INR 12 Lakh is spent for all environmental monitoring activities during the F.Y. 2017-18 (till Sept' 17). Half yearly compliance reports containing monitoring report is regularly submitted to MoEF&CC, Bhopal and other concerned government agencies / offices. Last compliance report was submitted vide our letter reference No. APSEZL/EnvCell/2017-18/003 dated 23.05.2017 in soft as well as hard copy.
vi	Adequate provision for infrastructure facilities such as water supply, fuel for cooking, sanitation etc. must be provided for the laborers during the construction period in order to avoid damage to the environment. Colonies for the laborers should not be located in the CRZ area. It should also be	Already complied. Not Applicable at present. Construction Activity is already completed. Adequate infrastructure facilities as mentioned in the condition were provided during construction phase. The facility for drinking water, toilet and rest shelter are provided for the dignity of operation labours. Photographs of the same were provided along with the compliance submission for the duration of Oct'16 to Mar'17.

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	ensured that the construction workers do not cut trees including mangroves for fuel wood purpose.	
vii	To prevent discharge of sewage and other liquid wastes in to the water bodies, adequate system for collection and treatment of the wastes must be provided. No sewage and other liquid wastes without treatment should be allowed to enter into the water bodies. The quality of treated effluents, emissions, solid wastes and noise levels must confirm to the standards laid down by the competent authority including the Central/State Pollution Control Board.	Complied. Adequate pipelines are provided to ensure the collection and treatment of effluent. Raw sewage is collected from 30 different collection pits at APSEZ locations through browsers and is transferred to ETP/STPs for treatment. Sewage generated from port is being treated in designated ETP/STPs and treated sewage is used for horticulture purposes. No treated water is discharged into the water bodies. Summary of treated effluent for the duration from Apr'17 to Sep'17 is provided in Specific Condition No. xii above. Third party analysis of the treated water, Flue Gas, Ambient Air and Noise is being carried out regularly by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Summary of six monthly monitoring of Flue gas emission is provided below. **Parameter** / **Unit** / **Limit** / **Min** / **Max** PM / mg/Nm^3 / 150 / 3.5 / 34.0 SO_2 / mg/Nm^3 / 100 / 5.2 / 33.3 NO_x / mg/Nm^3 / 50 / 5.6 / 40.0 Six monthly report of Flue Gas emissions for duration from Apr'17 to Sep'17 is attached as **Annexure – 2.** Summary of Ambient Air and Noise for duration from Apr'17 to Sep'17 is provided in general condition No. v above. **<u>Solid Waste Management</u>**: APSEZL adopted 5R concept for environmentally sound management of different types of solid & liquid waste. The following table summarizes the waste management practice (for Apr – Sept '17) for different types of wastes at Mundra: <u>Municipal Solid Waste</u> A well-established system for segregation of dry & wet

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		waste is in place, by which all wet waste (Organic waste) is being segregated & utilized for compost manufacturing; compost is further used by our horticulture team for green belt development. Dry Recyclable Waste - is being sorted out in various categories & finally being sent for recycling. E- Waste & Used Batteries - is being sold to registered recycler. Solid Hazardous Waste - is being disposed through common facility i.e. CHWIF and / or co-processing at cement industries. Used/Waste Oil - It is being sold to authorized recycler/reprocesser. Downgrade Chemicals - It is being sold to authorized solvent recover. Slop Oil – Slop oil from vessels are received and water and oil particles from the same are separated in Oil Water Separator system. Separated oil from the same is being sold to authorized recycler /reprocessor.

Waste	Quantity in MT	Disposal method
Municipal Solid Waste		
Dry Waste	115	After recovery sent for recycling
Wet Waste	98	Converted to Manure for Horticulture use

Waste	Quantity in MT	Disposal method
Hazardous Waste		
ETP Sludge	1.04	Landfilling at TSDF Site
Pig Waste	3.52	Co-processing at cement industries
Tank Bottom Sludge	1.73	Co-processing at cement industries
Oily Cotton waste	29.23	Co-processing at Cement Industries
Used / Spent Oil	41.41	Sell to registered recycler
Discarded Containers	4.18	Sell to registered recycler

Sr. No.	Conditions	Compliance Status as on 30-09-2017
viii	Appropriate facility should be created for the collection of solid and liquid wastes generated by the barges/vessels and their safe treatment and disposal should be ensured to avoid possible contamination of the water bodies.	Complied. • Ships berthing at Mundra Port comply with MARPOL regulations. • Waste reception facility provided at port collects Solid waste (i.e. Garbage) from vessels and collected waste is being sorted at Material Recovery Facility & it is sent for recycling. • No discharge such as bilge wastes, sewage or any other liquid wastewater is allowed into marine environment inside port limits and APSEZ does not receive sewage/liquid waste from ship. • Oily sludge (a mixture of oil, water and dirt) is disposed through authorized recycler / re-processor. • As a general practice APSEZ receives slop oil from vessels and water and oil particles from the same are separated in Oil Water Separator system. Separated oil from the same is being sold to authorized recycler /re-processor. However, no slope oil was received during the compliance period.
ix	Necessary navigational aids such as channel markers should be provided to prevent accidents. Internationally recognized safety standards shall be applied in case of barge /vessel movements.	Complied. Navigational aids such as buoys and leading lights have been provided. The rules and regulation of the port contributes to the safe, efficient and environmentally responsible handling of shipping traffic. The international rules of IMO, such as SOLAS convention and its amendments and national regulations are in force at APSEZ, Mundra. **APPLICABLE REGULATION** ➢ Port Security Law (ISPS) ➢ Indian Port Act ➢ Gujrat Maritime Board Act 1981 ➢ Navigational Safety Port Committee (NSPC) ➢ All relevant international rules and regulations on MARPOL, Load lines etc.
x	During operation phase proper precautions should be taken to avoid any oil spills and no oily wastes shall be discharged into the water bodies.	Complied. Proper precautions are taken to avoid any oil spills during operation such as pressure checks of oil transfer lines and manual watch during oil cargo transfer.

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		Available mechanisms to avoid oil spills are identified as below At liquid terminal: • Immediate shut off valve from vessel and shore. • Periodical testing of lines • Immediate suction of material by pump. • Emergency operation shut down. At Marine Operations: • Scupper plug, dip tray, absorbent pad, saw dust is provided to address confined spillage/leakage. At Container Terminals: • Leak cart is available for collect spilled chemical. • Spill control materials in place. • Oil drums are stored in covered shed where pellets are used. Tray provided to collection of spillage/leakage if occurred. No oily waste is discharged to water bodies. Oily waste or oil contaminated waste is being disposed as mentioned in General Condition no. vii above.
xi	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.	Complied. The CSR Activities are planned out at Mundra by Adani Foundation in below five persuasions. For the FY 2017-18. **Area** / **Activity** Community Health: • During this six month, total **13077** patients were provided with free Health Care Services by Mobile Dispensaries at 26 villages and 6 Fisher folk settlements. **15993** patients benefitted by the medical services at Rural Clinics at 11 locations. • During the month, total **4787** transactions were done out of **7487** card holders by beneficiaries Sr. Citizens of **65** Villages Mundra Taluka and they received cash less medical services under this project. Sustainable Livelihood – Fisher folk: • Average **130** KL of water was supplied to 983 households from different settlements on a daily basis under Machhimar Shudhh Jal Yojana. • Computer Training: 30 Fisherman Youth • Sewing Training: 60 Women • Mangrove Plantation: 4000 Man-days • Painting Labour: 3800 Man-days Education: • Praveshotsav Kit is ready for 106 schools of Mundra Taluka, 6 Schools of Mandvi Taluka and 8 Schools of Anjar Taluka. Total **2200** kit distributed. • Education Material support to 67 Students of Juna Bandar, Zarpara, Navinal, Bhadreshwar & Vandi of Standard 9th and 10th. Rural Infrastructure: Work Completed • Mota Bhadiya and Bhujpur- Pond deepening work

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		• Bhadreshwar- Prayer shed in School • Kandagara – Garden work in matang temple • Zarapara – Canal repairing work • Shekhadia- Pagadiya fisherman road repair • Shekhadia- construction of Bhunga Pagadiya fisherman • Kutdi bander- construction of cricket pitch • ASDC- civil works completed. • Kandagara - Repairing of Checkdam and river widening • Mundra- crematorium development • Ragha - Prayer shed in primary school • Shekhadiya – Const. of house of fisherman Skill Development: • Soft skill training – 206 Nos. • Technical Training – 400 Nos. Budget for CSR Activity for the FY 2017-18 (Till Sep'2017) is to the tune of INR 1187 lakh. Out of which, Approx. INR 427 lakh are spent. Details of the CSR activity and expenditure for the period Apr'17 to Sep'17 is enclosed as **Annexure – 7.**
xii	The quarrying material required for the construction purpose shall be obtained only from the approved quarries / borrow areas. Adequate safeguard measures shall be taken to ensure that the overburden and rocks at the quarry site does not find their way into water bodies.	Not applicable at present. Construction activities are completed. No such activity is carried out during the compliance period of Apr'17 to Sep'17.
xiii	The dredging operations, if any, to be undertaken with the prior approval of this Ministry, shall be executed with appropriate safeguard measures to prevent turbidity conditions in consultation with the expert agencies such as CWPRS / NIO.	Complied Capital dredging is completed and only maintenance dredging is being carried out, if required. Dredged material generated by maintenance dredging is used for level rising. The measures recommended by NIO are implemented
xiv	For employing unskilled, semi-skilled and skilled workers for the project, preference shall be given to local people.	Complied • Adani Skill Development Center (ASDC), Mundra is providing skill development training to the locals for Soft Skill, Technical Training and Carrier Guidance & knowledge based training. Total 400 students were enrolled as per above topics

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		during Apr'17 to Sep'17. Allocation of fund for education is availed by Adani Foundation. Total INR 59.70 Lacs are allotted for community education & skill development out of which INR 16.33 Lacs are spent for the purpose till Sep'17. • Preference is given to local people for employment based on their qualification and experience. • All Mangrove plantations are done in consultation with GUIDE and Local forest dept. • 24 hectare of mangrove afforestation at Mundra was done through active participation of local fishermen at the cost of INR 25.0 Lac Details on skill development training imparted during period of Apr'17 to Sep'17 by Adani Foundation are enclosed as **Annexure - 7**
xv	To meet any emergency situation, appropriate firefighting system and water pipelines 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.	Complied. Tug (Dolphin-11) has firefighting system of 1200 m^3/hr. along with 20 ton lifting "A" frame and diving support facility for support at offshore. 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 APSEZ is enclosed as **Annexure – 8.**
xvi	Regular drills should be conducted to check the effectiveness of the on-site Disaster Management Plan.	Complied. . Regular drills are being conducted for effectiveness of the system. There were four drills conducted for various scenario during the compliance period of Apr'17 to Mar'17 as mentioned below. **Location** / **Date** / **Sceario** CT - 3 / 07.04.15 / Evacuation Mock Drill for any emergency Liquid Terminal T-30 (Enclosure 2) / 10.04.17 / Fire in ethyl alcohol Tank -30 with 2 No. casualties.

Sr. No.	Conditions	Compliance Status as on 30-09-2017
		Liquid Terminal Tanker Parking Area — 12.07.17 — Collision of tanker & Leakage of Ethyl Alcohol AMCT- STS 01 — 24.08.17 — We assumed that One Lasher of M/s Zenith Ent Mr.Rajni fall In Sea while getting down from vessel gangway. Report on drills conducted is attached as **Annexure - 9.**
xvii	The recommendations made in the Environmental Plan and Disaster Management Plan, as contained in the EIA and Risk Analysis Reports of the project, shall be effectively implemented.	Complied All the recommendations are being implemented. **Few Marine EIA recommendations:** Operational protocols and safety procedure should be printed and freely available to concerned staff. The employees must be adequately trained to inculcate a high level of competence not only in day to day operations but also during emergency sictuations. Periodic refresher cources must also be organized to maintain the level of their competence. — The company has written the operational protocols and safety procedures as a part of ISO 14001:2008, OHSAS 18001:2008 and ISO 9001:2008certifications . APSEZ has established training department to impart training to its employees. IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification exercise, Incident are conducted at different frequency. Periodic monitoring should be undertaken at the designated sites after the terminals become — Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater,

Sr. No.	Conditions	Compliance Status as on 30-09-2017	
		operational and the results of each monitoring should be carefully evaluated to identify changes if any and to take corrective measures, if warranted.	ground water, marine water and sediments is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Monitoring reports for the period from Apr'17 to Sep'17are enclosed as **Annexure-2**.
		Adequate vigilance is required to adherence of ships to Marpol protocol and related regulations.	During the vessel declaration compliances with respect to Air Pollution and Oil are monitored by the Port Authority. The ships are certified with international certification bodies only after complying with the Marpol protocol.
		Manual Listing Procedure for conducting ship movement operations in the port area must be available to the concerned staff.	Berthing Policy & Tariff Structure is made available for conducting ship movement to the concerned staff and made available on web link www.adaniports.com/pdfs/PIB_06122013.pdf Port Information Booklet is also made available on web link www.adaniports.com/Port_Operations_Port_Tariffs.aspx
		Few Tata AIG Risk Assessment Recommendations:	

Sr. No.	Conditions	Compliance Status as on 30-09-2017	
		There should be facilities of boom, skimmer, dispersant, diving suits, firefighting equipment and excellent communication facilities.	11 Dolphin tugs fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 10 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors.
		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 -5**.
		Water samples around SPMs may be monitored periodically for checking up any oil contamination.	Marine water and sediment testing near SPM is being carried out monthly by NABL and MoEF&CC accredited agency. Monitoring reports for the period from April'17 to Sept.'17 are enclosed as **Annexure-2**.
xviii	A separate Environment Management Cell with suitably qualified staff to carry out various environment related functions should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the company.	Complied. M/s APSEZL has a well structured Environment Management Cell, staffed with qualified manpower for implementation of the Environment Management Plan. The Environment Management Cell is headed by Sr. Manager who directly reports to the top management. The organogram of Environment Cell is attached as **Annexure - 10**	
xix	The project affected people, if any, should be properly compensated and	Not applicable. The project was conceptualized in such a way that there are no impacts on the local settlements due to the project	

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	rehabilitated.	proposal. However, the project is already implemented and is in operation phase.
xx	The funds earmarked for environment protection measures should be maintained in a separate account and there should be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards should be reported to this Ministry.	Complied. Separate budget for the Environment protection measures is earmarked every year. All environment and horticulture activities are considered at corporate level and budget allocation is done accordingly. No separate bank account is maintained for the same however, all the expenses are recorded in advanced accounting system of the organization. Budget for environmental management measures (including horticulture) for the FY 2017-18 is to the tune of INR 966 lakh. Out of which, Approx. INR 682 lakh are spent during F.Y. 2017-18 (till Sep'17) period. Detailed breakup of the expenditures is attached as **Annexure – 11**.
xxi	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 Boards 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.	Complied APSEZL is always extending full support to the regulatory authorities during their visit to the project site. Last visit of Regional Office, GPCB was done on 20.07.2017 for Main port. 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.
xxii	In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new ones for ensuring environmental protection. The project proponents should be	Point Noted.

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	responsible for implementing the suggested safeguard measures.	
xxiii	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.
xxiv	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.	Point Noted.
xxv	A copy of the clearance letter will be marked to concerned Panchayat / local NGO. If any, from whom any suggestion / representation has been received while processing the proposal.	Not applicable at present
xxvi	State Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industries centre and Collector's Office/Tehsildar's Office for 30 days	Applicable for State Pollution Control Board.
xxvii	The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen at Website of the	Already Complied. references of newspapers.

Sr. No.	Conditions	Compliance Status as on 30-09-2017
	Ministry of Environment and Forests at http://www.envfor.nic.in/.	
xxviii	The Project Proponents should inform the Regional Office as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.	Already Complied.
xxix	The Project Proponent should make specific arrangements for rainwater harvesting in the project design and the rainwater so harvested should be optimally utilized.	Groundwater recharge cannot be done at the project site since the entire project is in the intertidal / sub tidal areas. Rain water within project area is managed through storm water drainage. However, APSEZL has carried out pond deepening activity at Mota Bhadiya and Bhujpur villages during the compliance period to envisage rainwater harvesting.

ANNEXURE - A

CRZ Recommendation Compliance Report of WFDP

Half yearly Compliance report of CRZ recommendation for "Port expansion project including dry/break bulk cargo container terminal, railway link and related ancillary and back-up facilities at Mundra Port, Dist. Kutch in Gujarat vide DoEF, GOG letter no. ENV-1098-6477-p1 dated 28th October 1999

<table>
<tr><th>Sr. No.</th><th>Conditions</th><th>CRZ Compliance Status as on 30-09-2017</th></tr>
<tr><td colspan="3">A. Specific Condition</td></tr>
<tr><td>1</td><td>The company shall submit comprehensive Environmental Impact Assessment Report and Risk Assessment Report containing worst case scenario and detailed oil spill control management plan before carrying out the construction activities and shall implement all the mitigative measures/suggestions/recommendations given in the report of NIO and Tata AIG Risk Management Services.</td><td>Already Complied. Not applicable at present

Environmental Clearance was granted based on the submission of said documents. Rapid EIA was submitted on Feb 29, 2000 & Risk Assessment Report containing worst case scenario and detailed oil spill control management plan was submitted on Dec 28, 1999.

All the recommendations given in the report of NIO and Tata AIG Risk Management Services are implemented. Few examples are provided below.

Few Marine EIA recommendations:
<table>
<tr><td>Operational protocols and safety procedure should be printed and freely available to concerned staff. The employees must be adequately trained to inculcate a high level of competence not only in day to day operations but also during emergency sictuations. Periodic refresher cources must also be organized to maintain the level of their competence.</td><td>The company has written the operational protocols and safety procedures as a part of ISO 14001:2008, OHSAS 18001:2008 and ISO 9001:2008 certifications.
APSEZ has established training department to impart training to its employees.

IMO module course organized by Maritime Training Institute is conducted & 36 personnel have achieved IMO level 1 & 4 personnel have achieved IMO Level 2. Different training modules as Oil Spill, Oil Spill Equipment, Notification exercise, Incident are conducted at different frequency.</td></tr>
<tr><td>Temporary colonies of workforce should be located sufficiently away from the HTL with proper</td><td>Construction activity is already completed.
Most of the construction labours were residing in the</td></tr>
</table></td></tr>
</table>

Sr. No.	Conditions	CRZ Compliance Status as on 30-09-2017	
		sanitation. Adequate arrangement of fuel supply to the workers should be made to discourage them from using mangroves for firewood.	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 APSEZ.
		Periodic monitoring should be undertaken at the designated sites after the terminals become operational and the results of each monitoring should be carefully evaluated to identify changes if any and to take corrective measures, if warranted.	Monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments is being carried out by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratories Pvt. Ltd. Monitoring reports for the period from April'17 to Sept.'17 are enclosed as **Annexure-2.**
		Adequate vigilance is required to adherence of ships to Marpol protocol and related regulations.	During the vessel declaration compliances with respect to Air Pollution and Oil are monitored by the Port Authority. The ships are certified with international certification bodies only after complying with the Marpol protocol.
		Manual Listing Procedure for conducting ship movement operations in the port area must be available to the concerned staff.	Berthing Policy & Tariff Structure is made available for conducting ship movement to the concerned staff and made available on web link www.adaniports.com/pdfs/PIB_06122013.pdf Port Information Booklet is also made available on web link www.adaniports.com/Port_Operations_Port_Tariffs.aspx

Sr. No.	Conditions	CRZ Compliance Status as on 30-09-2017
		Few Tata AIG Risk Assessment Recommendations: There should be facilities of boom, skimmer, dispersant, diving suits, firefighting equipment and excellent communication facilities. — 11 Dolphin tugs fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required; out of them 10 Dolphin Tugs are fitted with a fire curtain and remote controlled fire monitors. 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 -5.** Water samples around SPMs may be monitored periodically for checking up any oil contamination. — Marine water and sediment testing near SPM is being carried out monthly by NABL and MoEF&CC accredited agency. Monitoring reports for the period from April'17 to Sept.'17 are enclosed as **Annexure-2.**
2	The company in no case tap ground water.	Complied. Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited. Average water consumption for entire APSEZ area is 5.6 MLD out of which 2.8 MLD is obtained from Desalination plant whereas remaining 2.8 MLD is obtained from GWIL.
3	The company shall not cut mangroves for the project activities except for stray mangrove seeding required for the	Already Complied. Not applicable at present The company has not cut mangroves. APSEZ has carried out 24 hectare of mangrove plantation near Navinal creek.

Sr. No.	Conditions	CRZ Compliance Status as on 30-09-2017
	railway line only after detailed assessment through NIO and 25 acre of land shall be planted with mangroves in consultation with NIO.	It may be noted that to enhance the marine biodiversity, till date APSEZ has carried out mangrove afforestation in more than 2800 ha. area across the coast of Gujarat. Total expenditure for the same till date is INR 782 lakh. So, far APSEZ have developed more than 400 ha. area as greenbelt with plantation more than 8.0 Lacs saplings within the APSEZ area. Details of mangrove plantation and green belt development carried out by APSEZ till date is annexed as **Annexure – 3** EIA report was prepared by NIO in which all impacts on mangroves and coastal ecology of the region for the proposed design were studied in detail.
4	The company shall carry out the mangroves plantation programme in addition to 25-acre mangrove plantation to be done with the help of the NIO, in consultation with the forest department.	
5	The company shall ensure that the construction labors do not cut mangroves for fuel, etc.	Already Complied. Not applicable at present 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 APSEZ.
6	The company shall ensure that no creek are blocked due to the project activities,	Complied. Prominent creek system (main creeks and small branches of creeks) in the study region are: (1) Kotdi (2) Baradimata (3) Navinal (4) Bocha (5) Mundra (Oldest port (Juna Bandar) leading to Bhukhi river) All above creeks are in existence allowing free flow of water and there is no filling or reclamation of any creek area. APSEZ has so far constructed 19 culverts having total length of approx. 1100 m with cost of INR 20 Crores. Apart from that three RCC bridges have been constructed over Kotdi creek with total length of 230 m at the cost of INR 10 Crores. . Photographs of the same are attached as **Annexure – 4**.
7	The company shall ensure that there will be no disposal of sullage and sewage generated from construction camps, surface run-off	Already complied. Not applicable at present. Project is in operation phase. Sewage and effluent generated from port is being treated in designated ETP and treated water is used for horticulture purposes.

Sr. No.	Conditions	CRZ Compliance Status as on 30-09-2017
	from construction sites, and oil and grease spillage from construction equipment in the creeks.	Third party analysis of the treated water is being carried out twice in a month by NABL and MoEF&CC accredited agency namely M/s. Pollucon Laboratory Pvt. Ltd. Summary of the same for duration from Apr'17 to Sep'17 is mentioned in the condition no. xii of EC Compliance report. The results of the same are attached as **Annexure – 2.**
8	The company shall stick to the time bound programme submitted to this department for the proposed activities including installation of desalination plant for meeting the entire water requirement.	Already complied. Not applicable at present. Construction work was completed on time and project is in operation phase. Desalination plant with the capacity of 47 MLD is installed to meet the water requirement. Present source of water for various project activities is desalination plant of APSEZ and/or Narmada water through Gujarat Water Infrastructure Limited. Average water consumption for entire APSEZ area is 5.6 MLD out of which 2.8 MLD is obtained from Desalination plant whereas remaining 2.8 MLD is obtained from GWIL.
9	The company shall ensure that the commercial fisheries are not hampered due to the presence of barges, vessels and other activities in the region. Necessary plan in this regards shall be prepared in consultation with the NIO.	Complied. No commercial fisheries are prevailing in this area except Pagadia and fishermen with small boats. Unhindered access is provided to the fishing boats. During project proposal, APSEZ proposed to provide four (4) dedicated accesses at Juna Bandar, Luni, Bavdi Bandar and Zarpara for the fishermen to approach the sea for fishing activity. However, during construction as well as operation, through fishermen consultative process, APSEZ has provided seven (7) access roads. Total length of all the approach roads is approx. 23 Kms and expenditure involved is Rs. 637 Lacs. There is no hindrance to the movement of fisherman boats. Communication mechanisms have been developed for the smooth movement of fishing boats vis-à-vis shipping activities.
10	The company shall bear the cost of the external agency that may appointed by this department for carrying out the supervision	Complied. Construction activities are completed and project is in operation phase. If at all any study is suggested by Govt. of Gujarat, we will give full co-operation

Sr. No.	Conditions	CRZ Compliance Status as on 30-09-2017
	and/or the monitoring of the construction activities.	
11	The company shall carry out the post project monitoring of various environmental parameters in consultation with this department and Gujarat Pollution Control Board.	Being complied. Post project monitoring of various environmental parameters for Ambient Air, Noise, Wastewater, ground water, marine water and sediments is being carried out by NABL and MoEF&CC accredited agency M/s. Pollucon Laboratory Pvt. Ltd. Monitoring reports for the period from Apr'17 to Sep'17 are enclosed as **Annexure-2.**
12	The company shall prepare the detailed traffic control management plan for the port and shall participate in the VTMS to be developed for the Gulf of Kachchh.	Complied. APSEZ is practicing well defined traffic control procedure. A VTS service for Gulf of Kutch is provided by the VTS Gulf of Kutch, operated by Directorate General of Lighthouses and Lightships (DGLL), Govt.of India. Marine Control of APSEZ provides traffic update to vessels in Mundra Port Limit on VHF Channel- 77. Arrival and departure information before arrival and departure respectively in Gulf of Kutch is provided to VTS information cell through agent or by directly sending mail to vtsmanagergulfofkutch@yahoo.com and vtsgok@yahoo.com
13	In order the eliminate adverse impact on the mangroves of Bocha Island and coastal ecology of the region, the company shall carry out construction activities only after the construction design and methodology is approved by NIO.	Already complied. Not applicable at present. Construction activity is already completed. EIA report was prepared by NIO in which all impacts on mangroves and coastal ecology of the region for the proposed design were studied in detail.
14	Any other conditions may be stipulated by this department from time to time.	Point noted.

Annexure – 1

GPCB

GUJARAT POLLUTION CONTROL BOARD

PARYAVARAN BHAVAN
Sector-10-A, **Gandhinagar** 382 010
Phone : (079) 23222425
(079) 23232152
Fax : (079) 23232156
Website : www.gpcb.gov.in

By R.P.A.D.

AMENDMENT OF CONSOLIDATED CONSENT AND AUTHORIZATION (C C & A)

GPCB/CCA-Kutch (39 (4)/ ID-17739/ 424578

Date 27.9.2017
03/10/17

To,
M/s. Adani Ports & Special Economic zone Limited,
Plot No: 169/P
At Navinal Island, Taluka: Mundra,
Dist: Kutch – 370 421

Sub: - Amendment of Consolidated Consent and Authorization (CC& A) of this Board under the provision the Water (Prevention and Control of Pollution) Act-1981, the air Prevention and Control of Pollution) 1981 and the Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 framed under the Environmental (Protection) Act-1986.

Ref: -

1. Consent Renewal Order No: AWH-83561 dated 9.1.2017 validity up to 20.11.2021 issued vide letter No: GPCB/CCA-Kutch-39 (4)/ID-17739/403658 dated 9.2.2017
2. Your CCA- Amendment application Inward no-124026 dated 12.7.2017

The Board has granted Consolidated Consent (CC & A) vide order No: AWH-83561 dated 9.1.2017 validity up to 20.11.2021 issued vide letter No: GPCB/CCA-Kutch-39 (4)/ID-17739/403658 dated 9.2.2017 is amended as under:

1. The above referred CC&A order is amended as order **No: WH-88317** and issued dated 12.7.2017 and validity period i.e. up to 20.11.2021 & shall remains unchanged.

2. The Products mentioned at Condition No: 2 of the above said CCA order is amended as under:

No.	Name Of Product	Existing Quantity	Proposed Quantity	TOTAL Quantity
1.	General Cargo	4.0 Lac MT/Month	------	4.0 Lac MT/Month
2.	Liquid Cargo (Chemical/Poc Products	2.65 Lac MT/Month	--------	2.65 Lac MT/Month
3.	Storage And Distribution Of Bitumen	26,400 MT/Month	------	26,400 MT/Month
4.	Dry Cargo Handling	9 MMT/Month	------	9 MMT/Month
5.	Container Terminal Handling Operation	4.5 Million TEUs/Annum	-----	4.5 Million TEUs/Annum
6.	Waste destruction system for decomposition/destruction of municipal solid waste	3.5 Cubic Meter (MSW Destruction Capacity @ 500 Kg/day)	-----	3.5 Cubic Meter (MSW Destruction Capacity @ 500 Kg/day)
7.	Oil water separate (Flame Proof) to remove –Oil portion from slope oil received from Vessels/Ships	25 M^3/Hr	---	25 M^3/Hr
8.	Import, Storage And Distribution Of Edible Oil	1.25 Lac MT/Month	0.6 Lac MT/ Month	1.85 Lac MT/Month

Clean Gujarat Green Gujarat
ISO-9001-2008 & ISO-14001 - 2004 Certified Organisation

4.0 The condition No: 4.1 is amended as under:

4.1 The following shall be used as fuel in addition to Existing.

	FUEL DETAILS	Existing	Proposed	Total after expansion
1.	Furnace oil/LDO/HSD	860 Liter/Hour	115	975 Liter/Hour
2.	HSD	100 Liter/Hour	-------	100 Ltr/ Hr

4.2 The condition No: 4.2 for flue gas emissions shall, confirm to the following standards as under:

Sr. no.	Stack attached to	Stack height in meters, Mtr	Parameter	Permissible limit
1.	Hot Water Generator --1	35	PM SO_2 NOx	150 mg/Nm^3 100 ppm 50 ppm
2.	Hot Water Generator ---2	35		
3.	Fuel Heater (Thermic) (2 Nos)	35		
4.	D.G. Set – 9 Nos (500 KVA) (Stand By)	9 Meter Each		
5.	D.G. Set – 3 Nos (1250 KVA) (Stand By)	30 Meter common		
6.	D.G. Set – 6 Nos (1500 KVA) (Stand By)	30 Meter Each		

5.2 Condition NO 5.2 shall be amended for addition to existing waste as under, in accordance with the Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016 as under:

Sr. No.	Waste	Existing Quantity	Proposed Quantity	Total Quantity	Cat.	Facility
1.	Used oil m	300 T/ Year	60 T/ year	360 T/ year	5.1	Collection, storage, Transportation,, Disposal by reuse within premises and / or selling out to registered recyclers/ /reprocessers
2	Contaminated cotton rags or other cleaning material	100 T/ Year	5 T/ Year	105 T/ Year	33.2	Collection, storage, Transportation, Disposal by Co-processing at cement Industries and / or incineration at CHWIF site.

3. Remaining all other conditions of Consolidated Consent (CC&A) vides order No: AWH-83561 dated 9.1.2017 validity up to 20.11.2021 issued vide letter No: GPCB/CCA-Kutch-39 (4)/ID-17739/403658 dated 9.2.2017 shall remains unchanged.

For and on behalf of
Gujarat Pollution Control Board

(P.J. Vachhani)
Sr. Environmental Engineer

Annexure – 2

"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"

FOR

ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED
TAL: MUNDRA, KUTCH, MUNDRA – 370 421

MONITORING PERIOD:
APRIL 2017 TO SEPTEMBER 2017

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 web: www.polluconlab.com**

TC - 5945 ISO 9001:2008 ISO 14001:2004 OHSAS 18001:2007

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	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	7.96	8.04	8.02	8	8.08	8.19	8.14	8.18	8.11	8.23	7.96	8.04	IS3025(P11)83Re.02
2	Temperature	°C	28	29	29	30	29	30	28	29	28	29	29	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	18	20	14	20	24	18	16	22	18	24	16	22	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL*	BDL*	BDL*	BDL*	7	10	3	4	BDL*	4	BDL*	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.60	5.20	5.6	4.6	5.6	5	5	4.6	5.2	4.8	5.8	5.4	IS3025(P38)89Re.99
6	Salinity	ppt	41.40	41.80	41.2	42.8	40.54	41.17	38.21	39	34.6	35.8	31.4	32.8	APHA (22ndEdi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22ndEdi)5520 D
8	Nitrate as NO_3	mg/L	0.500	0.730	0.532	0.598	0.673	0.734	0.63	0.72	0.54	0.7	0.6	0.69	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.022	0.035	0.03	0.047	0.06	0.072	0.058	0.069	0.06	0.067	0.021	0.033	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.980	1.130	0.924	1.1	0.721	0.887	0.8	0.99	0.74	0.89	0.85	1.16	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.048	0.100	1.03	1.215	0.636	0.781	0.75	0.83	0.46	0.64	0.044	0.98	APHA(22ndEdi) 4500 C
12	Total Nitrogen	mg/L	1.600	1.910	1.486	1.745	1.454	1.693	1.47	1.77	1.34	1.657	1.471	1.883	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	46980	47860	48593	48878	49870	50560	47580	48670	37580	38670	36980	37860	IS3025(P16)84Re.02
15	COD	mg/L	19	24	19	28	29	38	9	19	10	20	15	24	APHA(22ndEdi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.530	0.470	0.6	0.44	0.68	0.48	0.44	0.38	0.5	0.42	0.48	0.37	SOP – PLPL – 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L /day	2.700	1.350	1.125	0.338	2.02	0.9	1.91	0.428	2.21	0.522	2.7	1.46	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	2.670	0.908	1.28	0.267	1.816	0.427	2.18	0.534	2.76	0.504	2.67	0.9	APHA (22ndEdi) 10200-H

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Lab Manager

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Lab Manager (Q)

18.2	Phaeophytin	mg/m^3	1.290	3.017	0.98	1.39	0.072	1.348	0.203	1.727	0.198	1.62	BDL*	1.03	APHA (22ndEdi) 10200-H
18.3	Cell Count	Unit x 10^3/L	250.0	314.0	147	52	186	45	232	54	178	52	252	110	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Coscinodiscus sp. Pinnularia sp. synendra sp. Navicula sp. Pleurosigma sp. Green algae Volvox sp. Chlorella sp. Ulothrix sp. Cyanophyceae Oscillatoria sp. Nostoc sp.	Bacillariophyceae Fragillaria sp. Navicula sp. Pinnularia sp. Melosira sp. Green algae Spirogyra sp. Spirogyra sp. Cyanophyceae Oscillatoria sp.	Bacillariophyceae Nitzschia sp. Rhizosolenia sp. Navicula sp. Asterionella sp. Cymbella sp. Synedra sp. Green Algae Pandorina sp. Pediastrum sp. Ulothrix sp. Cyanophyceae Oscillatoria sp. --	Bacillariophyceae Navicula sp. Fragillaria sp. Pinnularia sp. Biddulphia sp. Green Algae Ulothrix sp. Cyanophyceae Oscillatoria sp. Spirulina sp. -- -- -- --	Bacillariophyceae Asterioello.sp Navicula sp. Nitzschia sp. Coscinodiscus sp. Pinnularia sp. Rhizosolenia sp. Amphora sp. Cyanophyceae Chlorella sp. Volvox sp. Hydrodictyon sp. Hydrodictyon sp. --	Bacillariophyceae Asterionella sp. Cyclotella sp. Fragillaria sp. Coscinodiscus sp. -- -- Cyanophyceae Oscillatoria sp. Spirulina sp. Green Algae Chlorella sp. Spirogyra sp. --	Bacillariophyceae Biddulphia sp. Fragillaria sp. Gomphonema sp. Rhizosolenia sp. Cymbella sp. Thallasiosira sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Hydrodictyon sp.	Bacillariophyceae Gomphonema sp. Nitzschia sp. Synedra sp. Fragillaria sp. Cyanophyceae Spirulina sp. Oscillatoria sp. Green Algae Chlorella sp. Hydrodictyon sp. -- -- --	Bacillariophyceae Biddulphia sp. Fragillaria sp. Gomphonema sp. Rhizosolenia sp. Cymbella sp. Thallasiosira sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Nostoc sp. Green Algae Hydrodictyon sp. Pediastrum sp.	Bacillariophyceae Fragillaria sp. Synedra sp. Nitzschia sp. Gomphonema sp. Cyanophyceae Spirulina sp. Green Algae Chlorella sp. Hydrodictyon sp. -- -- -- --	Bacillariophyceae Coscinodiscus sp. Gomphonema sp. Gyrosigma sp. Pleurosigma sp. Navicula sp. Synedra sp. Pinnularia sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Anabaena sp. Green Algae Ankistrodesmus sp Chlorella sp. Pandorina sp. Ulothrix sp.	Bacillariophyceae Coscinodiscus sp Nitzschia sp. Gomphonema sp. Skeletonema sp. Thallasionema sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Green Algae Chlorella sp. Pandorina sp. Pediastrum sp. -- -- -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	313	38	280	60	275	100	240	80	250	78	425	150	APHA (22nd Edi) 10200-G

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19.2	Name of Group Number and name of group species of each group	--	copepods Fish egg Cyclops Gastropods	Copepods Cyclops Daphnia	Gastropods Isopods Decapods Krill Namatodes Molluscans Copepods	Copepods Polychaete worms Crustaceans -- --	Crustaceans Cyclops Decapods Copepods Gastropods Rotifers --	Copepods Crustaceans Platinelminths -- -- -- --	Copepods Decapods Ostracods Crustaceans Krill Barnades	Polychaetes Worms Crustaceans Gastropods -- -- --	Copepods Decapods Ostracods Crustaceans Krill Barnades	Polychaete worms Crustaceans Gastropods -- -- --	Copepods Decapods Gastropods Polychaete worms Cyclops	Echinoderms -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	225	4	38	23	91	18	87.8	8.4	77.3	8.2	76.3	12.1	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1780	1520	1130	870	1840	1580	1480	1020	1680	1160	1780	1520	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi.2.4 (2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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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	APRIL 2017	MAY 2017	JUNE 2017	JULY 2017	AUGUST 2017	SEPTEMBER 2017	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.48	0.352	0.622	0.5	0.45	0.47	FCO:2007
2	Phosphorus as P	µg/kg	140	146	144	127	133	138	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy loam	Sandy Loam	Sandy Loam	Sandy loam	Sandy Loam	Sandy Loam	--
4	Petroleum Hydrocarbon	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.05	4.99	5.59	4.85	5.86	4.92	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/kg	189	189	188	200	198	210	AAS 3111B
5.3	Manganese as Mn	µg/kg	709	789	860	689	884	722	AAS APHA 3111 B
5.4	Iron as Fe	%	3.95	2.61	2.12	4.07	2.06	4.02	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/kg	52.29	57.96	50	51.96	51.89	54.4	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/kg	39.13	37.99	32	37.96	36.12	34.42	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/kg	137	143	139	143	140	148	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/kg	1.63	1.13	1.18	1.54	1.66	1.28	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Polychaete Worms Echinoderms Mysids	Crabs Anthozoans Isopods Decapods	polychaete worms isopods Decapods mysids	Polychaete worms Mysids Decapods	Polychaete worms Mysids Decapods	Polychaete worms Hydrozoa Nematodes Isopods	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Isopods Nematodes Hydrozans	Copepods Foraminiferans --	Copepods ostracodes --	Foraminiferans Nematodes Ciliates	Foraminiferans Nematodes Ciliates	Mysids Echinoderms	APHA (22nd Edi) 10500-C
6.3	Population	no/m2	503	288	440	357	399	470	APHA (22nd Edi) 10500-C

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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Lab Manager (Q)

RESULTS OF MARINE WATER [M2 MOUTH OF BOCHA & NAVINAL CREEK - N 22°44'239" E 069°43'757"]

SR. NO.	TEST PARAMETERS	UNIT	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	7.96	8.04	8.02	8	8.08	8.19	8.14	8.18	8.11	8.23	7.96	8.04	IS3025(P11)83Re.02
2	Temperature	°C	28	29	29	30	29	30	28	29	28	29	29	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	18	20	14	20	24	18	16	22	18	24	16	22	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL*	BDL*	BDL*	BDL*	7	10	3	4	BDL*	4	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	5.6	5.2	5.6	4.6	5.6	5	5	4.6	5.2	4.8	5.8	5.4	IS3025(P38)89Re.99
6	Salinity	ppt	41.4	41.8	41.2	42.8	40.54	41.17	38.21	39	34.6	35.8	31.4	32.8	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	mg/L	0.5	0.73	0.532	0.598	0.673	0.734	0.63	0.72	0.54	0.7	0.6	0.69	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.022	0.035	0.03	0.047	0.06	0.072	0.058	0.069	0.06	0.067	0.021	0.033	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.98	1.13	0.924	1.1	0.721	0.887	0.8	0.99	0.74	0.89	0.85	1.16	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.048	0.1	1.03	1.215	0.636	0.781	0.75	0.83	0.46	0.64	0.044	0.98	APHA(22nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.6	1.91	1.486	1.745	1.454	1.693	1.47	1.77	1.34	1.657	1.471	1.883	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	46980	47860	48593	48878	49870	50560	47580	48670	37580	38670	36980	37860	IS3025(P16)84Re.02
15	COD	mg/L	19	24	19	28	29	38	9	19	10	20	15	24	APHA(22nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.53	0.47	0.6	0.44	0.68	0.48	0.44	0.38	0.5	0.42	0.48	0.37	SOP – PLPL - 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L/day	2.7	1.35	1.125	0.338	2.02	0.9	1.91	0.428	2.21	0.522	2.7	1.46	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	2.67	0.908	1.28	0.267	1.816	0.427	2.18	0.534	2.76	0.504	2.67	0.9	APHA (22nd Edi) 10200-H
18.2	Phaeophytin	mg/m^3	1.29	3.017	0.98	1.39	0.072	1.348	0.203	1.727	0.198	1.62	BDL*	1.03	APHA (22nd Edi) 10200-H
18.3	Cell Count	Unit x 10^3/L	250	314	147	52	186	45	232	54	178	52	252	110	APHA (22nd Edi) 10200-H

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Coscinodiscus sp. Pinnularia sp. synendra sp. Navicula sp. Pleurosigma sp. Green algae Volvox sp. Chlorella sp. Ulothrix sp. Cyanophyceae Oscillatoria sp. Nostoc sp.	Bacillariophyceae Fragillaria sp. Navicula sp. Pinnularia sp. Melosira sp. Green algae Spirogyra sp. Spirogyra sp. Cyanophyceae Oscillatoria sp.	Bacillariophyceae Nitzschia sp. Rhizosolenia sp. Navicula sp. Asterionella sp. Cymbella sp. Synedra sp. Green Algae Pandorina sp. Pediastrum sp. Ulothrix sp. Cyanophyceae Oscillatoria sp. --	Bacillariophyceae Navicula sp. Fragillaria sp. Pinnularia sp. Biddulphia sp. Green Algae Ulothrix sp. Cyanophyceae Oscillatoria sp. Spirulina sp. -- -- -- --	Bacillariophyceae Asterioello.sp Navicula sp. Nitzschia sp. Coscinodiscus sp. Pinnularia sp. Rhizosolenia sp. Amphora sp. Cyanophyceae Chlorella sp. Volvox sp. Hydrodictyon sp. Hydrodictyon sp. --	Bacillariophyceae Asterionella sp. Cyclotella sp. Fragillaria sp. Coscinodiscus sp. -- -- Cyanophyceae Oscillatoria sp. Spirulina sp. Green Algae Chlorella sp. Spirogyra sp. --	Bacillariophyceae Biddulphia sp. Fragillaria sp. Gomphonema sp. Rhizosolenia sp. Cymbella sp. Thallasiosira sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Hydrodictyon sp.	Bacillariophyceae Gomphonema sp. Nitzschia sp. Synedra sp. Fragillaria sp. Cyanophyceae Spirulina sp. Oscillatoria sp. Green Algae Chlorella sp. Hydrodictyon sp. --	Bacillariophyceae Biddulphia sp. Fragillaria sp. Gomphonema sp. Rhizosolenia sp. Cymbella sp. Thallasiosira sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Nostoc sp. Green Algae Hydrodictyon sp. Pediastrum sp.	Bacillariophyceae Fragillaria sp. Synedra sp. Nitzschia sp. Gomphonema sp. Cyanophyceae Spirulina sp. Green Algae Chlorella sp. Hydrodictyon sp. -- -- -- --	Bacillariophyceae Coscinodiscus sp. Gomphonema sp. Gyrosigma sp. Pleurosigma sp. Navicula sp. Synedra sp. Pinnularia sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Anabaena sp. Green Algae Ankistrodesmus sp Chlorella sp. Pandorina sp. Ulothrix sp.	Bacillariophyceae Coscinodiscus sp Nitzschia sp. Gomphonema sp. Skeletonema sp. Thallasionema sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Green Algae Chlorella sp. Pandorina sp. Pediastrum sp. -- -- -- --	APHA (22nd Edi) 10200-H
C							Zooplanktons								
19.1	Abundance (Population)	no/m^2	313	38	280	60	275	100	240	80	250	78	425	150	APHA (22nd Edi) 10200-G

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19.2	Name of Group Number and name of group species of each group	--	copepods Fish egg Cyclops Gastropods	Copepods Cyclops Daphnia	Gastropods Isopods Decapods Krill Namatodes Molluscans Copepods	Copepods Polychaete worms Crustaceans -- --	Crustaceans Cyclops Decapods Copepods Gastropods Rotifers	Copepods Crustaceans Platinelminths -- -- --	Copepods Decapods Ostracods Crustaceans Krill Barnades	Polychaetes Worms Crustaceans Gastropods -- -- --	Copepods Decapods Ostracods Crustaceans Krill Barnades	Polychaete worms Crustaceans Gastropods -- -- --	Copepods Decapods Gastropods Polychaete worms Cyclops	Echinoderms -- -- -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	225	4	38	23	91	18	87.8	8.4	77.3	8.2	76.3	12.1	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1780	1520	1130	870	1840	1580	1480	1020	1680	1160	1780	1520	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi.2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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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	APRIL 2017	MAY 2017	JUNE 2017	JULY 2017	AUGUST 2017	SEPTEMBER 2017	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.68	--	--	--	--	--	FCO:2007
2	Phosphorus as P	µg/kg	159	--	--	--	--	--	APHA(22ndEdi) 4500 C
3	Texture	--	Sandy loam	--	--	--	--	--	--
4	Petroleum Hydrocarbon	mg/kg	BDL*	--	--	--	--	--	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.22	--	--	--	--	--	AAS APHA 3111 B
5.2	Total Chromium as Cr+3	µg/kg	146	--	--	--	--	--	AAS 3111B
5.3	Manganese as Mn	µg/kg	808	--	--	--	--	--	AAS APHA 3111 B
5.4	Iron as Fe	%	2.06	--	--	--	--	--	AAS APHA(22ndEdi)3111 B
5.5	Nickel as Ni	µg/kg	36.61	--	--	--	--	--	AAS APHA(22ndEdi)3111 B
5.6	Copper as Cu	µg/kg	80.88	--	--	--	--	--	AAS APHA(22ndEdi)3111 B
5.7	Zinc as Zn	µg/kg	120	--	--	--	--	--	AAS APHA(22ndEdi)3111 B
5.8	Lead as Pb	µg/kg	1.12	--	--	--	--	--	AAS APHA(22ndEdi)3111 B
5.9	Mercury as Hg	µg/kg	BDL*	--	--	--	--	--	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Isopods Decapods Echonodems	--	--	--	--	--	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Nematodes isopods ciliats	--	--	--	--	--	APHA (22nd Edi) 10500-C
6.3	Population	no/m^2	314	--	--	--	--	--	APHA (22nd Edi) 10500-C

H. T. Shah
Lab Manager

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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	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	7.84	8.19	7.62	8.08	7.55	7.92	7.86	8.09	7.77	8.18	7.83	8.2	IS3025(P11)83Re.02
2	Temperature	°C	29	30	29	30	29	30	30	31	28	29	28	29	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	22	26	22	25	30	38	24	28	20	24	20	24	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	5	9.0	BDL*	BDL*	4	5	5	6	4	8	6	10	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.60	4.50	5.4	4.6	5.6	4.8	5.4	4.6	5.2	4.8	5.4	4.6	IS3025(P38)89Re.99
6	Salinity	ppt	41.60	42.80	42.8	43.02	41.66	42.92	37.84	38.33	32.6	33.6	41.6	42.5	APHA (22ndEdi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	0.2	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22ndEdi)5520D
8	Nitrate as NO_3	mg/L	0.370	0.450	0.3	0.42	0.28	0.36	0.3	0.4	0.32	0.43	0.41	0.49	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.013	0.023	0.019	0.028	0.02	0.026	0.018	0.023	0.016	0.025	0.017	0.026	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.580	0.687	0.8	0.9	0.7	0.8	0.63	0.7	0.6	0.69	0.48	0.51	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.073	0.099	0.64	0.81	0.58	0.72	0.54	0.7	0.58/	0.73	BDL*	BDL*	APHA(22ndEdi) 4500 C
12	Total Nitrogen	mg/L	0.91	1.143	1.12	1.35	1.08	1.21	0.948	1.123	0.92	1.14	0.907	1.026	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	50900	51220	51288	51492	49920	51430	49380	50840	40890	41360	51500	51910	IS3025(P16)84Re.02
15	COD	mg/L	16	30	18	28	20	26	18	24	14	28	22	32	APHA(22ndEdi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.290	0.170	0.31	0.2	0.28	0.21	0.26	0.22	0.3	0.2	0.27	0.19	SOP – PLPL - 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L /day	2.295	0.450	2.25	0.225	1.46	0.113	2.08	0.526	1.77	0.319	2.13	0.675	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	3.520	0.267	2.05	0.053	1.01	0.24	2.184	0.484	1.597	0.362	2.2	0.507	APHA (22ndEdi) 10200-H
18.2	Phaeophytin	mg/m^3	1.520	4.064	0.523	2.52	1.56	2.17	BDL*	1.628	BDL*	1.62	BDL*	1.5	APHA (22ndEdi) 10200-H

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18.3	Cell Count	Unit x 10^3/L	262.0		254	25	178	18	220	46	199	32	241	58	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Asterionella sp. Gyrosigma sp. Fragillaria sp. Rhizosolenia sp. Green algae Hydrodictyon sp. Ulothrix sp. Oedogonium sp. Cyanophyceae microcystis sp. Nostoc sp.	Bacillariophyceae Fragillaria sp. Melosira sp. Rhizosolenia sp. Green algae Scenedesmus sp. Cyanophyceae Anabaena sp. Nostoc sp.	Bacillariophyceae Synedra sp. Nitzschia sp. Rhizosolenia sp. Thallasiira sp Coscinodiscus sp. Green Algae Scenedesmus sp. Chlorella sp. Spirogyra sp. Cyanophyceae Nostoc sp. Oscillatoria sp. --	Bacillariophyceae Nitzschia sp. Navicula sp. Gyro sigma sp. Green Algae Chlorella sp. Desmids Closterium sp. -- -- -- -- -- --	Bacillariophyceae Cymbella sp. Pinnularia sp. Coscinodiscus sp. Rhizosolenia sp. Green Algae Chlorella sp. Oedogonium sp. Oscillatoria sp. Anabaena sp. --	Bacillariophyceae Fragillaria sp. Pinnularia sp. Navicula sp. Nitzschia sp. Gyrosigma sp. Green Algae Chlorella sp. -- -- --	Bacillariophyceae Tabellaria sp. Thallasiira sp. Rhizosolenia sp. Fragillaria sp. Cyclotella sp. Cheatoceros sp. Biddulphia sp. Cyanophyceae Spirulina sp. Nostoc sp. Microcystis sp. Green Algae Pediastrum sp. Hydrodictyon sp. Chlorella sp.	Bacillariophyceae Gyrosigma sp. Melosira sp. Skeletonema sp. Nitzschia sp. Cyclotella sp. Cyanophyceae Oscillatoria sp. Green Algae Scenedesmus sp. Pandorina sp. --	Bacillariophyceae Biddulphia sp. Cheatoceros sp. Cyclotella sp. Fragillaria sp. Rhizosolenia sp. Thallasiira sp. Tabellaria sp. Cyanophyceae Microcystis sp. Nostoc sp. Spirulina sp. Green Algae Hydrodictyon sp. Pediastrum sp.	Bacillariophyceae Cyclotella sp. Nitzschia sp. Skeletonema sp. Melosira sp. Gyrosigma sp. Cyanophyceae Oscillatoria sp. Green Algae Pandorina sp. Scenedesmus sp. -- -- -- --	Bacillariophyceae Tabellaria sp. Thallasiira sp. Rhizosolenia sp. Fragillaria sp. Cyclotella sp. Cheatoceros sp. Biddulphia sp. Cyanophyceae Microcystis sp. Nostoc sp. Spirulina sp. Green Algae Chlorella sp. Hydrodictyon sp. Pediastrum sp.	Bacillariophyceae Gyrosigma sp. Melosira sp. Skeletonema sp. Nitzschia sp. Cyclotella sp. Cyanophyceae Oscillatoria sp. Green Algae Scenedesmus sp. Pandorina sp. -- -- -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	188	63	150	30	213	25	208	56	210	40	233	67	APHA (22nd Edi) 10200-G

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19.2	Name of Group Number and name of group species of each group	--	Copepods Crustaceans Ctenophores Ostracods	Crustaceans Polychaete worms Nematodes	Polychaete Worms Echinoderms Molluscans -- --	Gastropods Isopods -- -- --	Copepods Ostracods Crustaceans Krill Ctenophores -- --	Polychaetes Decapods Nauplius larvae -- -- --	Copepods Cyclops Krill Ctenophores Chaetognathes Ostracods Decapods	Polychaete worms Copepods -- -- -- -- --	Copepods Decapods Ostracods Chaetognathes Ctenophores Krill Cyclops	Polychaete worms Copepods -- -- -- --	Copepods Decapods Ostracods Chaetognathes Ctenophores Krill Cyclops	Copepods Polychaetes -- -- -- -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	225	5	46	7	54	9	90.6	8.4	96.5	8.9	93.55	8.65	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1590	1220	1840	1550	1680	1375	1850	1280	1640	1120	1560	1220	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi.2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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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	APRIL 2017	MAY 2017	JUNE 2017	JULY 2017	AUGUST 2017	SEPTEMBER 2017	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.59	0.52	--	0.54	0.6	0.57	FCO:2007
2	Phosphorus as P	µg/kg	142	150	--	140	146	140	APHA(22ndEdi) 4500 C
3	Texture	--	sandyloam	Sandy Loam	--	Sandy loam	Sandy Loam	Sandy Loam	--
4	Petroleum Hydrocarbon	mg/kg	BDL*	BDL*	--	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	4.78	5.4	--	5.6	5.2	5.4	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/kg	182	140	--	180	160	168	AAS 3111B
5.3	Manganese as Mn	µg/kg	866	890	--	790	810	850	AAS APHA 3111 B
5.4	Iron as Fe	%	1.9	2.02	--	2.28	2.22	2.3	AAS APHA(22ndEdi)3111 B
5.5	Nickel as Ni	µg/kg	52	52	--	56	54	58	AAS APHA(22ndEdi)3111 B
5.6	Copper as Cu	µg/kg	36	36	--	32	34	32	AAS APHA(22ndEdi)3111 B
5.7	Zinc as Zn	µg/kg	142	138	--	140	136	130	AAS APHA(22ndEdi)3111 B
5.8	Lead as Pb	µg/kg	1.46	1.6	--	1.34	1.32	1.29	AAS APHA(22ndEdi)3111 B
5.9	Mercury as Hg	µg/kg	BDL*	BDL*	--	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Bivalxes Echinoderms Decapods Amphipods	Polychaete Worms Bivalves Anthozoans --	--	Polychaete worms Isopods Echinoderms Decapods	Echinoderms Polychaete worms Isopods Decapods	Echinoderms Polychaetes Isopods Decapods	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Nematodes ostrucodes Gastrotriches	Foraminiferans Copepods --	--	Ostracods --	Ostracods	Ostracods	APHA (22nd Edi) 10500-C
6.3	Population	no/m^2	252	337	--	294	377	273	APHA (22nd Edi) 10500-C

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RESULTS OF MARINE WATER [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.03	8.13	8.02	8	7.98	8.13	7.98	8.14	8.01	8.12	7.69	8.17	IS3025(P11)83Re.02
2	Temperature	°C	29	30	29	30	29	30	29	30	29	30	28	29	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	16	22	28	32	24	30	19	22	16	20	18	16	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	6	6	BDL*	BDL*	7	9	4	5	3	4	4	5	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	5	4.80	5.8	4.8	5.6	4.8	5.2	4.4	5.4	4.8	5.6	4.8	IS3025(P38)89Re.99
6	Salinity	ppt	42.40	43.80	38.4	39.1	39.82	40.54	34.52	38.41	32.4	33.2	42.2	43	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	mg/L	0.49	0.620	0.384	0.222	0.367	0.397	0.46	0.55	0.33	0.2	0.51	0.59	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.052	0.067	0.054	0.076	0.051	0.065	0.054	0.07	0.059	0.077	0.047	0.066	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.720	0.840	1.01	1.29	0.702	0.776	0.74	0.82	0.91	1.15	0.69	0.74	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.068	0.089	0.54	0.675	0.248	0.353	0.18	0.17	0.02	0.11	0.057	0.073	APHA(22nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.262	1.467	1.448	1.588	1.12	1.238	1.254	1.44	1.3	1.42	1.247	1.396	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	52840	54110	45313	46173	46890	48030	53670	54820	32990	34280	52910	54310	IS3025(P16)84Re.02
15	COD	mg/L	14	19	14	24	24	28	14	18	14	19	16	20	APHA(22nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.840	0.380	0.5	0.46	0.82	0.46	0.82	0.38	0.8	0.43	0.8	0.36	SOP – PLPL - 07
A							Flora and Fauna								
17	Primary productivity	mgC/L/day	1.8	0.45	1.575	0.675	1.688	0.788	2.36	0.563	3.03	1.46	97	8.2	APHA (22nd Edi) 10200-J
B							Phytoplankton								
18.1	Chlorophyll	mg/m^3	3.040	0.801	1.89	0.16	1.789	0.587	1.816	0.721	2.48	0.69	2.148	0.654	APHA (22nd Edi) 10200-H
18.2	Phaeophytin	mg/m^3	2.480	3.420	0.067	1.69	0.23	1.207	0.24	1.03	BDL*	1.36	0.2	1.11	APHA (22nd Edi)

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															10200-H
18.3	Cell Count	Unit x 10^3/L	302	30.0	162	33	189	41	214	68	326	82	264	75	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Melosira sp. synendra sp. Tabellaria sp. Cheatoceros sp. Green algae Ulothrix sp. Pediastrum sp. Cyanophyceae Oscillatoria sp. Spirulina sp.	Bacillariophyceae synendra sp. Navicula sp. Nitzschia sp. Green algae Chlorella sp. Cyanophyceae Oscillatoria sp. Lyngbya sp.	Bacillariophyceae Asterionella sp. Coscinodiscus sp. Navicula sp. Nitzschia sp. Fragillaria sp. Surirella sp. Thallasionema sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pandorina sp. Cyanophyceae Anabaena sp.	Bacillariophyceae Tabellaria sp. Navicula sp. Gyrosigma sp. Coscinodiscus sp. Asterionella sp. Cyanophyceae Oscillatoria sp. Nostoc sp. -- -- -- -- --	Bacillariophyceae Nitzschia sp. Coscinodiscus sp. Pleurosigma sp. Pinnularia sp. Cyanophyceae Oscillatoria sp. Spirulina sp. Green Algae Chlorella sp. Ulothrix sp. Ankistrodesmus sp. Volvox sp. -- --	Bacillariophyceae Pinnularia sp. Fragillaria sp. Nitzschia sp. Navicula sp. Cyanophyceae Anabaena sp. #VALUE! Green Algae Pandorina sp. Ankistrodesmus sp. -- -- --	Bacillariophyceae Asterionella sp. Biddulphia sp. Gomphonema sp. Rhizosolenia sp. Pinnularia sp. Skeletonema sp. Nitzschia sp. Navicula sp. Cocconeis sp. Cyanophyceae Oscillatoria sp. Anabaena sp. Green Algae Ankistrodesmus sp. Oedogonium sp. Pediastrum sp.	Bacillariophyceae Coscinodiscus sp. Pleurosigma sp. Nitzschia sp. Fragillaria sp. Navicula sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Spirulina sp. Green Algae Oedogonium sp. Pediastrum sp. -- -- -- --	Bacillariophyceae Amphora sp. Asterionella sp. Coscinodiscus sp. Fragillaria sp. Gomphonema sp. Skeletonema sp. Cyclotella sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pandorina sp. Scenedesmus sp.	Bacillariophyceae Cymbella sp. Fragillaria sp. Melosira sp. Nitzschia sp. Cyanophyceae Oscillatoria sp. Microcystis sp. Nostoc sp. Green Algae Chlorella sp. Hydrodictyon sp. Scenedesmus sp. Volvox sp.-- -- --	Bacillariophyceae Pleurosigma sp. Coscinodiscus sp. Nitzschia sp. Thallasiosira sp. Pinnularia sp. Cyanophyceae Oscillatoria sp. Spirulina sp. Green Algae Chlorella sp. Volvox sp. Ankistrodesmus sp. Ulothrix sp.	Bacillariophyceae Navicula sp. Nitzschia sp. Fragillaria sp. Pinnularia sp. Cyanophyceae Oscillatoria sp. Anabaena sp. Green Algae Ankistrodesmus sp. Pandorina sp. -- -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	213	25	267	133	350	75	275	50	300	160	312.5	62.5	APHA (22nd Edi) 10200-G

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Lab Manager (Q)

19.2	Name of Group Number and name of group species of each group	--	Chaetognaths Copepods Nematodes Nauplius larvae Cyclops	Cyclops Copepods Crustaceans	Gastropods Copepods Decapods Ostracods Krill Crustaceans Cyclops	Ctenophores Gastropods Krill Nematodes --	Copepods Chaetognathes Ctenophores Krill Cyclops Decapods Rotifiers	Copepods Decapods -- -- -- -- --	Ctenophores Ostracods Gastropods Decapods Polychaete worms	Copepods Decapods -- -- --	Copepods Polychaetes Crustaceans Nematodes Mysids Rotifers	Crustaceans Gastropods Nematodes -- -- --	Copepods Krill Decapods Chaetognathes Cyclops Rotifers Ctenophores	Copepods Decapods -- -- -- -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	194	5	75	15	97	8.2	97.4	7.8	62.4	7.4	79.9	7.6	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1750	1590	1850	1680	2130	1870	1560	1220	1700	1580	1610	1280	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi.2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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POLLUCON LABORATORIES PVT. LTD. SURAT-3

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RESULTS OF SEDIMENT ANALYSIS [M4 JUNA BANDAR N 22°47'577" E 069°43'620"]

SR. NO.	TEST PARAMETERS	UNIT	APRIL 2017	MAY 2017	JUNE 2017	JULY 2017	AUGUST 2017	SEPTEMBER 2017	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.42	0.495	0.463	0.51	0.425	0.63	FCO:2007
2	Phosphorus as P	µg/kg	174	172	178	192	175	150	APHA(22nd Edi) 4500 C
3	Texture	--	Sandy loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	--
4	Petroleum Hydrocarbon	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.42	5.21	5.19	5.08	5.41	5.62	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/kg	118	127	165	146	119	129	AAS 3111B
5.3	Manganese as Mn	µg/kg	854	896	885	798	856	809	AAS APHA 3111 B
5.4	Iron as Fe	%	1.76	2.33	2.4	2.82	1.75	266	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/kg	57.94	49.9	49.97	52	57.99	44.19	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/kg	43.9	45.9	43.97	48	43.98	40.22	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/kg	162	179	166	190	160	189	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/kg	1.84	1.94	1.96	1.88	1.87	0.91	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Bivalves Decapods Lobsters	Polychaete worms Echinoderms Isopods Anthozoans	Echinoderms Decapods Isopods --	Polychaete worms Echinoderms Isopods	Echinoderms Isopods --	Echinoderms Polychaete worms Mysids	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Bryozoans Water bears Foraminiferans	Namatodes Foraminiferans Hydrozoa --	Nematodes Foraminiterams --	Nematodes Foraminiferans --	Nematodes Foraminiferans Hydrozoa	Nematodes Foraminiferans Ciliotes	APHA (22nd Edi) 10500-C
2	Population	no/m^2	440	440	314	314	433	481	APHA (22nd Edi) 10500-C

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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Lab Manager (Q)

RESULTS OF MARINE WATER [M5 TOWARDS WESTERN SIDE OF EAST PORT – N 22°46'041" E 069°47'296"]

SR. NO.	TEST PARAMETERS	UNIT	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.04	8.13	8.08	8.14	8.02	8.11	7.87	7.7	8.14	7.73	8.02	8.17	IS3025(P11)83Re.02
2	Temperature	°C	28	29	28	29	29	30	29	30	29	30	29	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	14	18	26	30	24	32	18	24	18	24	28	20	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	3	4	BDL*	BDL*	4	5	BDL*	3	3	4	BDL*	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.60	5.40	5.4	4.6	5.8	4.6	48.45	4.6	5.9	4.6	5.8	5.2	IS3025(P38)89Re.99
6	Salinity	ppt	40.80	41.40	39.2	40.4	38.2	39.37	38.45	49	44.8	46.4	40.6	41.2	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	mg/L	0.640	0.690	0.518	0.607	0.627	0.704	0.61	0.67	0.916	0.6777	0.58	0.65	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.047	0.031	0.036	0.025	0.047	0.039	0.047	0.035	0.008	0.035	0.038	0.029	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.320	0.440	0.48	0.619	0.277	0.397	0.37	0.44	0.6	0.44	0.29	0.38	IS3025(P34)88Cl a.2.3
11	Phosphates as PO_4	mg/L	0.026	0.096	0.45	0.27	0.158	0.171	0.24	0.57	0.922	0.157	0.021	0.088	APHA(22nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.000	1.120	1.034	1.251	0.951	1.14	1	1.1	1.041	1.155	0.908	1.059	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	0.84	BDL*	0.42	BDL*	2	BDL*	0.8	BDL*	0.8	BDL*	0.6	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	44620	45130	45966	46874	47860	48320	46800	47300	42800	47300	44260	45590	IS3025(P16)84Re.02
15	COD	mg/L	9	14	9	24	14	19	5	14	9	14	9	19	APHA(22nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.540	0.420	0.5	0.42	0.58	0.46	0.56	0.42	0.56	0.42	0.58	0.46	SOP – PLPL - 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L /day	2.250	0.670	1.688	0.563	1.463	0.788	1.6	0.56	1.688	0.563	1.57	0.45	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	2.770	0.960	1.362	0.294	1.922	0.721	1.8	0.61	ND*	0.614	2.08	0.9	APHA (22nd Edi) 10200-H
18.2	Phaeophytin	mg/m^3	2.793	3.300	0.806	0.959	0.134	0.737	0.61	1.27	5.3	1.274	0.179	0.98	APHA (22nd Edi) 10200-H

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18.3	Cell Count	Unit x 10^3/L	546	24.0	215	40	196	52	145	32	145	32	222	58	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Biddulphia sp. Cymbella sp. Navicula sp. sydra sp. pinnularia sp. Green algae Volvox sp. Pediastrum sp. Ulothrix sp. Cyanophyceae Lyngbya sp. Nostoc sp.	Bacillariophyceae Cocconeis sp. Fragillaria sp. Navicula sp. Green algae Chlorella sp. Pediastrum sp. Cyanophyceae Spirulina sp.	Bacillariophyceae Rhizosolenia sp. Synedra sp. Navicula sp. Coscinodiscus sp. Skeletonema sp. Green Algae Spirogyra sp. Pediastrum sp. Hydrodictyon sp. Desmids Cosmarium sp. --	Bacillariophyceae Nitzschia sp. Pinnularia sp. Fragillaria sp. Biddulphia sp. Cyanophyceae Anabaena sp. Nostoc sp. -- -- -- -- --	Bacillariophyceae Gomphonema sp. Pleurosigma sp. Nitzschia sp. Synedra sp. Rhizosolenia sp. Surirella sp. Tabellaria sp. Biddulphia sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Green Algae Chlorella sp. Ulothrix sp. Scenedesmus sp. --	Bacillariophyceae Asterionella sp. Cyclotella sp. Cymbella sp. Gyrosigma sp. Pinnularia sp. Cocconeis sp. Green Algae Oedogonium sp. Hydrodictyon sp. Scenedesmus sp. -- -- -- -- -- --	Bacillariophyceae Cyclotella sp. Cocconeis sp. Pinnularia sp. Skeletonema sp. Pleurosigma sp. Biddulphia sp. Amphiprora sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pediastrum sp. Volvox sp.	Bacillariophyceae Gomphonema sp. Pleurosigma sp. Navicula sp. Nitzschia sp. Coscinodiscus sp. Cyanophyceae Oscillatoria sp. Green Algae Pandorina sp. -- -- -- -- -- --	Bacillariophyceae Amphiprora sp.. Biddulphia sp. Pleurosigma sp. Skeletonema sp. Pinnularia sp. Cocconeis sp. Cyclotella sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Spirulina sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pediastrum sp. Volvox sp.	Bacillariophyceae Coscinodiscus sp. Nitzschia sp. Pleurosigma sp. Navicula sp. Gomphonema sp. Cyanophyceae Oscillatoria sp. Green Algae Pandorina sp. -- -- -- -- -- -- --	Bacillariophyceae Navicula sp. Synedra sp. Nitzschia sp. Coscinodiscus sp. Thallasionema sp. Pleurosigma sp. Cyclotella sp. Skeletonema sp. Cyanophyceae Anabaena sp. Nostoc sp. Oscillatoria sp. Green Algae Ankistrodesmus sp. Pandorina sp. Scenedesmus sp.	Bacillariophyceae Navicula sp. Fragillaria sp. Gomphonema sp. Pleurosigma sp. Coscinodiscus sp. Cyanophyceae Oscillatoria sp. Lyngbya sp. Green Algae Chlorella sp. Pediastrum sp. Pandorina sp. -- -- -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	250	30	260	60	250	50	210	60	200	50	275	100	APHA (22nd Edi) 10200-G

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19.2	Name of Group Number and name of group species of each group	--	Crustaceans Nematodes Nauplius larvae Gastropods	Bivalves Rotifers Nematodes	Copepods Cyclops Decapods Krill Polychaete worms	Copepods Polychaete worms Ostracods -- --	copepods krill Polychaete worms Siphonophores Rotifers Cyclops	Gastropods Polychaete worms -- -- -- --	Copepods Decapods Ostracods Gastropods Crustaceans	Polychaetes Gastropods Absent -- --	Copepods Decapods Ostracods Gastropods Crustaceans	Polychaete worms Gastropods -- -- --	Nematodes Gastropods Crustaceans Mysids	Copepods Cyclops Nematodes --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	189	7	69	11	75	15	72	13	85	0.7	45.2	7.4	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1640	1500	1830	1630	1650	1370	1740	1480	1740	1480	1620	1480	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi. 2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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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	APRIL 2017	MAY 2017	JUNE 2017	JULY 2017	AUGUST 2017	SEPTEMBER 2017	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.62	0.546	0.701	0.64	0.58	0.6	FCO:2007
2	Phosphorus as P	µg/kg	182	148	189	180	166	162	APHA(22nd Edi) 4500 C
3	Texture	--	sandyloam	Sandy Loam	Sandy Loam	Sandy loam	Sandy Loam	SandyLoam	--
4	Petroleum Hydrocarbon	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.66	5.39	5.6	5.79	5.82	5.61	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/kg	120	131	120	119	132	121	AAS 3111B
5.3	Manganese as Mn	µg/kg	722	789	760	729	756	745	AAS APHA 3111 B
5.4	Iron as Fe	%	2.38	2.09	2.45	2.41	2.12	2.32	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/kg	48.34	46.77	48.32	48.21	58.6	97.57	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/kg	52.48	36.39	52.52	54.52	44.48	49.82	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/kg	176	161	166	179	182	167	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/kg	2.04	1.8	2.02	2.02	2.08	2.06	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Bivalxes Sponges Tubellaria	Crabs Polychaete worms Mysids Decapods Bivalves	Echinoderms Decapods Isopods Chaetognaths	Isopods Polychaete worms Echinoderms	Echinoderms Isopods Polychaete worms	Crabs Bivalves Echinoderms	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Copepodes Cilliates Decapods	Gastrotriches Ostracods --	Gadtrotriches Bryozoans Ostracods	Bryozoans Copepods --	Copepods Bryozoans	Hydrozoa Nematodes	APHA (22nd Edi) 10500-C
6.3	Population	no/m2	252	385	337	440	361	377	APHA (22nd Edi) 10500-C

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULTS OF MARINE WATER [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO.	TEST PARAMETERS	UNIT	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.06	8.17	8.1	8.18	7.94	8.08	7.86	7.99	7.89	7.66	8.02	8.13	IS3025(P11)83Re.02
2	Temperature	°C	28	29	29	30	29	30	29	30	30	31	28	29	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	16	24	18	22	14	16	18	20	16	22	25	20	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	8.0	6.0	BDL*	BDL*	6	4	7	6	8	7	6	4	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.40	5.00	5.6	4.8	5.8	4.6	5.6	4.8	5.4	4.8	5.4	4.6	IS3025(P38)89Re.99
6	Salinity	ppt	38.50	39.12	38.1	39.2	39.37	40.18	38.19	39.3	35.2	36.4	38.42	39.26	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	0.1	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	mg/L	0.520	0.780	0.681	0.784	0.616	0.857	0.42	0.7	0.17	0.162	0.52	0.81	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.057	0.049	0.063	0.05	0.067	0.053	0.024	0.022	0.026	0.021	0.037	0.52	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.150	0.310	0.295	0.554	0.203	0.488	0.2	0.36	0.22	0.38	0.13	0.34	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.190	0.170	0.54	0.585	0.545	0.492	0.16	0.15	0.17	0.162	0.21	0.22	APHA(22nd Edi) 4500 C
12	Total Nitrogen	mg/L	0.710	1.590	1.039	1.189	0.886	1.399	0.644	1.082	0.707	1.15	0.687	1.67	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	10.20	BDL*	1.4	BDL*	1.4	BDL*	2	BDL*	2.2	BDL*	1	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	47020	47530	43186	43828	44020	44680	44620	45600	46800	33500	46930	47460	IS3025(P16)84Re.02
15	COD	mg/L	24	18	24	28	24	14	26	22	28	24	24	15	APHA(22ndEdi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.700	0.500	0.82	0.58	0.48	0.39	0.66	0.56	0.76	0.58	0.82	0.52	SOP – PLPL - 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L /day	1.350	0.675	1.35	0.45	2.138	0.563	1.808	0.686	1.913	0.787	1.91	0.56	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	3.097	0.748	1.682	0.107	2	0.507	2.18	0.808	2.296	0.988	1.2	0.26	APHA (22nd Edi) 10200-H
18.2	Phaeophytin	mg/m^3	1.239	4.410	0.598	2.02	0.053	1.287	BDL*	0.8	BDL*	0.9	0.75	1.39	APHA (22nd Edi) 10200-H

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Lab Manager (Q)

18.3	Cell Count	Unit x 10^3/L	276	24.0	227	29	202	56	108	46	184	48	180	20	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Cymbella sp. Navicula sp. Nitzschia sp. Surirella sp. Green algae Hydrodictyon sp. Scenedesmus sp. Cyanophyceae oscillatoria sp. Spirulina sp.	Bacillariophyceae Asterionella sp. Melosira sp. Nitzschia sp. Green algae Pandorina sp. Spirogyra sp. Cyanophyceae Nostoc sp.	Bacillariophyceae Nitzschia sp. Synedra sp. Coscinodiscus sp. Pleurosigma sp. Thallasiosira sp. Pinnularia sp. Green Algae Chlorella sp. Pandorina sp. Ulothrix sp. Desmids Closterium sp. --	Bacillariophyceae Navicula sp. Fragillaria sp. Cyclotella sp. Tabellaria sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. -- -- -- --	Bacillariophyceae Navicula sp. Coscinodiscus sp. Fragillaria sp. Asterionella sp. Cymbella sp. Rhizosolenia sp. Skeletonema sp. Coscinodiscus sp. Biddulphia sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pandorina sp. Desmids Cosmarium sp. Closterium sp.	Bacillariophyceae Fragillaria sp. Biddulphia sp. Pleurosigma sp. Thallasiosira sp. Pinnularia sp. Cyanophyceae Oscillatoria sp. Spirulina sp. Lyngbya sp. -- -- -- -- -- -- --	Bacillariophyceae Nitzschia sp. Fragillaria sp. Gyrosigma sp. Pinnularia sp. Cheatoceros sp. Pediastrum sp. Ankistrodesmus sp. Oscillatoria sp. Microcystis sp.	Bacillariophyceae Rhizosolenia sp. Cocconeis sp. Cheatoceros sp. Biddulphia sp. Achnanthes sp. Cyanophyceae Spirulina sp. Nostoc sp. Oscillatoria sp. Microcystis sp.	Bacillariophyceae Gyrosigma sp. Cheatoceros sp. Fragillaria sp. Pinnularia sp. Nitzschia sp. Pleurosigma sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Spirulina sp. Green Algae Ankistrodesmus sp. Pediastrum sp.	Bacillariophyceae Achnanthes sp. Biddulphia sp. Cheatoceros sp. Cocconeis sp. Rhizosolenia sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Nostoc sp. Green Algae Pandorina sp. Scenedesmus sp. --	Bacillariophyceae Asterionella sp. Navicula sp. Synedra sp. Rhizosolenia sp. Melosira sp. Skeletonema sp. Coscinodiscus sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pandorina sp. Scenedesmus sp.	Bacillariophyceae Nitzschia sp. Fragillaria sp. Rhizosolenia sp. Coscinodiscus sp. Cyclotella sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Hydrodictyon sp. Pediastrum sp. Pandorina sp. -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	275	75	280	40	300	125	166	50	140	60	175	50	APHA (22nd Edi) 10200-G

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Lab Manager (Q)

19.2	Name of Group Number and name of group species of each group	--	copepods ctenophors molluscans Rotifry	Cylons Nematodes Bivalves	Copepods Krill Decapods Crustaceans Ostracods & Fish egg	Copepods Gastropods -- -- --	Copepods Crustaceans Decapods Krill Ostracods Rotiferd	Polychaetes worms Chaetognathes -- -- -- --	Gastropods Chaetognathes Ostracods Decapods Copepods	Decapods Ostracods Polychaetes -- --	Copepods Decapods Ostracods Ctenophores Gastropods Absent	Polychaete worms Ostracods Decapods -- -- --	Echinoderms Nematodes Decapods Gastropods	Bivalves Decapods Nematodes --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	148	4	56	5	101	46	80.8	6.6	82.5	7.4	48.52	8.72	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1870	1610	1760	1580	1970	1680	1790	1380	1680	1260	1890	1600	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi.2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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Lab Manager (Q)

RESULTS OF MARINE WATER [M8 RIGHT SIDE OF BOCHA CREEK N 22°45'987" E 069°43'119"]

SR. NO.	TEST PARAMETERS	UNIT	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.08	8.17	8.04	8	8.1	8.16	8.03	8.23	8.13	8.28	7.78	8.01	IS3025(P11)83Re.02
2	Temperature	°C	28	29	28	29	29	30	28	29	28	29	29	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	22	24	16	20	18	22	20	28	22	26	22	30	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	6.0	7	BDL*	BDL*	5	6	4	6	4	5	5	6	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.40	4.80	5.4	4.6	5.6	4.8	5.6	4.8	5.8	4.6	5.4	4.6	IS3025(P38)89Re.99
6	Salinity	ppt	44.80	45.22	38.8	39.6	39.82	40.54	44.6	45.8	30.96	34.88	44.2	45.6	APHA (22ndEdi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22ndEdi)5520D
8	Nitrate as NO_3	mg/L	0.020	0.580	0.325	0.399	0.443	0.52	0.54	0.66	0.33	0.58	0.52	0.64	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.330	0.022	0.044	0.019	0.497	0.638	0.02	0.029	0.032	0.022	0.019	0.025	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.032	0.520	0.554	0.591	0.684	0.748	0.62	0.7	0.59	0.52	0.6	0.68	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.027	0.042	0.495	0.585	0.447	0.479	0.19	0.15	0.027	0.041	0.048	0.029	APHA(22ndEdi) 4500 C
12	Total Nitrogen	mg/L	0.952	1.12	0.923	1.009	1.624	1.906	1.18	1.389	0.96	1.13	1.1	1.4	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	1.2	BDL*	0.4	BDL*	1	BDL*	0.88	BDL*	1.2	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	47250	47870	42750	43320	43460	45020	51990	53890	38830	39690	52090	54680	IS3025(P16)84Re.02
15	COD	mg/L	20	22.000	24	28	19	24	18	24	19	24	20	22	APHA(22ndEdi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.440	0.23	0.54	0.62	0.38	0.24	0.48	0.62	0.63	0.76	0.46	0.6	SOP – PLPL - 07
A							Flora and Fauna								
17	Primary productivity	mgC/L /day	1.350	0.450	1.463	0.113	1.193	0.45	1.35	0.338	1.12	0.033	78	22	APHA (22nd Edi) 10200-J
B							Phytoplankton								
18.1	Chlorophyll	mg/m^3	2.720	1.220	1.922	0.427	1.842	0.614	7.762	0.614	1.73	0.61	4.802	0.58	APHA (22ndEdi) 10200-H
18.2	Phaeophytin	mg/m^3	1.680	2.990	0.021	1.479	0.12	1.199	0.294	1.33	0.97	1.64	0.207	1.15	APHA (22ndEdi) 10200-H

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Lab Manager (Q)

18.3	Cell Count	Unit x 10^3/L	282	36.0	202	33	178	32	220	51	188	31	199	41.5	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Asterionella sp. Gyrosigma sp. Melosira sp. Fragillaria sp. Green algae Scenedesmus sp. Ulothrix sp. Cyanophyceae Microcystis sp. Nostoc sp.	Bacillariophyceae Biddulphia sp. Cymbella sp. Navicula sp. Fragillaria sp. Green algae Oedogonium sp. Ulothrix sp. Spirogyra sp. Cyanophyceae Spirulina sp.	Bacillariophyceae Asterionella sp. Fragillaria sp. Navicula sp. Synedra sp. Coscinodiscus sp. Cymbella sp. Pleurosigma sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Pediastrum sp.	Bacillariophyceae Fragillaria sp. Navicula sp. Nitzschia sp. Gyrosigma sp. Cyanophyceae Oscillatoria sp. Desmids Closterium sp. -- -- -- -- --	Bacillariophyceae Cheatocerous sp. Pinnularia sp. Thallasiosira sp. Biddulphia sp. Asterionella sp. Cyanophyceae Spirulina sp. Microcystis sp. Anabaena sp. Green Algae Scenedesmus sp. -- --	Bacillariophyceae Cyclotella sp. Thallasiosira sp. Fragillaria sp. Pinnularia sp. Nitzschia sp. Green Algae Volvox sp. Ulothrix sp. Chlorella sp. Pandorina sp. -- -- --	Bacillariophyceae Asterionella sp. Gyrosigma sp. Pinnularia sp. Synedra sp. Tabellaria sp. Gomphonema sp. Cyanophyceae Oscillatoria sp. Oedogonium sp. Hydrodictyon sp. Pandorina sp. Pediastrum sp.	Bacillariophyceae Fragillaria sp. Gomphonema sp. Navicula sp. Nitzschia sp. Cyanophyceae Oscillatoria sp. Spirulina sp. Green Alage Pandorina sp. -- -- --	Bacillariophyceae Asterionella sp. Biddulphia sp. Nitzschia sp. Rhizosolenia sp. Thallasiosira sp. Skeletonema sp. Cyclotella sp. Cyanophyceae Anabaena sp. Oscillatoria sp. Nostoc sp. Green Algae Ankistrodesmus sp. Pandorina sp. Pediastrum sp. Ulothrix sp.	Bacillariophyceae Fragillaria sp. Nitzschia sp. Biddulphia sp. Navicula sp. Cyanophyceae Oscillatoria sp. Microcystis sp. Nostoc sp. Green Algae Chlorella sp. Hydrodictyon sp. Pandorina sp. -- -- -- --	Bacillariophyceae Biddulphia sp. Pinnularia sp. Thallasiosira sp. Cheatocerous sp. Asterionella sp. Cyanophyceae Anabaena sp. Microcystis sp. Spirogyra sp. Green Algae Scenedesmus sp.	Bacillariophyceae Nitzschia sp. Fragillaria sp. Pinnularia sp. Thallasiosira sp. Cyclotella sp. Green Algae Pandorina sp. Chlorella sp. Ulothrix sp. Volvox sp. --	APHA (22nd Edi) 10200-H
C							Zooplanktons								
19.1	Abundance (Population)	no/m^2	350	6	240	80	375	50	280	100	200	80	327.5	75	APHA (22nd Edi) 10200-G

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19.2	Name of Group Number and name of group species of each group	--	Nauplius larvae Nematodes Daphnia Mysids	Ostracods Nematodes Polychaete worms	Nematodes Copepods Krill Molluscans	Polychaete worms Isopods -- --	Copepods Krill Decapods Isopods Crustaceans Chaetognathes Rotifers	Ostracods Decapods -- -- -- -- --	Copepods Decapods Ostracods	Copepods Decapods Isopods	Copepods Ostracods Krill Crustaceans Echinoderms	Decapods Krill	Copepods Krill Isopods Decapods Crustaceans Chaetognathes	Ostracods Decapods -- -- -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	243	6	61	9	78	22	83.8	5.7	68.9	9	80.9	13.8	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1700	1540	1470	1110	1540	1220	1860	1340	1690	1500	1750	1280	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi. 2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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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	APRIL 2017	MAY 2017	JUNE 2017	JULY 2017	AUGUST 2017	SEPTEMBER 2017	TEST METHOD
			SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	
1	Organic Matter	%	0.544	0.441	0.569	0.53	0.51	0.52	FCO:2007
2	Phosphorus as P	µg/kg	146	187	170	200	170	198	APHA(22nd Edi) 4500 C
3	Texture	--	sandyloam	Sandy Loam	Sandy Loam	Sandy loam	Sandy loam	Sandy Loam	--
4	Petroleum Hydrocarbon	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	**Heavy Metals**								
5.1	Aluminum as Al	%	5.7	5.59	5.33	5	5.09	5.6	AAS APHA 3111 B
5.2	Total Chromium as Cr^{+3}	µg/kg	136	99.98	87.99	98	101	102	AAS 3111B
5.3	Manganese as Mn	µg/kg	820	879	735	880	829	770	AAS APHA 3111 B
5.4	Iron as Fe	%	2.42	2.12	2.13	2.8	2.42	2.6	AAS APHA(22nd Edi)3111 B
5.5	Nickel as Ni	µg/kg	32.4	35.9	38.98	50	43.98	48	AAS APHA(22nd Edi)3111 B
5.6	Copper as Cu	µg/kg	40.18	45.9	43.97	54	47.98	52	AAS APHA(22nd Edi)3111 B
5.7	Zinc as Zn	µg/kg	182	162	162	160	148	174	AAS APHA(22nd Edi)3111 B
5.8	Lead as Pb	µg/kg	1.14	1.88	1.99	2.2	1.47	1.8	AAS APHA(22nd Edi)3111 B
5.9	Mercury as Hg	µg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	**Benthic Organisms**								
6.1	Macrobenthos	--	Sponges Bivalxes Corals Prawns	Polychaete worms Isopods Decapods Prawn	Echinoderms Decapods Isopods --	Mysids Isopods Echinoderms	Polychaete worms Echinoderms Decapods	Echinoderms Decapods Isopods	APHA (22nd Edi) 10500-C
6.2	MeioBenthos	--	Copepodes Bryozoans Mysids	Namatodes Foraminiferans -- --	Gastrotriches Copepods Ostracodes	Polychaete worms Copepods Ostracods Ciliates	Nematodes Foraminiferans --	Gastropods Copepods Ostracods	APHA (22nd Edi) 10500-C
6.3	Population	no/m^2	252	433	503	317	385	503	APHA (22nd Edi) 10500-C

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Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

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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	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	8.06	8.17	8	8.09	8.02	8.11	8.08	8.32	8.12	8.33	7.62	7.27	IS3025(P11)83Re.02
2	Temperature	°C	29	30	28	29	29	30	28	29	29	30	28	29	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	20	22	16	20	14	20	17	24	19	25	20	24	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	4	6	BDL*	BDL*	3	4	3	6	5	6	4	5	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.40	5.00	5.4	4.8	5.8	4.8	5.2	5	5.4	4.6	5.6	4.8	IS3025(P38)89Re.99
6	Salinity	ppt	42.40	43.60	39.6	40.2	40.3	41.6	37.82	38.3	31.8	33	42.1	42.93	APHA (22nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	0.4	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22nd Edi)5520D
8	Nitrate as NO_3	mg/L	0.689	0.903	0.34	0.414	0.474	0.673	0.413	0.566	0.67	0.87	0.28	0.32	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.081	0.082	0.026	0.011	0.027	0.049	0.031	0.027	0.079	0.081	0.08	0.085	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.489	0.602	0.221	0.351	0.64	0.76	0.672	0.766	0.69	0.79	0.44	0.46	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.084	0.140	0.495	0.63	0.279	0.361	0.479	0.56	0.075	0.089	0.083	0.144	APHA(22nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.258	1.593	0.587	0.776	1.141	1.482	1.116	1.359	1.45	1.74	0.8	0.865	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	11.20	BDL*	6.2	BDL*	0.2	BDL*	19	BDL*	0.88	BDL*	1.7	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	35240	35180	46326	47880	47980	49710	39810	40180	38830	39620	34120	35330	IS3025(P16)84Re.02
15	COD	mg/L	16	22	9	19	14	18	24	28	24	28	18	20	APHA(22nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.940	0.380	0.55	0.43	0.44	0.62	0.48	0.29	0.78	0.49	0.88	0.4	SOP – PLPL - 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L /day	1.8	0.45	1.125	0.338	1.913	0.563	2.25	0.45	2.47	0.33	79.6	21	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	2.290	0.740	1.44	0.32	1.816	0.908	1.7	0.507	2.35	0.32	1.922	0.824	APHA (22nd Edi) 10200-H

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18.2	Phaeophytin	mg/m^3	2.900	3.360	0.689	1.511	0.24	1.148	0.422	1.62	BDL*	1.86	0.32	0.992	APHA (22ndEdi) 10200-H
18.3	Cell Count	Unit x 10^3/L	316	32.0	196	42	210	63	172	34	314	162	240	98	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Cocconeis sp. Cheatoceros sp. Biddulphia sp. Pinnularia sp. Green algae Pediastrum sp. Scenedesmus sp. Cyanophyceae Spirulina sp. Oscillatoria sp.	Bacillariophyceae Coscinodiscus sp. Gyrosigma sp. synendra sp. Pinnularia sp. Green algae Ulothrix sp. Pediastrum sp. Cyanophyceae Anabaena sp. Nostoc sp.	Bacillariophyceae Rhizosolenia sp. Nitzschia sp. Navicula sp. Coscinodiscus sp. Pleurosigma sp. Thallasionema sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Pediastrum sp. --	Bacillariophyceae Fragillaria sp. Nitzschia sp. Navicula sp. Gyrosigma sp. Green Algae Chlorella sp. Pandorina sp. -- -- -- -- -- --	Bacillariophyceae Rhizosolenia sp. Coscinodiscus sp. Gomphonema sp. Cymbella sp. Nitzschia sp. Navicula sp. Green Algae Ciismarium sp. Desmids Spirogyra sp. Hydrodictyon sp. Scenedesmus sp. --	Bacillariophyceae Nitzschia sp. Navicula sp. Pinnularia sp. Thallasiora sp. Gyrosigma sp. Synedra sp. Green Algae Ulothrix sp. Chlorella sp. -- -- -- --	Bacillariophyceae Asterionella sp. Biddulphia sp. Synedra sp. Nitzschia sp. Navicula sp. Pinnularia sp.	Bacillariophyceae Pinnularia sp. Fragillaria sp. Navicula sp. -- Absent --	Bacillariophyceae Navicula sp. Nitzschia sp. Coscinodiscus sp. Fragillaria sp. Gomphonema sp. Skeletonema sp. Rhizosolenia sp. Cyanophyceae Anabaena sp. Microcystis sp. Oscillatoria sp. Green Algae Ankistrodesmus sp. Chlorella sp. Hydrodictyon sp. Volvox sp.	Bacillariophyceae Fragillaria sp. Gomphonema sp. Asterionella sp. Rhizosolenia sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Pandorina sp. Pediastrum sp. -- -- -- --	Bacillariophyceae Nitzschia sp. Navicula sp. Cymbella sp. Gomphonema sp. Coscinodiscus sp. Rhizosolenia sp. Green Algae Scenedesmus sp. Hydrodictyon sp. Spirogyra sp. Cosmarium sp.	Bacillariophyceae Synedra sp. Gyrosigma sp. Thallasiora sp. Pinnularia sp. Navicula sp. Nitzschia sp. Green Algae Ulothrix sp. Chlorella sp. -- --	APHA (22nd Edi) 10200-H
C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	200	50	325	75	225	75	220	50	367	100	250	100	APHA (22nd Edi) 10200-G

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19.2	Name of Group Number and name of group species of each group	--	decapods Echinoderms Fish egg Foraminiferans	Molluscans Bivalves Crustaceans	Polychaete worms Krill Isopods Gastropods --	Copepods Nematodes -- -- --	Chaetognathes Krill Ostracods Crustaceans Polychaetes --	Gastropods Decapods Nematods -- -- --	Nematodes Polychaete worms Gastrotrichs Crustaceans Isopods	Decapods Isopods Nematodes -- --	Polychaete worms Echinoderms Amphipods Krill	Nematodes Gastrotrichs -- --	Chaetognaths Krill Ostracods Cyclops Polychaete worms	Gastrotrichs Decapods Nematodes -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	159	29	72	11	79.6	21	142	48.8	80.24	16	110.8	34.6	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1860	1450	1470	1180	1820	1690	1770	1460	1840	1680	1820	1580	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi. 2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	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	APRIL 2017		MAY 2017		JUNE 2017		JULY 2017		AUGUST 2017		SEPTEMBER 2017		TEST METHOD
			SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	BOTTOM	
1	pH	--	7.94	8.13	7.99	8.05	7.89	8.16	8.28	8.38	7.82	7.74	7.92	8.02	IS3025(P11)83Re.02
2	Temperature	°C	28	29	29	30	29	30	29	28	28	29	28	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	20	24	20	26	20	29	21	26	24	30	16	26	IS3025(P17)84Re.02
4	BOD (3 Days @ 27°C)	mg/L	5	8	BDL*	BDL*	6	7	4	8	5	6	3	4	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.20	5.00	5.8	4.6	5.8	4.8	5.6	4.8	5.2	4.8	5.8	4.8	IS3025(P38)89Re.99
6	Salinity	ppt	40.60	46.80	39.6	40.1	40.12	41.08	35.18	37.52	31.7	32.3	39.6	40.2	APHA (22ndEdi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22ndEdi)5520D
8	Nitrate as NO_3	mg/L	0.580	0.720	0.458	0.888	0.474	0.581	0.612	0.566	0.508	0.61	0.24	0.18	IS3025(P34)88
9	Nitrite as NO_2	mg/L	0.084	0.088	0.037	0.063	0.044	0.068	0.054	0.061	0.075	0.097	0.089	0.09	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH_3	mg/L	0.480	0.530	0.887	1.06	0.591	0.702	0.317	0.504	0.81	0.9	0.32	0.59	IS3025(P34)88Cla.2.3
11	Phosphates as PO_4	mg/L	0.120	0.340	0.585	0.675	0.117	0.139	0.56	0.718	0.16	0.189	0.09	0.15	APHA(22ndEdi) 4500 C
12	Total Nitrogen	mg/L	1.144	1.338	1.382	2.011	1.1	1.351	0.983	1.13	1.39	1.607	1.15	0.8	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	1.56	BDL*	BDL*	BDL*	1.3	BDL*	1.8	BDL*	0.4	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	48130	48920	47310	47738	47980	48710	47900	48800	38400	39500	47290	48260	IS3025(P16)84Re.02
15	COD	mg/L	16	26	24	28	26	30	24	32	19	24	14	24	APHA(22ndEdi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.670	0.430	0.52	0.32	0.74	0.4	0.71	0.52	0.7	0.38	0.63	0.41	SOP – PLPL - 07
A	**Flora and Fauna**														
17	Primary productivity	mgC/L /day	2.47	0.450	1.575	0.225	2.138	0.338	1.755	0.563	2.25	0.789	2.25	0.22	APHA (22nd Edi) 10200-J
B	**Phytoplankton**														
18.1	Chlorophyll	mg/m^3	2.830	1.220	1.362	0.187	1.896	0.534	1.89	0.748	2.163	0.454	1.3	0.64	APHA (22ndEdi) 10200-H

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18.2	Phaeophytin	mg/m^3	1.240	2.430	0.844	1.77	0.142	1.428	0.235	1.27	BDL*	1.602	0.74	1.11	APHA (22ndEdi) 10200-H
18.3	Cell Count	Unit x 10^3/L	304	38.0	225	31	208	60	164	26	223	62	178	70	APHA (22nd Edi) 10200-H
18.4	Name of Group Number and name of group species of each group	--	Bacillariophyceae Nitzschia sp. Surirella sp. Rhizosolenia sp. Pinnularia sp. Green algae Ankistrodesmus sp. Hydrodictyon sp. Pandorina sp. Desmids Closterium sp.	Bacillariophyceae Cocconeis sp. Navicula sp. Skeletonema sp. Green algae Spirogyra sp. Volvox sp. Cyanophyceae Anabaena sp. Spirulina sp.	Bacillariophyceae Rhizosolenia sp. Nitzschia sp. Navicula sp. Thallasionema sp. Coscinodiscus sp. Fragillaria sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Volvox sp.	Bacillariophyceae Thallasionema sp. Fragillaria sp. Synedra sp. Pleurosigma sp. Asterionella sp. Cyanophyceae Oscillatoria sp. Desmids Closterium sp. -- -- --	Bacillariophyceae Fragillaria sp. Navicula sp. Nitzschia sp. Pinnularia sp. Synedra sp. Skeletonema sp. Amphora sp. Biddulphia sp. Cyanophyceae oscillatoria sp. Anabaena sp. Nostoc sp. Green Algae Chlorella sp. Ankistrodesmus sp. Ulothrix sp.	Bacillariophyceae Melosira sp. Cheatoceros sp. Navicula sp. Coscinodiscus sp. Rhizosolenia sp. Green Algae Pandorina sp. Ulothrix sp. Volvox sp. -- -- -- -- -- -- --	Bacillariophyceae Synedra sp. Nitzschia sp. Navicula sp. Thallasionema sp. Coscinodiscus sp. Tubellaria sp. Cyclotella sp. Melosira sp. Sudioella sp. --	Bacillariophyceae Melosira sp. Fragillaria sp. Nitzschia sp. -- -- -- -- -- -- --	Bacillariophyceae Asterionella sp. Cocconeis sp. Fragillaria sp. Pinnularia sp. Rhizosolenia sp. Skeletonema sp. Thallasionema sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Microcystis sp. Green Algae Ankistrodesmus sp. Chlorella sp. Hydrodictyon sp.	Bacillariophyceae Biddulphia sp. Pinnularia sp. Cocconeis sp. Gyrosigma sp. Thallasiosira sp. Cyanophyceae Microcystis sp. Green Algae Chlorella sp. Hydrodictyon sp. Pandorina sp. -- -- -- --	Bacillariophyceae Asterionella sp. Biddulphia sp. Coscinodiscus sp. Gyrosigma sp. Nitzschia sp. Rhizosolenia sp. Thallasiosira sp. Cyanophyceae Microcystis sp. Oscillatoria sp. Nostoc sp. Green Algae Ankistrodesmus sp. Chlorella sp. Pediastrum sp. Scenedesmus sp.	Bacillariophyceae Fragillaria sp. Nitzschia sp. Skeletonema sp. Asterionella sp. Cyanophyceae Oscillatoria sp. Nostoc sp. Green Algae Chlorella sp. Pandorina sp. Ankistrodesmus sp. -- -- -- -- --	APHA (22nd Edi) 10200-H

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C	**Zooplanktons**														
19.1	Abundance (Population)	no/m^2	213	63	280	150	300	125	200	10	280	60	250	50	APHA (22nd Edi) 10200-G
19.2	Name of Group Number and name of group species of each group	--	Daphnia Copepods Fish egg Foraminiferans	Crustaceans Copepods Rotifers	Copepods Decapods Nematodes Isopods Krill	Isopods Hydrozoans Namatodes -- --	Copepods Decapods Nematods Gastropods Ostracods --	Polychaetes Chaetognathes Copepods -- -- --	Gastropods Polychaete worms Nematodes Isopods Mysids	Gastropods -- -- -- --	Copepods Ctenophores Krill Daphnia Ostracods Gastropods	Ctenophores Copepods -- -- -- --	Polychaete worms Echinoderms Amphipods Isopods Decapods	Copepods Molluscans -- -- --	APHA (22nd Edi) 10200-G
19.3	Total Biomass	ml/100 m^3	162	9	75	9	86.9	6.2	170	1.1	91.2	10.8	10.24	30.1	APHA (22nd Edi) 10200-G
D	**Microbiological Parameters**														
20.1	Total Bacterial Count	CFU/ml	1560	1320	1590	1320	1550	1230	1810	1560	1720	1360	1500	1310	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22ndEdi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi. 2.4(2003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 15186 :2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 1887 (P-7)
20.7	Vibrio	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS : 5887 (P-5)

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Lab Manager (Q)

RESULTS OF ETP WATER OUTLET

SR. NO.	PARAMETERS	UNIT	RESULTS OF ETP WATER OUTLET							GPCB Limit	TEST METHOD
			04/04/2017	03/05/2017	07/06/2017	16/06/2017	04/07/2017	04/08/2017	04/09/2017		
1	Colour	Co-pt	30	10	30	10	30	60	10	**100**	IS3025(P4)83Re.02
2	pH	--	6.55	6.78	7.04	6.58	7.55	6.9	6.93	**6.5 TO 8.5**	IS3025(P11)83Re.02
3	Temperature	°C	29	30	31	28	29	30	30	**40**	IS3025(P9)84Re.02
4	Total Suspended Solids	mg/L	28	22	34	22	30	62	58	**100**	IS3025(P17)84Re.02
5	Total Dissolved Solids	mg/L	1512	1302	1116	950	1528	1480	1436	**2100**	IS3025(P16)84Re.02
6	COD	mg/L	80	60	98	28	76	81	76	**100**	APHA(22ndEdi) 5520-D Open Reflux
7	BOD (3 Days @ 27 °C)	mg/L	21	18	26	8	22	27	22	**30**	IS 3025 (P44)1993Re.03Edition2.1
8	Chloride as Cl	mg/L	302	629	346	359	509	569	509	**600**	IS3025(P32)88Re.99
9	Oil & Grease	mg/L	BDL*	1.12	1.02	BDL*	1.04	1.08	BDL*	**10**	APHA(22ndEdi)5520D
10	Sulphate as SO_4	mg/L	60	152	138	33.52	138	130	112	**1000**	APHA(22ndEdi)4500 SO_4 E
11	Ammonical Nitrogen as NH_3	mg/L	2.44	2.52	2.4	2.39	2.4	12.6	1.74	**50**	IS3025(P34)88Cla.2.3
12	Phenolic Compound	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	**1**	IS3025(P43)92Re.03
13	Copper as Cu	mg/L	0.014	0.014	0.024	0.015	0.017	0.031	0.027	**3**	AAS APHA(22ndEdi)3111 B
14	Lead as Pb	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	**0.1**	AAS APHA(22ndEdi)3111 B
15	Sulphide as S	mg/L	BDL*	BDL*	BDL*	BDL*	1.24	0.96	0.34	**2**	APHA(22ndEdi) 4500-S
16	Cadmium as Cd	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	0.28	0.19	**2**	AAS APHA(22ndEdi)3111 B
17	Fluoride as F	mg/L	BDL*	BDL*	BDL*	BDL*	0.62	0.31	0.42	**2**	APHA(22ndEdi) 4500 F D SPANDS

*Below detection limit

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RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI PORT – T1 TERMINAL NR.MARINE BUILDING								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m^3	Particulate Matter (PM 2.5) µg/m^3	Sulphur Dioxide (SO2) µg/m^3	Oxides of Nitrogen (NO2) µg/m^3	Carbon Monoxide as CO mg/m^3	Hydrocarbon as CH_4 mg/m^3	Benzene as C_6H_6 µg/m^3
1	04/04/2017	52.58	18.71	5.65	15.34	0.18	BDL*	BDL*
2	07/04/2017	82.44	46.56	14.35	34.41	0.53	BDL*	BDL*
3	11/04/2017	71.42	26.61	18.05	26.16	0.39	BDL*	BDL*
4	14/04/2017	81.53	44.52	15.93	35.80	0.69	BDL*	2.24
5	18/04/2017	68.58	40.32	9.69	19.06	0.30	BDL*	BDL*
6	21/04/2017	55.29	24.53	13.42	24.27	0.48	BDL*	BDL*
7	25/04/2017	79.60	42.40	16.85	31.39	0.22	BDL*	BDL*
8	28/04/2017	65.63	28.68	6.30	18.31	0.36	BDL*	BDL*
9	05/02/2017	58.43	32.43	14.96	26.81	0.52	BDL*	BDL*
10	05/05/2017	73.33	27.44	9.57	21.41	0.29	BDL*	BDL*
11	05/09/2017	84.22	37.41	18.72	34.56	0.17	BDL*	BDL*
12	05/12/2017	70.62	40.74	5.62	19.27	0.38	BDL*	BDL*
13	16/05/2017	61.50	24.53	11.59	23.46	0.44	BDL*	BDL*
14	19/05/2017	56.27	29.52	7.00	29.33	0.14	BDL*	BDL*
15	23/05/2017	89.27	45.73	17.71	39.93	0.77	BDL*	BDL*
16	26/05/2017	67.23	33.67	13.60	36.47	0.57	BDL*	BDL*
17	30/05/2017	75.60	34.50	20.66	30.26	0.40	BDL*	BDL*
18	02/06/2017	82.62	43.65	15.19	36.35	0.80	BDL*	BDL*
19	06/06/2017	60.40	31.59	18.77	24.37	0.60	BDL*	BDL*
20	06/09/2017	59.78	23.70	12.79	32.31	0.33	BDL*	BDL*
21	13/06/2017	68.28	30.76	20.49	28.51	0.55	BDL*	BDL*
22	16/06/2017	54.18	25.36	8.96	19.24	0.30	BDL*	BDL*
23	20/06/2017	81.33	45.73	7.04	26.51	0.17	BDL*	BDL*
24	23/06/2017	77.57	35.75	16.14	31.00	0.21	BDL*	BDL*
25	27/06/2017	53.19	22.45	11.06	21.38	0.46	BDL*	BDL*
26	30/06/2017	61.20	32.43	5.97	17.10	0.40	BDL*	BDL*
27	04/07/2017	68.40	40.74	18.23	25.39	0.54	BDL*	BDL*
28	07/07/2017	72.59	38.66	13.09	32.79	0.78	BDL*	BDL*
29	11/07/2017	66.68	29.52	15.21	21.16	0.60	BDL*	BDL*
30	14/07/2017	76.77	33.70	10.59	29.21	0.52	BDL*	BDL*

Continue …

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RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI PORT – T1 TERMINAL NR. (MARINE BUILDING)								
Sr.No.	Date of Sampling	Particulate Matter (PM10) µg/m^3	Particulate Matter (PM 2.5) µg/m^3	Sulphur Dioxide (SO2) µg/m^3	Oxides of Nitrogen (NO2) µg/m^3	Carbon Monoxide as CO mg/m^3	Hydrocarbon as CH_4 mg/m^3	Benzene as C_6H_6 µg/m^3
31	18/07/2017	53.38	20.37	7.05	24.45	0.33	BDL*	BDL*
32	21/07/2017	46.73	19.54	12.92	17.45	0.29	BDL*	BDL*
33	25/07/2017	71.48	31.59	9.48	36.36	0.18	BDL*	BDL*
34	28/07/2017	59.23	34.50	5.64	19.39	0.45	BDL*	BDL*
35	01/08/2017	64.21	36.58	16.65	29.42	0.49	BDL*	BDL*
36	04/08/2017	71.60	44.48	11.64	31.69	0.42	BDL*	BDL*
37	08/08/2017	83.61	47.39	14.23	36.18	0.61	BDL*	BDL*
38	11/08/2017	56.27	26.61	19.95	28.46	0.46	BDL*	BDL*
39	15/08/2017	62.61	29.52	9.64	20.40	0.39	BDL*	BDL*
40	18/08/2017	76.28	33.67	12.88	26.48	0.66	BDL*	BDL*
41	22/08/2017	44.33	17.46	5.59	15.60	0.13	BDL*	BDL*
42	25/08/2017	79.30	35.75	15.21	27.33	0.24	BDL*	BDL*
43	29/08/2017	51.28	24.53	7.95	23.88	0.14	BDL*	BDL*
44	01/09/2017	50.30	19.54	6.25	17.21	0.11	BDL*	BDL*
45	05/09/2017	87.61	46.56	15.31	27.10	0.21	BDL*	BDL*
46	08/09/2017	72.89	32.43	18.77	32.26	0.44	BDL*	BDL*
47	12/09/2017	82.62	43.65	12.09	35.49	0.38	BDL*	BDL*
48	15/09/2017	57.63	27.44	14.22	30.54	0.14	BDL*	BDL*
49	19/09/2017	92.60	52.38	17.85	39.20	0.53	BDL*	BDL*
50	22/09/2017	68.40	29.52	10.61	22.59	0.41	BDL*	BDL*
51	26/09/2017	52.58	25.36	13.26	29.58	0.47	BDL*	BDL*
52	29/09/2017	76.22	33.67	16.01	25.33	0.61	BDL*	BDL*
	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-NaAsO2)	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

*Below detection limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
1	04/04/2017	77.71	42.49	11.64	30.34	0.56	BDL*	BDL*
2	07/04/2017	67.77	37.49	7.28	20.27	0.47	BDL*	BDL*
3	11/04/2017	82.38	40.40	10.41	24.18	0.66	BDL*	BDL*
4	14/04/2017	90.51	52.46	19.76	38.56	0.96	BDL*	BDL*
5	18/04/2017	79.59	44.57	23.22	42.37	0.54	BDL*	BDL*
6	21/04/2017	64.01	30.41	15.36	33.35	0.34	BDL*	BDL*
7	25/04/2017	88.62	50.40	5.32	21.62	0.11	BDL*	BDL*
8	28/04/2017	72.50	32.49	14.46	27.12	0.46	BDL*	BDL*
9	02/05/2017	67.59	35.41	17.80	36.45	0.33	BDL*	BDL*
10	05/05/2017	83.41	32.49	25.69	33.39	0.60	BDL*	BDL*
11	09/05/2017	94.32	52.48	5.95	23.74	0.31	BDL*	BDL*
12	12/05/2017	77.77	44.57	15.18	29.68	0.47	BDL*	BDL*
13	16/05/2017	90.93	49.57	22.25	41.37	0.78	BDL*	BDL*
14	19/05/2017	82.68	46.65	12.69	32.47	0.45	BDL*	BDL*
15	23/05/2017	96.20	54.57	20.75	44.52	0.87	BDL*	BDL*
16	26/05/2017	73.23	37.49	7.96	22.34	0.49	BDL*	BDL*
17	30/05/2017	87.17	41.65	11.89	27.23	0.72	BDL*	BDL*
18	06/02/2017	59.41	49.57	19.94	41.69	0.90	BDL*	BDL*
19	06/06/2017	65.77	34.57	15.85	33.67	0.49	BDL*	BDL*
20	09/06/2017	52.62	26.66	8.72	21.81	0.29	BDL*	BDL*
21	13/06/2017	79.23	38.32	10.67	25.34	0.34	BDL*	BDL*
22	16/06/2017	86.32	45.40	23.85	31.40	0.62	BDL*	BDL*
23	20/06/2017	73.59	41.65	12.04	30.88	0.45	BDL*	BDL*
24	23/06/2017	89.17	47.49	14.97	22.96	0.32	BDL*	BDL*
25	27/06/2017	69.53	31.66	21.54	39.20	0.81	BDL*	BDL*
26	30/06/2017	56.38	40.40	13.25	27.62	0.47	BDL*	BDL*
27	04/07/2017	89.29	48.32	9.62	22.00	0.36	BDL*	BDL*
28	07/07/2017	64.20	35.41	17.69	36.44	0.93	BDL*	BDL*
29	11/07/2017	77.23	31.66	22.85	29.20	0.51	BDL*	BDL*
30	14/07/2017	84.19	37.47	5.54	16.63	0.71	BDL*	BDL*

Continue …

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR FIRE STATION								
Sr.No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
31	18/07/2017	72.38	29.57	15.87	27.11	0.29	BDL*	BDL*
32	21/07/2017	62.50	26.66	7.16	19.17	0.64	BDL*	BDL*
33	25/07/2017	55.41	23.74	19.30	29.97	0.45	BDL*	BDL*
34	28/07/2017	82.38	44.57	12.78	38.79	0.86	BDL*	BDL*
35	01/08/2017	79.47	45.40	25.57	36.90	0.41	BDL*	BDL*
36	04/08/2017	89.29	54.57	17.87	39.19	0.57	BDL*	BDL*
37	08/08/2017	74.20	41.65	19.59	42.45	0.73	BDL*	BDL*
38	11/08/2017	68.20	33.74	21.43	24.42	0.29	BDL*	BDL*
39	15/08/2017	90.32	43.74	12.90	38.59	0.68	BDL*	BDL*
40	18/08/2017	82.38	37.49	16.81	33.76	0.53	BDL*	BDL*
41	22/08/2017	56.68	23.74	9.89	20.90	0.19	BDL*	BDL*
42	25/08/2017	65.59	30.41	10.39	29.84	0.44	BDL*	BDL*
43	29/08/2017	59.41	27.49	11.62	26.77	0.37	BDL*	BDL*
44	01/09/2017	61.89	25.41	10.88	23.42	0.22	BDL*	BDL*
45	05/09/2017	70.20	35.41	12.99	32.26	0.39	BDL*	BDL*
46	08/09/2017	86.38	39.57	27.60	39.26	0.36	BDL*	BDL*
47	12/09/2017	96.63	53.32	20.71	42.30	0.52	BDL*	BDL*
48	15/09/2017	77.41	34.57	17.92	28.08	0.37	BDL*	BDL*
49	19/09/2017	82.50	48.74	22.86	45.41	0.65	BDL*	BDL*
50	22/09/2017	94.20	55.40	13.85	38.54	0.55	BDL*	BDL*
51	26/09/2017	74.20	40.40	21.76	26.29	0.24	BDL*	BDL*
52	29/09/2017	84.50	36.66	19.24	37.28	0.30	BDL*	BDL*
	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-NaAsO2)	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

*Below detection limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
1	04/04/2017	57.59	22.49	18.97	38.58	0.37	BDL*	BDL*
2	07/04/2017	62.61	28.73	22.04	29.64	0.44	BDL*	BDL*
3	11/04/2017	76.49	36.64	6.33	17.20	0.62	BDL*	BDL*
4	14/04/2017	74.49	41.57	9.60	30.46	0.82	BDL*	BDL*
5	18/04/2017	63.60	34.56	19.40	24.85	0.25	BDL*	BDL*
6	21/04/2017	50.71	20.40	8.79	19.88	0.57	BDL*	BDL*
7	25/04/2017	71.47	38.73	13.07	28.83	0.15	BDL*	BDL*
8	28/04/2017	60.50	30.40	11.62	21.45	0.60	BDL*	BDL*
9	02/05/2017	53.50	28.73	8.73	21.53	0.64	BDL*	BDL*
10	05/05/2017	66.20	26.65	20.91	26.53	0.24	BDL*	BDL*
11	09/05/2017	75.81	33.73	13.80	30.58	0.11	BDL*	BDL*
12	12/05/2017	63.23	30.40	10.95	25.14	0.68	BDL*	BDL*
13	16/05/2017	72.40	31.65	17.52	27.76	0.39	BDL*	BDL*
14	19/05/2017	61.18	24.57	21.50	42.48	0.30	BDL*	BDL*
15	23/05/2017	80.40	41.64	9.59	33.52	0.95	BDL*	BDL*
16	26/05/2017	58.58	29.57	18.64	29.85	0.53	BDL*	BDL*
17	30/05/2017	81.58	37.48	6.17	19.38	0.70	BDL*	BDL*
18	02/06/2017	74.51	37.48	8.89	30.88	1.02	BDL*	BDL*
19	06/06/2017	55.42	27.48	11.82	19.80	0.56	BDL*	BDL*
20	09/06/2017	49.53	19.57	10.51	26.73	0.13	BDL*	BDL*
21	13/06/2017	73.39	34.56	5.61	17.53	0.70	BDL*	BDL*
22	16/06/2017	59.32	22.49	18.45	28.06	0.26	BDL*	BDL*
23	20/06/2017	68.37	36.64	14.97	38.08	0.31	BDL*	BDL*
24	23/06/2017	82.38	30.40	9.63	29.40	0.14	BDL*	BDL*
25	27/06/2017	63.41	26.65	15.13	25.54	0.41	BDL*	BDL*
26	30/06/2017	45.62	29.57	7.16	22.45	0.72	BDL*	BDL*
27	04/07/2017	76.37	37.48	16.63	30.41	0.70	BDL*	BDL*
28	07/07/2017	66.89	32.48	11.95	27.42	1.02	BDL*	BDL*
29	11/07/2017	70.17	26.65	13.46	18.34	0.56	BDL*	BDL*
30	14/07/2017	61.20	28.68	12.72	24.52	0.62	BDL*	BDL*

Continue …

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

ADANI HOUSE								
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³	Carbon Monoxide as CO mg/m³	Hydrocarbon as CH_4 mg/m³	Benzene as C_6H_6 µg/m³
31	18/07/2017	59.57	23.74	17.59	31.21	0.12	BDL*	BDL*
32	21/07/2017	52.63	20.40	10.63	23.14	0.27	BDL*	BDL*
33	25/07/2017	69.18	33.73	15.89	33.38	0.31	BDL*	BDL*
34	28/07/2017	74.20	39.56	9.90	26.45	0.40	BDL*	BDL*
35	01/08/2017	54.61	30.40	10.19	33.76	0.45	BDL*	BDL*
36	04/08/2017	66.70	38.73	19.55	36.18	0.50	BDL*	BDL*
37	08/08/2017	59.32	33.73	12.83	26.53	0.85	BDL*	BDL*
38	11/08/2017	62.30	29.57	15.94	31.26	0.52	BDL*	BDL*
39	15/08/2017	78.60	37.48	17.48	23.06	0.33	BDL*	BDL*
40	18/08/2017	69.92	28.73	14.86	41.38	0.87	BDL*	BDL*
41	22/08/2017	49.59	19.57	11.44	24.60	0.23	BDL*	BDL*
42	25/08/2017	52.50	24.57	13.42	35.27	0.32	BDL*	BDL*
43	29/08/2017	46.31	21.65	9.71	29.30	0.25	BDL*	BDL*
44	01/09/2017	55.42	21.65	12.32	26.89	0.18	BDL*	BDL*
45	05/09/2017	78.42	40.39	24.31	37.44	0.26	BDL*	BDL*
46	08/09/2017	60.50	27.48	10.63	35.49	0.40	BDL*	BDL*
47	12/09/2017	71.91	38.73	26.14	39.15	0.46	BDL*	BDL*
48	15/09/2017	65.58	30.40	15.84	25.54	0.29	BDL*	BDL*
49	19/09/2017	56.22	25.40	20.59	30.11	0.60	BDL*	BDL*
50	22/09/2017	89.57	42.47	18.94	27.53	0.32	BDL*	BDL*
51	26/09/2017	68.19	37.48	14.90	33.61	0.54	BDL*	BDL*
52	29/09/2017	58.58	24.57	11.33	43.50	0.79	BDL*	BDL*
	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-NaAsO2)	NDIR Digital Gas Analyzer	SOP: HC: GC/GCMS/Gas analyzer	IS 5182 (Part XI):2006/CPCB Method

*Below detection limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR SHANTIVAN COLONY'S STP					
Sr. No.	Date of Sampling	Particulate Matter (PM10) µg/m³	Particulate Matter (PM 2.5) µg/m³	Sulphur Dioxide (SO2) µg/m³	Oxides of Nitrogen (NO2) µg/m³
1	03/04/2017	49.62	27.44	8.83	23.41
2	06/04/2017	76.22	42.40	14.49	21.51
3	10/04/2017	45.50	22.45	5.31	25.31
4	13/04/2017	52.70	18.71	11.20	31.63
5	17/04/2017	62.80	32.43	9.63	11.60
6	20/04/2017	58.61	26.61	13.28	26.36
7	24/04/2017	72.59	41.57	10.53	29.52
8	27/04/2017	42.48	16.63	7.13	15.39
9	01/05/2017	56.21	19.54	7.17	18.58
10	04/05/2017	64.21	35.75	17.42	35.68
11	08/05/2017	72.40	39.49	20.51	27.21
12	11/05/2017	61.38	25.77	5.60	20.64
13	15/05/2017	76.77	23.70	12.67	29.35
14	18/05/2017	58.18	20.37	10.47	23.22
15	22/05/2017	45.50	27.44	15.11	32.61
16	25/05/2017	69.82	32.43	9.78	19.21
17	29/05/2017	55.47	29.52	13.42	25.34
18	01/06/2017	45.50	23.70	15.15	33.52
19	05/06/2017	72.40	34.50	20.43	27.29
20	08/06/2017	56.27	31.59	9.62	25.64
21	12/06/2017	61.38	25.36	16.76	32.54
22	15/06/2017	76.40	33.67	12.52	29.45
23	19/06/2017	58.61	26.61	10.32	30.17
24	22/06/2017	69.38	38.66	17.53	23.49
25	26/06/2017	55.59	29.52	13.37	28.44
26	29/06/2017	49.50	19.54	7.10	21.31
27	03/07/2017	76.40	41.57	21.94	27.72
28	06/07/2017	67.23	34.50	8.89	25.59
29	10/07/2017	58.61	29.52	19.34	34.54
30	13/07/2017	65.63	27.44	14.23	36.49

Continue ...

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULT OF AMBIENT AIR QUALITY MONITORING

NEAR SHANTIVAN COLONY'S STP					
Sr.No.	Date of Sampling	Particulate Matter (PM10) µg/m^3	Particulate Matter (PM 2.5) µg/m^3	Sulphur Dioxide (SO2) µg/m^3	Oxides of Nitrogen (NO2) µg/m^3
31	20/07/2017	63.41	28.68	15.80	33.48
32	24/07/2017	55.59	45.31	11.89	18.12
33	27/07/2017	47.78	18.71	13.16	21.11
34	31/07/2017	69.38	25.36	16.81	30.09
35	03/08/2017	67.23	42.40	14.14	31.50
36	07/08/2017	55.22	31.59	17.73	35.49
37	10/08/2017	62.43	33.67	11.53	29.41
38	14/08/2017	76.77	40.74	15.96	26.47
39	17/08/2017	69.38	32.43	13.61	33.47
40	21/08/2017	52.27	22.45	7.21	21.15
41	24/08/2017	84.53	39.49	16.70	25.52
42	28/08/2017	70.49	29.52	10.74	32.33
43	31/08/2017	49.19	20.37	12.64	24.50
44	04/09/2017	82.62	45.73	14.19	34.69
45	07/09/2017	56.21	34.50	9.75	28.40
46	11/09/2017	65.32	25.36	11.41	25.36
47	14/09/2017	72.40	28.68	7.95	22.64
48	18/09/2017	59.23	31.59	19.51	35.65
49	21/09/2017	67.23	23.70	16.85	26.50
50	25/09/2017	80.59	29.52	5.59	31.43
51	28/09/2017	71.17	27.44	8.90	33.60
	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-NaAsO2)

*Below detection limit

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	T1 TERMINAL NR.MARINE BUILDING					
		Result [Leq dB(A)]					
	Sampling Date & Time	11/04/2017	15/05/2017	23/06/2017	14/07/2017	18/08/2017	15/09/2017
1	6:00-7:00	61.4	62.0	68.4	63.1	64.1	68.1
2	7:00-8:00	68.4	68.4	62.4	68.7	70.46	62.8
3	8:00-9:00	62.5	65.4	68.1	69.1	68.2	63.4
4	9:00-10:00	63.4	62.1	62.8	62.8	65.1	69.9
5	10:00-11:00	65.4	69.7	63.4	65.8	67.9	72.4
6	11:00-12:00	68.1	62.5	68.4	70.4	62.4	74.1
7	12:00-13:00	62.7	71.5	67.1	69.7	70.1	70.1
8	13:00-14:00	67.4	70.2	69.4	65.7	60.7	66.4
9	14:00-15:00	65.7	70.6	67.4	63.1	68.5	68.4
10	15:00-16:00	62.1	69.4	66.4	62.8	68.7	62.8
11	16:00-17:00	62.8	65.2	63.4	68.4	64.3	65.6
12	17:00-18:00	62.4	68.2	65.8	65.5	70.6	68.8
13	18:00-19:00	69.4	63.1	70.4	69.1	67.9	64.1
14	19:00-20:00	68.7	62.8	68.4	62.8	69.5	63.4
15	20:00-21:00	68.1	62.9	68.4	65.0	67.3	68.9
16	21:00-22:00	65.4	69.4	68.2	66.7	61.3	66.8
Day Time Limit*		75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	T1 TERMINAL NR.MARINE BUILDING					
		Result [Leq dB(A)]					
1	Sampling Date & Time	11/04/2017 & 12/04/2017	15/05/2017 & 16/05/2017	23/06/2017 & 24/06/2017	14/07/2017 & 15/08/2017	18/08/2017 & 19/08/2017	15/09/2017 & 16/09/2017
2	22:00-23:00	65.1	64.1	63.1	63.8	61.4	65.1
3	23:00-00:00	62.7	61.4	61.8	65.7	67.6	60.8
4	00:00-01:00	66.4	57.1	65.1	64.1	62.1	68.4
5	01:00-02:00	66.9	56.4	68.7	62.8	60.4	68.4
6	02:00-03:00	60.1	60.1	65.4	63.7	61.5	68.8
7	03:00-04:00	62.4	65.1	62.9	63.9	65.8	65.1
8	04:00-05:00	62.8	62.8	69.4	69.8	67.3	62.5
9	05:00-06:00	63.7	61.9	70.5	62.7	65.0	66.1
Night Time Limit*		70 Leq dB(A)					

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
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	18/04/2017	19/05/2017	06/09/2017	21/07/2017	11/08/2017	26/09/2017
1	6:00-7:00	68.4	68.1	68.1	63.7	61.2	68.4
2	7:00-8:00	65.1	62.7	65.4	61.8	63.8	65.1
3	8:00-9:00	65.2	65.1	63.1	65.4	64.7	63.4
4	9:00-10:00	69.4	65.9	70.4	69.4	67.8	65.1
5	10:00-11:00	73.4	68.2	73.1	74.1	70.4	72.1
6	11:00-12:00	72.4	63.7	65.1	72.5	65.5	68.8
7	12:00-13:00	71.5	65.4	69.4	68.4	63.4	65.1
8	13:00-14:00	69.4	62.8	68.4	65.4	70.2	69.8
9	14:00-15:00	70.4	69.1	63.1	61.5	72.1	67.2
10	15:00-16:00	67.4	67.1	62.4	60.4	68.8	65.3
11	16:00-17:00	65.1	63.4	65.1	69.1	61.2	62.1
12	17:00-18:00	62.5	69.1	68.4	62.4	63.4	63.4
13	18:00-19:00	63.8	71.1	68.1	62.9	68.5	65.8
14	19:00-20:00	68.4	68.1	62.4	67.1	67	66.9
15	20:00-21:00	62.8	65.2	61.8	62.8	64.3	71.4
16	21:00-22:00	66.1	68.1	62.4	65.1	63.8	72.8
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)]					
1	Sampling Date & Time	18/04/2017 & 19/04/2017	19/05/2017 & 20/05/2017	09/06/2017 & 10/06/2017	21/07/2017 & 22/07/2017	11/08/2017 & 12/08/2017	26/09/2017 & 27/09/2017
2	22:00-23:00	64.1	65.1	63.7	69.4	68.8	61.5
3	23:00-00:00	63.4	68.7	65.1	66.2	62.4	68.4
4	00:00-01:00	62.1	59.4	69.4	68.1	65.4	65.1
5	01:00-02:00	60.4	60.8	64.1	62.8	58.4	60.4
6	02:00-03:00	68.4	63.1	66.1	68.4	59.3	69.4
7	03:00-04:00	63.4	62.4	62.8	62.8	63.4	62.8
8	04:00-05:00	65.4	60.4	68.4	66.7	66.8	66.1
9	05:00-06:00	67.1	60.8	62.7	62.8	61.7	68.7
Night Time Limit*		70 Leq dB(A)					

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	ADANI HOUSE					
		Result [Leq dB(A)]					
	Sampling Date & Time	14/04/2017	05/12/2017	13/06/2017	18/07/2017	01/08/2017	19/09/2017
1	6:00-7:00	62.5	65.4	65.4	67.2	64.3	65.4
2	7:00-8:00	68.4	62.8	62.7	65.9	68.8	68.1
3	8:00-9:00	68.1	68.1	64.7	68.1	65.7	62.5
4	9:00-10:00	63.4	72.1	70.4	62.4	70.1	73.1
5	10:00-11:00	72.4	71.5	68.1	62.8	72.4	70.5
6	11:00-12:00	70.4	69.4	65.4	61.8	63.4	69.9
7	12:00-13:00	70.9	65.2	68.2	68.4	60.4	66.4
8	13:00-14:00	68.1	62.8	63.4	68.7	67.9	62.1
9	14:00-15:00	62.4	62.8	65.1	68.2	67.4	68.4
10	15:00-16:00	65.1	62.1	62.4	64.1	62.4	63.4
11	16:00-17:00	62.8	65.1	68.1	69.1	70.3	68.1
12	17:00-18:00	66.8	69.1	63.8	73.1	71.9	66.8
13	18:00-19:00	69.4	63.4	65.1	70.4	68.8	63.1
14	19:00-20:00	62.1	65.1	62.9	64.1	62.1	62.9
15	20:00-21:00	68.4	61.8	68.4	62.8	60.1	65.4
16	21:00-22:00	68.2	60.4	67.1	60.8	64.1	66.7
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)]					
1	Sampling Date & Time	14/04/2017 & 15/04/2017	12/05/2017 & 13/05/2017	13/06/2017 & 14/06/2017	18/07/2017 & 19/07/2017	01/08/2017 & 02/08/2017	19/09/2017 & 20/09/2017
2	22:00-23:00	60.4	62.5	65.1	63.4	62.3	63.4
3	23:00-00:00	65.1	65.1	61.4	65.1	64.5	69.7
4	00:00-01:00	65.4	65.7	61.8	68.7	67.2	65.1
5	01:00-02:00	61.8	60.8	68.4	66.2	67.0	62.4
6	02:00-03:00	63.4	60.7	66.1	66.4	62.8	69.8
7	03:00-04:00	62.4	62.4	65.8	62.9	63.5	60.4
8	04:00-05:00	65.7	58.1	69.4	68.1	65.4	62.8
9	05:00-06:00	67.1	61.8	62.8	62.8	60.7	63.8
Night Time Limit*		70 Leq dB(A)					

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	AIRSTRIP					
		Result [Leq dB(A)]					
	Sampling Date & Time	12/04/2017	17/05/2017	06/02/2017	19/07/2017	23/08/2017	06/09/2017
1	6:00-7:00	52.1	57.1	54.1	52.1	49.5	55.2
2	7:00-8:00	56.4	56.1	58.1	59.7	47.7	60.1
3	8:00-9:00	63.1	60.1	60.4	60.4	58.5	59.4
4	9:00-10:00	62.4	59.8	62.4	55.1	53.4	63.1
5	10:00-11:00	68.4	59.1	68.4	63.8	59.1	54.1
6	11:00-12:00	61.4	62.4	59.4	65.8	62.4	63.1
7	12:00-13:00	60.4	63.1	60.4	65.4	63.1	60.4
8	13:00-14:00	58.4	66.4	62.1	63.9	57.3	60.9
9	14:00-15:00	60.4	64.1	58.7	68.2	52.1	63.2
10	15:00-16:00	60.9	62.7	56.1	62.9	56.4	62.8
11	16:00-17:00	63.1	62.8	58.4	60.8	64.8	65.1
12	17:00-18:00	61.4	60.4	60.4	59.7	58.8	60.8
13	18:00-19:00	65.4	65.1	55.8	62.7	60.0	60.6
14	19:00-20:00	62.4	62.7	59.8	62.8	58.4	57.2
15	20:00-21:00	60.4	60.8	56.4	60.8	65.2	59.1
16	21:00-22:00	60.7	63.4	58.4	60.4	63.3	62.4
Day Time Limit*		75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	AIRSTRIP					
		Result [Leq dB(A)]					
1	Sampling Date & Time	12/04/2017 & 13/04/2017	17/05/2017 & 18/05/2017	02/06/2017 & 03/06/2017	19/07/2017 & 20/08/2017	23/08/2017 & 24/08/2017	06/09/2017 & 07/09/2017
2	22:00-23:00	62.4	58.1	59.4	55.7	55	56.1
3	23:00-00:00	60.1	55.1	51.4	59.4	51.4	47.1
4	00:00-01:00	55.4	50.4	50.4	56.1	50.6	52.1
5	01:00-02:00	59.7	53.1	58.7	60.8	49.8	51.8
6	02:00-03:00	56.1	57.1	56.4	62.8	57.6	58.4
7	03:00-04:00	52.4	60.4	52.4	57.1	54.9	53.1
8	04:00-05:00	53.7	56.1	60.4	53.8	49.0	52.8
9	05:00-06:00	59.7	62.8	58.7	59.7	53.4	56.8
Night Time Limit*		70 Leq dB(A)					

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

RESULTS OF NOISE LEVEL MONITORING

Result of Noise level monitoring [Day Time]

SR. NO.	Name of Location	NEAR SHANTIVAN STP					
		Result [Leq dB(A)]					
	Sampling Date & Time	13/04/2017	04/05/2017	26/06/2017	03/07/2017	21/08/2017	21/09/2017
1	6:00-7:00	60.4	59.7	60.4	57.1	60.1	63.1
2	7:00-8:00	63.4	63.4	62.1	60.4	58.8	65.4
3	8:00-9:00	59.4	62.8	65.4	60.8	62.7	61.5
4	9:00-10:00	62.4	67.1	68.1	65.1	68.5	69.9
5	10:00-11:00	68.1	63.9	66.1	62.8	61.9	72.4
6	11:00-12:00	67.1	68.1	65.1	68.4	65.4	63.4
7	12:00-13:00	62.5	62.8	62.4	65.5	61.1	65.8
8	13:00-14:00	66.4	66.1	68.4	64.1	65.4	68.1
9	14:00-15:00	69.1	63.5	62.8	62.8	61.9	62.8
10	15:00-16:00	67.1	65.1	68.7	69.1	62.1	65.1
11	16:00-17:00	71.5	65.8	65.1	62.4	68.0	63.8
12	17:00-18:00	68.1	68.7	62.8	61.8	69.1	68.4
13	18:00-19:00	65.4	69.1	69.1	62.8	60.4	67.1
14	19:00-20:00	65.1	62.8	65.4	65.1	63.4	69.1
15	20:00-21:00	62.8	70.4	62.4	63.1	65.9	62.8
16	21:00-22:00	63.7	69.7	66.1	60.8	62.8	58.1
Day Time Limit*		75 Leq dB(A)					

Result of Noise level monitoring [Night Time]

SR. NO.	Name of Location	NEAR SHANTIVAN STP					
		Result [Leq dB(A)]					
1	Sampling Date & Time	13/04/2017 & 14/04/2017	04/05/2017 & 05/05/2017	26/06/2017 & 27/06/2017	03/07/2017 & 04/07/2017	21/08/2017 & 22/08/2017	21/09/2017 & 22/09/2017
2	22:00-23:00	62.4	62.4	58.4	67.1	64	60.8
3	23:00-00:00	59.4	61.8	54.1	65.2	65.1	63.4
4	00:00-01:00	56.2	59.7	62.4	62.8	62.4	60.8
5	01:00-02:00	60.4	55.1	61.4	67.1	68.8	65.4
6	02:00-03:00	59.4	60.4	60.4	65.3	63.4	62.8
7	03:00-04:00	63.1	58.2	60.8	63.9	61.8	66.4
8	04:00-05:00	62.4	59.1	63.4	68.4	64.5	69.7
9	05:00-06:00	64.1	56.2	64.7	65.6	67.3	65.4
Night Time Limit*		70 Leq dB(A)					

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

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
				APRIL 17				
1	Particulate Matter	mg/Nm^3	**150**	14.57	--	27.55	21.73	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	5.07	--	7.69	7.11	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	34.04	--	32.75	40.61	IS:11255 (Part-VII):2005
				MAY 17				
1	Particulate Matter	mg/Nm^3	**150**	18.84	--	32.74	28.61	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	5.72	--	6.85	8.89	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	32.29	--	38.00	39.44	IS:11255 (Part-VII):2005
				JUNE 17				
1	Particulate Matter	mg/Nm^3	**150**	13.84	--	26.71	21.75	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	4.35	--	8.75	6.77	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	28.28	--	33.80	35.69	IS:11255 (Part-VII):2005
				JULY 17				
1	Particulate Matter	mg/Nm^3	**150**	10.82	--	20.25	15.52	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	3.49	--	6.61	5.79	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	25.40	--	38.30	33.60	IS:11255 (Part-VII):2005
				AUGUST 17				
1	Particulate Matter	mg/Nm^3	**150**	18.55	15.45	28.75	22.61	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	4.62	5.19	5.59	6.47	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	30.30	33.30	40.07	36.16	IS:11255 (Part-VII):2005
				SEPTEMBER 17				
1	Particulate Matter	mg/Nm^3	**150**	12.42	--	20.55	16.66	IS:11255 (Part-I):1985
2	Sulfur dioxide	ppm	**100**	3.87	--	5.75	7.28	IS:11255 (Part-II):1985
3	Oxides of Nitrogen	ppm	**50**	25.39	--	33.52	29.83	IS:11255 (Part-VII):2005

*Below detection limit
Results on 11 % O2 Correction when Oxygen is greater than 11 %.

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

MINIMUM DETECTION LIMIT [MDL]

Water parameter(mg/L)

Sr. No.	Test parameter	MDL
1	Total Suspended Solids	1
2	Oil & Grease	1
3	BOD	3
4	COD	5
5	Total Dissolved Solids	3
6	Sulphate	0.3
7	Ammonical Nitrogen	0.05
8	Nickel	0.01
9	Phenolic Compound	0.001
10	Fluoride	0.01
11	Copper	0.013
12	Sulphide	0.01
13	Cyanide	0.0001
14	Residual Chlorine	0.1
15	Boron	0.02
16	Insecticides/Pesticides	0.01
17	Nitrate Nitrogen	0.15
18	Phosphorous	0.15
19	Petroleum Hydrocarbon	0.01
20	Lead	0.005
21	Mercury	0.0005
22	Zinc	0.022
23	Cadmium	0.001
24	Arsenic	0.00015
Sediment parameter(mg/kg)		
1	Petroleum Hydrocarbon	0.2

Stack parameter

Sr. No.	Test parameter	MDL
1	Particulate Matter (mg/Nm3)	10
2	Sulphur Dioxide(ppm)	1.52
3	Oxides of Nitrogen (ppm)	2.65

Ambient Air Parameter

1	Particulate Matter (PM10)	10
2	Particulate Matter (PM 2.5)	10
3	Sulphur Dioxide (SO2) (µg/m3)	5
4	Oxides of Nitrogen (NO2) (µg/m3)	5
5	Benzene as C6H6 (µg/m3)	2
6	Carbon Monoxide as CO (mg/m3)	0.1
7	Hydrocarbon as CH4 (mg/m3)	0.15
8	Hydrogen Sulphide (H2S) (µg/m3)	6

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. ArunBajpai
Lab Manager (Q)

"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"

FOR

BORE HOLE WATER

TAL: MUNDRA, KUTCH, MUNDRA – 370 421

MONITORING PERIOD:

APRIL 2017 TO SEPTEMBER 2017

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.
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TC - 5945 ISO 9001:2008 ISO 14001:2004 OHSAS 18001:2007

RESULTS OF BORE HOLE WATER

SR. NO	TEST PARAMETERS	UNIT	RESULTS					TEST METHOD
			OPP. DRUB RAILWAY STATION		NEAR PUB BUILDING		SEZ MAIN GATE NEAR FLYOVER BRIDGE	
	GPS Location		N 22° 43.073' E 069° 39.861'		N 22° 46.761' E 069° 40.999'		N 22° 48.446' E 069° 42.238'	
	Sampling Date		17/04/2017	19/07/2017	17/04/2017	19/07/2017	19/07/2017	
	Sampling Time		11:45	12:40	11:20	12:10	11:05	
1	pH	--	7.55	7.32	8.02	7.59	8.01	IS3025(P11)83Re.02
2	Salinity	mg/L	30.15	0.129	6.05	6.02	0.14	APHA 2520B
3	Oil & Grease	mg/L	BDL*	1.06	BDL*	3.4	1.12	APHA(22ndEdi)5520D
4	Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	GC/GC-MS
5	Lead as Pb	mg/L	0.013	0.13	BDL*	0.24	0.11	AAS APHA(22ndEdi)3111 B
6	Arsenic as As	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA 3114 B
7	Nickel as Ni	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA(22ndEdi)3111 B
8	Total Chromium as Cr	mg/L	0.021	0.008	0.019	BDL*	BDL*	AAS 3111B
9	Cadmium as Cd	mg/L	BDL*	BDL*	BDL*	BDL*	0.007	AAS APHA(22ndEdi)3111 B
10	Mercury as Hg	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
11	Zinc as Zn	mg/L	0.94	0.041	0.039	1.26	0.069	AAS APHA(22ndEdi)3111 B
12	Copper as Cu	mg/L	BDL*	0.051	BDL*	0.74	0.033	AAS APHA(22ndEdi)3111 B
13	Iron as Fe	mg/L	0.084	0.67	0.31	14.2	0.67	AAS APHA(22ndEdi)3111 B
14	Insecticides/Pesticides	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	GC/GC-MS
15	Depth of Water Level from Ground Level	meter	2.8	2.5	2.7	2.8	2.4	--

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. Arun Bajpai
Lab Manager (Q)

SR. NO	TEST PARAMETERS	UNIT	RESULTS						TEST METHOD
			LIQUID TERMINAL ETP		TANK NO. 5		PUMP HOUSE-1	PUMP HOUSE-3	
	GPS Location		N 22° 44.549′ E 069° 41.464′		N 22° 44.508′ E 069° 41.401′		N 22° 44.555′ E 069° 41.432′	N 22° 44.554′ E 069° 41.471′	
	Sampling Date		09/05/2017	25/05/2017	09/05/2017	25/05/2017	25/05/2017	25/05/2017	
	Sampling Time		11:30	10:45	11:00	12:15	11:40	12:10	
1	pH	--	7.93	7.46	8.11	7.43	7.57	7.68	IS3025(P11)83Re.02
2	Salinity	mg/L	2.68	12.73	9.02	3.75	3.38	0.55	APHA 2520B
3	Oil & Grease	mg/L	BDL*	1.88	BDL*	1.2	5.3	3.8	APHA(22ndEdi)5520D
4	Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	GC/GC-MS
5	Lead as Pb	mg/L	0.007	0.06	0.01	0.12	0.11	0.53	AAS APHA(22ndEdi)3111 B
6	Arsenic as As	mg/L	BDL*	ND*	BDL*	ND*	ND*	ND*	AAS APHA 3114 B
7	Nickel as Ni	mg/L	BDL*	0.2	BDL*	ND*	ND*	ND*	AAS APHA(22ndEdi)3111 B
8	Total Chromium as Cr	mg/L	0.014	0.004	0.024	0.008	ND*	ND*	AAS 3111B
9	Cadmium as Cd	mg/L	BDL*	ND*	BDL*	ND*	0.008	0.13	AAS APHA(22ndEdi)3111 B
10	Mercury as Hg	mg/L	BDL*	ND*	BDL*	ND*	ND*	ND*	AAS APHA- 3112 B
11	Zinc as Zn	mg/L	0.019	0.043	0.57	1.19	1.81	ND*	AAS APHA(22ndEdi)3111 B
12	Copper as Cu	mg/L	BDL*	0.04	BDL*	0.37	0.755	0.07	AAS APHA(22ndEdi)3111 B
13	Iron as Fe	mg/L	0.029	0.67	0.057	14.99	17.05	1.1	AAS APHA(22ndEdi)3111 B
14	Insecticides/Pesticides	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	GC/GC-MS
15	Depth of Water Level from Ground Level	meter	3.14	2.6	3.04	2.2	2.3	2.8	--

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. Arun Bajpai
Lab Manager (Q)

SR. NO	TEST PARAMETERS	UNIT	RESULTS	
			PUMP HOUSE-2	TEST METHOD
	GPS Location		N 22° 44.554' E 069° 41.453'	
	Sampling Date		25/05/2017	
	Sampling Time		12:30	
1	pH	--	6.84	IS3025(P11)83Re.02
2	Lead as Pb	mg/L	30.76	AAS APHA(22ndEdi)3111 B
3	Arsenic as As	mg/L	ND*	AAS APHA 3114 B
4	Nickel as Ni	mg/L	ND*	AAS APHA(22ndEdi)3111 B
5	Total Chromium as Cr	mg/L	ND*	AAS 3111B
6	Cadmium as Cd	mg/L	0.085	AAS APHA(22ndEdi)3111 B
7	Mercury as Hg	mg/L	ND*	AAS APHA- 3112 B
8	Zinc as Zn	mg/L	3.06	AAS APHA(22ndEdi)3111 B
9	Copper as Cu	mg/L	54.18	AAS APHA(22ndEdi)3111 B
10	Iron as Fe	mg/L	12.99	AAS APHA(22ndEdi)3111 B

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. Arun Bajpai
Lab Manager (Q)

"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"

FOR

ADANI MUNDRA SEZ INFRASTRUCTURE PVT. LTD.
TAL: MUNDRA, KUTCH, MUNDRA – 370 421

MONITORING PERIOD:

APRIL 2017 TO SEPTEMBER 2017

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 Web: www.polluconlab.com

TC - 5945 ISO 9001:2008 ISO 14001:2004 OHSAS 18001:2007

RESULTS OF SOIL

SR. NO.	TEST PARAMETERS	UNIT	RESULT			
			MAY-2017			
			Opp. Dhrub Railway Station	Nr. Flyover Bridge	Nr. Pub Building	CETP Gate
1	pH	--	7.90	7.25	8.21	7.01
2	Nitrogen as N	%	0.0068	0.0092	0.0074	0.0048
3	Phosphorus as P	mg/kg	140	282	190	720
4	Potassium as K	mg/kg	58	40	18	33
5	Baron as B	mg/kg	2.4	1.8	2.6	3.4
6	Calcium as Ca	mg/kg	89.70	445	49.60	1246
7	Magnesium as Mg	mg/kg	5.81	59.42	5.95	1496
8	Iron as Fe	%	0.56	0.48	0.28	0.45
9	Moisture	%	8.4	6.2	10.2	9.8
10	Organic Matter	%	0.054	0.063	0.025	0.04
11	CEC	meq/100 gm	5.4	6.6	4.8	5.1
12	TVC	CFU/gm	2.4×10^{-6}	3.2×10^{-7}	4.2×10^{-7}	3.8×10^{-6}
Heavy Metal						
13	Cadmium as Cd	mg/kg	2.1	4.5	1.8	2.6
14	Thorium as Th	mg/kg	BDL*	BDL*	BDL*	BDL*
15	Antimony as Sb	mg/kg	BDL*	BDL*	BDL*	BDL*
16	Arsenic as As	mg/kg	BDL*	BDL*	BDL*	BDL*
17	Lead as Pb	mg/kg	18.5	30	32.4	18.2
18	Chromium as Cr	mg/kg	15.2	17.2	16.8	17.4
19	Cobalt as Co	mg/kg	1.3	0.8	2.4	1.6
20	Copper as Cu	mg/kg	10.7	11.4	9.8	11.4
21	Nickel as Ni	mg/kg	74	68	140	68
22	Manganese as Mn	mg/kg	210	510	82	154
23	Vanadium as V	mg/kg	10.4	14.8	9.2	7.4

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. Arun Bajpai
Lab Manager (Q)

SR. NO.	TEST PARAMETERS	UNIT	MAY-2017
			Near Thermic Fluid Heater (Bitumin)
1	pH	--	7.46
2	Nitrogen as N	%	0.0036
3	Phosphorus as P	mg/kg	410
4	Potassium as K	mg/kg	48
5	Baron as B	mg/kg	1.4
6	Calcium as Ca	mg/kg	129
7	Magnesium as Mg	mg/kg	71.98
8	Iron as Fe	%	0.70
9	Moisture	%	7.2
10	Organic Matter	%	0.032
11	CEC	meq/100 gm	6.2
12	TVC	CFU/gm	2.4×10^{-8}
Heavy Metal			
13	Cadmium as Cd	mg/kg	1.1
14	Thorium as Th	mg/kg	BDL*
15	Antimony as Sb	mg/kg	BDL*
16	Arsenic as As	mg/kg	BDL*
17	Lead as Pb	mg/kg	27.4
18	Chromium as Cr	mg/kg	16.2
19	Cobalt as Co	mg/kg	1.8
20	Copper as Cu	mg/kg	8.6
21	Nickel as Ni	mg/kg	214
22	Manganese as Mn	mg/kg	94
23	Vanadium as V	mg/kg	14.4

H. T. Shah
Lab Manager

POLLUCON LABORATORIES PVT. LTD. SURAT-3

Dr. Arun Bajpai
Lab Manager (Q)

Annexure – 3

Details of Greenbelt development at APSEZ, Mundra

LOCATION	Total Green Zone Detail				
	Area (In Ha.)	Trees (Nos.)	Palm (Nos.)	Shrubs (SQM)	Lawn (SQM)
SV COLONY	65.34	30051.00	6965.00	51138.00	80069.00
PORT & NON SEZ	77.52	131942.00	18613.00	68166.78	58455.18
SEZ	99.52	227135.00	15924.00	220449.60	27462.03
MITAP	2.48	8168.00	33.00	1670.00	4036.00
WEST PORT	83.20	182118.00	50221.00	24112.00	22854.15
AGRO- PARK	7.52	17244.00	1332.00	5400.00	2121.44
SOUTH PORT	14.08	25150.00	3430.00	3882.00	4826.97
Samudra Township	38.67	28252.00	11818.00	19978.07	35071.67
Productive Farming	15.69	19336.00	0.00	0.00	0.00
TOTAL (APSEZL)	**404.02**	**669396.00**	**108336.00**	**394796.45**	**234896.44**
		7,77,732			

Details of Mangrove Afforstation 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
	Total Mangrove Plantation:	**2827.90 Ha**			

A. Green Development at APSEZL,Mundra (Till Nov.2017) as per EC

Green Belt Developed as per EC Condition

Sr No.	Symbol	EC	Ec Details	Locations	Green Belt (ha.)	Trees (No.)	Average Tree Density (ha.)
GB1		23.Au.1995	Handling facility of General cargo/LPG/Chemical and theil storage terminal at Navinal island	Navinal island, Liquid area	15.15	51605	3406
GB2		20.Sept..2000	Port Expantion project including dry/bulk/break bulk cargo/container terminal ,Rly Link , related ancillary and back up	Inside port,Avenue, Fire station,Rly.building, CT2 areaetc	13.66	18074	1323
GB3		21.july 2004	SPM,OOT and connected pipeline at mundra port	IOCL/HPCL /MMPL area	6.1853	7607	1230
GB4		05.Feb.2007	Development of Multipurpose berth(T2)Mundra	Terminal 2	4.37	5988	1370
GB5		12.Jan.2009	Waterfront development project at mundra	Waterfront area (Adani hou and nearer area,South and west basin,APL Road,etc)	122.36	281819	2303
GB6		20.Feb 2010	Establisment of CETP (17MLD) capacity at survey no.141(part),mundra	CETP area and treated water utilization area	16.98	31083	1831
GB7		20.Feb 2010	Township and area Development project,at survey no.141(part),Mundra	Samudra township , Adani hospital,Periffery of Bhukhi river banketc	43.55	59166	1359
			(A.)Total		**222.26**	**455342**	**2049**

Additional Green Belt Developed

B. Additional Green Development at APSEZL,Mundra (Till Nov.2017)

Sr No.		Area Details	Green Belt (ha.)	Trees(No.)	Tree Density (ha.)
GB8		Shantiwan colony ,Adani School,Temple,Guest houses,Mundra	65.34	40554	621
GB9		Mitap and nearer area	2.4	8168	3403
GB10		Agripark area	7.52	17244	2293
GB11		Airstrip and airstrip road ,Along road from Rly Gate 24 to 25,North gate & other SEZ area	88.76	243059	2737
GB12		New Development (area 1 to 13 ,AB)	26.03	38625	1484
		(B.)Total	**190.08**	**347650.00**	**1828.97**

Total Green Development at APSEZL,Mundra (Till Nov.2017)

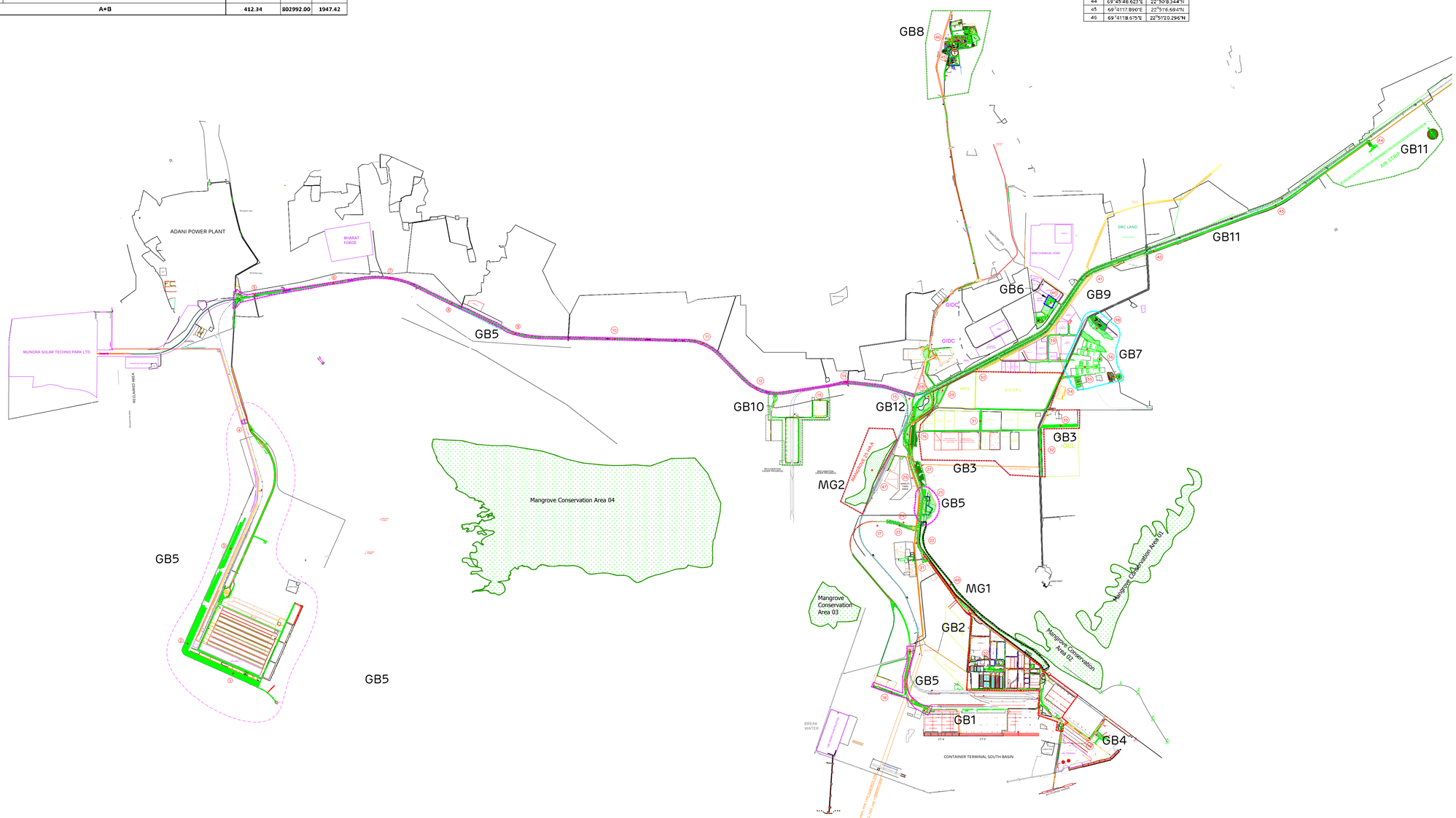
Sr No.	Area Details	Green Belt (ha.)	Trees (No.)	Tree Density (ha.)
	A+B	**412.34**	**802992.00**	**1947.42**

Lat Long Of Green Belt Area

Sr. No.	Latitude	Longitude
1	69°33'29.798"E	22°44'38.842"N
2	69°33'2.398"E	22°45'14.365"N
3	69°33'32.735"E	22°46'17.109"N
4	69°33'44.520"E	22°47'20.650"N
5	69°33'41.090"E	22°48'43.306"N
6	69°34'31.981"E	22°48'50.120"N
7	69°35'11.005"E	22°48'54.268"N
8	69°35'58.337"E	22°48'36.557"N
9	69°36'38.620"E	22°48'19.874"N
10	69°37'44.008"E	22°48'16.797"N
11	69°38'35.659"E	22°48'14.104"N
12	69°39'12.318"E	22°47'46.137"N
13	69°39'51.720"E	22°47'39.717"N
14	69°40'10.522"E	22°47'30.513"N
15	69°40'48.508"E	22°47'40.312"N
16	69°40'47.610"E	22°47'18.746"N
17	69°40'28.982"E	22°46'29.237"N
18	69°40'38.405"E	22°44'44.679"N
19	69°42'43.751"E	22°44'17.492"N
20	69°40'47.452"E	22°44'57.528"N
21	69°40'56.317"E	22°46'6.039"N
22	69°40'53.035"E	22°46'13.077"N
23	69°40'42.589"E	22°46'28.874"N
24	69°40'43.374"E	22°46'32.175"N
25	69°41'0.940"E	22°46'38.096"N
26	69°40'36.601"E	22°46'53.156"N
27	69°40'54.883"E	22°47'3.674"N
28	69°40'57.778"E	22°47'26.690"N
29	69°41'9.996"E	22°47'44.046"N
30	69°41'30.201"E	22°47'37.098"N
31	69°41'34.576"E	22°47'26.535"N
32	69°42'13.593"E	22°47'8.318"N
33	69°42'28.888"E	22°47'23.695"N
34	69°42'37.345"E	22°47'50.499"N
35	69°42'42.000"E	22°47'58.780"N
36	69°42'51.726"E	22°48'3.073"N
37	69°42'43.597"E	22°48'9.573"N
38	69°42'50.949"E	22°48'21.573"N
39	69°42'14.088"E	22°49'18.784"N
40	69°42'19.906"E	22°49'37.682"N
41	69°42'43.190"E	22°49'52.628"N
42	69°43'26.341"E	22°49'8.778"N
43	69°44'49.105"E	22°49'36.665"N
44	69°45'48.623"E	22°50'8.344"N
45	69°41'17.890"E	22°51'6.694"N
46	69°41'18.675"E	22°51'20.296"N

Lat Long Of Mangrove Area

Sr. No.	Latitude	Longitude
47	69°40'22.704"E	22°46'59.824"N
48	69°41'12.855"E	22°49'49.811"N



DRG NO. HORTI/APSEZL

Implemented Green Zone Development In APSEZL Area
(Mangrove afforestation and Conservation, Green Zone area & Additional Green Belt Development)

DRG. TITLE:

Landscape Drawing

SCALE :- N.T.S.

DATE : 14.11.2017

adani

DEPT.OF HORTICULTURE
ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED, MUNDRA .

Annexure – 4

Creek System (before & after)

As per Marine EIA of Waterfront Development project, prominent creek system in the study region are

1. Kotdi
2. Baradimata
3. Navinal
4. Bocha
5. Mundra (Oldest port (Juna Bandar) leading to bhukhi river)

All above creeks are in existence and well functioning as on date.

Culverts & Bridge

APSEZL has so far constructed 19 culverts having total length of approx. 1100 m and total cost of Rs. 20 Crores.

Culverts & Bridge

Three RCC Bridges have been constructed over Kotdi creek with total length of 230 m and cost of Rs. 10 Crores.

adani

Kotdi Creek

Outfall of APSEZL

Outfall of APSEZ and free flowing Kotdi Creek

Annexure – 5

Tele 079-23243264
Fax 079-23243283
Email ops-nw@indiancoastguard.nic.in

तटरक्षक क्षेत्रीय मुख्यालय (उत्तर पश्चिम)
Headquarter
Coast Guard Region (NW)
Post Box No 09
Udyog Bhavan, Sector-11
Gandhinagar 382010

Quoting: 7563

07 Nov 16

The DGM Marine Service
(Kind Attn Capt. Rahul Agarwal)
Adani Port and SEZ Ltd
Adani House, P.O. Box 1
Mundra –Kutch-Gujarat- 370421

APPROVAL OF OIL SPILL CONTINGENCY RESPONSE PLAN- APSEZ MUNDRA

Sir,

1. Kindly refer to Headquarters No.1 Coast Guard Dist (Guj) letter 711/1(i) dated 18 Oct 16 (not addressed to all).

2. The Oil Spill Contingency Plan (OSCP) in respect of M/s Adani Port & SEZ Ltd Mundra is approved.

3. It is requested that OSCP to be updated every year and the plan be revised every five years, or earlier if deemed necessary.

Regards,

(Sumit Pant)
Commandant
Regional Pollution Response Officer (AOD)
for Commander
Coast Guard Region (NW)

Copy to:-

The Director General
{for D (F&E)}
Coast Guard Headquarters
New Delhi - 110001

The Commander
No. 1 Coast Guard District (Gujarat)
Porbandar - 360575

The Commanding Officer
ICGS Mundra
Port User Building (5 B) Navinal Island
Mundra (Kutch) Gujarat 370421

भारतीय तटरक्षक अवस्थान मुंद्रा
Indian Coast Guard Station Mundra
डाक क्र. सं. Mail SL No. 3717 दिनांक Date 17NOV 16
कमान अधिकारी CO
कार्यकारी अधिकारी EXO
अवस्थान प्र. एवं वो अधिकारी SOPO
अवस्थान तकनीकी अधिकारी STO
प्र. चिकित्सा अधिकारी PMO
स्टाफ अधिकारी SO
कार्रवाई Action by Operations
मिसिल सं

adani

Date: 04 Sep 2017

APSEZ/MARINE/CG/04

To,

The Commander
(For Regional Pollution Response Officer)
Headquarter Coast Guard Region (NW)
Gandhinagar

Sub: **Updating of Oil Spill Contingency Response Plan (Tier 1) – APSEZ, Mundra**

Dear Sir,

The Oil Spill Contingency Plan was approved vide your letter no 7563 dated 07th November 2016.

The Oil Spill Contingency Plan was updated in the month on 04th Sep 2017(copy enclosed). The details of changes incorporated are mentioned below:

Sl No	Amendment	Page No
1	Added Annexure 16- List of agency for support & guidance for rescue & rehabilitation of oiled bird & mangroves management during oil spill	92
2	Clause No 3.6- Additional Information added	45
3	Contact details of Adani Group Personnel updated	78

The above is for your kind information.

Thanking you,

Yours faithfully,
For Adani Ports and SEZ Ltd

Adani Ports and Special Economic Zone Limited
HOD
Marine

Capt Sansar Chaube
Head– Marine Services
E Mail: Sansar.Chaube@adani.com
Mob: +91 99252 23674

भारतीय तटरक्षक जलयान मुंद्रा
INDIAN COAST GUARD STATION MUNDRA

CC: The Commanding Officer, Indian Coast Guard Station, Mundra

Enclosure: Oil Spill Contingency Plan

Adani Ports and Special Economic Zone Ltd
Adani House
P.O. Box 1
Mundra, Kutch 370 421
Gujarat, India

Tel +91 2838 25 5000
Fax +91 2838 25 5110
info@adani.com
www.adani.com

Registered Office: Adani House, Nr. Mithakhali Circle, Navrangpura, Ahmedabad 380 009, Gujarat, India

O/C

OIL SPILL CONTINGENCY RESPONSE PLAN TIER 1

(To be used in conjuction 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

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This document is distributed as per Oil Spill Contingency Response plan. In addition, documents on a "need based" basis will be distributed.

All documents so distributed will be controlled documents & identified by a unique control number as per Oil Spill Contingency Response plan.

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SN.	**Issued To**	**Copy No.**	**Date of Issue**
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2.	Management Representative	02	01/01/2014
3.	Marine Control Room	03	01/01/2014
4.	Sr. Manager (Fire Services)	04	01/01/2014
5.	Auditor's Copy	05	01/01/2014
6.	Systems Co-ordinator	Original Copy	01/01/2014
7.	HOD (Marine)	06	01/01/2014
8.	Coast Guard	07	01/01/2014
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Section 02: Amendment Records

AMENDMENT RECORD SHEET							
Sr. No.	**Section**	**Sub-section**	**Page No.**	**Revision No.**	**Revision Date**	**Description of Revision**	**Approved**
1.	Annex 3		75			Location of Oil Spill Equipment mentioned	Approved
2.	Annex 15		91			List of recycler approved by state of Gujarat	Approved
3.			96			Contingency Planning Compliance Checklist	Approved
4	Annex 16		92		29.08.2017	List of agency for support & guidance for rescue & rehabilitation of oiled bird & mangroves management during oil spill	Approved
5	03	3.6	45		29.08.2017	Additional information added	Approved

Section 03: Strategy

1 Introduction

1.1 Authorities and responsibilities
1.2 Coordinating committee
1.3 Statutory requirements
1.4 Mutual aid agreements
1.5 Geographical limits of plan
1.6 Interfaces with ROSDCP and NOSDCP

2 Risk assessment

2.1 Identification of activities and risks
2.2 Types of oil likely to be spilled
2.3 Probable fate of spilled oil
2.4 Development of oil spill scenarios including worst case discharge
2.5 Shoreline sensitivity mapping
2.6 Shoreline resources, priorities for protection
2.7 Special local considerations

3 Response strategy

3.1 Philosophy and objectives
3.2 Limiting and adverse conditions
3.3 Oil spill response in offshore zones
3.4 Oil spill response in coastal zones
3.5 Shoreline oil spill response
3.6 Storage and disposal of oil and oily waste

4 Equipment

4.1 Marine oil spill response equipment
4.2 Inspection, maintenance and testing
4.3 Shoreline equipment, supplies and services

5 Management

5.1 Crisis manager and financial authorities
5.2 Incident organization chart
5.3 Manpower availability (on-site, on call)
5.4 Availability of additional manpower
5.5 Advisors and experts – spill response, wildlife and marine environment
5.6 Training / safety schedules and drill / exercise programme

6 Communications

6.1 Incident control room and facilities
6.2 Field communications equipment
6.3 Reports, manuals, maps, charts and incident logs

Action and operations

7 Initial procedures

7.1 Notification of oil spill to concerned authorities,
7.2 Preliminary estimate of response tier
7.3 Notifying key team members and authorities
7.4 Manning Control Room
7.5 Collecting information (oil type, sea / wind forecasts, aerial surveillance, beach reports)
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

9 Control of operations

9.1 Establishing a Management team with experts and advisors
9.2 Updating information (sea, wind, weather forecasts, aerial surveillance, beach reports)
9.3 Reviewing and planning operations
9.4 Obtaining additional equipment, supplies, manpower
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

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

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

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-coordinating Authority for marine pollution control in the country. The Indian Coast Guard is responsible for implementation and enforcement of the relevant marine pollution laws.

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.

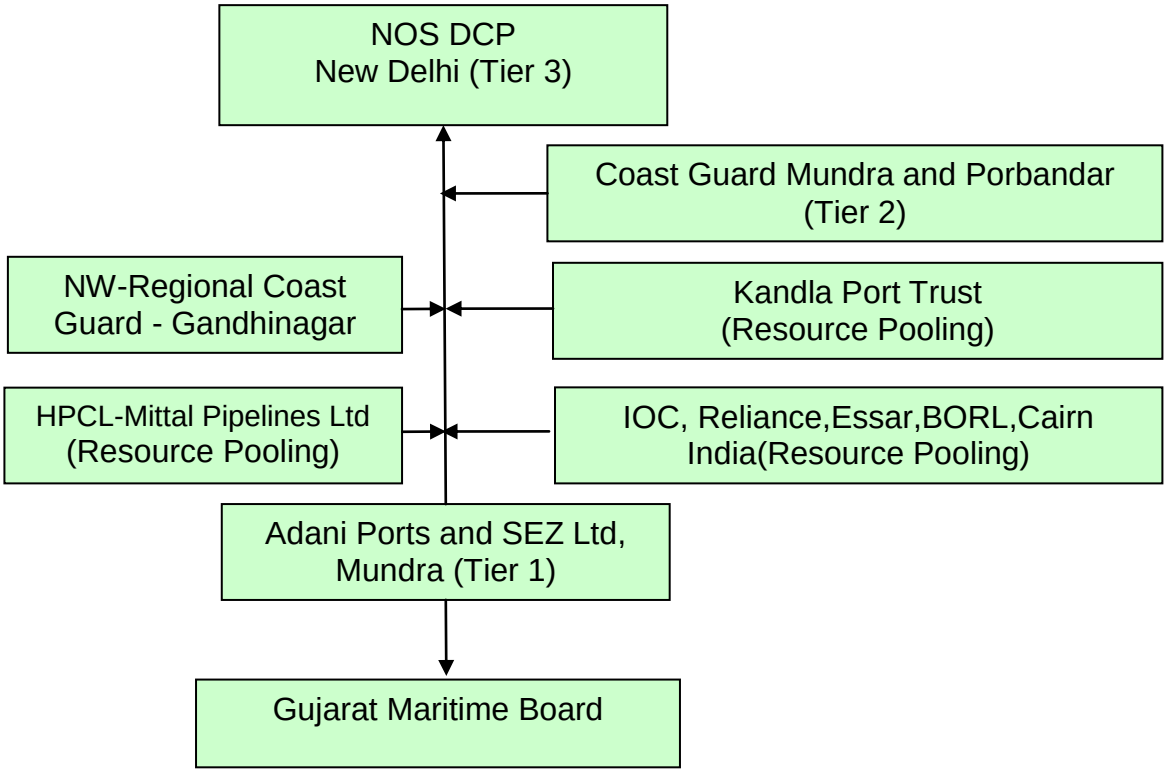
Emergency Response Team

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 organisations 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.

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)

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 cascadable 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.

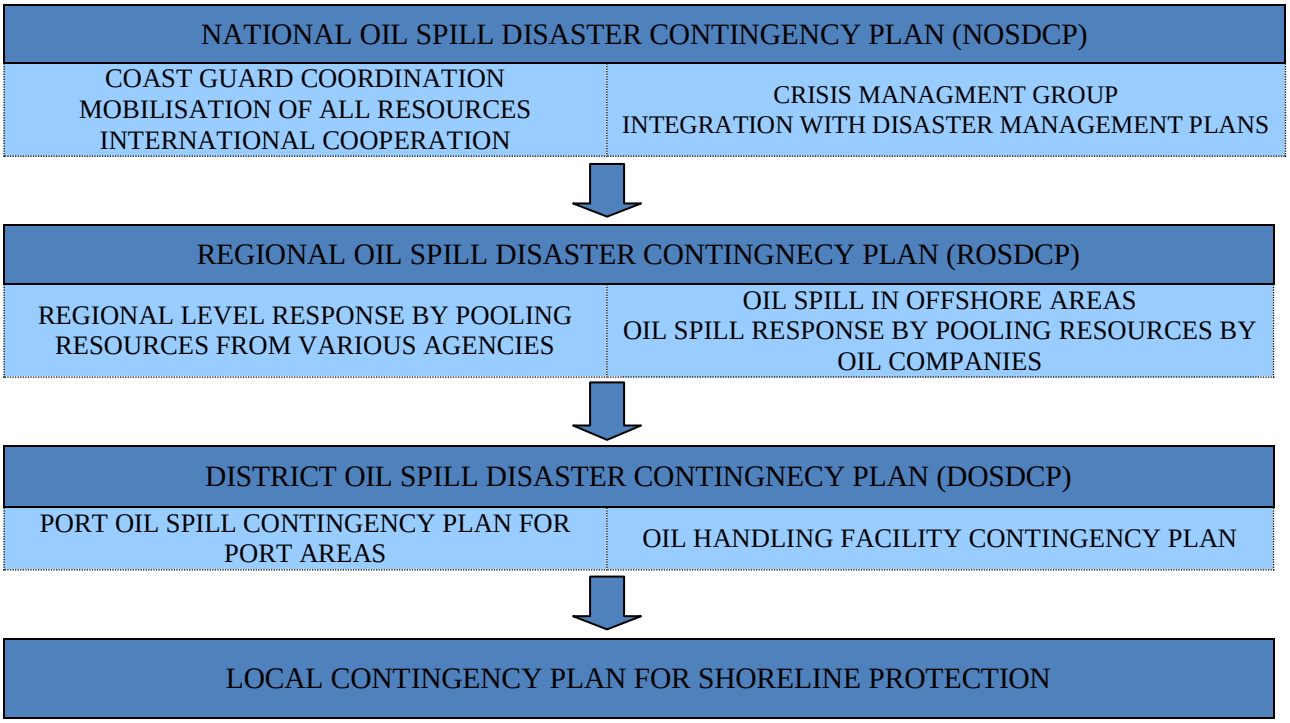


Figure 1 - Contingency Plan hierarchy

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, minimise 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
ISTRICT OIL SPILL CONTINGN

2 Risk Assessment

The number of vessels calling annually at APSEZL is more than 3000 including Chemical 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).

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^3/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^3/hr and 10000 m^3/hr. In the present study, the maximum pumping rate of 10000m^3/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^3/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^3/hr to10000 m^3/hr. In the present study, to assess the maximum risk, pumping rate of 10000 m^3/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^2 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^2 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^3/s)

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 kg/cm^2 = 65 m)

This would give a value of 0.04 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 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 m^3 or 7622 t.
Hence the total oil leaked due to rupture in sub-sea pipeline will be 2.15 t + 5% of pipeline volume of oil in t (0.05 x 7622 =381 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.

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 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 is 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.

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:

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

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

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

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

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 070^0 – 250^0 at an average rate of 3 kts and 4-5 kts during spring tides.

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 340ºC (645ºF), and at least 95% of the hydrocarbon fractions, by volume, distill at a temperature of 370ºC (700ºF) 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 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 arte 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.

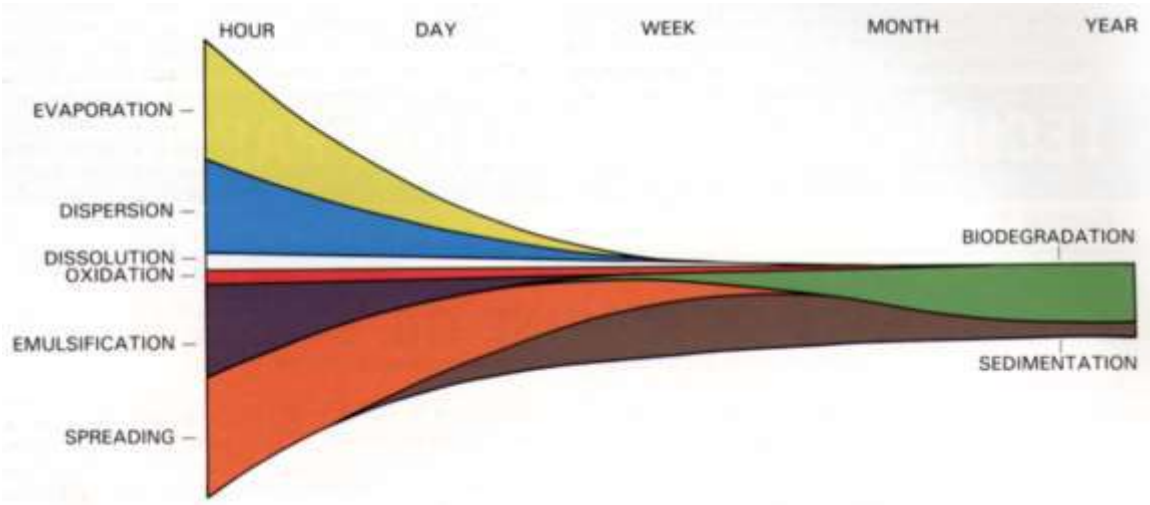
f) **Sedimentation**: Very few oils are sufficiently heavy to sink in sea water. However, the weathered residue gets mixed up with the suspended substances in water and may sink. This process becomes significant when water-in-oil emulsions attain specific gravity near to one and therefore need very little 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.



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.

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 500^2 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.

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, his 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 70^0 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.

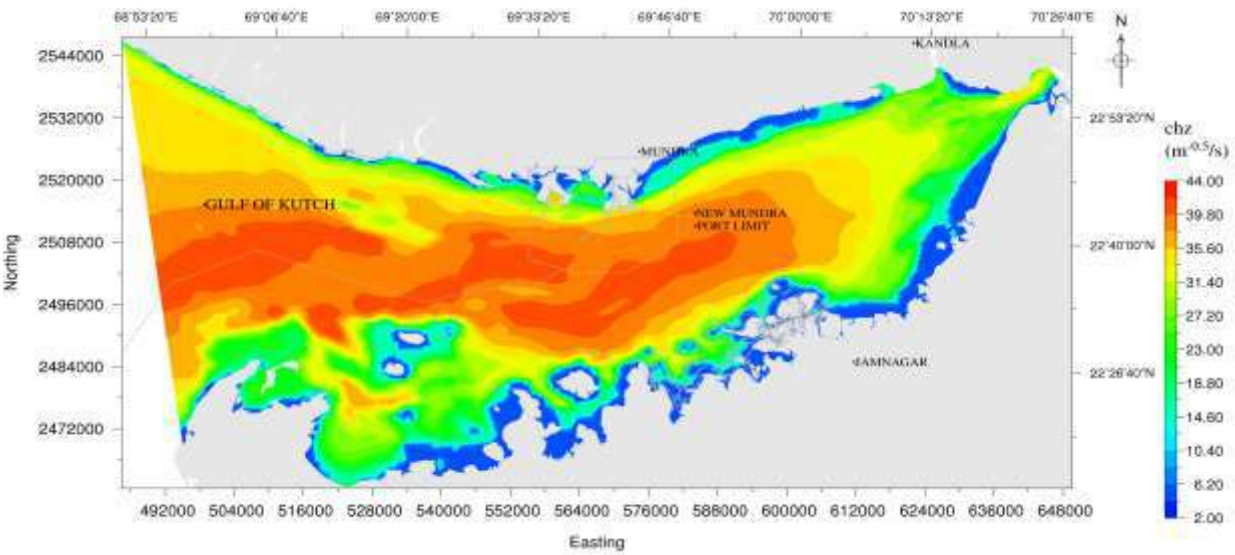


Fig.A1.4 Chezy’s coefficient

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

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 raise 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
Absorbent pads	1000
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Oil discharge hose, 3”, 2 x 10 m	1 set
Rachet belt (Eco make)	10 nos.
Tool box (Eco)	6 nos.
Tanker Trucks	04 nos.
Mini Vacuum Pump (30 m3 / hr)	02 nos.
Slurry Pump (60 m3 / hr)	01 no.

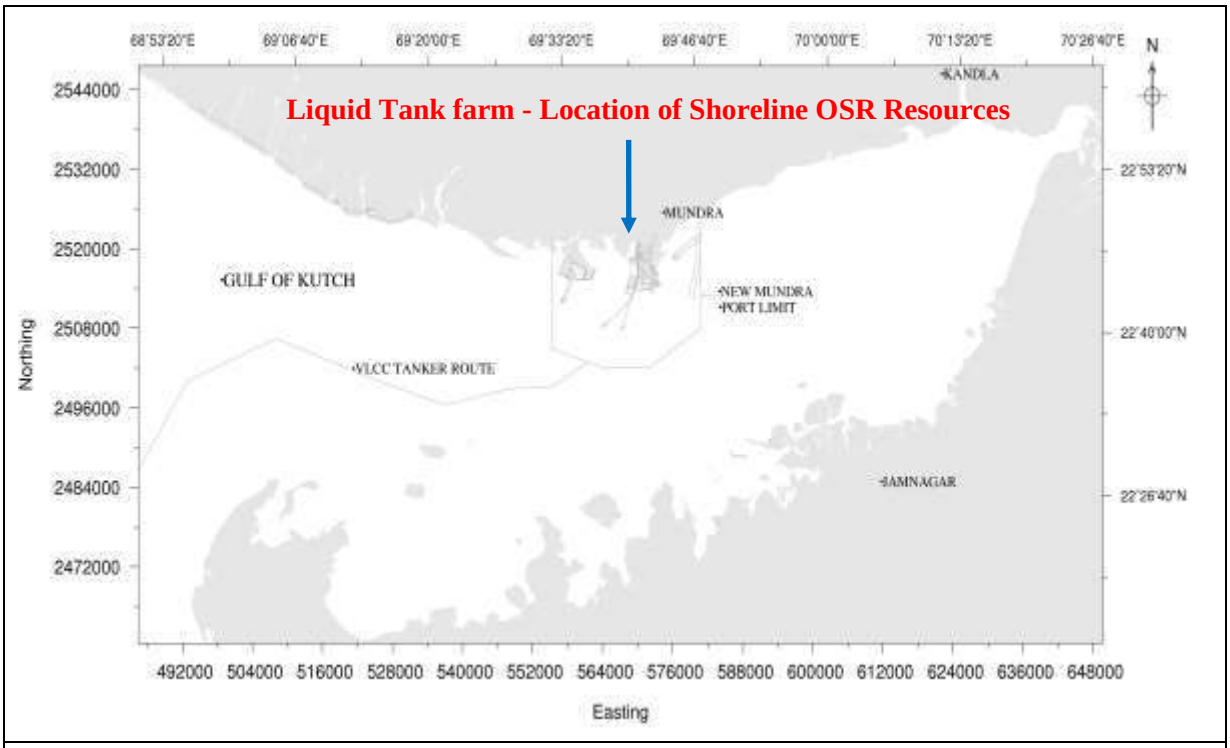


Fig.1.1 :General Arrangement of the marine facilities at Mundra port showing the VLCC route and facilities within the new Mundra port limit considered for carrying out the oil spill risk assessment studies.

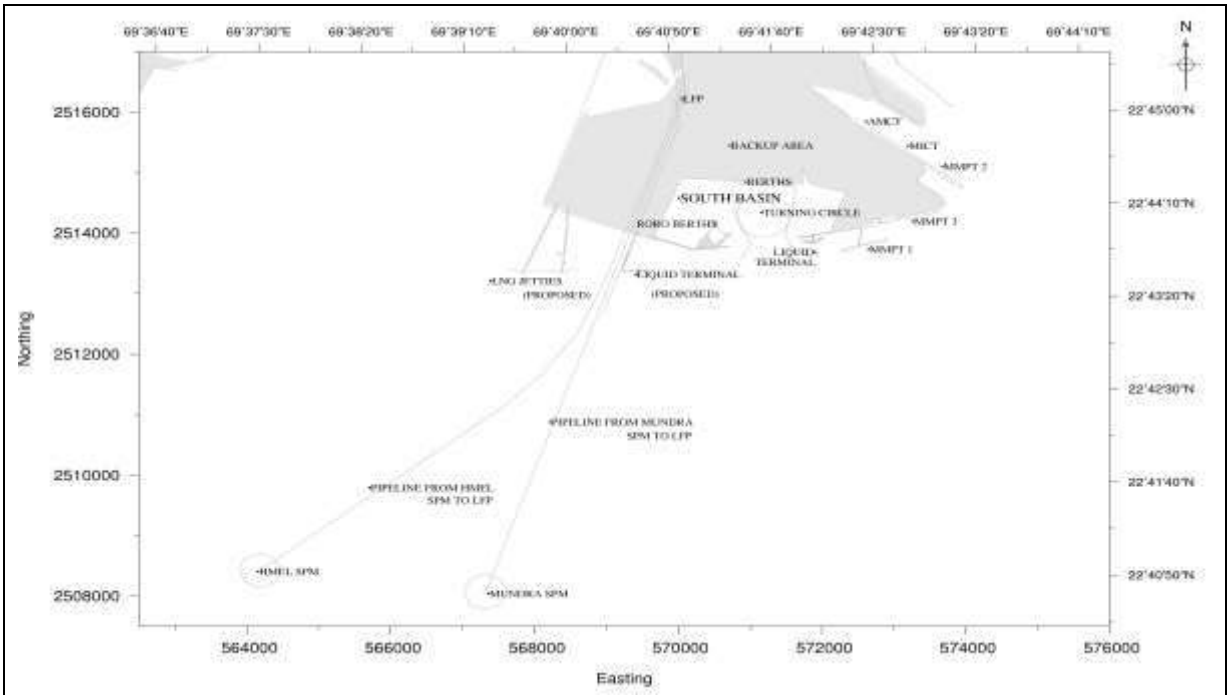


Fig1.2: Zoomed up portion of the South Basin showing the berths, turning circle, LNG jetty and existing berths as well as SPMs.

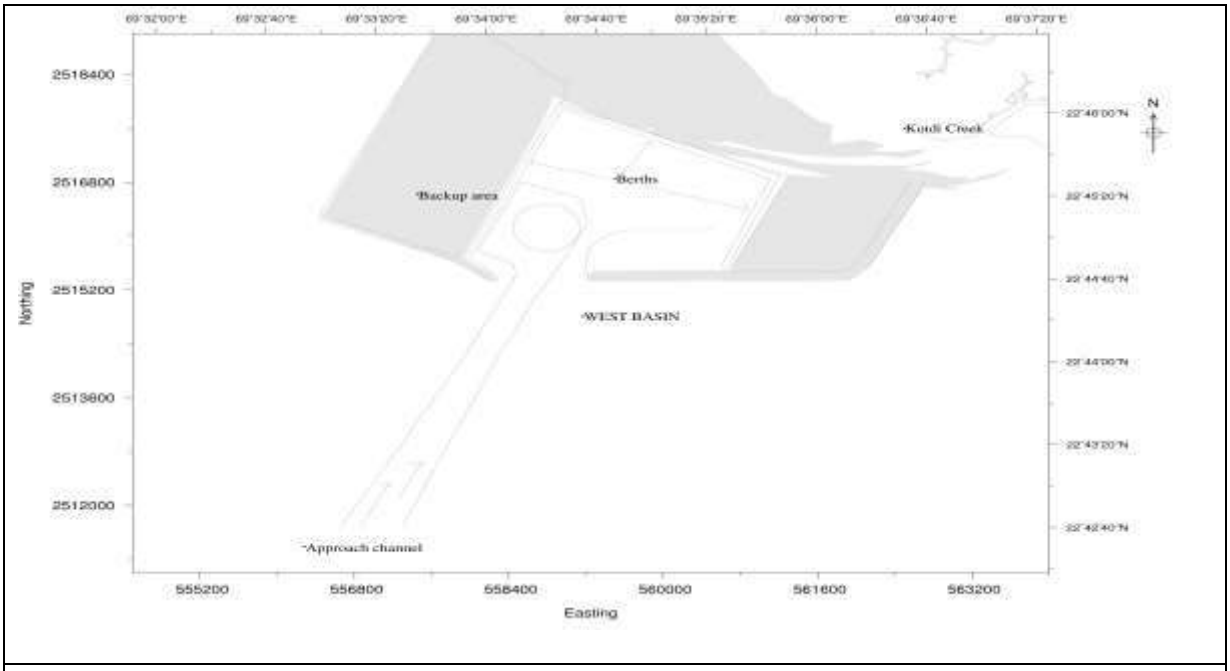


Fig.1.3 Zoomed up portion of the West Basin showing the berth locations and the approach channel for the vessels

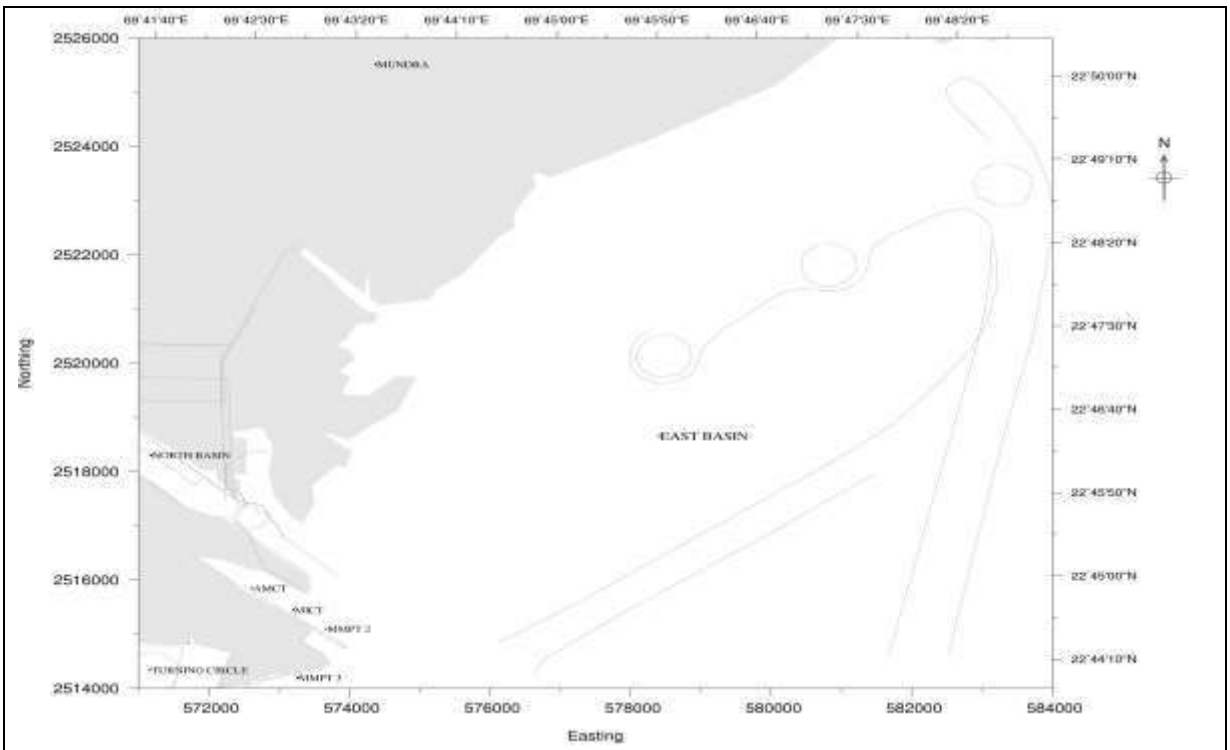


Fig.1.4 Zoomed up portion showing the East Basin & North Basin

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/m3; av 1.9 mg/m3) and phaeophytin (0.3 – 1.2 mg/m3; av 0.7 mg/m3) varied considerably. In October 2010, chlorophyll a ranged from 2.0 – 4.2 mg/m3 (av 3.1 mg/m3) and phaeophytin from 0.7 - 1.1 mg/m3 (av 0.7 mg/m3) (Tables 8.1 and 8.2). The average concentration (mg/m3) of chlorophyll a off Vadinar during different sampling events (2010) is listed in Table 8.1:

Table 8.1: Average chlorophyll a (mg/m3) 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/m3) between different sampling events (April 2010 and October 2010) are listed in Table 8.2.

Table 8.2: Average phaeophytin (mg/m^3) 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 nox10^3/l; av 186 no x 10^3/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 nox10^3/l (av 329.4 no x 10^3/l) and generic diversity ranged from 12-25 no (av 19 no) (Table 8.4) off Vadinar.

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

Month	Pathfinder		Nearshore		ESSAR DP		IOC SPM	
	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/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 (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/l)	Total genera (no.)	Cell count (nox10^3/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^2. The mangrove area has increased in recent years due to extensive plantations made by the Forest Department. Mangrove cover and mudflat areas (km^2) 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^2) 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

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^2)
D1	22° 26'42.6''N 69° 42' 07.8''E	*A. marina*	100	Sep-67 -38	0.5 - 3.5	<2.6 - 6	0 - 2
D2	22° 26' 50.5''N 69° 41' 52.9''E	*A. marina*	40	0 - 5 -2	0.5 - 1.5	<2.5 - 4	0 - 1
Vadinar (Dargah - south side; afforested area)							
D3	22° 26' 30.8''N 69° 42' 05.6''E	*A. marina*	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^2 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^2. 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^2 with an average of 50 plants/100 m^2. 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^2), 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.

Table 8.6: Distribution of mangroves at Narara

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

* no/500 m^2

As can be noticed in the above table, the plant density of *A.marina* varied from 20 - 130 plants/100 m^2 with a frequency of occurrence of 100% at Narara. The species like *Ceriops tagal* (7 plants/500 m^2) and *Rhizophora mucronata* (2 plants/500 m^2 - 3 plants/100 m^2) were rarely noticed. The locations N2 (85 plants/100 m^2) and N4 (80 plants/100 m^2) 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^2 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*, *Cystoceira*, *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.

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/m2.

Table 8.7: Marine algal flora along Narara/Vadinar

Sr. No.	Species	% FO*	ES*
1	*Enteromorpha clathrata*	100	D
2	*Enteromorpha intestinalis*	100	D
3	*Caulerpa racemosa*	50	C
4	*Ulva fasciata*	100	D
5	*Ulva lactuta*	100	D
6	*Ulva reticulate*	90	D
7	*Codium elongatum*	30	O
8	*Sargassum ilicifolium*	45	C
9	*Sargassum tenerimmum*	60	CD
10	*Gracilaria corticata*	55	C
11	*Gracillaria verrucosa*	85	C
12	*Polysiphonia platycarpa*	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^3 (av 3.3 ml/100m^3) and 2.2-722.7 x 10^3/100m^3 (av 39 x 10^3/100m^3), respectively while during October 2010 the zooplankton biomass and abundance ranged from 0.2 to 12.0 ml/100m^3 (av 3.5 ml/100m^3) and 2.5-157.8 x 10^3/100m^3 (av 48.4 x 10^3/100m^3) respectively suggesting normal secondary production off Vadinar during the monitoring period.

The average zooplankton biomass (ml/100m^3), population density (nox10^3/100m^3) 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$^{3)}$ (B) Population density (nox10^3/100m^3) 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

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^2, av 2292 no/m^2) and biomass (0.1-37.2 g/m^2; wet wt, av. 9.2 g/m^2; 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^2 (av 1185 no/m^2) and biomass from 0-67.8 g/m^2; wet wt (av. 14.6 g/m^2; 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^2) (B) Population density (no/m^2) 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^2; av 8.0 g/m^2 wet wt) and population density (150-8925 no/m^2; av 1902 no/m^2) during April 2010. In October 2010 the biomass ranged from 0.3 – 23.9 g/m^2 (av 7.1 g/m^2; wet wt) and population density ranged from 125-14975 no/m^2 (av 2282 no/m^2) The current data is listed (April 2010 – Oct 2010) in Table 8.10.

Table 8.10 Average of subtidal macrobenthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m^2) (B) Population density (no/m^2) 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.

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.

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.

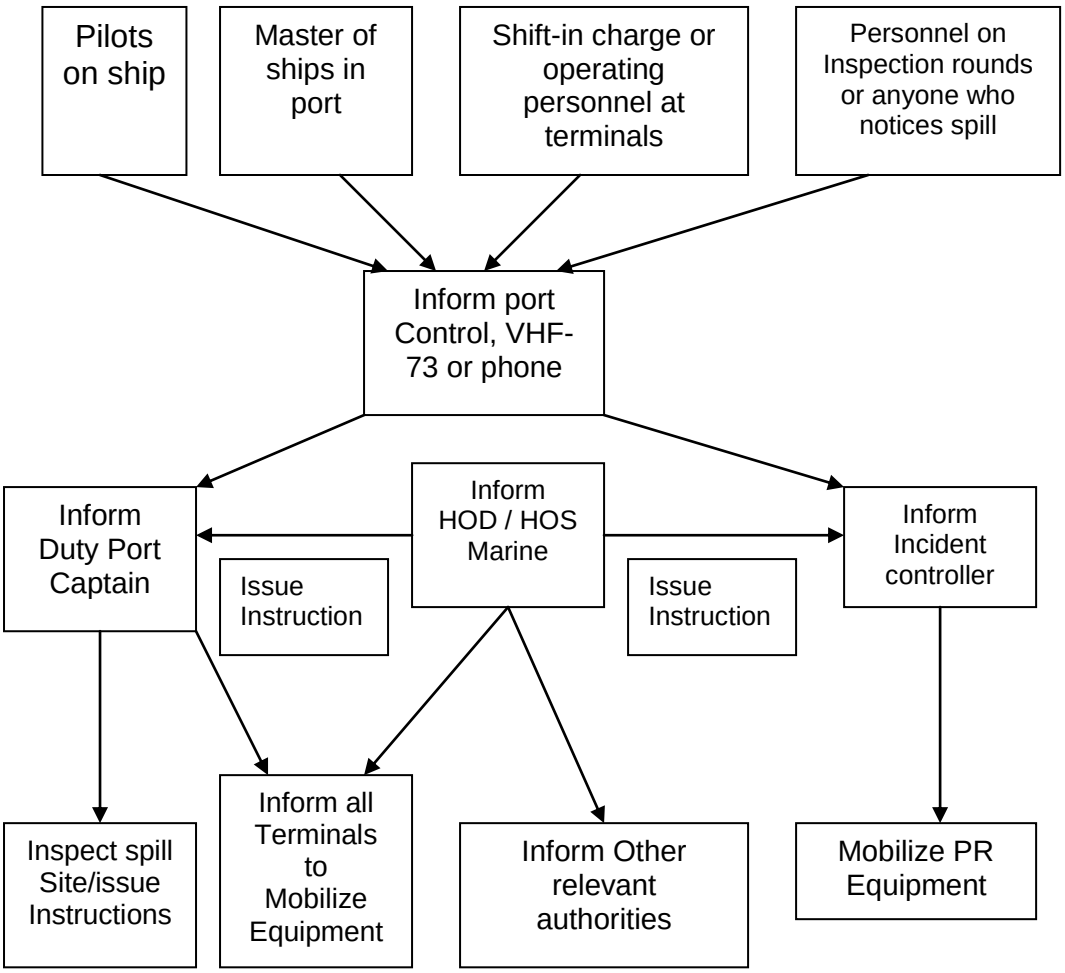
3.3 Oil spill response in offshore zones

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.

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.

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

Fire Coordinator – (HOS - Fire / HOS -Safety)
(Under the direction of the Incident Control Officer)

- Announces fire incident point over the public address system and evacuates workers to the assembly points
- Informs fire station immediately and leads 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.
- 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 / Marine Control In-charge)

- 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

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)

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.

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.

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 m3 considering spill of level 1 (Tier-1) is required.

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:

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
Material			
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 socked 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 socked birds to transfer from affected area to treatment facility center.

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:-

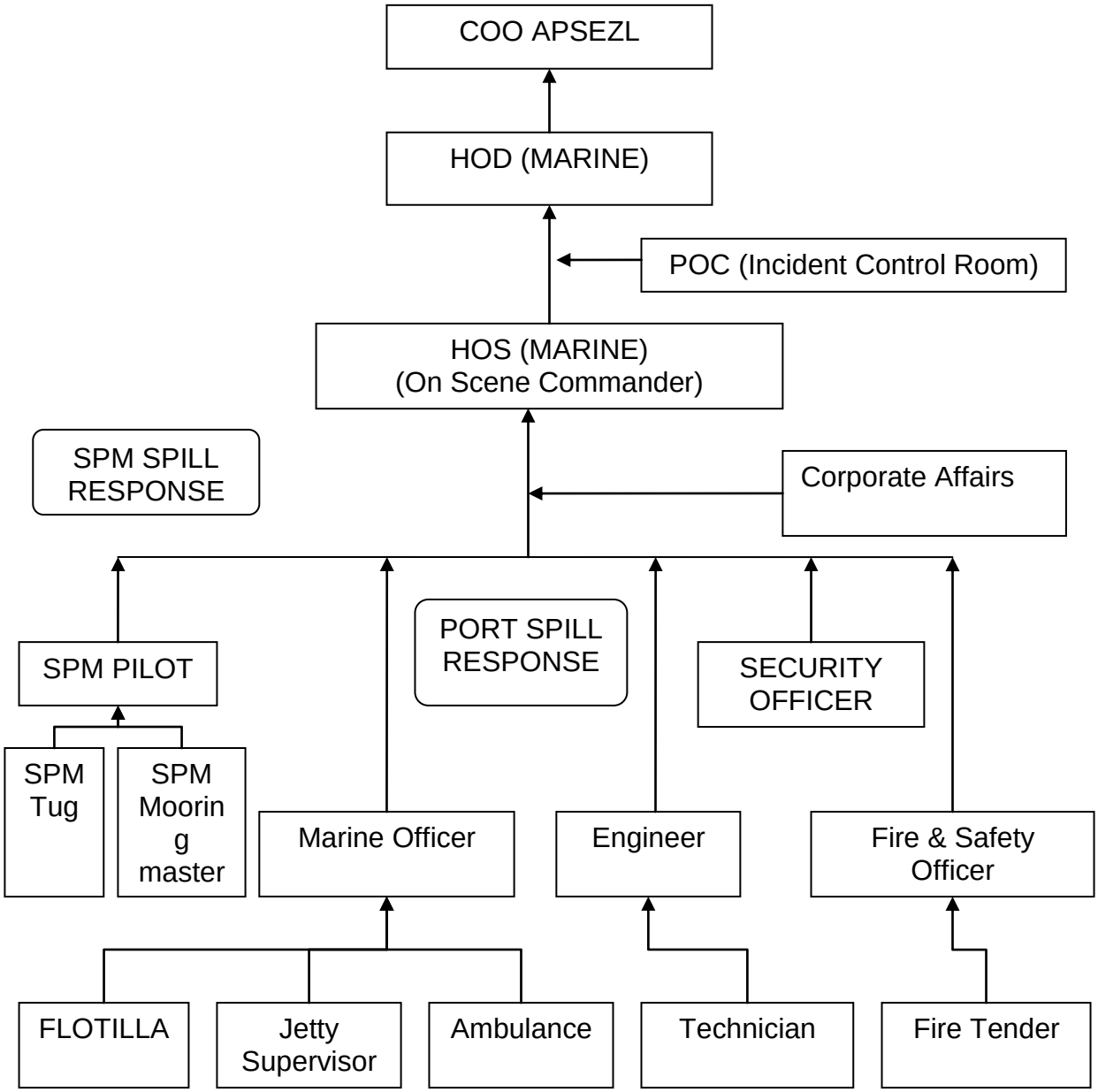
- Protective clothing for everybody (including boots and gloves), spare clothing.
- Cleaning material, rags, soap, detergents, and brushes.
- Equipment to clean clothes, machinery, etc., with jets of hot water.
- Plastic bags (heavy duty) for collecting oily debris.
- Heavy duty plastic sheets for storage 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.

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



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.

Training Module	Duration	Frequency	Participants	Remarks
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 spillManagement 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 - 30
IMO Level-2 - 03

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

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.

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.

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

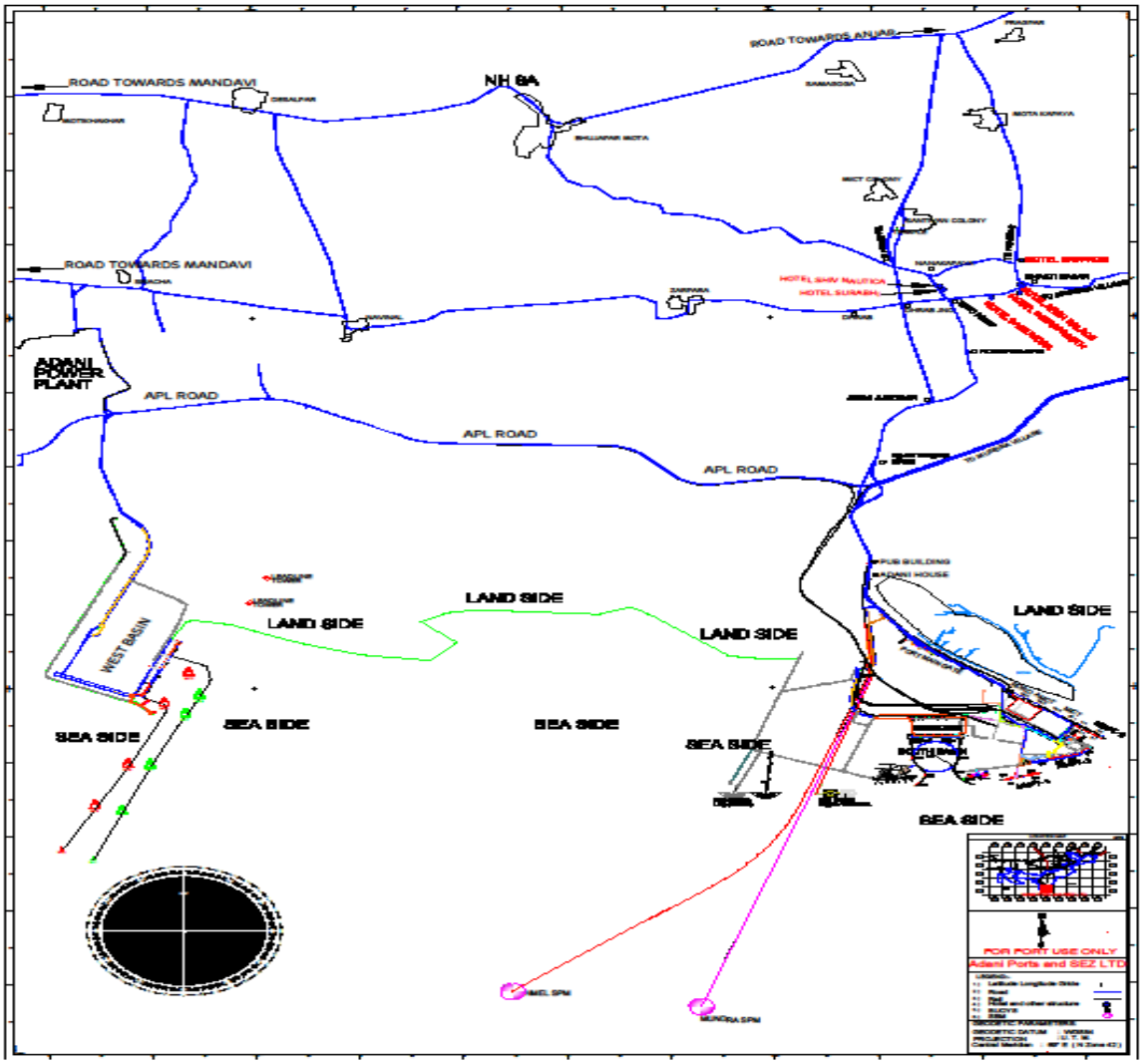
A complete spill response report will be produced by the Marine manager providing comprehensive and all-inclusive details of the circumstances leading to the spill, initial response and consequent affect of the same, subsequent follow up, effect of prevailing weather, adverse situations, safety issues,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

Data Directory

Maps / Charts

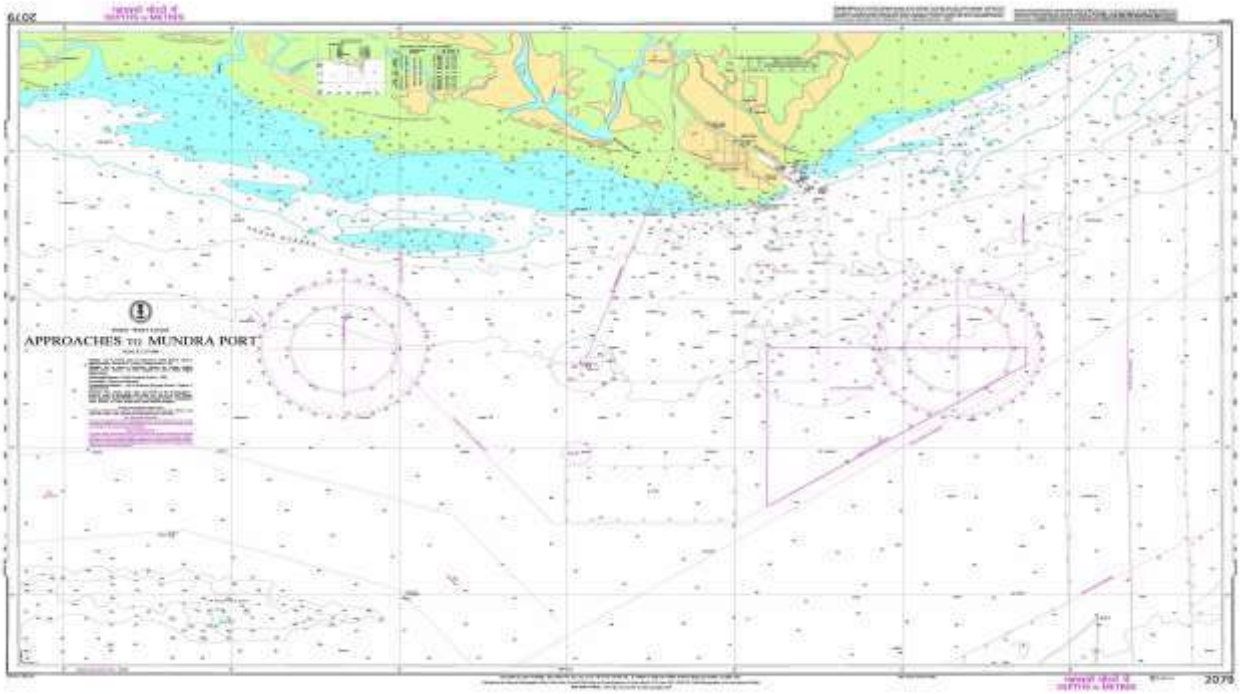
1. Coastal facilities, access roads, hotels etc.

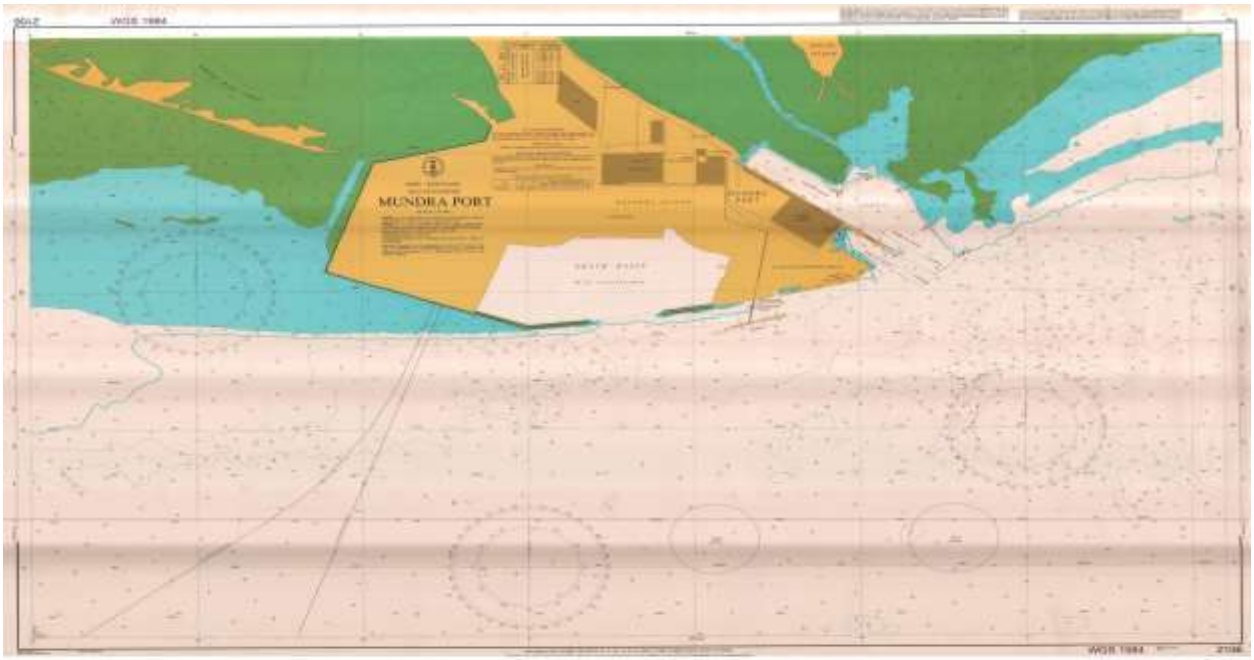


Telephones: Detailed in Annexure **4**

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





WGS 1984
MUNDRA PORT
WEST BASIN
WGS 1984
2107

3. Risk locations and probable fate of oil

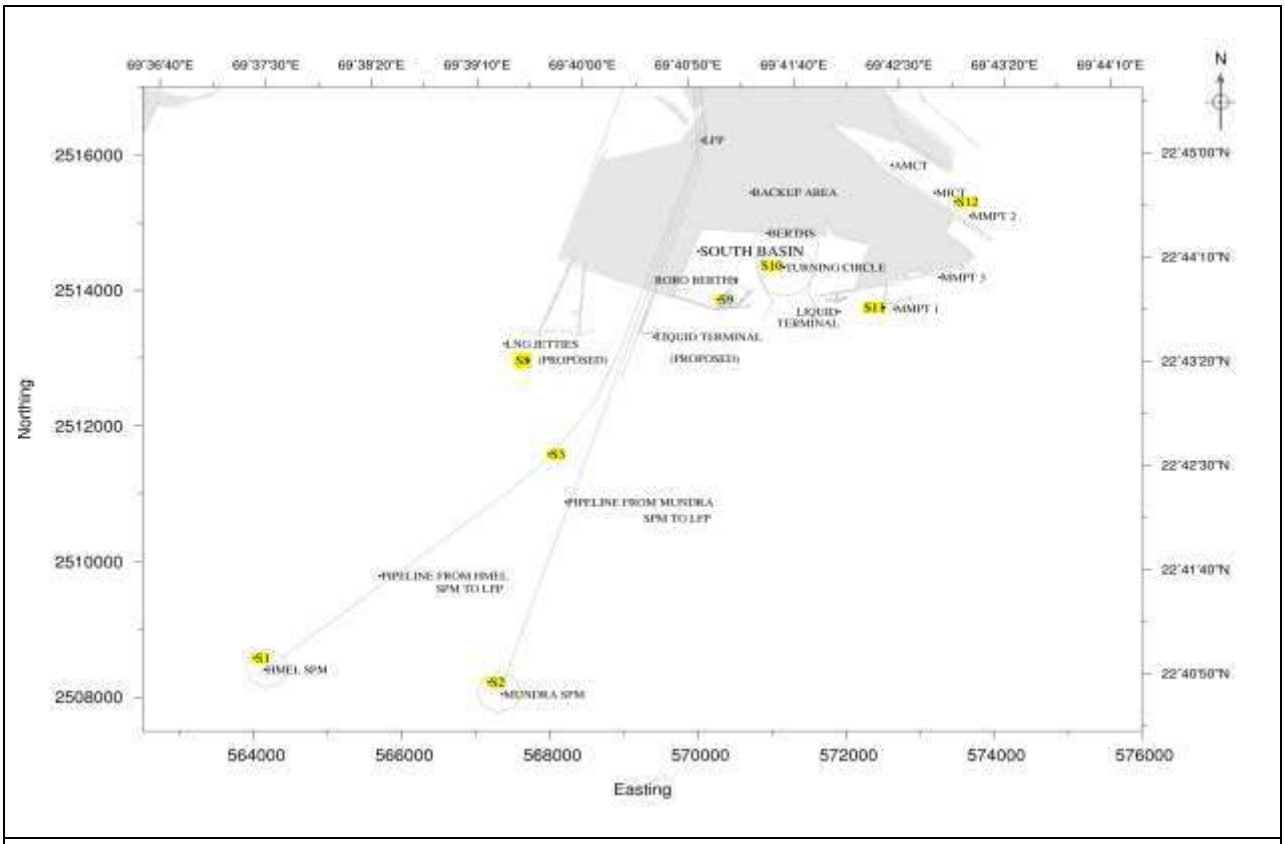


Fig.1: General layout of the Mundra port facilities of APSEZL showing the location of Spill Points for SPMs, South Basin berths, LNG jetty and existing berths

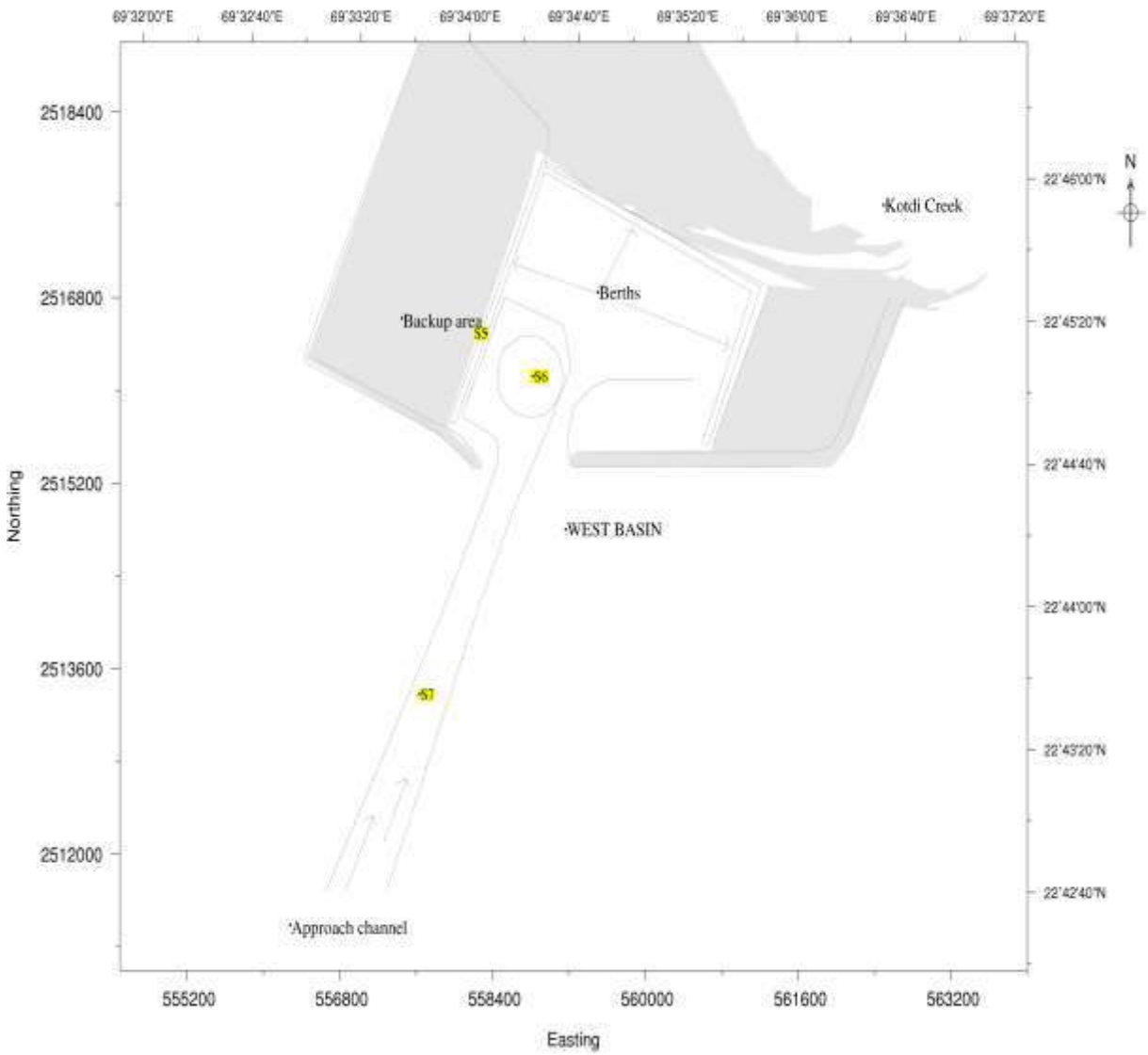


Fig.2: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for West Basin

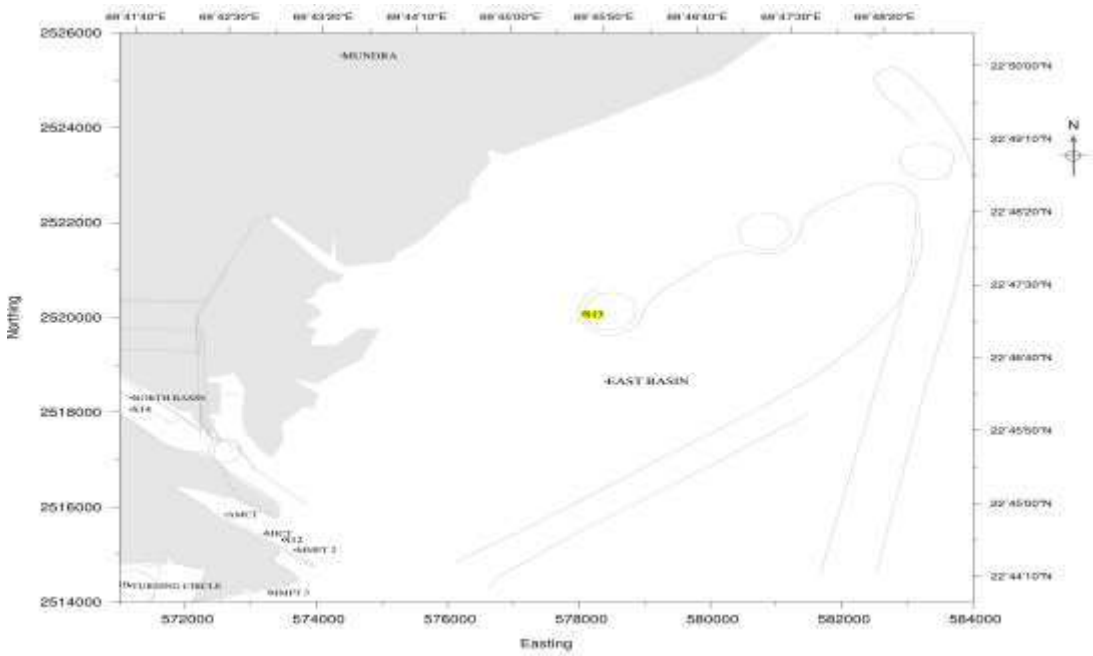
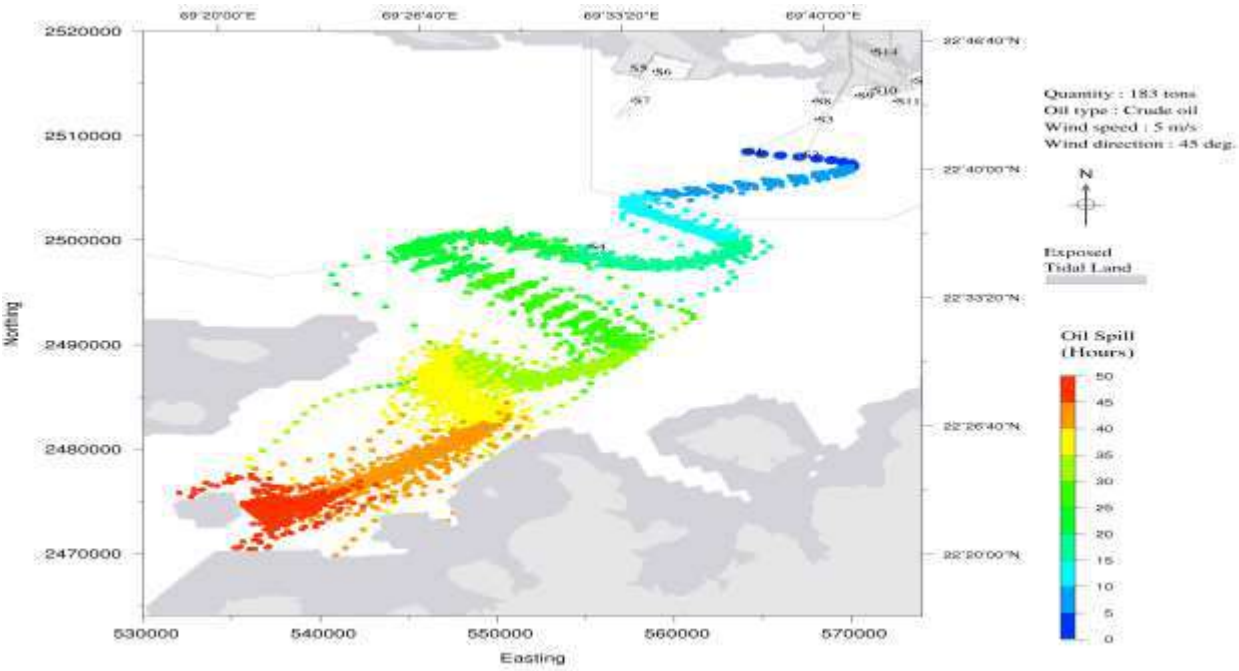
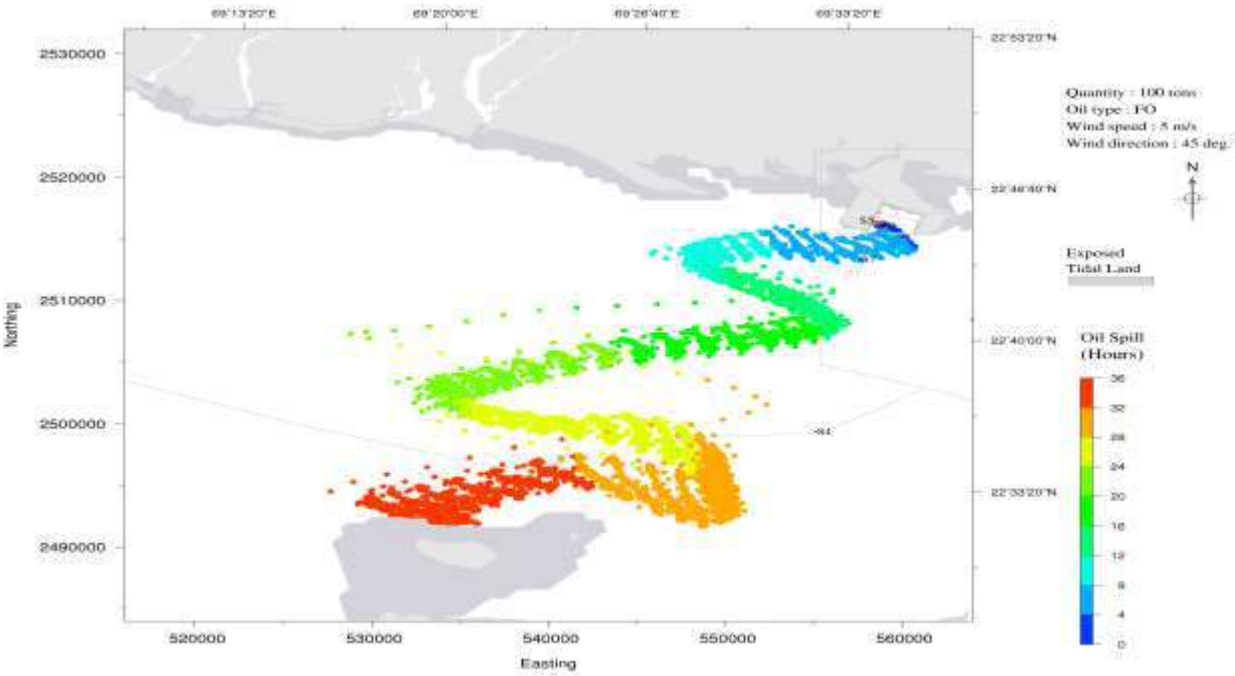


Fig.3: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for North Basin & East Basin



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



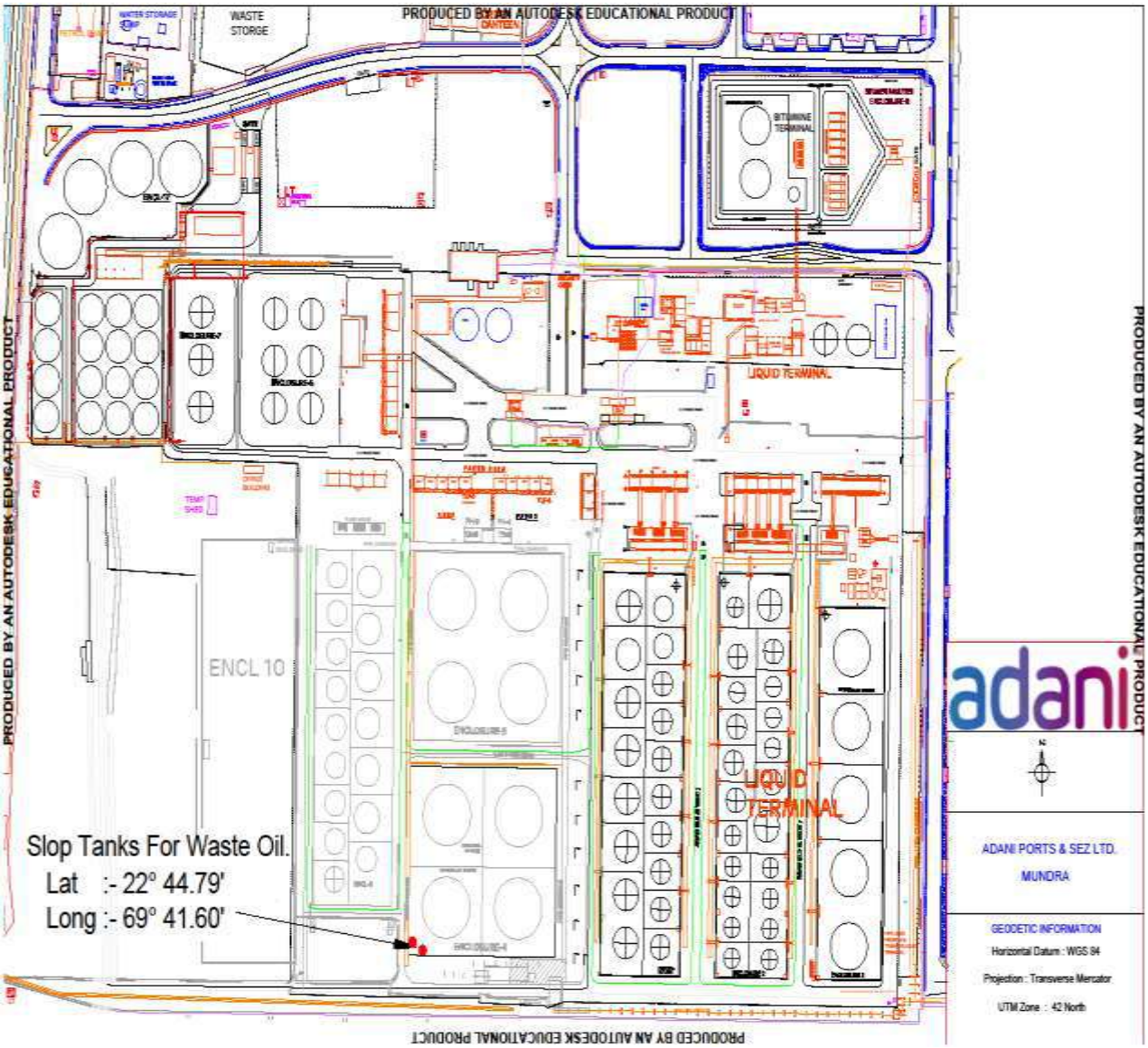
Oil Spill trajectory due to instantaneous FO leakage of 700 t (due to hull failure/ fire / explosion) at typical berth location in the West Basin

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

Shoreline resources for priority protection

Oil and Waste Storage / Disposal sites

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



Sensitivity Maps/ Atlas

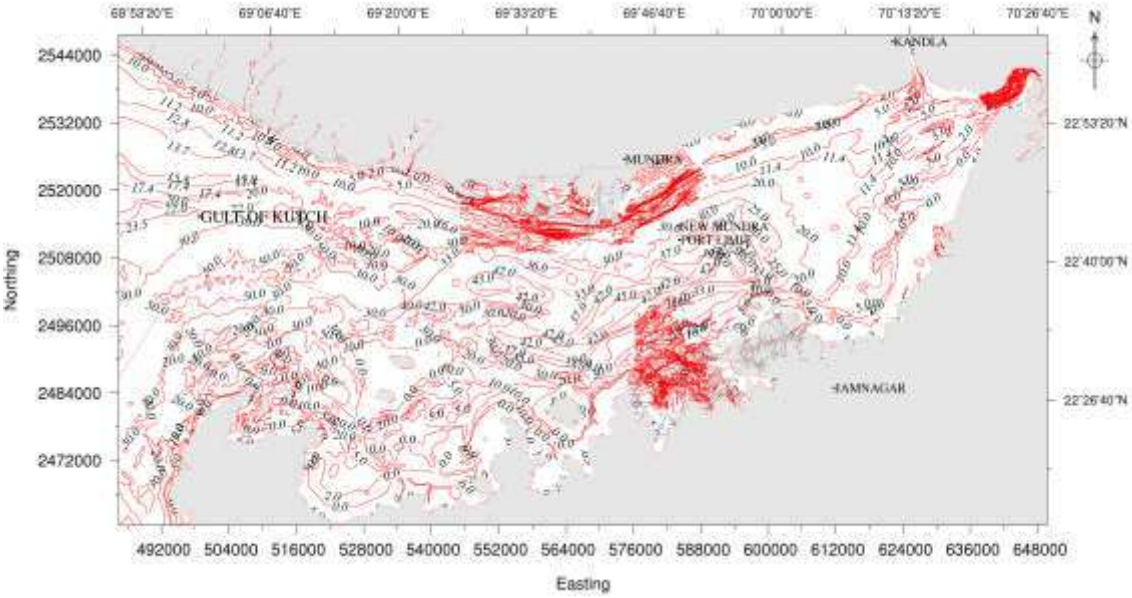


Fig.A1.1 Terrain features of study domain.

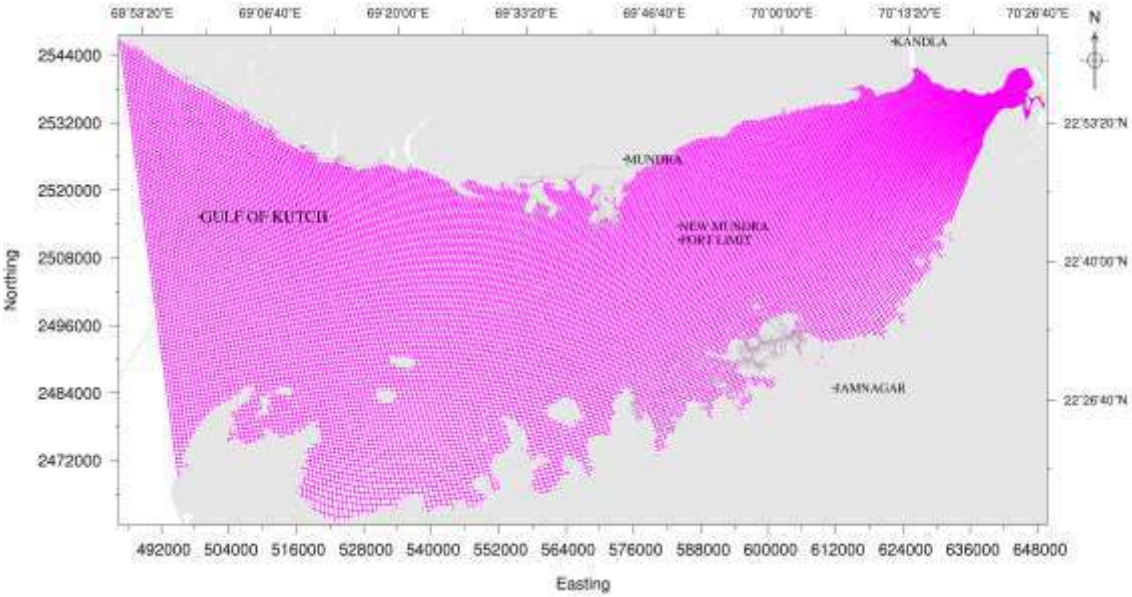


Fig.A1.2 Computational grid

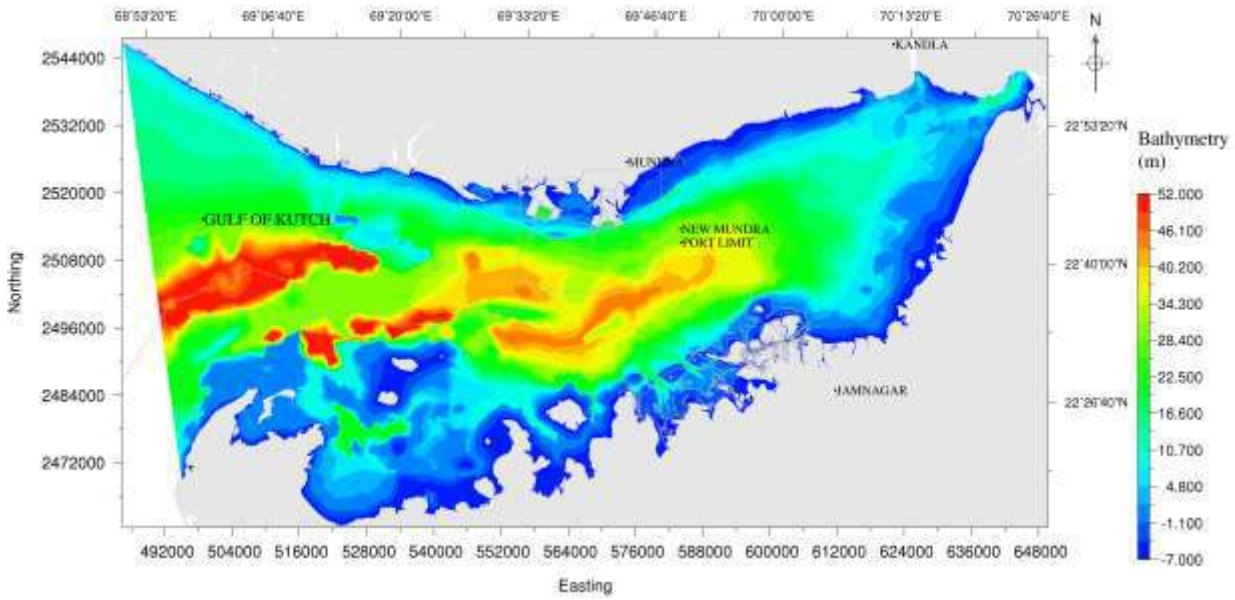


Fig.A1.3 Interpolated depth contours

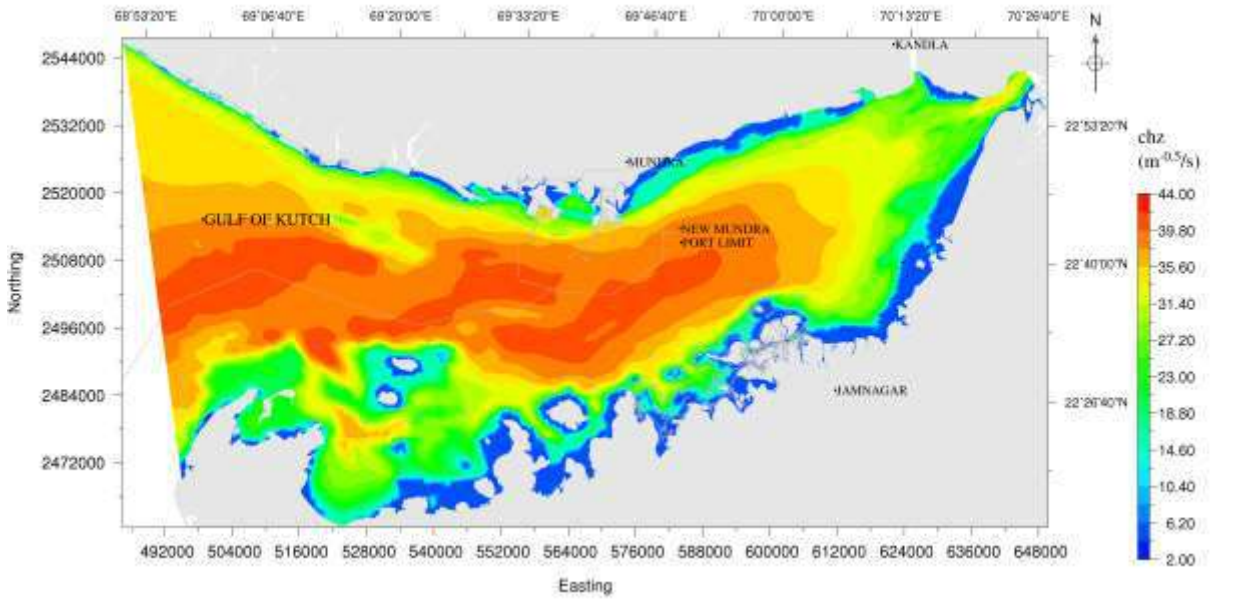


Fig.A1.4 Chezy's coefficient

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.

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

Sl. No	Chemical	Boiling Range (^{o}C)	Specific Heat of Liquid (J/Kg ^{o}K)	Heat of Evaporation (x 10^5 J/Kg)	Heat of Combustion (x 10^5 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 = > 260^0 C
Vapor pressure = < 0.1 psia at 21^0 C

(c) HSD
Sp. Gr = 0.86
Pour point = 6^0 C - 18^0 C
Vapor pressure = 2.12 to 26 mm Hg at 21^0 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 hydo-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.

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 70E 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.

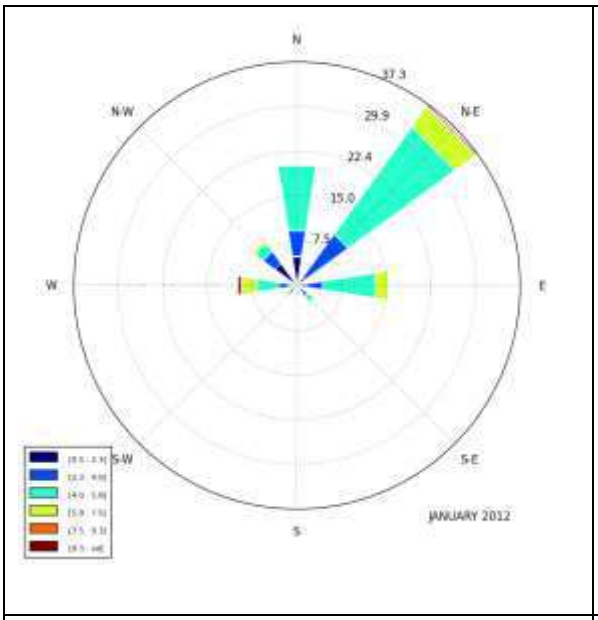


Fig.1.5 January 2012 winds

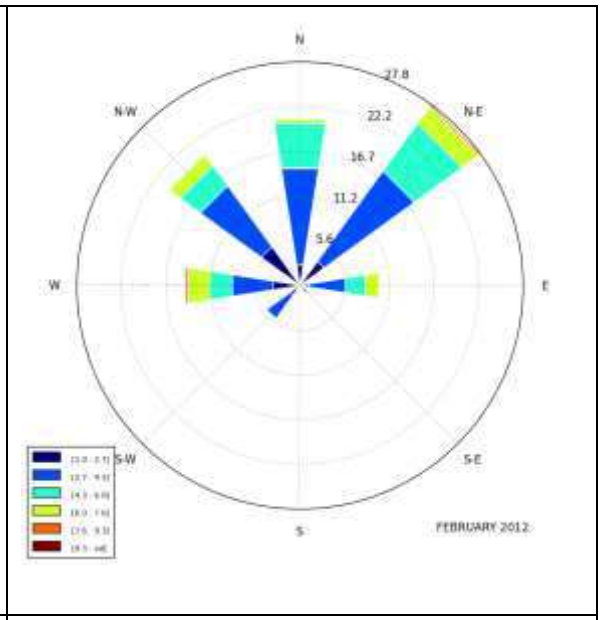


Fig.1.6 February 2012 winds

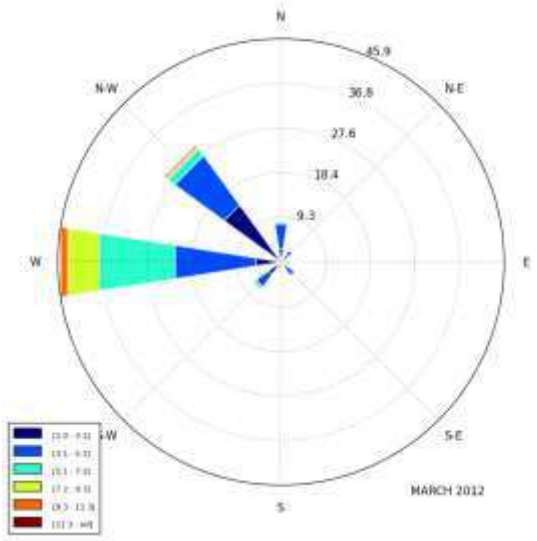


Fig.1.7 March 2012 winds

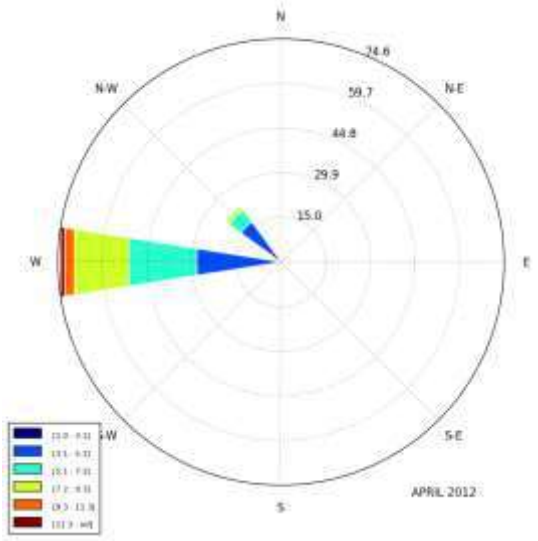


Fig.1.8 April 2012 winds

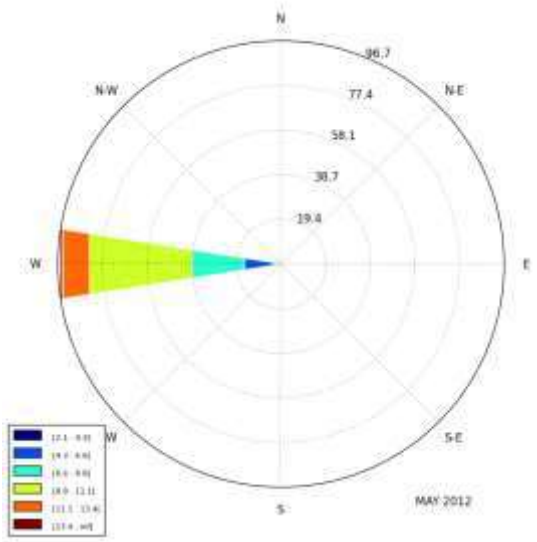


Fig.1.9 May 2012 winds

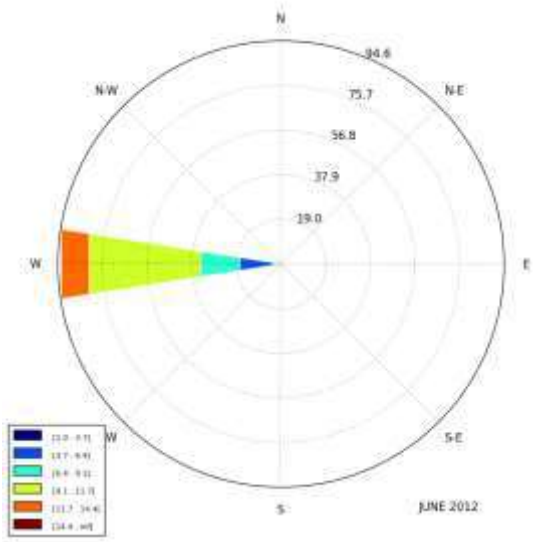


Fig.1.10 June 2012 winds

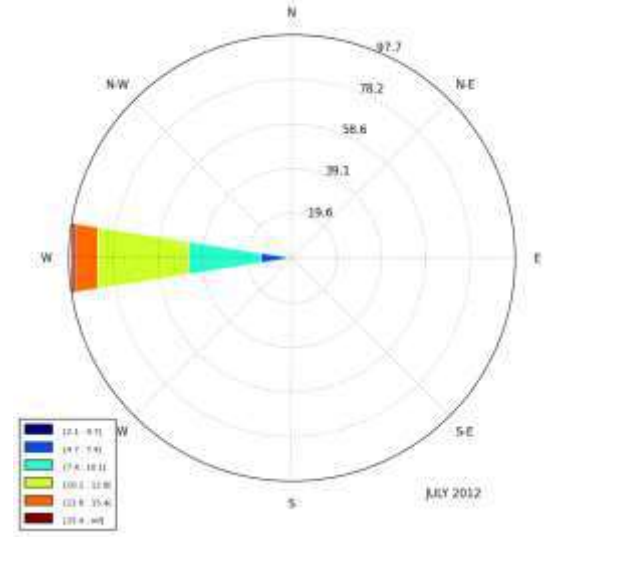


Fig.1.11 July 2012 winds

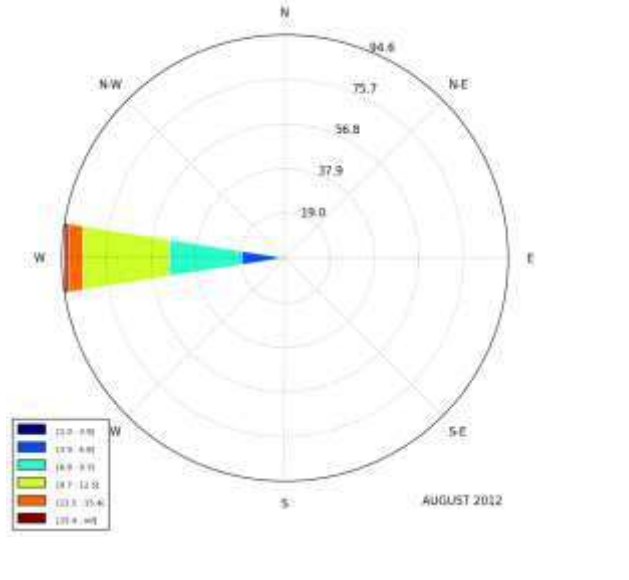


Fig.1.12 August 2012 winds

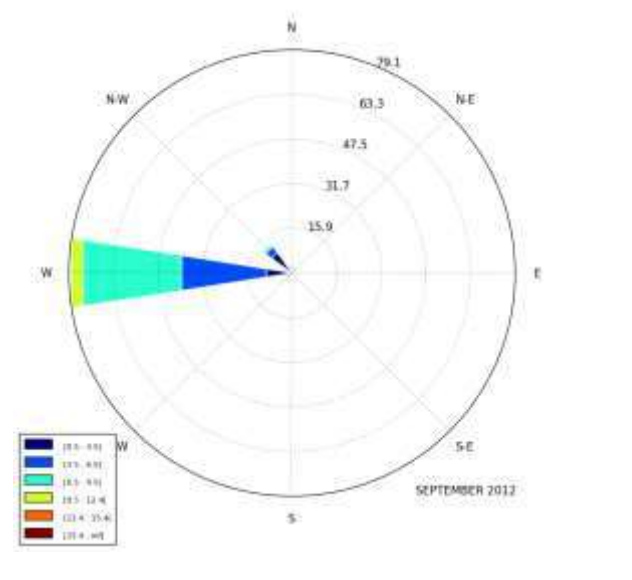


Fig.1.13 September 2012 winds

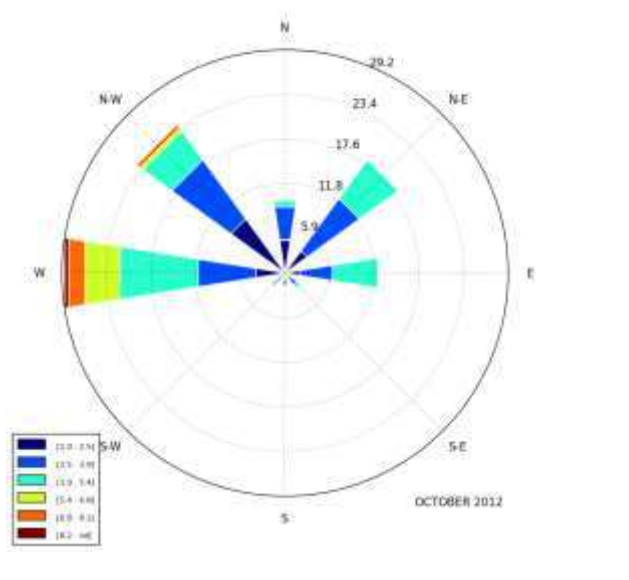


Fig.1.14 October 2012 winds

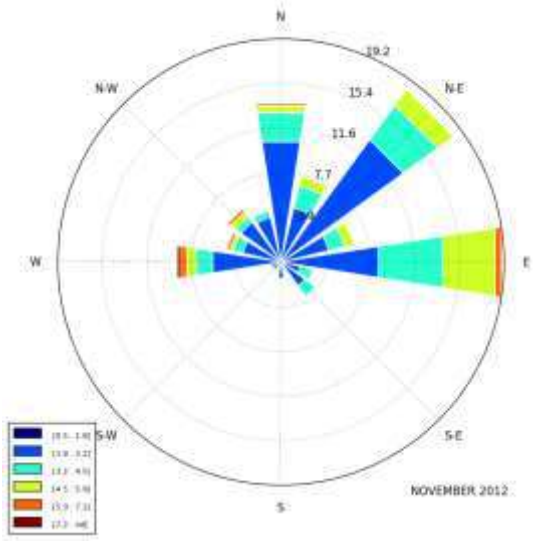


Fig.1.15 November 2012 winds

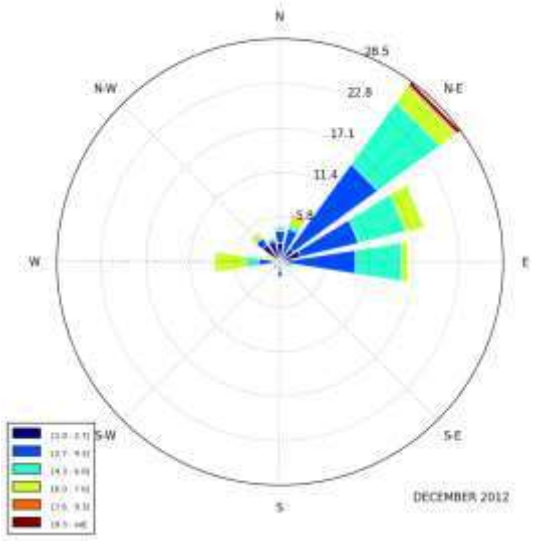


Fig.1.16 December 2012 winds

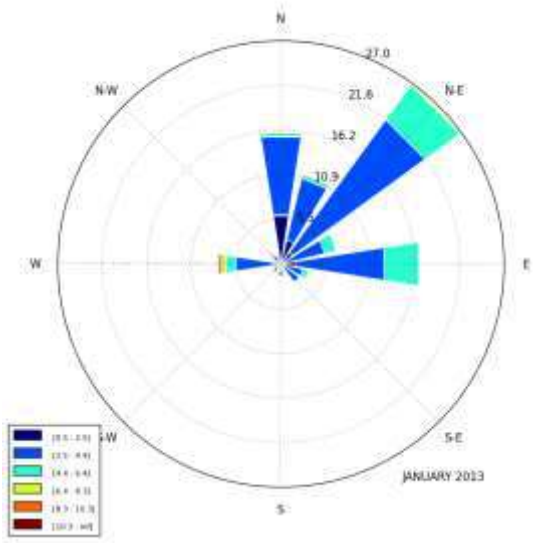


Fig.1.17 January 2013 winds

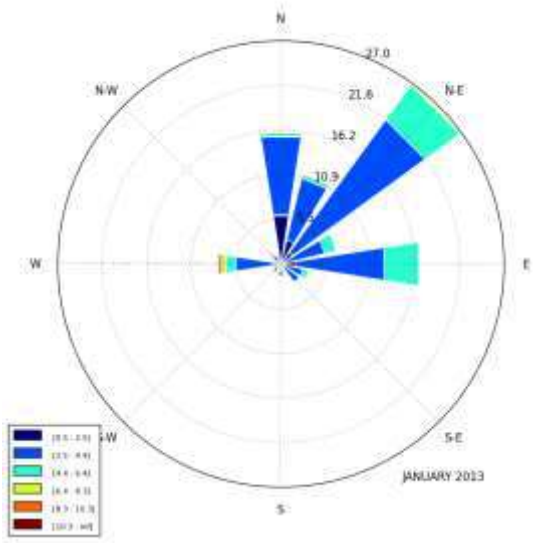


Fig.1.18 February 2013 winds

(Readings till Feb 18,2013)

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 (ºN)	Return Period (years)	Inshore Direction (ºN)	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 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 : $30^{o}C$
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:

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)

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		

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.

This FIR is to be followed by company's incident report also.

Following POLREP report to the Government through nearest CG information will also be required:

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)	

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	

Additional Information :

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. 6	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 7	ASD	2200 X 2	3000 ltr	2000 ltr	1200	55
Dolphin No. 8	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. 12	ASD	3000 X 2	3000 ltr	2000 ltr	1200	70
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
Khushboo	Fixed screw	401 X 2	-	-	-	10

Dolphin No. 6, 7, 8, 10, 11, 12, 14,15,16 ,17& 18 are fitted with Oil Spill Dispersant boom and proportionate pump to mix OSD and Sea water as required. Dolphin No.2, 6, 7, 8, 11, 12, 14, 15, 16, 17 & 18 are fitted with a fire curtain and remote controlled fire monitors.

All above twelve Tugs have class notation as Harbour Tugs and are certified to work within the Harbour limits only.
Reception Facility : 12" pipe line, connected to a slop tank at chemical tank farm.

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

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

Resources / Equipment Available with APSEZL, Mundra

Item	Quantity
Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 235 meter	1 no
Power pack with boom reel with hydraulic hoses	2 nos.
Power pack - 20 KV with boom reel with hydraulic hoses	2 nos.
Lamor Side Collector system (Recovery Capacity 123 m³/ hr) (Side collector LSC-3C/2300(01CO2-P536). Oil transfer pump OT A 50 with oil transfer hose set	2 nos. 2 sets
Lamor Minimax 12 m³ skimmer	2 sets
Power pack for skimmers with hydraulic hoses	4 nos.
Power pack - 20 KV for skimmers with hydraulic hoses	1 no.
Floating tank (25 m³)	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
Oil Containment Boom-Length 2000 metres, Height -1500 mm, Draft-900mm, Free Board-600mm	2000 mtr
Current Buster Boom-Fasflo -75 (for response in fast current)	2 Nos
Skimmer-KOMARA 15 Duplex Skimmer System with floating IMP 6 Pump.	4 Nos
12.5T Flexible Floating Storage Tank (PUA).	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
Shoreline Cleanup Equipment	
Mini Vac System	5 Nos
OSD Applicator- Oil Dispersant Spry Unit(20 Ltr) for use on Beach and Inter Tidal Zones	2 Nos
Startank with Capacity 10000 liter(10m^3)	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.

LIST OF TELEPHONE NUMBERS OF EXPERT ADVISORS ANNEXURE 4

List of Important Telephone Numbers of Govt. Officials and other neighboring Organisations (Expert and Advisors) related to Spill Combating Plan

SN.	Company	Name and Designation	Telephone Numbers
1.	APSEZL, Mundra	Chief Executive Officer Head Marine Pollution Response Officer Port Control	02838-61115 02838-255727 02838-255727 02838-255761 / 289170 (Fax)
2.	Kandla Port Trust	Chairman Dy. Conservator Harbor Master Signal Station	02836-233001 / 234601 02836-223585 / 220235 02836-270201 02836-270194 / 549
3	Indian Oil Corporation, Mundra	CM (Ops) Manager (Ops) Control Room	02838- 222194 02838- 222197 02838- 224444
4	Indian Oil Corporation, Vadinar	DGM (Ops) Manager Tech Services Port Control	02833-256527 02833-256464 02833-256555
5	Reliance Petroleum Ltd Jamnagar	Marine Chief Senior Port Captain Port Control	0288-4013607 0288-4013750 0288-4012600 / 4012610
6	The Commanding Officer Indian Coast Guard Station, Mundra	ICGS, Mundra Station Ops Officer	02838 - 271402 & 03 (Tel) 02838 – 271404 (Fax)
7	The Commander Coast Guard Region (North West), Gandhinagar	COMCG (NW) Regional Ops & Plans Officer	079-23243241 (Tel) 079-23243283 (Fax)
8	The Commander No.1 Coast Guard District (Guj), Porbandar	COMDIS-1 District Ops & Plans Officer	0286-2214422 (Tel) 0286-2210559 (Fax)
9	The Commander Coast Guard Region (West) Mumbai	COMCG (W) Regional Ops & Plans Officer	022-24376133 (Tel) 022-24333727 (Fax)
10	The Officer-in-Charge Coast Guard Pollution Response Team (West), Mumbai	PRT (W) Officer-in-Charge	022-23722438 (Tel) 022-23728867 (Fax)
11	Gujarat Maritime Board	Vice Chairman & CEO Chief Nautical Officer	079-23238346 / 23238363 079-23234716

12	Ministry of Environment Govt. of Gujarat	Director (Environment)	079-23252154 / 23251062 079-23252156 (Fax)
13	Gujarat Pollution Control Board	Environmental Engineer	079-232 22756 079-232 22784 (Fax)

List Of Important Telephone Numbers Of Adani Group Personnel

S.No.	Description / contact person / designation	Telephone Nos.	
		Landline	Mobile
01	Capt. Sansar Chaube, Head – Marine & PFSO, APSEZL	02838 - 255727	91 9925223674
02	Mr.Cherian Abraham, Dy. PFSO - (AICTPL)	91-2838 - 255733	9189800 48850
03	Capt. Kumar Paritosh, Dy. PFSO, ACMACGM	02838 – 255733	91 9879104839
04	Mr. Vilsan Kurian, Dy.PFSO, MICT	02838 – 252015	91 9879104805
05	Marine control, APSEZL	02838 – 255333 / 255761	91 9825228673
06	Port Operation center, APSEZL	02838 –255762	91 9825000949
07	Port security Control, APSEZL	02838 – 289322	91 9825000933
08	Head - Security, APSEZL	02838 – 289947	91 90999 99262
09	Head - Health, safety & Environment, APSEZL	02838 - 255777	91 7574894383
10	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035
11	Occupational Health Centre	02838 - 255710	91 8980015070

	Marine Officer/ SPM Mooring master	**ANNEXURE 5**
Responsibilities	• Observe or receive report of oil or chemical spill incident • Initiate measures to prevent/ reduce further spillage • Maintain communication with other all vessels	
Step	**Actions**	**Additional Information**
Alert	☐ (Marine Manager / On Scene Commander / SPM Pilot ☐ Tugs and other support/ response craft	*VHF Channel 73 / 77*
Initial Actions	☐ Stop all cargo operations ☐ Ensure all safety precautions taken/observed ☐ Verify incident details ☐ Advise all relevant information to (Marine Manager / On Scene Commander / or SPM Pilot ☐ Initiate personal log ☐ Place tugs/other response craft on stand-by	*Liaise with Terminal Shift Engineer*
Further Actions	☐ Brief (Marine Manager / On Scene Commander / SPM Pilot as necessary ☐ Mobilize response equipment/ personnel as directed by (Marine Manager / On Scene Commander / ☐ Maintain personal log of communications and events ☐ Act as instructed by (Marine Manager / On Scene Commander / SPM Pilot	
Final Actions	☐ Submit personal log to HOD – Marine ☐ Attend debrief	

	MARINE MANAGER / On Scene Commander	**ANNEXURE 6**
Responsibilities	• Initially assess situation • Verify classification • Verify fate of spill • Verify resources immediately at risk, inform parties • Provide accurate situation reports to Radio Room/ HOD – Marine • Collect evidence and/ or statements • Liaise with HOD-Health, Safety, Environment & Fire • Liaise with incident vessel regarding status of oil spill (if applicable)	
Step	**Actions**	**Additional Information**
Alert	HOD – Marine	
Initial Actions	☐ Proceed to incident location, assume role of On-Scene Coordinator ☐ Ensure all safety precautions have been taken ☐ Initiate response / ☐ Investigate cause/ source of spill ☐ Communicate all information to HOD – Marine ☐ Ensure samples of spilled oil taken ☐ Initiate personal log ☐ Take photographic evidence ☐ Collect evidence and take statements	*Stopped or ongoing*
Further Actions	☐ Ensure resources are being deployed as required ☐ Provide co-ordination at-sea response ☐ Provide detailed situation reports to HOD- Marine ☐ Liaise with -Health, Safety Environment & Fire Department.	
Final Actions	☐ Submit personal log to HOD – Marine ☐ Attend debrief	

	SPM Pilot	**ANNEXURE 7**
Responsibilities	• Initially assess situation • Verify classification • Provide accurate situation reports to Radio Room/ OSC • Collect evidence and/ or statements • Liaise with incident vessel regarding status of oil spill (if applicable)	
Step	**Actions**	**Additional Information**
Alert	☐ Marine Control Room ☐ OSC ☐ Tugs and other support / response crafts	*VHF Channel 73 / 77*
Initial Actions	☐ Assume role of On-Scene Coordinator ☐ Investigate cause/ source of spill ☐ Communicate all information to Marine Control Room ☐ Ensure samples of spilled oil taken ☐ Initiate personal log ☐ Take photographic evidence ☐ Collect evidence and take statements	*Stopped or ongoing*
Further Actions	☐ Ensure resources are being deployed as required ☐ Provide co-ordination of the at-sea response ☐ Provide detailed situation reports to HOD – Marine	
Final Actions	☐ Submit personal log to HOD – Marine ☐ Attend debrief	

	HOD – Marine	**ANNEXURE 8**
Responsibilities	• Confirm/ amend initial classification • Manage the APSEZL response • Authorize expenditure after consultation with COO APSEZL • Brief COO, APSEZL • Liaise with Coast Guard • Approve press statements for release	

Step	Actions	Additional Information
Alert	☐ Coast Guard ☐ External organizations	
Initial Actions	☐ Verify/ amend spill classification ☐ Ensure all safety precaution have been taken ☐ Confirm external organizations have been alerted ☐ Convene Emergency Response Team ☐ Predict slick movement ☐ Liaise with vessel Agents/ Owners as appropriate	
Further Actions	☐ Chair the Emergency Response Team meetings ☐ Constantly review the strategy being employed and advise of changes where necessary ☐ Approve all expenditure commitments ☐ Brief President APSEZ ☐ Agree press statements with Corporate Relations Chief ☐ Confirm formal samples have been taken ☐ Advise Coast Guard if oil migrates outside of Local Area	
Final Actions **Final Actions (contd.)**	☐ Terminate the clean-up ☐ Collate personal logs. ☐ Prepare the incident report. ☐ Hold full de-brief involving all members. ☐ Amend contingency plan as required. ☐ General Report to President	

OIL SPILL PROGRESS REPORT	**ANNEXURE 9**
Incident Name:	
Updated by:	
Date:	**Time (local):**
Summary of Incident Response Operations:	
Summary of Incident Response Resource Utilization:	
Number of Aircraft:	Number of Vessels:
Dispersant Used: Liters	Length of Booms in Use: m
Number of Recovery Devices:	Number of Storage Devices:
Sorbent Used: kg	Bio-remediation Used: kg
Number of Personnel:	Number of Vehicles:
Specialist Equipment:	
Oil Spill Balance Sheet:	
Total amount of oil spilled:	Tons
Total amount of oil recovered:	Tons
Outstanding amount of spilled oil:	Tons
Mass balance:	
Estimated Natural Weathering:	Tons
Mechanically agitated:	Tons
Chemically dispersed:	Tons
Skimmer recovered:	Tons
Sorbent recovered:	Tons
Manually recovered:	Tons
Bio-remediated:	Tons
Other:	Tons

Emergency Response Log	**ANNEXURE 10**
Page Number:	**Date:**
Name:	**Position:**
Contact Number	**Signature:**

Time	Activity Completed:

Control Room Officer **HOD – Marine**

Classification of Oil	ANNEXURE 11

Group 1 oils

A: °API > 45 (Specific gravity < 0.8)
B: Pour point °C
C: Viscosity @ 10–20°C: less than 3 CSt
D: % boiling below 200°C: greater than 50%
E: % boiling above 370°C: between 20 and 0%

	A	B	C	D	E
Aasgard	49	-28	2 @ 10°C	58	14
Arabian Super Light	51	-39	2 @ 20°C		
Cossack	48	-18	2 @ 20°C	51	18
Curlew	47	-13	2 @ 20°C	57	17
F3 Condensate	54	<-63	1 @ 10°C	81	0
Gippsland	52	-13	1.5 @ 20°C	63	8
Hidra	52	-62	2.5 @ 10°C	60	11
Terengganu condensate	73	-36	0.5 @ 20°C	>95	0
Wollybutt	49	-53	2@ 20°C	55	4
Gasoline	58		0.5 @ 15°C	100	0
Kerosene	45	-55	2 @ 15°C	50	0
Naptha	55		0.5 @ 15°C	100	0

Group 2 oils

A: °API 35–45 (Specific gravity 0.8–0.85)
B: Pour point °C
C: Viscosity @ 10–20°C: between 4 Cst and semi-solid
D: % boiling below 200°C: between 20 and 50%
E: % boiling above 370°C: between 15 and 50%

	A	B	C	D	E
Low pour point <6°C					
Arabian Extra Light	38	-30	3 @ 15°C	26	39
Azeri	37	-3	8 @ 20°C	29	46
Brent	38	-3	7 @ 10°C	37	33
Draugen	40	-15	4 @ 20°C	37	32
Dukhan	41	-49	9 @ 15°C	36	33
Liverpool Bay	45	-21	4 @ 20°C	42	28
Sokol (Sakhalin)	37	-27	4 @ 20°C	45	21
Rio Negro	35	-5	23 @ 10°C	29	41
Umm Shaif	37	-24	10 @ 10°C	34	31
Zakum	40	-24	6@ 10°C	36	33
Marine Gas oil (MGO)	37	-3	5 @ 15°C		
High pour point >5°C					
Amna	36	19	Semi-solid	25	30
Beatrice	38	18	32 @ 15°C	25	35
Bintulu	37	19	Semi-solid	24	34
Escravos	34	10	9 @ 15°C	35	15
Sarir	38	24	Semi-solid	24	39
Statfjord	40	6	7 @ 10°C	38	32

Group 3 oils

A: °API 17.5–35 (Specific gravity 0.85–0.95)
B: Pour point °C
C: Viscosity @ 10–20°C: between 8 CSt and semi solid
D: % boiling below 200°C: between 10 and 35%
E: % boiling above 370°C: between 30 and 65%

	A	B	C	D	E
Low pour point <6°C					
Alaska North Slope	28	-18	32 @ 15°C	32	41
Arabian Heavy	28	-40	55 @ 15°C	21	56
Arabian Medium	30	-21	25 @ 15°C	22	51
Arabian Light	33	-40	14 @ 15°C	25	45
Bonny Light	35	-11	25 @ 15°C	26	30
Iranian Heavy	31	-36	25 @ 15°C	24	48
Iranian Light	34	-32	15 @ 15°C	26	43
Khafji	28	-57	80 @ 15°C	21	55
Sirri	33	-12	18 @ 10°C	32	38
Thunder Horse	35	-27	10 @ 10°C	32	39
Tia Juana Light	32	-42	500 @ 15°C	24	45
Troll	33	-9	14 @ 10°C	24	35
IFO 180	18–20	10–30	1,500–3,000 @ 15°C		–
High pour point >5°C					
Cabinda	33	12	Semi-solid	18	56
Coco	32	21	Semi-solid	21	46
Gamba	31	23	Semi-solid	11	54
Mandji	30	9	70 @ 15°C	21	53
Minas	35	18	Semi-solid	15	58

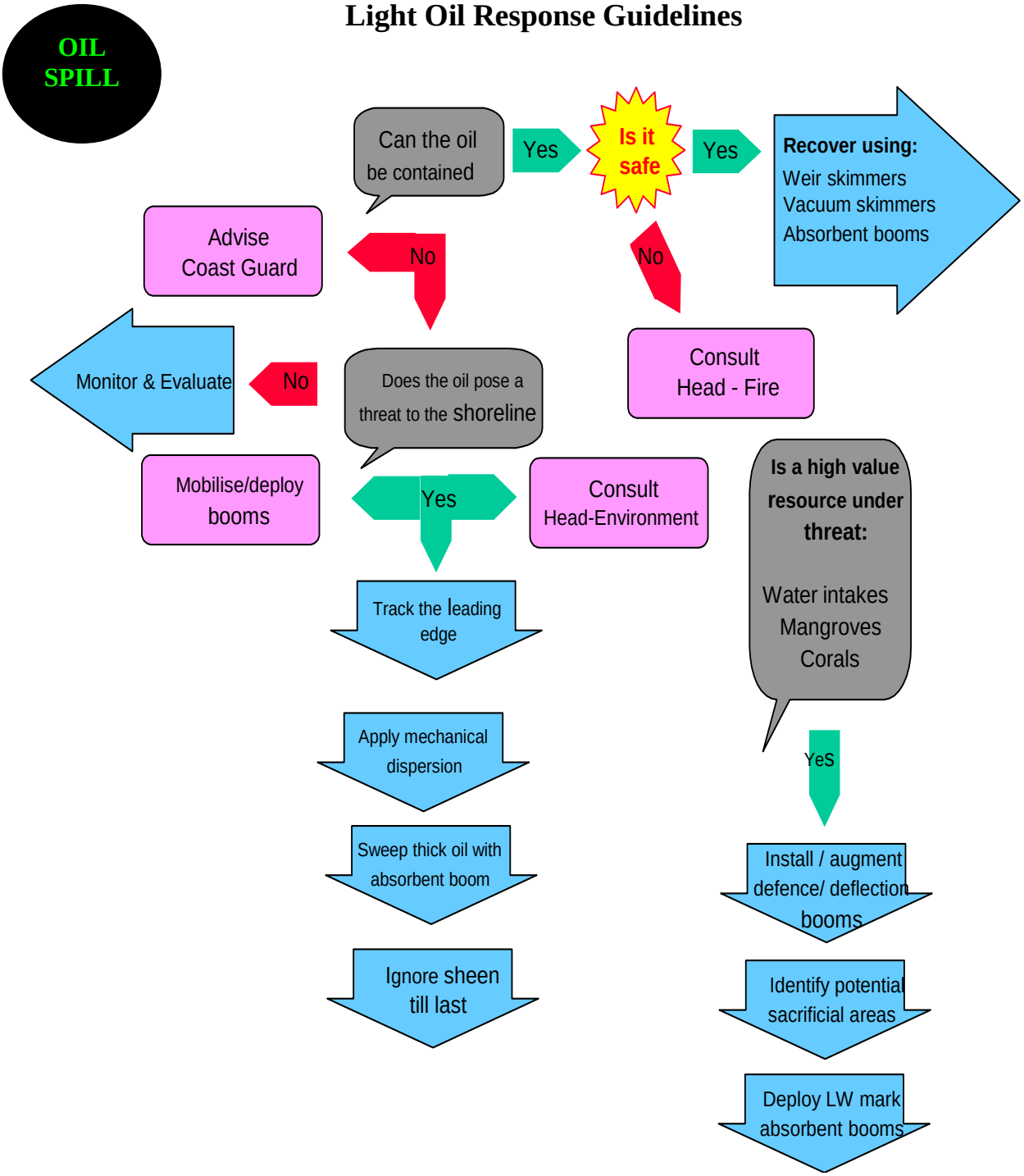
Group 4 oils

A: °API <17.5 (Specific gravity >0.95) or
B: Pour point >30°C
C: Viscosity @ 10–20°C: between 1500 CSt and semi-solid
D: % boiling below 200°C: less than 25%
E: % boiling above 370°C: greater than 30%

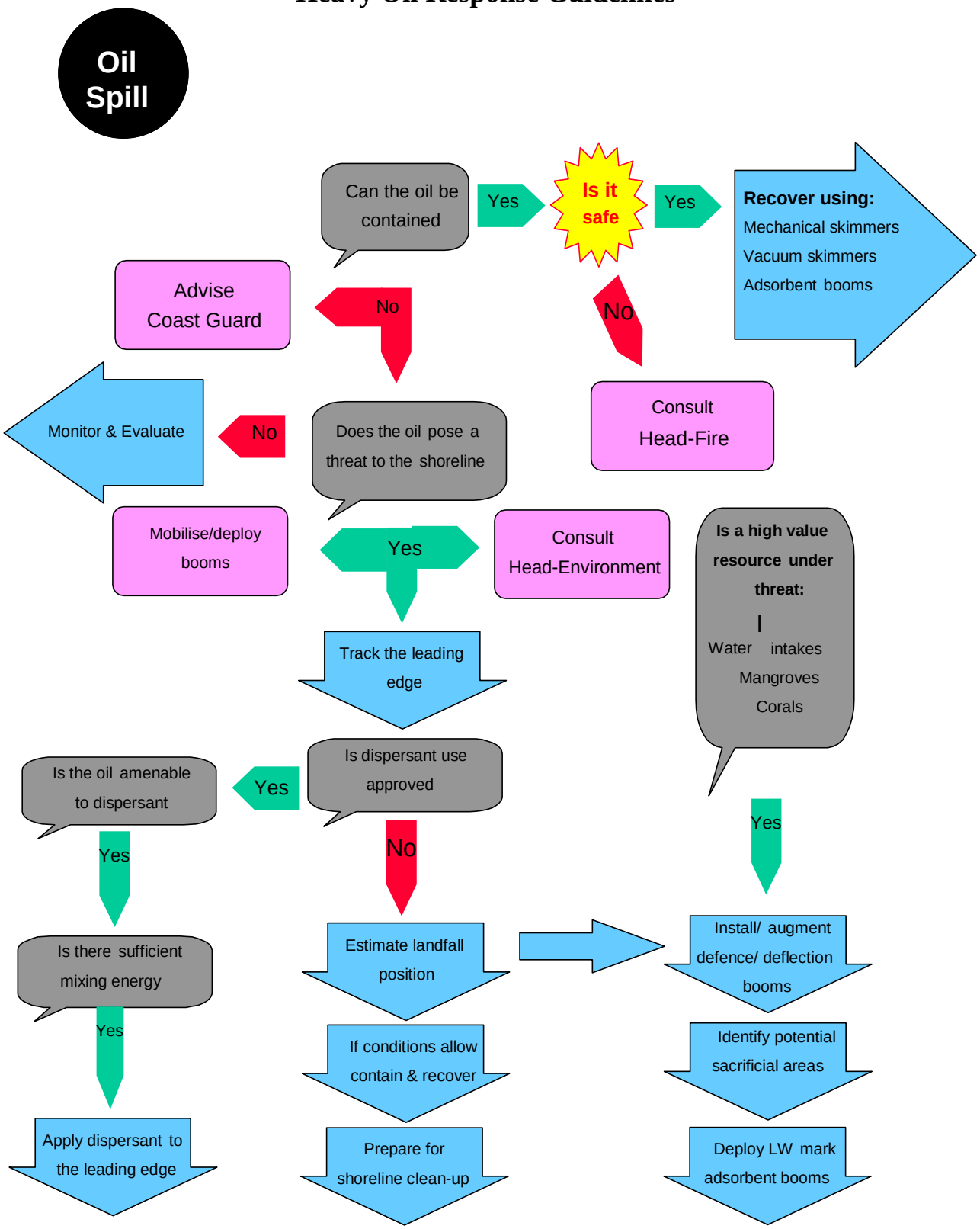
	A	B	C	D	E
Bachaquero 17	16	-29	5,000 @ 15°C	10	60
Boscan	10	15	Semi –solid	4	80
Cinta	33	43	Semi –solid	10	54
Handil	33	35	Semi –solid	23	33
Merey	17	-21	7,000 @ 15°C	7	70
Nile Blend	34	33	Semi-solid	13	59
Pilon	14	-3	Semi-solid	2	92
Shengli	24	21	Semi-solid	9	70
Taching	31	35	Semi-solid	12	49
Tia Juana Pesado	12	-1	Semi-solid	3	78
Widuri	33	46	Semi-solid	7	70
IFO 380	11–15	10–30	5,000–30,000 @ 15°C		

Response Guidelines	ANNEXURE 12

Light Oil Response Guidelines



Heavy Oil Response Guidelines



Site Specific Health and Safety Plan					**ANNEXURE 13**
Assessment Form					
1. APPLIES TO SITE :					
2. DATE :		**3. TIME :**		**4. INCIDENT :**	
5. PRODUCT(S) :					(Attach MSDS)
6. Site Characterization					
6a. Area	☐ Open water	☐ Inshore water	☐ River / Creek	☐ Salt marsh	☐ Mudflats
	☐ Shoreline	☐ Sand	☐ Shingle	☐ Intake Channel	
6b. Use	☐ Commercial	☐ Industrial	☐ Public	☐ Government	☐ Recreational
	☐ Residential	☐ Other			

7. Site Hazards			
	☐ Boat safety	☐ Fire, explosion, in-situ burn	☐ Slips, trips and falls
	☐ Chemical hazards	☐ Heat stress	☐ Steam and hot water
	☐ Drum handling	☐ Helicopter operations	☐ Tides
	☐ Equipment operations	☐ Lifting	☐ Trenches, excavations
	☐ Electrical hazards	☐ Motor vehicles	☐ Visibility
	☐ Fatigue	☐ Noise	☐ Weather
	☐ Others	☐ Overhead/buried utilities	☐ Work near water
	☐	☐ Pumps and hoses	

8. Air Monitoring										
	☐ O_2		☐ LEL		☐ Benzene		☐ H_2S		☐ Other	

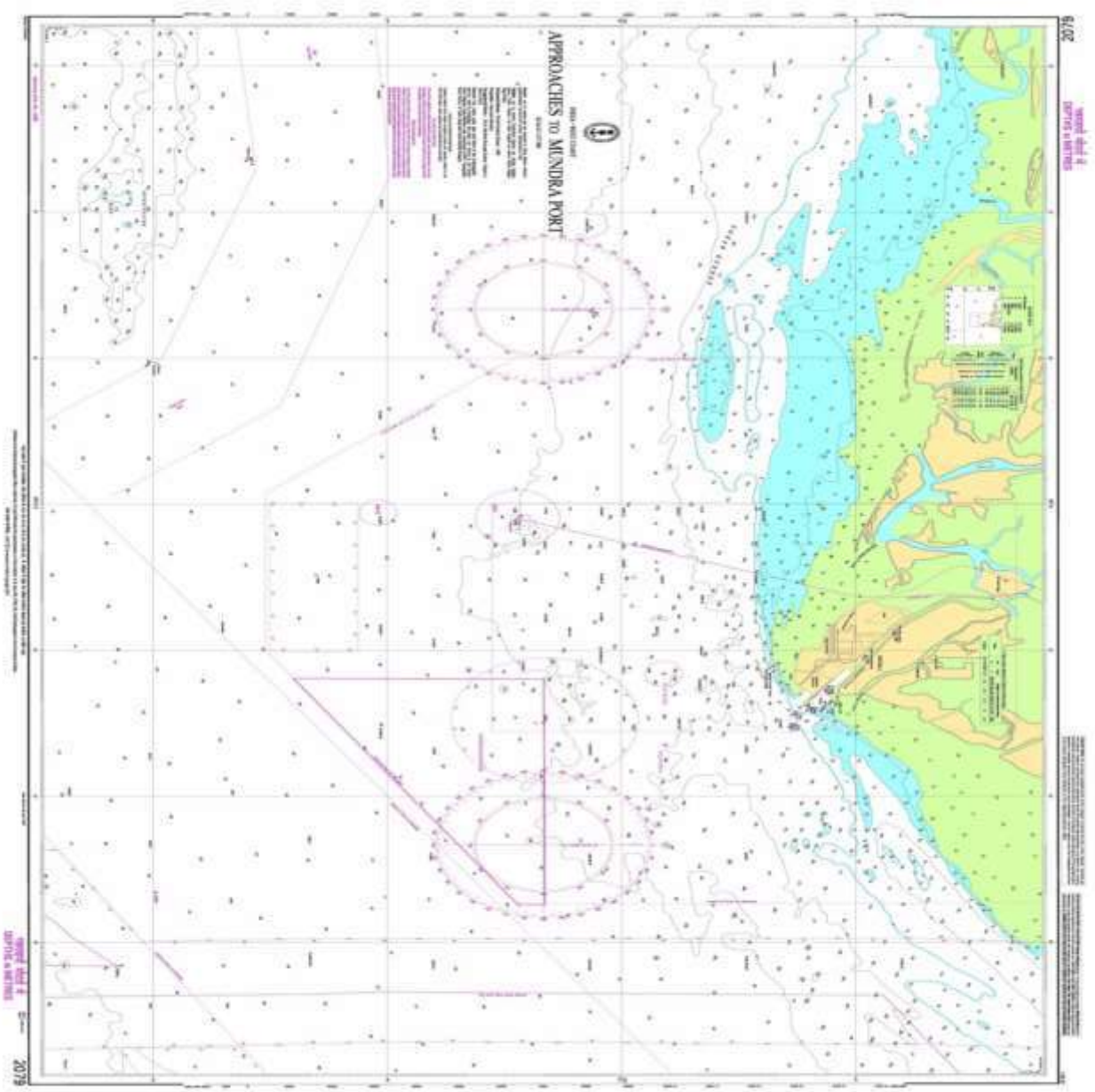
9. Personal Protective Equipment			
☐ Foot Protection		☐ Coveralls	
☐ Head Protection		☐ Impervious suits	
☐ Eye Protection		☐ Personal Floatation	
☐ Ear Protection		☐ Respirators	
☐ Hand Protection		☐ Other	

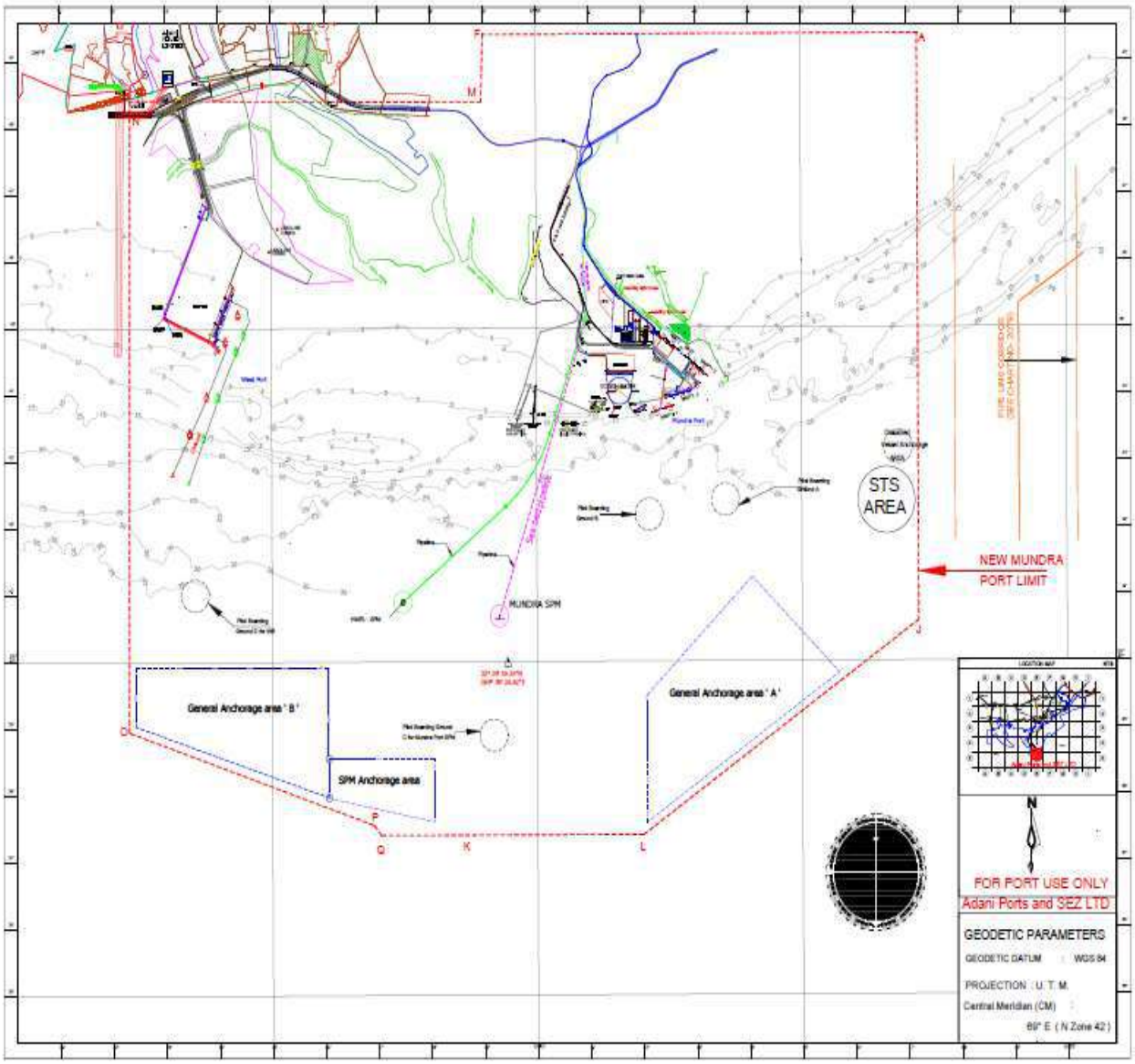
10. Site Facilities		
☐ Sanitation	☐ First Aid	☐ Decontamination

11. Contact details :		
☐ Doctor	Phone	
☐ Hospital	Phone	
☐ Fire	Phone	
☐ Police	Phone	
☐ Other	Phone	

12. Date Plan Completed	
13. Plan Completed by	

Indian Chart 2079	**ANNEXURE 14**




STS AREA
NEW MUNDRA PORT LIMIT
MUNDRA SPM
General Anchorage area ' B '
General Anchorage area ' A '
SPM Anchorage area
FOR PORT USE ONLY
Adani Ports and SEZ LTD
GEODETIC PARAMETERS
GEODETIC DATUM : WGS 84
PROJECTION : U. T. M.
Central Meridian (CM) :
69° E (N Zone 42)

List of recycler approved by state of Gujarat	ANNEXURE 15

LIST OF APPROVED VENDOR FOR COLLECTION & DISPOSAL OF OIL SPILL WASTE WATER AND OILY SOIL

Sr No.	Name of the party & Contact Detail	Date of Issue of Passbook alongwith validity	Capacity
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)

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	Kalapoornasuri Karunadham Karunadham Hospital, At – Shedata, Bhuj, Kucth		(M) 9925020776	Rescue of oil socked birds / animals and medical treatment facility
3	Anchorwala Ahinshadham Bhagwan Mahavir Pashu Raksha Kendra, Pragpar, Mundra, Kutch.		Phone (02838) 22352	Rescue of oil socked birds / animals and medical treatment facility
4	**ASHA Foundation** 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 socked birds / animals and medical treatment facility

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

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:

Signature:

Name: Capt. Sansar Chaube

Designation: Head - Marine

Organisation: Adani Ports and SEZ Ltd, Mundra

Place: Mundra

Date: 29 Aug 2017

Appendix E5 to NOS DCP 2015

(Para 4.5 refers)

Contingency Planning Compliance Checklist

Name of the Port/ Oil Handling Agency	Adani Ports and SEZ Limited, Mundra

DESCRIPTION		Complied Yes/No	Remarks
Risk Assessment			
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 ,saltpans ,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, saltpans, mangroves and other socio-economic elements in the area	Yes	**(Ref. OSCRP 2.5 & 2.6)**

18	Do the sensitivity maps indicate area to be protected on priority	Yes	**(Ref. OSCRP 2.6)**
19	Does the maps indicate boom deployment locations	NA	Booms not deployed permanently
20	Whether any marine protected area will be affected	YES	**(Ref. OSCRP 2.5 & 2.6)**
21	Whether total number of fishermen likely to affected is mentioned in the plan	Yes	**(Ref. OSCRP 2.6)**
22	Whether any saltpan in the area is going to be affected	Yes	**(Ref. OSCRP 2.6)**
23	Whether any mangroves in the area will be affected by a spill	Yes	**(Ref. OSCRP 2.6)**
Preparedness			
24	whether any containment equipment is available	Yes	**(Ref. OSCRP Annex 3)**
25	Whether any recovery equipment is available	Yes	**(Ref. OSCRP Annex 3)**
26	Whether the facility is having any temporary storage capacity	Yes	**(Ref. OSCRP Annex 3)**
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	**(Ref. OSCRP Annex 3)**
29	Whether OSD held with facility	Yes	**(Ref. OSCRP Annex 3)**
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	**(Ref. OSCRP 1.4)**
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	**(Ref. OSCRP 1.4)**
35	Whether additional manpower is available	Yes	**(Ref. OSCRP 5.4)**
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	**Whether the areas from priority protection have identify in the plan**	YES	**(Ref. OSCRP 2.5 & 2.6)**
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

			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.
Action Plan			
41	Whether the plan outlines procedure for reporting of oil spill to coast guard	Yes	**(Ref. OSCRP 7.3)**
42	Whether the oil spill response action is clearly mentioned	Yes	**(Ref .OSCRP 3.1 to 3.6)**
43	Whether the action plan include all duties to be attended in connection with an oil spill	Yes	**(Ref. OSCRP 3.4)**
44	Whether the action plan includes key personnel by their name and designation viz. C/C, S/C	Yes	**Ref. OSCRP Annexure-4**
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	**(Ref. OSCRP 5)**
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	**(Ref. OSCRP 3.4)**
47	Whether contact directory containing numbers of key response and management personnel is intimated in the plan	Yes	Ref. OSCRP Annexture-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	**(Ref. OSCRP 2.5 & 2.6)**
50	Whether final report on the incident is submitted to CGHQ as per NOS-DCP 2014	NA	**No incident**
51	Whether the spill incident and its consequences	NA	**No incident**

	are informed to fishermen and other NGOs for environment protection through media		
	Training and exercises		
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

I, hereby ,declare that the all information appended above and true and correct to my knowledge of belier

Date: 29 Aug 2017 Chief conservator /Installation manager

VERIFIED

Date: (District commander ICG)
or his representative

Date: (Regional commander ICG)
or his representative

Annexure – 6

ANNEXURES

INITIAL OIL SPILL REPORT		ANNEXURE 1
Particulars of person, office reporting	Capt. Sansar Chaube , HOD Marine, APSEZ Mundra,	
Tel No.	9925223674	
Date & time of incident	19.04.2017 / 10:00 hrs	
Spill location	South Basin	
Likely cause of spill	Overflow of bunkers from vessel during inter tank transfer	Witness – Boat Anjali
Initial response action	Informed Port Control	By- Boat Anjali
Any other information	OSR action plan initiated	

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.

This FIR is to be followed by company's incident report also.

Following POLREP report to the Government through nearest CG information will also be required:

Identity of informant	Boat Anjali Master (Hired to APSEZ)
Time of FIR	19 / 10 00 HRS
Source of spill	Container vessel at berth
Cause of spill	Overflow of bunker from bunker tank
Type of spill	Black Oil
Colour code information (from CG)	Black Oil
Radius of slick	5 to 8 m
Tail	10 m
Volume	0.3 to 0.5 cubic meter approx.
Quantity	450 to 500 L
Weather	SW' Ly x 20 - 22 knts.
Tide / current	Ebbing / 0.2 to 0.5 knts.
Density	0.75 to 0.89
Layer thickness	0.7 to 0.8 mm approx.
Air / Sea temp.	35 deg C / 29 deg C
Predicted slick movement	Towards break water
Size of spill classification (Tier 1, 2 or 3)	Tier 1

POLREP **ANNEXURE 2**

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 Anjali
2.	Time of information receipt	10:00 hrs
3.	Source of Spill	Container vessel at berth
4.	Cause of Spill	Overflow of bunker from bunker tank
5.	Type of oil	Black Oil
6.	Colour code information	Black Oil
7.	Configuration	-
8.	Radius	5 to 8 m
9.	Tail	10 m
10.	Volume	0.3 to 0.5 cubic meter approx.
11.	Quantity	450 to 500 L
12.	Weathered or Fresh	Fresh
13.	Density	0.7 to 0.8 specific gravity
14.	Viscosity	-
15.	Wind	SW' Ly x 20 - 22 knts.
16.	Wave Height	0.1 to 0.2 m
17.	Current	0.2 to 0.5 knts.
18.	Layer Thickness	0.7 to 0.8 mm approx.
19.	Ambient air temperature	35 deg C
20.	Ambient sea temperature	29 deg C
21.	Predicted slick movement	Towards Break Water
22.	Confirm Classification of spill size	Tier 1

Page Number: 1 of 1	**Date**: 19.04.2017
Name: Arpan	**Position:** Radio Officer
Contact Number: 9825228673	**Signature:**

Time	**Activity Completed:**
10:00	Information received from Boat Anjali that there is oil patch in South Basin
10:01	Information given to HOD, HOS, SPM Manager and Informed Boat Anjali to follow the slick.
10:05	Instructed Dolphin 11 to proceed to south basis for Oil Spill Response.
10:20	Information passed on to MMD respective to the oil spillage
10:35	Dolphin 11 reported at South Basin and deployment of Oil Spill Response started.
11:11	Dolphin 11 confirmed Boom layout of 250 m completed and skimmer deployed and Oil Recovery commenced.
11:27	On site status passed on to MMD.
12:35	Oil recovery completed. Boom and other equipment recovered onboard. Mock Drill Called Off.
12:40	Drill completion status provided to MMD.

PHOTOS TAKEN DURING THE DRILL

Personnel & Boats Participated in Drill

1. Capt. Sansar Chaube
2. Mr. Sanjay Kewalramani
3. Mr. M P Choudhary
4. Mr. Anand Raithatha
5. Mr. Ramdas Pawale
6. Mr. Bharmal Bishnoi
7. Mr. Y K Sharma
8. Mr. Sashikant Padave
9. Mr. Santosh Rasam
10. Mr. Vishwanath Chavan
11. Mr. Upinder Samkaria
12. Mr. Sudhakar Singh
13. Mr. Vilas Ingle
14. Mr. Saket Kumar
15. Mr. Amitesh
16. Mr. Arpan
17. Mr. Srinivas
18. Mr. Ashish Kadiyan
19. Mr. Narayan Tamhankar
20. Mr. Surinder
21. Mr. Sujit Jena
22. Mr. Jimish Patel
23. Crew of Dolphin 11
24. Crew of Boat Anjali
25. Leelu Singh

Oil Spill Equipment's deployed during the Drill

1. Bulk head boom 250 mtrs with power pack
2. Portable skimmer with power pack
3. Floating tank
4. Portable spray by Zodiac boat
5. Sprinkle system of Diving support vessel

Annexure – 7

Adani Foundation Mundra

DEDICATED EFFORTS FOR HOLISTIC DEVELOPMENT

Contents

Mission AF : "Save Girl Child" & "Greet Girl Child"

Education

Adani Vidya Mandir, Bhadreshwar

Community Health

G.K.G.S, Bhuj

Fisherman Amenities

Agriculture Initiatives

Rural Infrastructure Development

Adani Skill Development Centre

Media Corner

EDUCATION PROJECTS

1. Balvadi at Fisherfolk settlements
2. Other Education Project

Education :

- Praveshotsav Kit is ready for 106 schools of Mundra Taluka, 6 Schools of Mandvi Taluka and 8 Schools of Anjar Taluka. Total 2200 kit distributed.
- Initiated Same concept at Sharda Mandir Govt Primary school Mundra (School is situated between worker/labour Vasahats. Students are not able to cope up with basic subjects (Maths, Science and Gujarati). Our objective is to strengthen their base and increase their minimum level.
- Total more than 80 students benefitted, minimum level exams taken. Students are distributed as per their levels after minimum level test. Course material is designed for all level. Not only study we do over all personality development and personnel meeting with each students.
- Education : Fisherman
- Children are of age 2.5 to 5 years are learning in Balwadi and they also teach each other. Children are learning rhythms, best out of waste, balvarta display on LCD and other activities of education with fun. Total Number of students : 1st year – 64 and 2nd Year – 81 Total : 145 students are studying in Balvadi
- Education Material support to 67 Students of Juna Bandar, Zarpara, Navinal, Bhadreshwar & Vandi of Standard 9th and 10th.
- Vehicle Support is planned for 106 students of Juna Bandar, Luni Bandar, Bavadi Bandar and Luni Village. Entertainment through Games like Snakes and Leaders.
- As Education initiative for children at Balwadi are able to read write and speak A B C , numeric 1-50 very well. Moreover they are also teaching other fellow students.

Adani Vidya Mandir : Success in Gujrat Board Examination

AVMB Std.-10 First Batch Result 2016/17			
No.	Grade	Students	Pass
1	Upto 70%	2	Pass
2	Upto 60%	5	Pass
3	Upto 50%	11	Pass
4	Upto 45%	3	Pass
Total		23	21
Percentage		90%	

AVMB Std.-10 First Batch Result 2016-17

Adani Vidya Mandir Bhadreshwar achievement in Gujrat Board Standard 10th Examination Result 91% (21 students have passed the examination out of 23). Adani Foundation will take all responsibility of further study of students with respect to their interest.

Community Health : Mundra

Mobilevan OPD April to Sep-2016							
Month	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Total
OPD	2758	2460	2157	1751	2024	1927	13077

Rural Clinic OPD April to Sep-2016							
Month	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Total
OPD	2999	2811	3034	2275	2390	2484	15993

Sr.No	Name CFS	Total HCP	Submit Cards	submit Files
1	All Cargo	10	5	10
2	Sea Bird	20	14	20
3	Maruti Nandan	78	22	66
3	Saurastra CFS	90	90	90
4	other all CFS	227	67	66
	Total	**425**	**198**	**252**

Senior Citizen Scheme	
Month	**OPD**
April	710
May	796
June	787
July	804
Aug,	758
Sep.	932
Total	**4787**

- **Mobile Dispensaries & Rural Clinics**

During this six month, total **13077** patients were provided with free Health Care Services by Mobile Dispensaries at 26 villages and 6 Fisherfolk settlements . **15993** patients benefitted by the medical services at Rural Clinics at 11 locations.

- **Health Cards to Senior Citizens**

During the month, total 4787 transactions were done out of 7487 card holders by beneficiaries Sr. Citizens of 65 Villages Mundra Taluka and they received cash less medical services Under this project. We have entered into third phase of the project.

Poor Patients Support
698 Patients had been supported for treatment of illness.

Dialysis Data April -17 To Sept-17								
Sr.No.	Patient Name	17-Apr	17-May	17-Jun	17-Jul	17-Aug	17-Sep	Total
1	Ramjan Adam	8	10	10	7	8	7	50
2	Narshi Samecha	5	-	-	0	0	0	5
3	Karim Theba	10	10	11	11	8	7	57
4	Budhiya Juma	8	7	9	5	0	0	29
	Total.	31	27	30	23	16	14	141

Community Health All Project Data at Adani Hospital - Total OPD & IPD for April to September-2017

Community Health Project OPD & IPD Data April -17 to Sep-17																				
Projects	Apr-17			May-17			June-17			July-17			Aug-17			Sep-17			Total		
	OPD	IPD	Total	OPD	IPD	Total	OPD	IPD	Total	OPD	IPD	Total	OPD	IPD	Total	OPD	IPD	Total	OPD	IPD	Total
Sr.Citizen	710	0	710	796	0	796	787	0	787	804	0	804	758	0	758	932	0	932	**4,787**	**0**	**4,787**
Medical Supports	120	3	123	127	5	132	115	3	118	82	1	83	115	0	115	126	1	127	**685**	**13**	**698**
Physio Camp	0	0	0	0	0	0	23	0	23	23	0	23	7	0	7	14	0	14	**67**	**0**	**67**
Dialysis	31	0	31	25	0	25	30	0	30	23	0	23	16	0	16	14	0	14	**139**	**0**	**139**
CFS Drives HCP	0	0	0	0	0	0	0	0	0	162	0	162	175	0	175	86	0	86	**423**	**0**	**423**
Total	**861**	**3**	**864**	**948**	**5**	**953**	**955**	**3**	**958**	**1094**	**1**	**1095**	**1071**	**0**	**1071**	**1172**	**1**	**1173**	**6101**	**13**	**6114**

Overview: "Suposhan Project"

- **To curb malnutrition amongst Children, Adolescent girls and Women in our CSR villages**
- To reduce malnutrition and anaemia amongst adolescent girls and pregnant & lactating women by 70% in three years
- To create awareness about the issue of malnutrition and anaemia and related factors amongst all stakeholders and role they may play in curbing the issue
- To create a pool of resources to be utilised for combating the issue of Malnutrition and Anaemia
- To support efforts in reducing IMR and MMR

Strategy: "Suposhan Project"

- Community based intervention with Community Health Workers from local communities. (Sangini)
- Each child and especially malnourished will be mapped with growth chart
- Regular inputs of THR, RUTF and other micronutrients treatment when necessary facilitated via Govt. Schemes and if necessary through AF
- FDGs with mothers and adolescent girls
- Village meeting one in a month at every village
- Health camp every month
- Awareness campaigns
- Cross Functional, across locations learnings

Outcome: "Suposhan Project"

- Reduction in occurrence of malnutrition amongst Children by 95 % in three years
- Reduction in malnutrition and anaemia amongst adolescent girls and pregnant & lactating women by 70% in three years
- Create awareness about the issue of malnutrition and anaemia and related factors amongst all stakeholders and role they may play in curbing the issue
- Create a pool of resources to be utilised for combating the issue of Malnutrition and Anaemia
- Support efforts in reducing IMR and MMR

8

Overview: "Suposhan Project"

Community Engagement and other Activities		Sept-17
Sr.No	Activity	Progress
1	No of Sangini	40
2	Total Village Cover	56
3	Total Anghanvadi Cover	99
4	Total PRA	9
5	SAM to MAM Monitoring Progress	28
6	MAM to Normal Monitoring Progress	13
7	SAM/MAM Child Camp	3
8	Focus Group Discussion	1003
9	Family Based Counselling	174
10	Village level Events	390
11	Formation of women's groups	242
12	Formation of adolescent's Groups	219
13	No of SAM children referred to CMTC	18
14	No of SAM children provided with RUTF	58
15	Total HB screening - RPA	2172
16	Total HB screening - Adolescent girls	3774
17	Women in RPA provided with IFA Tablets	161
18	Adolescent girls provided with IFA Tablets	239
19	Anthromatry Study (0 to 5)	7202
20	Sangini Meeting	17
21	Sangini Training	9

Community Health : Overview

Rural Clinic

Dead Body Van

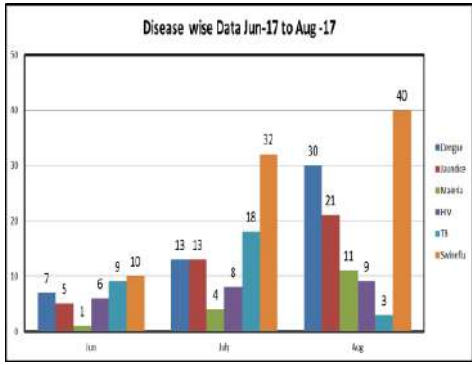
Sangini Training

Mobile Van

Physiotherapy Camp

GAIMS : Health is Wealth ....

- Total 5547 Patients received Special Care and Coordination upto Sep 17 at GKGH regarding Hospital, Lab, OPD Department, Ward and Pharmacy Service.
- During six months Different 125 Village Level Meetings Organised with Sarpanch, Leader, Women Groups and other Stakeholders .
- We have Started School Health Check Up Under the "Safe child Project" in this six months Total 11 Schools Covered and 2263 Students has been benefited in camp.
- In this six months Total 363 dead bodies were shifted to different villages in Kutch District.



Safe Child Project/ School Health Checkup

No of School	Covered	No.of Student	Covered
	11		2263

Death Body Van and Hospital Death Data

Sr No.	Month	AF Van	Death in GKGH
1	April	57	65
2	May	63	78
3	Jun	52	58
4	July	49	55
5	Aug	75	92
6	Sep	67	120
	Total	**363**	**468**

Fisherfolk Amenities

Computer training : 30 Fisherman Youth

- Regular Meetings at bander with fishermen, fisheries department and coast guard
- to create awareness about fisheries scheme and cooperate during mock drill and Vessel approach
- Meeting at Kutdi regarding street light drinking water and approach.

Sewing training : 60 Women (Zarpara/Juna Bandar)

- Meeting and site visit with Luni fishermen leader & Kutch Jilla Machhimar Association Pramukh to provide potable water at Bavadi, Randh and Luni fishermen vasahat with collaboration of gram panchayat and GWIL(Gujarat water infra structure limited).
- Survey and meeting with fishermen regarding use of "Ma- Amrutam Yojna" and RSBY card.

- We have applied for Model cage unit in fisheries department for juna bandar(shekhdiya) fishermen in consultation with CMFRI.
- Cage culture project the total production may be 120 kg and we have plan for harvesting In next month. Community operated projects and taken care by community.

Mangroves plantation : 4000 Man-days

- With the help of I Khedut portal We can apply online for different agricultural(fisheries)department scheme.
- We have create awareness of this portal by Luni and Juna Bandar computer training center

Painting Labour : 3800 Man-days

Sustainable Livelihood Programme

Fodder Demonstration

Demonstration for NB 21 extended with 42 farmers for get better results for fodder cultivation. In this project, Parjanya Ecology was our implementing partner and Krishi Vigyan Kendra was our guide for the project. Total 14 acre land has been covered under this demo production in first phase 1.12 Lac Kg.

"Saheli Mahila Gruh Udyog"

Till date "Saheli Mahila Gruh Udyog "has annual turn over of more than Rs. 5.00 Lacs.
After one year of Pilot phase, Saheli Mahila Gruh Udyog includes 70 women. We are planning to convert "Saheli Mahila Gruh Udyog" into Producer company. Planning for 1. Production of Hygiene Products 2. Edible products and 3. Handicraft items capacity building women group

"Beti Vadhavo"

Beti Vadhavo Abhiyan" initiative has been taken by Adani Foundation in order to change the mindset of our society and think positively towards the girl child since four years. We are greeting each girl child born in Mundra Taluka with Kit including (one pair cloth, soap, shampoo, powder, mosquito net, bed sheet and nutritious food for mother). Joint efforts of Taluka Health Office, ICDS and Adani foundation greeted 121 daughters at Tunda, Siracha, Vadala, Goersama, Navinal and Gundala Village.

"Support to Handicapped, widows and senior citizen by Govt Schemes"

- We are playing the role of facilitator in case of tie up with Government Scheme for Widows, Senior Citizens and Handicapped people. The identity cards are issued to two persons for the handicapped in coordination with Bhuj Samaj Suraksha Khata for regular visit and follow up.
- During the period , 8 widows and 204 handicapped - total 212 members got benefitted by different schemes of Government. The financial benefit of the senior citizen Yojana is Rs. 400 per month and the widow scheme is of Rs. 900 per month.

Rural Infrastructure Development : Building Block of the Society

Adani Foundation has designed, planned and built a strong infrastructure for bettering education, community health, agriculture and living standards, all according as per official requests and demands of people of the community and the Gram Panchayat.

Work completed :

- Mota Bhadiya and Bhujpur- Pond deepening work
- Bhadreshwar- Prayer shed in School
- Kandagara – Garden work in matang temple
- Zarapara – canal repairing work
- Shekhadia- Pagadiya fisherman road repair
- Shekhadia- construction of Bhunga Pagadiya fisherman
- Kutdi bander- construction of cricket pitch
- ASDC- civil works completed.
- Kandagara - Repairing of Checkdam and river widening
- Mundra- crematorium development
- Ragha - Prayer shed in primary school
- Shekhadiya – Const. of house of fisherman

Adani Skill Development Center: Mundra

Along with computer related trainings, Stitching and Bagging training, Beauty Parlor and Mobile Repairing Training are also in full fledge at Gundala, Adani Ports, Navinal and Mundra

Soft Skill training					
Sr. No.	Course Name	Location	Male	Female	No.of students
1	Beautification training.	Mundra	0	20	20
2	Advance Excel training	Adani house	20	0	20
3	IT Basic Computer training	Navinal	13	7	20
4	IT Basic Computer training	ASDC	2	4	6
5	IT Basic computer-CRTG student training	ASDC	7	0	7
6	Wedding Mehnadi training	Gundala	0	16	16
7	Thread work training	Gundala	0	20	20
8	IT Basic computer-CRTG student training	ASDC	7	0	7
9	Spoken English	ASDC	13	3	16
10	IT Basic Computer training	Adani house	20	0	20
11	IT Basic Computer training	ASDC	0	7	7
12	IT Basic computer-CRTG student training	ASDC	7	0	7
13	Thread work training	Luni	0	14	14
14	Computer Excel training	Adani house	19	0	19
15	IT Basic Computer training	ASDC	7	0	7
		Total - A	**115**	**91**	**206**

Adani Skill Development Center: Mundra

Technical Training					
1	Checker cum RTG crane operator training	APSEZ	21	0	21
2	Tailoring training	Borana	0	30	30
3	Tailoring training	ASDC	0	14	14
4	Tailoring training	Mundra	0	41	41
5	Vocational training	Zarpara	38	7	45
		Total - B	**59**	**92**	**151**
Carier Guidance and Knowlage bage training					
1	Personality Devlopment training	ASDC	23	4	27
2	Personality Devlopment training	ASDC	13	3	16
		Total - C	**36**	**7**	**43**
		Grand Total A + B+C =	**210**	**190**	**400**

Important Events

Adani Cricket tournament final match between Navinal and Kathada team was organized at Shantivan cricket ground . The Final match was very thrilling and after all king of Navinal team won. we invited fishermen leader from different villages and officers from Gujrat Fisheries board, Forest and Sport department. on this occasion Mr. Mukesh Saxena (COO,APSEZ) were present to motivate players and promised to support them for coaching for their better future in cricket. The trophy and prize of- 25000 INR and 15000 INR awarded to winner and runners up team. Total 58 team & 609 Youth participated in tournament and We distributed cricket kit to all participated teams. **The best player is selected for training at Rajkot (Yusuf Bamaniya Academy) for his bright future.**

Shikshan Manthan Shibir

Background : Kutchh District is very poor in case of Education. Educational Standards of Govt. School is considerably depraved. It leads to pathetic situation for students. It continuously destroys our young generation in absence of proper direction and base. That's why we have planned for workshop for school teachers on innovative teaching.

Objective : It will be one of the many initiatives taken by AF to changing the teaching patterns being practised and how to simplify it.

Outcome : This would be extremely beneficial for the teachers and would help them get equipped with new teaching techniques and broaden up their notions in the domain of education

Impact : This kind of workshops can have a long term impact on the development of teachers and enhance their soft skills. First Workshop arranged on 1st Aug 2017 Guest : Mr. Jargela – DPEO

Beneficiaries : Principles of all 106 primary schools of Mundra

Trainers : Mr. Daxa Rajgor and Mr. Sanjay Thaker (District Institute of Education Training)

Seminar on " Qualities of an effective teacher: This module has given answers to some focussed questions on Qualities of an effective teacher like How, why and what works best in a classroom? Child psychology, Where to start to improve in teaching learning styles? What makes an effective teacher?

Important Events

Adani Foundation believes that, "The children of today will shape the future of tomorrow" and "We should always give a chance and support to educate girl child". To make bright future of children of fisherman Adani foundation has provided fee support to 174 Students at SMJ High School Luni.

Adani Foundation plays role of facilitator between government and community for Government Schemes for divyang, widows and senior citizens. Till date we were supporting divyang by schemes of state government. Tri-cycles were distributed among 142 differently able persons of Mundra and surrounding areas, at a function held at Mundra Taluka Health Office on Wednesday. AF, Mundra coordinated the entire process of issuance of tri-cycles to the beneficiaries with concerned authorities in Govt. of India and facilitated the distribution jointly with local Health dept. authorities.

Public hearing Copper Plant Adani Foundation Mundra has organized "Sneh Milan" Programme on 27th April 2017 Thursday. Total 155 local people participated including Sarpanch, village leaders and NGO working for welfare of community and media as well. Main Objective of Sneh Milan Programme was to brief about upcoming "Adani Copper Project". Mr. Surya Rao (VP, Adani Copper) had presented information about copper plant. Mr. Mukesh Saxena had warmly welcomed community leaders and obliged for their strong support in journey of development.

Stake holder Engagement

Women Participation in income generation activities through self help groups has created a positive impact on the life pattern of women and that has empowered them at various levels not only as individuals but also as members of the community and the society as whole. Adani Foundation has developed 7 SHG Groups consists of 97 members (Saving 2.5 Lacs for 18 months). Apart from savings, this women are associated with Saheli Mahila Gruh Udyog – preparing household items i.e. washing powder, phynayle, dish wash liquid etc. The groups are empowered to market their products themselves. The profits drawn from their rural enterprises are now being used for their essential family requirements and education of their children.

Regular meetings with Fisherman Community at Vasahats are conducted regularly. Main topics are covered about safety in sea, importance of savings, health and hygiene, various schemes of fisheries department, women empowerment, training and development of Adani skill development center etc. This type of interaction create trust and transparency towards community. Direct contact will increase rapport also. AF Team is also part of community function as well as personnel functions of the community. The youth engagement initiatives i.e. fisherman cricket match, cycle marathon etc. are also necessary.

"Spreading Smiles"

Biogas is a clean, non-polluting and low cost fuel. It contains about 55 to 75 percent methane, which is inflammable. Bio gas can be produced from cattle dung, human waste and other organic matter by a process called "Anaerobic digestion" which takes place in a biogas plant. The digested effluent, which comes out of the plant, is enriched manure.
The Multiple benefits of the biogas have changed many lives in rural areas. During the last year 11 plants have been constructed and process for 10 more plants is going on. We are providing support addition to Government support to the beneficiary. (Under bio-gas scheme of government, the total cost is Rs.33, 500 out of which Rs.15, 000 will be granted by the government and out of the pending amount of Rs.18, 500 sum of Rs.10, 000 will be contributed by the Adani Foundation. The beneficiary will have to pay only Rs. 8, 500). Beneficiary women use the time, saved from cooking and fuelwood collection, to take up an additional economic activities.

During the non-fishing months, the fishermen under usual circumstances were benefit of any other alternate economic activity to sustain them. Under such cases due to the scarcity of their available funds and resources, it became extremely difficult for a majority of them to survive. Looking at the miseries the Foundation introduced 'mangrove plantation' and "Mangroves Algae Removal" in the area as a means of alternate income generating activity for the fisher folk community during the non-fishing months. Both men and women from the communities received trainings on Cheriya Plantation, moss cleaning etc. required for mangrove plantation. The program again was developed holistically, where focus was not only given on income generation but this initiative was seen as an important means to ensure environment sustainability. At the moment total 110 fisher folks from Luni, Shekhadia and Bhadreshwar are working for mangroves plantation and cleaning and getting income upto Rs. 300 per day.

"Spreading Smiles"

Kitchen Garden
We have motivated adolescent girls and their mothers to develop kitchen garden at the back of their house. We have selected three different beneficiaries having biogas at their vadi. Kitchen garden and bio gas plant combination brings worth results for "Suposhan" in Adolescent girls.
All the vegetables grown at the garden are consumed by their own house. This is a model developed to motivate local people to develop a small kitchen garden in their home to get access to nutritional vegetables.

Bhujpur, a village 20 kilometres from Mundra has agriculture as its main occupation. The people of Kutch have to face the water related problems due to the geographical location of Kutch and the salinity of sea water here. Bhujpur has two inter connected ponds. Once the Sarpanch of the village Meghraj Gadhvi thought of deepening the pond and this he put forward in form of a request to the Head of the Adani foundation in coordination with the village heads, school teachers and the various members of women organizations. This participatory approach brought matter of great amazement when the village offered their services of three tractors. The villagers were happy to acknowledge that if the ponds keep on getting filled up year after year, it would help in increasing the level of ground water. It would also decrease the salinity of water and increase the agricultural production.

"Spreading Smiles"

A Large portion of the rain fed areas in Kutchh are characterized by low productivity, high risk and uncertainty. This leads to degradation of natural resources. Part of watershed management programmes, Check dam strengthening by de silting and repairing at Kandagara village is initiated. Work is completed before monsoon and village community is with Adani Foundation team since beginning of the project. Main objective is to control damaging runoff and degradation and thereby conservation of soil and water

Kamila ben Sheda owns 11 milch cows and two bulls. She was spending almost 40% money she earned from selling milk – on feeding his cattle. This squeezed his profits. Adani Foundation in coordination with Krishi Vigyan Kendra/Parjanya Ecology started demonstration of NB-21 (Type of Fodder which grows fast with less water)
Impact : She adopted this technique and also ensures that cattle will get proper balance food. This has reduce her cost of cattle feed considerably. She demonstrated the technique in 0.75 Acres of land and production in first cutting is total 8000 kg. She is our proud as she is the first lady farmer who adopted NB-21 technique and got good results.

"Disaster Management"
Building Relations Over Troubled Water : Banaskantha District

Due to the recent heavy rains, many villages in the Banaskatha region of Gujarat have become flooded.

Many villages in Banaskantha district continue to remain cut off because the bridges and roads in route have been washed away. Number of villages affected by flood and faced large damage of lives, animals and goods.

Adani Foundation Mundra decided to start relief work after taking a preliminary survey of the flood affected areas. Mr. Karsan Gadhavi and Mr. Ishvar Parmar started their journey towards Banaskantha on 28th July 2017. They visited Dhanera, Tharad and Vav District . First they meet SDM and Mamlatdar of Tharad and Dhanera. With help of Govt dignitaries they received list of most affected villages of Tharad district. As a second step, they visited all suggested villages and did survey about issues i.e. ration, drinking water, approaches, cattle fatality, damages in schools and other govt. properties. Ishvar bhai and Karsanbhai was stationed there for four days.

Based on requirements of district administration and feedback of our team members, AF Mundra team had decided to march on 3rd Aug 2017 early morning with big flood rescue team.

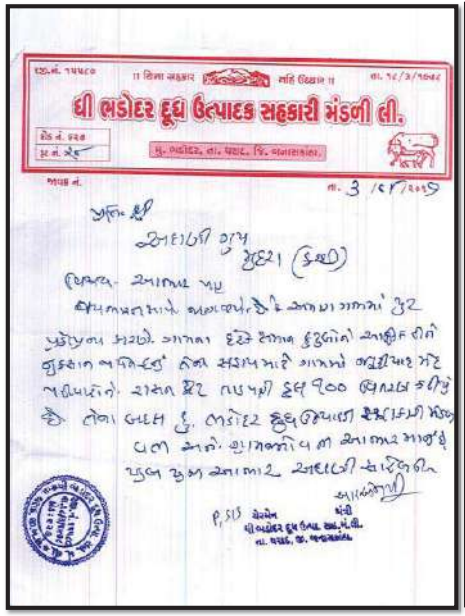
Journey towards dignity

It is our moral responsibility as a Foundation to take the responsibility of flood relief work in Tharad taluka which is badly affected by flood. With based on suggestions of district administration, AF Mundra has started march with 12 members team and AF Ahmedabad has started with 8 members team on 30th July 2017.
The flag off done by SDM Mundra and Mamlatdar Mundra. Entire teams are fully charged up to severe affected villages as per need given by Govt and based on survey of our team members who went earlier to get details.

"Disaster Management"
Building Relations Over Troubled Water : Banaskantha District

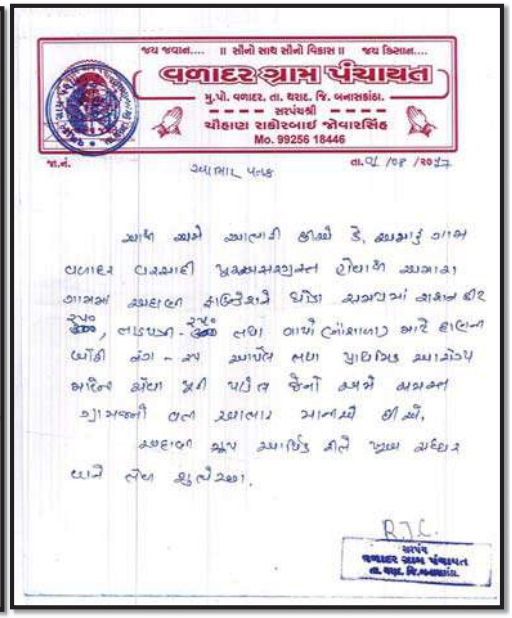
Flood Relief Work at Tharad Taluka (Banaskantha - Gujarat)							
Sr. No	Village	Details of Supported Items					
		Food Packet (Rasan Kit)	Tarpaulin with rope	Fodder	Blanket	Water (Pouch)	Requirement (2nd Layer Flood Relief)
1	Nani Pavad	150	60	25	60	1000	Fodder for cattle and Health Service
2	Datiya	285	100	30	100	1000	R.O. Plant as drinking water is too bad quality, Education Kit
3	Vadadar	250	250	25	500	1000	Bore well for clean drinking water
4	Pepar	50	50	19	100	500	Fodder, Education Kit and Health services
5	Kesargam	50	50	6	100	500	Fodder and Health services
6	Vantadau	350	300	55	0	1500	R.O. Plant and Health services
7	Mahadevpura	175	180	0	100	1000	R.O. Plant and Education Kit Health services
8	Khanpur	50	0	0	0	500	Still some part of village is submerged Cleaning required, Road repairing work and fodder, Education Kit
9	Bhachar	400	0	0	0	2000	Health camps
10	Bhadodar	100	100	0	0	1000	Health services
11	Benap	80	80	0	0		
12	Other	60	30	0	40		
	Total	**2000**	**1200**	**160**	**1000**	**10000**	

"Thanks Letter"



ધી ભડોદર દૂધ ઉત્પાદક સહકારી મંડળી લી.

મુ. ભડોદર, તા. વડાદ, જિ. બનાસકાંઠા.



જય જવાન.... ॥ સૌનો સાથ સૌનો વિકાસ ॥ જય કિસાન....

વળાદર ગ્રામ પંચાયત

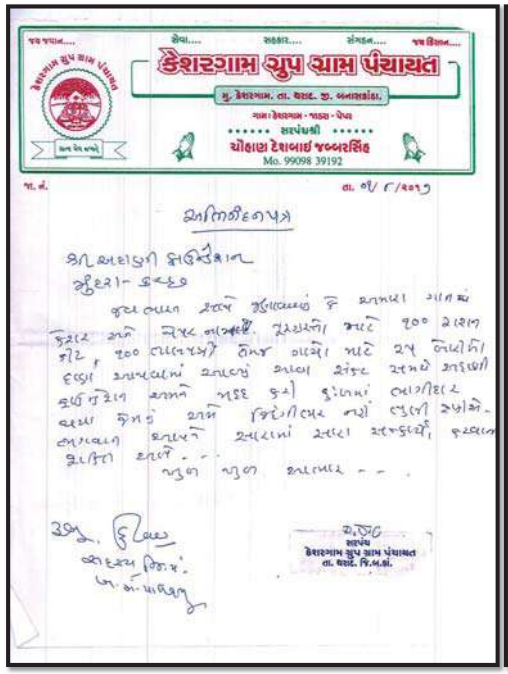
મુ.પો. વળાદર, તા. વડાદ, જિ. બનાસકાંઠા.

સરપંચશ્રી

ચૌહાણ સાહેરબાઈ જોવારસિંહ

Mo. 99256 18446

"Thanks Letter"



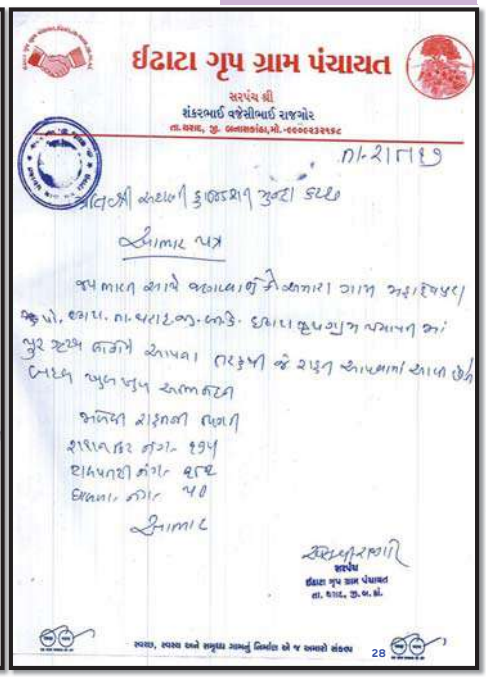
કેશરગામ ગ્રુપ ગ્રામ પંચાયત

મુ. કેશરગામ, તા. વડાદ, જી. બનાસકાંઠા.

સરપંચશ્રી

ચૌહાણ દેશાભાઈ જબ્બરસિંહ

Mo. 99098 39192



ઈટાટા ગ્રૂપ ગ્રામ પંચાયત

સરપંચ શ્રી

શંકરભાઈ વજેસીંભાઈ રાજગોર

"Thanks Letter"

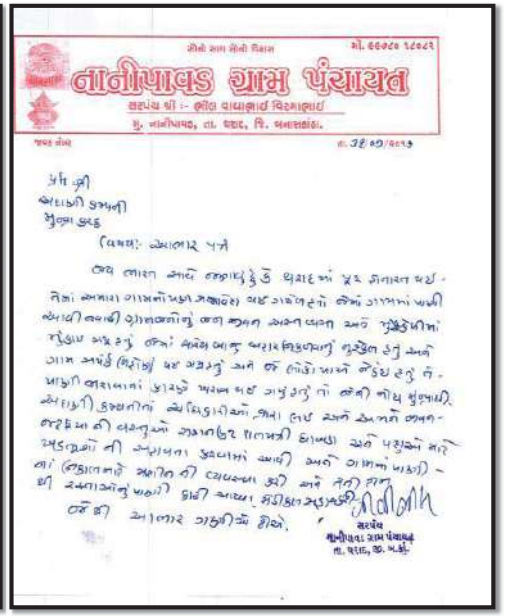
ભાયર ગ્રામ પંચાયત

મુ. ભાયર, પો. ઈટાટા, તા. વડાદ, જિ. બનાસકાંઠા.

સરપંચશ્રી

આંબાભાઈ સવદાસભાઈ પટેલ

Mo. 97275 31613



નાનીપાવડ ગ્રામ પંચાયત

મુ. નાનીપાવડ, તા. વડાદ, જિ. બનાસકાંઠા.

Media Notes

અદાણી ફાઉન્ડેશનનો આર્થિક સહયોગ

ભુજમાં 110 વર્ષના વૃદ્ધાના થાપાનો ગોળો બદલાવાયો

જી.કે. જનરલ હોસ્પિટલમાં કરાયું સફળ ઓપરેશન

ભાસ્કર ન્યૂઝ.ભુજ

સામાન્ય રીતે વરિષ્ઠોની શસ્ત્રક્રિયા તબીબો માટે પડકારરૂપ બની રહે છે, તેવામાં ભુજની જનરલ હોસ્પિટલમાં 110 વર્ષના વૃદ્ધાના થાપામાં ગોળો બેસાડવાનું ઓપરેશન સફળતાપૂર્વક પાર પાડવામાં આવ્યું હતું. અદાણી ફાઉન્ડેશનના આર્થિક સહયોગથી કરાયેલી આ શસ્ત્રક્રિયામાં વયોવૃદ્ધ દર્દીને લોહી ચડાવવાની કે આઈસીયુમાં રાખવાની જરૂર પણ પડી ન હતી.

મૂળ ગાગોદરના હાલે હમીપર કુબારામ આશ્રમમાં રહેતાં લાઈબેન મહાદેવ પ્રજાપતિ બેડા મહિના પહેલાં લપસી પડતાં તેમના થાપાના ભાગમાં ગંભીર ઈજાઓ થઈ હતી. તેમના પુત્ર કરસનભાઈએ સ્થાનિકે કરાવેલી સારવાર કારગત ન નીવડતાં તેમજ કેટલાક નિષ્ણાત તબીબોએ ઉંમરની દૃષ્ટિએ જોખમી જણાતા ઓપરેશનનો ઈન્કાર કરી દેતાં ભુજની અદાણી સંચાલિત જનરલ હોસ્પિટલમાં લાવ્યા હતા.

હાડકા વિભાગના ડો. પારસ મોટવાની, ડો. સંગીન ભુટિયા, ડો. ગૌરવ કાલરિયા, ડો. નવીન ગાગલ, ડો. સત્યજીત ભારડ, ડો. આનંદ હિરાણીની ટીમે ઉંમરના હિસાબે જોખમી કહી શકાય તેવું થાપાનો ગોળો બદલવાનું ઓપરેશન સફળતા સાથે કર્યું હતું. તબીબોના જણાવ્યા મુજબ દર્દીને ત્રીજા દિવસથી પથારીમાં હલન-ચલન રાહ કર્યું હતું. અદાણી ફાઉન્ડેશનના આર્થિક સહયોગ માટે કિશોર ચાવડાએ ચાવીરૂપ ભૂમિકા ભજવી હતી.

ભુજમાં જી. કે. જનરલ હોસ્પિટલમાં અત્યાધુનિક પેટિકલ વોર્ડને ઈ-ખાત્મો પરાવામાં જી. નીમાબેન આચાર્ય સાથે અગ્રણીઓ ખુલ્લા મૂકે છે (તસ્વીર : નવીન ઠક્કર)

જી.કે.માં ૧૫૦ પથારીવાળો કોર્પોરેટ વોર્ડ

ભુજ, તા. ૧૭ : અત્યાધુનિક સાધનોથી સજ્જ કોર્પોરેટ હોસ્પિટલની તર્જમાં સેવાઓ આપતી જી.કે. જનરલ હોસ્પિટલમાં વર્ષોથી દર્દીઓને સુપરફાસ્ટ અદ્યતન ઈન્ટિગ્રેટ સ્યોર મેડિકલ સાધનોથી સજ્જ કરાયેલા ખાસ વિભાગમાં મેડિકલ વોર્ડનો વિધિવત પ્રારંભ પદ્મશ્રી પરાક્રમસિંહ જી. નીમાબેન બી. આચાર્યે ઉદઘાટન પ્રસંગે જણાવ્યું હતું.

મેડિસિટીના પહેલા માળે વિશાળ મેડિકલ વોર્ડમાં મહિલાઓ અને પુરુષ દર્દીઓ માટે અલગ અલગ મળી ૧૫૦ પથારીની સુવિધા ઊભી કરાઇ છે. જેમાં વાત-દિવસ જે સુવિધાઓ તબીબ, જે.એમ.ઓ. ઈ.એમ.ઓ. છ ઇન્ટર્ન તેમજ સાયર-સર્જ સ્ટાફનાં ૨૩૦-ભર્યા ૨૩૬. ઉપરાંત ૩૦થી વધુ નર્સિંગ અને હાઉસ કિપિંગ સ્ટાફની દર્દીઓને સેવામાં તેનું વિભાગના વરિષ્ઠ સ્નીયોગ વિભાગને નહીં જણાવ્યા. ડો. નીમાબેન જણાવ્યું કે દાખલ થતા દર્દીનો ચેપ અન્ય દર્દીને ન લાગે તે માટે આવાર ૧૦૦ જેટલા દર્દીઓ માટે ઉપરાંત સ્ટાફ માટે વોર્ડમાં સુવિધા અપાઇ છે. વોર્ડમાં દર્દીના આરામની ખાસ જરૂરતે ખાનાં વાટ સંબંધીઓના પલંગ આગળ ઝાડાર-સાઈ એક-એક ફ્રાઇ એક ફ્રમ્પોર્ન પલંગની પરવાનગી અપાઈ. દરેક ખાટ ઉપરાંત ઓક્સિજન પ્રદાનો વીમેલ્યુએન્ટ ડી.આઇ.જી. સી મર્શલ, વિધિવત સર્જન ડી. વિક્રાબેન ઉપાધ્યાય, પૂર્વ સીઈઓ ડી. કે. કાની સહિત હોસ્પિટલના તબીબો, સ્ટાફ અને દર્દીઓ, ભુજ તા. ભાજપ અમુખ જગદીશ ભુજ, મંત્રી જેમાં રમાશી, ભુજ તા.પં. ઉપપ્રમુખ મિલેશ ગઢેચા, પૂર્વ ધિ.પ. સ. વસંતબેન અર્જુનદેવ ધિલેરિયા, ભરત સંઘવી વગેરે ઉપસ્થિત રહ્યા હતા. આરંભમાં ડી. આચાર્યને ડી. વેકાબેન પુષ્પગુચ્છથી આવકાર્યાં હતા. ત્યારબાદ ડો. એમિનિસ્ટ્રેશન, વિકલ્પિટી અને મેડિકલના વિભિન્નિક્સ વિભાગ વહેંચાયેલ સભાની હતી.

ત્રણ કરોડના ખર્ચે નિર્મિત આગવી હોસ્પિટલ તથા વોર્ડને દ્વારારંભમાં ખુલ્લો મૂકવો

વિભાગનું ખુલ્લા પરાવર કરવામાં આવેલ. પ્રસંગમાં ખાસ સ્થાનિક ઉપસ્થિત વ્યવસ્થાની સુવિધા અપાઇ. જે નિઃશુલ્ક ખુલી પડાશે. વિભાગમાં દર્દીઓની સુવિધાના મુજબ પોલિક ખોરાક પૂરો પડાશે.

ડિસ્ક્લિપ્સન ડી. વિનીત દલકે જણાવ્યું કે, આ વોર્ડમાં ખાસ સર્જન તાવ, સાવરી, ઉપરાંત, બોલિના દર્દીઓને દાખલ કરાશે. હાલ હોસ્પિટલમાં અત્યારે ૮૦ જેટલા દર્દી છે.

મંત્રી સુધિ. ડી. આઇસરમે જણાવ્યું હતું કે, હાલ પાંચ ડિસ્ક્લિપ્સન છે.

આ ઉદઘાટન પ્રસંગે વીમેલ્યુએન્ટ ડી.આઇ.જી. સી મર્શલ, વિધિવત સર્જન ડી. વિક્રાબેન ઉપાધ્યાય, પૂર્વ સીઈઓ ડી. કે. કાની સહિત હોસ્પિટલના તબીબો, સ્ટાફ અને દર્દીઓ, ભુજ તા. ભાજપ અમુખ જગદીશ ભુજ, મંત્રી જેમાં રમાશી, ભુજ તા.પં. ઉપપ્રમુખ મિલેશ ગઢેચા, પૂર્વ ધિ.પ. સ. વસંતબેન અર્જુનદેવ ધિલેરિયા, ભરત સંઘવી વગેરે ઉપસ્થિત રહ્યા હતા. આરંભમાં ડી. આચાર્યને ડી. વેકાબેન પુષ્પગુચ્છથી આવકાર્યાં હતા. ત્યારબાદ ડો. એમિનિસ્ટ્રેશન, વિકલ્પિટી અને મેડિકલના વિભિન્નિક્સ વિભાગ વહેંચાયેલ સભાની હતી.

૮૦૦ ગ્રામ વજનવાળા નવજાત શિશુને મોતના મુખેથી બચાવાયો

'મોનરા' તિથિ પ્ર

મહિલાઓ સ્તન કેન્સર બાબતે જાગૃત બને

ભુજ - સોમવાર, તા. ૨૫-૦૫-૨૦૧૭

વાહન ચલાવતી વેળાએ જાગૃતિ અને તકેદારી રાખવાથી માર્ગ અકસ્માત થતા નિવારી શકાય

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કચ્છ નાયક

અદાણી ફાઉન્ડેશન દ્વારા માછીમાર સમુદાયના યુવા માટે અદાણી પ્રિમિયર લીગ ક્રિકેટ ટુર્નામેન્ટનું આયો

માછીમાર સમુદાયની અદાણી પ્રીમિયર લીગમાં કિંગ ઓફ નવીનાળ ટીમ વિજેતા

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નિ:શુલ્ક હેલ્થ કેમ્પ : અદાણી ફાઉન્ડેશન ભુજ તથા સ્વામી વિવેકાનંદ યુવક મંડળ ધાનપ્રીના સહયોગથી લખપત તાલુકાના (ધાનપ્રી) વર્માનગર ખાતે નિ:શુલ્ક જનરલ મેડિકલ હેલ્થ કેમ્પનું આયોજન કરવામાં આવ્યું હતું. આ કેમ્પમાં ૨૫૦ લાભાર્થીઓએ આ આરોગ્યસેવાનો લાભ લીધો.

માંડવીમાં પોલીસની 'ચાલકમિત્ર' યોજના દ્વારા મેડિકલ ચેકપ યોજાઇ

૮૦૦ ગ્રામ વજન ધરાવતા નવજાત શિશુને અદાણી જી.કે.જનરલ હોસ્પિટલ મા મોતના મુખેથી બચાવાયું.

આમાન્ય રીતે બાળકનુ જન્મ થતા તેનુ વજન ૨.૫ થી ૩ કિ.ગ્રા.નો હોવુ જોઈએ તેવા બાળકને શારીરિક રીતે સ્વસ્થ માનવા મા આવે છે. ભુજ ની અદાણી જી.કે.જનરલ હોસ્પીટલ મા માત્ર ૮૦૦ ગ્રામ વજન ધરાવતા બાળકનુ બાળ રોગના નિષ્ણાત ડો. હરદાસ ચાવડા અને એન.આઈ.સી.યુ વિભાગના ઈનચાર્જ ડો. હસમુખ બીહાળ અને સ્ટાફ મુબ જ કાવજી પુર્વક સારવાર આપવામા આવી હતી જેથી બાળક ગંભીર બીમારીઓથી બચાવ આવી ગયુ

૧૪/૦૪/૧૭ ના હોસ્પિટલમા આવેલા નવજાત શિશુને ૧૦/૦૫/૧૭ ના રોજ રજા આપવામા આવી ત્યારે નવજાત શિશુનુ વજન ૮૦૦ ગ્રામ થી વધીને ૧કિલો ને ૩૫ ગ્રામ થયુ બાળકની બાબતમાં એ ગણવામા આવે છે કે આટલા ઓછા સમય સુધી તેમના માતા પિતાએ ધીરજ રાખી તેમને ડોક્ટર અને સ્ટાફ ની સારવાર ઉપર વિશ્વાસ હતો આ હોસ્પિટલના મેડીકલ ડીરેક્ટર ડો. શાંતીભાઈ રાવ સાહેબે જણાવ્યું હતુ આટલા દિવસ સારી સારવાર કરવી અને કરી એ બદલ બાળકના વાલીઓ અને હોસ્પિટલના સ્ટાફ અભિનંદને પાત્ર ગણાવ્યા હતા અને આ ઉપરાત અદાણી જી.કે.જનરલ હોસ્પિટલમાં વધારે સારી સારવાર મળી રહેશે એવુ જણાવ્યુ હતું. અદાણી ફાઉન્ડેશનના સહયોગથી ડો. હરદાસ ચાવડા, ડો. હસમુખ બીહાળ અને ડિસોર ચાવડા ના હસ્તે મુબંઇથી નવજાત શિશુને બેબી ડોલ કીટ આપવામા આવી હતી.

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Adani Foundation -Mundra
Executive Summary of Budget Utilization - April to September 2017
F.Y. 2017-'18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y.2017-18	Budget Plan upto Sept-2017	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
	Admin Expense	152.05	76.03	56.65	74.51%	37.26%	
A.	Education	59.70	29.85	16.33	54.70%	27.35%	
B.	Community Health	214.49	107.25	68.89	64.23%	32.12%	
C.	Sustainable Livelihood Development	215.00	107.50	149.91	139.45%	69.72%	
D.	Rural Infrastructure Development	374.70	187.35	63.82	34.07%	17.03%	
	TOTAL AF CSR Budget :	**1015.94**	**507.97**	**355.59**	**70.00%**	**35.00%**	
+	Adani Vidya Mandir-Bhadreshwar	142.08	71.04	48.82	68.73%	34.36%	
	TOTAL - AF & AVMB Approved Budget :	**1158.02**	**579.01**	**404.42**	**69.85%**	**34.92%**	
+	Additional Approved Works	29.20	14.60	22.38	153.29%	76.64%	
	GRAND TOTAL	**1187.22**	**593.61**	**426.80**	**71.90%**	**35.95%**	

Adani Foundation -Mundra
HR & Admin Budget Utilization - April to September 2017
F.Y 2017-18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y. 2017-18	Budget Plan upto Sept.-2017	Expenditure up to Sept..17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
A	**Salary**						
1	*Present Staff Salary*	91.50	45.75	47.33	103.46%	51.73%	
2	*New Staff Salary*	9.00	4.50	0.00	0.00%	0.00%	
3	HR Expenses	2.00	1.00	0.00	0.00%	0.00%	
	Total HR Expenses	**102.50**	**51.25**	**47.33**	**92.35%**	**46.18%**	
B	**Office Admin expenses**						
1	Office Printing and stationery	0.40	0.20	0.00	0.00%	0.00%	
2	*Travel and conveyance - Staff*	5.00	2.50	1.65	66.19%	33.10%	
3	Legal and professional fees (Lump sum)	0.05	0.03	0.00	0.00%	0.00%	
4	Office equipments and Maintenance	0.20	0.10	0.00	0.00%	0.00%	
5	*Mobile/Internet & Electricity Bill*	2.32	1.16	0.75	64.59%	32.29%	
6	Refreshment/ Guest Entertainment exp.	0.50	0.25	0.00	0.00%	0.00%	
7	Staff meetings / Trainings	0.20	0.10	0.00	0.00%	0.00%	
8	Field office / Training center rent & Field office other Expenses	1.44	0.72	0.09	13.10%	6.55%	
9	*Staff welfare activities*	4.75	2.38	0.00	0.00%	0.00%	
10	Insurance - vehicles	0.25	0.13	0.00	0.00%	0.00%	
11	Four wheel vehicle rent	12.00	6.00	3.09	51.58%	25.79%	
12	*Vehicle maintenance and fuel*	1.30	0.65	0.26	40.58%	20.29%	
13	Staff Capacity building, Training, Appreciation & Exposure visits	2.00	1.00	1.20	120.01%	60.01%	
14	Misc. Office & Admin Expense	0.24	0.12	0.00	0.00%	0.00%	
	Sub Total	***30.65***	***15.33***	***7.06***	**46.05%**	**23.02%**	
C	**Other exp.**						
1	Add. Misc. & Documentation Expenses	3.50	1.75	0.50	28.71%	14.36%	
3	***Staff SV Teachers Colony Exp***	**15.40**	**7.70**	**1.76**	22.83%	11.41%	
3.1	*Colony Maintanance Exp.*	15.00	7.50	4.54	60.50%	30.25%	
3.2	*Parking Shed in Shantivan Teacher Colony*	10.00	5.00	0.00	0.00%	0.00%	
Less:	*House Rent Recovery*	9.60	4.80	2.78	57.92%	28.96%	
	Sub Total	**18.90**	**9.45**	**2.26**	**23.92%**	**11.96%**	
	GRAND TOTAL (BUDGETED) :	**152.05**	**76.03**	**56.65**	**74.51%**	**37.26%**	

Adani Foundation -Mundra
Education Budget Utilization - April to September 2017
F.Y. 2017-'18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y. 2017-18	Budget Plan upto Sept.2017	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
1	**Support to Government / Private Educational Institutes**						
1.1	Educational Support at various Govt. schools	8.00	4.00	3.55	88.79%	44.40%	
1.2	Support to ITI	2.00	1.00	0.00	0.00%	0.00%	
	Sub Total	**10.00**	**5.00**	**3.55**	**71.03%**	**35.52%**	
2	**Adani Shaikshanik Vikas Kendra (Strenghening Primary Education)**	**5.90**	**2.95**	**1.87**	**63.55%**	**31.78%**	
2.1	Coaching & project staff Exp.	4.60	2.30	1.75	76.09%	38.04%	
2.2	Housekeeping Exp.	0.60	0.30	0.00	0.00%	0.00%	
2.3	Teaching & Learning Material Exp.	0.50	0.25	0.07	27.20%	13.60%	
2.4	Other Administrative Exp.	0.20	0.10	0.06	56.77%	28.39%	
3	**Training and Development (Strenghening Teachers of High School)**	**0.95**	**0.48**	**0.17**	**36.33%**	**18.17%**	
3.1	Seminar on " Qualities of an effective teacher" (Quarterly)	0.50	0.25	0.17	69.04%	34.52%	
3.2	Workshop 1 : "Continuous and comprehensive evaluation"	0.15	0.08	0.00	0.00%	0.00%	
3.3	Workshop 2 : "Effective Lesson Planning"	0.15	0.08	0.00	0.00%	0.00%	
3.4	Workshop 3: " Effective Administrative Skills" for Principles	0.15	0.08	0.00	0.00%	0.00%	
4	**Educational Support to Migrated Labour Children**	**10.00**	**5.00**	**0.00**	**0.00%**	**0.00%**	
5	**Support for Higher secondary students of AVMB**	**3.75**	**1.88**	**1.03**	**54.79%**	**27.40%**	
6	**Education Project Staff Salary & TA (1 CM)**	**3.10**	**1.55**	**1.25**	**80.48%**	**40.24%**	
7	**Education for Fisher folk**						
9.1	Education Initiative for children at vasahat	22.00	11.00	7.56	68.73%	34.36%	
9.2	Exposure tour, Fee & Other Edu. Support to poor students and cycle support to Fishermen Students	4.00	2.00	0.89	44.67%	22.34%	
	SUB TOTAL :	**26.00**	**13.00**	**8.45**	**65.03%**	**32.51%**	
	GRAND TOTAL (BUDGETED) :	**59.70**	**29.85**	**16.33**	**54.70%**	**27.35%**	

Adani Foundation -Mundra
Community Health Budget Utilization - April to September 2017
F.Y. 2017-'18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y. 2017-18	Budget Plan upto Sept.2017	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
B1. Community health programme - on going							
1	Medical mobile units	8.15	4.08	1.58	38.68%	19.34%	
2	Medicines for rural clinics - 12	8.75	4.38	1.65	37.82%	18.91%	
3	Medical support to very needy and poor patients	25.00	12.50	8.49	67.91%	33.95%	
	Sub Total	**41.90**	**20.95**	**11.72**	**55.94%**	**27.97%**	
B2. "Dialysis Support"							
1	Financial support for dialysis	10.00	5.00	2.27	45.37%	22.69%	
	Sub Total	**10.00**	**5.00**	**2.27**	**45.37%**	**22.69%**	
B3 Health card to Senior citizens *							
1	Health card services	90.00	45.00	28.20	62.68%	31.34%	
	Sub Total	**90.00**	**45.00**	**28.20**	**62.68%**	**31.34%**	
B4.Addressing Disability		**3.00**	1.50	0.49	32.75%	16.38%	
B5.Health Camps and Awareness programes							
1	General Health Camp for truckers	12.00	6.00	3.26	54.27%	27.13%	
	Sub Total	**12.00**	**6.00**	**3.26**	**54.27%**	**27.13%**	
Project Staff for Mundra Health Initiative		**8.59**	4.30	2.63	61.17%	30.59%	
	Grand total for Mundra Health Initiative :	**165.49**	**82.75**	**48.57**	**58.70%**	**29.35%**	
B6. Community Health Initiative from GKGH/GAIMS							
1	Medical Support to Poor Patients -GKGH	20.00	10.00	8.25	82.48%	41.24%	
2	Dignity to death - Dead body carrier vehicle support	7.00	3.50	4.22	120.63%	60.32%	
3	**Health Camps and Awareness programes**	**2.50**	**1.25**	**0.67**	**53.66%**	**26.83%**	
3.1	General Health Camp	1.00	0.50	0.27	54.75%	27.38%	
3.2	Safe Child Health Project - NEW	0.50	0.25	0.05	21.38%	10.69%	
3.3	Health Check Up Camping New	0.50	0.25	0.34	137.44%	68.72%	
3.4	GMDC Mining Labor Welfare Programme New	0.50	0.25	0.00	0.00%	0.00%	
4	Collaborative Actions in Lowering Maternity Encounters Death(CALMED)	1.50	0.75	0.01	1.35%	0.67%	
5	Medical Mobile Unit	2.00	1.00	0.61	61.12%	30.56%	
6	Project Staff & Administrative Exp.-GKGH	10.00	5.00	4.21	84.17%	42.09%	
7	Vehicle Hiring Charges	6.00	3.00	2.35	78.29%	39.15%	
	Sub Total - GKGH :	**49.00**	**24.50**	**20.32**	**82.94%**	**41.47%**	
	GRAND TOTAL :	**214.49**	**107.25**	**68.89**	**64.23%**	**32.12%**	

Adani Foundation -Mundra
Sustainable Livelihood Development Budget Utilization - April to September 2017
F.Y. 2017-'18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y.2017-18	Budget Plan upto Sept.17	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
Fisher Folk							
A	**Sustainable livelihood for Fisher folk**						
1	Community Engagement Activities	8.00	4.00	5.41	135.21%	67.61%	
2	Livelihood promotion - Income Generation to individual	5.00	2.50	1.57	62.85%	31.43%	
3	Awareness generation and capacity building	2.00	1.00	0.62	62.48%	31.24%	
4	Potable Water to Fisher Folk at vasahat	18.00	9.00	7.85	87.24%	43.62%	
5	Mangroves plantation and maintenance & Vasahat Cleaning	11.00	5.50	9.66	175.62%	87.81%	
6	Cage farming Asian Sea bass & Lobster	1.00	0.50	0.00	0.00%	0.00%	
	Fisher Folk Budget : Total	**45.00**	**22.50**	**25.12**	**111.62%**	**55.81%**	
Sustainable Livelihood							
B	**Women Empowerment**						
1	Women Empowerment	20.00	10.00	1.17	11.67%	5.83%	
	Sub Total	**20.00**	**10.00**	**1.17**	**11.67%**	**5.83%**	
C	**Agriculture**						
1	Fodder Support -	140.00	70.00	121.19	173.13%	86.57%	
2	Agriculture Initiatives and Support	10.00	5.00	2.43	48.66%	24.33%	
	Sub Total	**150.00**	**75.00**	**123.63**	**164.83%**	**82.42%**	
	TOTAL (APPROVED BUDGETED) :	**215.00**	**107.50**	**149.91**	**139.45%**	**69.72%**	
	Additional Approved Works :						
1	Cage farming Asian Sea bass & Lobster	3.00	1.50	0.00	0.00%	0.00%	
2	Polyculture	1.60	0.80	0.00	0.00%	0.00%	
3	Technical Expert for New Projects	3.60	1.80	1.51	83.92%	41.96%	
4	Flood Relief Work	21.00	10.50	20.87	198.76%	99.38%	
	Total	**29.20**	**14.60**	**22.38**	**153.29%**	**76.64%**	
	GRAND TOTAL	**244.20**	**122.10**	**172.29**	**141.10%**	**70.55%**	

Adani Foundation -Mundra
Rural Infrastructure Development Budget Utilization - April to September 2017
F.Y. 2017-'18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y. 2017-18	Budget Plan upto Sept.17	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
[1]	**Water Conservation and Ground Water Recharge**						
1.1	Pond deepening work	20.00	10.00	16.69	166.88%	83.44%	
	Sub Total	**20.00**	**10.00**	**16.69**	**166.88%**	**83.44%**	
[3]	**Education Related**						
3.1	Prayer shed in vaghervas school,bhadreshwar	5.00	2.50	0.97	38.82%	19.41%	
	Sub Total	**5.00**	**2.50**	**0.97**	**38.82%**	**19.41%**	
[4]	**Health Related**						
4.1	Sanitation block for girls in school, Sadau	3.00	1.50	1.66	110.44%	55.22%	
	Sub Total	**3.00**	**1.50**	**1.66**	**110.44%**	**55.22%**	
[5]	**Other Projects - Corporate Related**						
5.1	Drainage maintenance and JCB hiring	15.00	7.50	6.70	89.36%	44.68%	
5.2	Tuna Port Related CSR Projects	15.00	7.50	0.00	0.00%	0.00%	
5.3	Crematorium development, mundra	5.00	2.50	4.49	179.77%	89.88%	
5.4	Boundry wall and repair of iddgah, tragadi	6.50	3.25	0.00	0.00%	0.00%	
5.5	Garden work in matang temple, kandagara	4.00	2.00	3.09	154.69%	77.35%	
5.6	Basic infra. Facility in Labour Colony	20.00	10.00	0.00	0.00%	0.00%	
5.7	Infrastructure Development for HMV Drivers at North Gate	50.00	25.00	0.00	0.00%	0.00%	
5.8	Study for Mundra Town plan	5.00	2.50	0.00	0.00%	0.00%	
5.9	Development work in Zarpara & Mundra	30.00	15.00	2.84	18.91%	9.45%	
5.10	**Augmentation Of Check Dams budget** Construciton of Toilets in Bhuj taluka 2016-17 Repairing of Checkdam and river widening, kandagara 2017-18	6.00	3.00	4.38	145.88%	72.94%	
5.11	Prayer shed in school, Ragha-Luni	5.00	2.50	0.00	0.00%	0.00%	
5.12	Fisherman Shelter-house Repering-Shekhadiya	50.40	25.20	10.63	42.20%	21.10%	
	Sub Total	**211.90**	**105.95**	**32.14**	**30.33%**	**15.17%**	
[6]	**Fisherman Amenities :** **Infrastructure Support at different Bandar**	**54.80**	**27.40**	**12.37**	**45.15%**	**22.57%**	
[7]	**Startvision Projects**						
7.1	Participatory Ground Water Management	45.00	22.50	0.00	0.00%	0.00%	
	Sub Total	**45.00**	**22.50**	**0.00**	**0.00%**	**0.00%**	
[8]	**Spill Over Projects**						
8.1	Cricket Ground - Siracha	5.00	2.50	0.00	0.00%	0.00%	
	Sub Total	**5.00**	**2.50**	**0.00**	**0.00%**	**0.00%**	
[9]	**Retention Money**	30.00	15.00	0.00	0.00%	0.00%	
	GRAND TOTAL (BUDGETED) (A):	**374.70**	**187.35**	**63.82**	**34.07%**	**17.03%**	

Adani Vidya Mandir-Bhadreshwar
Budget Utilization - April to September 2017
F.Y. 2017-18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y. 2017-18	Budget Plan upto Sept.2017	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
A	**Salary Expenses**						
1	Staff Salary	51.15	25.58	19.16	74.94%	37.47%	
2	New Teachers Salary						
3	Non Teaching Staff Exp.	11.20	5.60	4.19	74.78%	37.39%	
	Sub Total	**62.35**	**31.18**	**23.35**	**74.91%**	**37.45%**	
B	**Student Expenses**						
1	Student Uniform Expense	4.42	2.21	3.20	144.62%	72.31%	
2	Food Expenses	50.30	25.15	16.04	63.78%	31.89%	
3	Text books, Notebooks and Work books Expenses	3.03	1.52	2.33	154.12%	77.06%	
4	Co-Curricular Activities	0.25	0.13	0.00	0.00%	0.00%	
5	Extra Curricular Activities Expenses	1.00	0.50	0.09	18.88%	9.44%	
6	Seminar/Conference/workshop/ Teachers Training	0.20	0.10	0.00	0.00%	0.00%	
7	Exposure Tour for Students & Staff	1.00	0.50	0.03	5.88%	2.94%	
8	Exam Fee for Board Examination	0.25	0.13	0.00	0.00%	0.00%	
9	Education Medical Expense, Student & Staff	0.20	0.10	0.00	4.60%	2.30%	
	Sub Total	**60.65**	**30.33**	**21.70**	**71.56%**	**35.78%**	
C	**Other Expenses**						
1	Mobile & Telephone bills/ Fax Expenses/Internet Charges	0.20	0.10	0.07	65.29%	32.65%	
2	Electricity Charges	2.40	1.20	1.03	85.77%	42.89%	
3	Postage & Courier Expenses	0.03	0.02	0.00	1.00%	0.50%	
4	Uniform for Peons-2, Security-2, Aaya-2,Sweeper-2	0.10	0.05	0.00	0.00%	0.00%	
5	Staff Welfare Expenses	0.15	0.08	0.00	0.00%	0.00%	
6	Misc. Expenses	1.00	0.50	0.04	8.35%	4.18%	
7	Travelling/Conveyance Expenses	0.20	0.10	0.05	47.87%	23.94%	
8	Printing & Stationary Expenses	1.50	0.75	0.51	67.49%	33.74%	
9	Newspapers & Periodical Expenses	0.10	0.05	0.01	12.80%	6.40%	
11	Vehicle Hire Charges	0.20	0.10	0.11	112.50%	56.25%	
12	House keeping	0.55	0.28	0.21	78.00%	39.00%	

Adani Vidya Mandir-Bhadreshwar
Budget Utilization - April to September 2017
F.Y. 2017-18

(Rs. In Lacs)

Sr. No.	Budget Line Item	Budget F.Y. 2017-18	Budget Plan upto Sept.2017	Expenditure up to Sept.17	% of total Utilization against Planned budget	% of utilization from FY 2017-18 budget	Remarks
13	Bike Expenses (Petrol & Maintenance)	0.20	0.10	0.10	96.39%	48.20%	
14	Vehicle Maintenance & Fuel Expenses (Transportation facilty for Science faculty)	2.85	1.43	0.15	10.72%	5.36%	
15	Water Tank Charges	0.50	0.25	0.48	192.37%	96.19%	
16	Computer Maintenance Charges (Old Computer) & UPS	0.50	0.25	0.01	4.00%	2.00%	
	Sub total	**10.48**	**5.24**	**2.76**	**52.75%**	**26.37%**	
D	**Building & Equipment related Expenses**						
1	Property Tax & Revenue Tax	0.50	0.25	0.00	0.00%	0.00%	
2	Insurance Premium						
3	School Building & Equipment Maintenance Expense + School classroom painting-2017-18	4.70	2.35	0.88	37.43%	18.72%	
	Sub Total	**5.20**	**2.60**	**0.88**	**33.83%**	**16.92%**	
	Total, Recurring expenses	**138.68**	**69.34**	**48.70**	**70.23%**	**35.11%**	
	E. Non-recurring expenses						
1	Library Books	0.30	0.15	0.00	0.00%	0.00%	
2	Smart Class	0.80	0.40	0.00	0.00%	0.00%	
3	Sport Equipment	0.20	0.10	0.00	0.00%	0.00%	
3	Kitchen Expenses	0.10	0.05	0.00	0.00%	0.00%	
4	Furniture & Fixture	0.30	0.15	0.00	0.00%	0.00%	
6	Cultural Dresses	0.20	0.10	0.00	0.00%	0.00%	
7	New CC TV Camera & Maintenance of old Camera	0.75	0.38	0.13	34.04%	17.02%	
8	New one Two wheeler	0.75	0.38	0.00	0.00%	0.00%	
	Total, Non-recurring expenses	**3.40**	**1.70**	**0.13**	**7.51%**	**3.75%**	
	Grand Total	**142.08**	**71.04**	**48.82**	**68.73%**	**34.36%**	

Annexure – 8

Annexure – 8

Details of APSEZ Fire Fighting Facility

- APSEZ Fire Services is well equipped with start of art Fire Fighting Facilities. All the critical areas are protected with Fixed Fire Fighting System having ample water storage capacity
- APSEZ Fire services possess 05 nos of Fire Tenders which can immediately respond to any eventuality
- We are equipped with Diesel engine operated pump in all the critical areas to meet the uninterrupted water requirement even in the case of power failure
- We conduct regular testing of each and every firefighting appliance to ensure its healthiness
- All the areas are protected with First Aid Fire Fighting Measures (i.e. Fire Extinguishers)
- APSEZ Fire Services possess qualified and experienced fire professionals to guide the associate Fire Staff.
- APSEZ Fire Services comprises of 110 nos of associate Fire Professionals for round "O" clock monitoring, Fire Prevention and Fire Protection of the organization.
- APSEZ Fire Services remain stand by during Class A,B Petroleum products handling to prevent & to minimize any unwanted incident.
- We impart regular firefighting training to employees as well as associate staff.
- APSEZ also possess modern hi-tech equipment to combat with any emergency
- We also conduct special awareness drives for home fire safety at our residential townships.
- Control of ignition source by spark arrester in each vehicle moving inside the LT area, use of intrinsically safe equipment & maintenance tools.
- Provision for deployment of 03 number rapid emergency responder 24x7 at liquid terminal as well as hot work close monitoring to avoid any fire incident or immediate mitigation.
- MOU signed with 06 number of mutual aid group industries for immediate support for emergency mitigation & resources mobilisation.

Testing of Fire Fighitng System of Liquid Terminal

Testing of Fire Fighitng System of Diesel Tank Area near Tug Berth

Annexure – 9

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Date	:	10.04.2017
Time	:	11:42 AM
Location	:	Liquid Terminal - T-30 (Enclosure-02)
Type/Text of the Scenario	:	Fire in Ethyl Alcohol T-30 with 02 Nos. casualties

INTRODUCTION:

Area supervisor Mr. Vinod Bhimani observed fire in Ethyl Alcohol T-30 with 02 Nos. casualties and he informed to Liquid Control In charge Mr. Hitesh Bhalani for the same. Immediately liquid In charge Informed to Fire, POC, OHC, Safety & Security. POC subsequently intimated the same through message/call to concern departments.

LOCATION (WITH PHOTOGRAPH):

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MOCK DRILL REPORT

SEQUENCE OF EVENTS WITH PHOTOGRAPHS:

Incident Spot : Inside Liquid Terminal T-30 (Enclosure-02)	First Responder informed to Incident Controller
Incident Controller reached at site	Ambulance reached at site
Fire tender reached at site	Security team reached at site

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Rescue of injured person 1	Rescue of injured person 2
First aid given to injured person	Mobilized ambulance towards OHC
Discussion about fire fighting with Incident Controller	Fire fighting Activity

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Cooling nearby tank no.31	Evacuation of People
Maintenance staff reached at site	People moving to Asssembly Point
Observer – Mr Dattatray Gore & Mr Manan Bhatt	Briefing at Assembly point (Near Driver Canteen)

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Briefing at Assembly point by Liquid Head, Safety, Fire & Security	**De-Briefing Meeting**

RESPONSE TIME:

#	Description		Exact Time
1.	First responder informed to Incident Controller	:	11:42 AM
2.	Incident controller comes on site	:	11:45 AM
3.	Declaration of Emergency	:	11:45 AM
4.	Security team reaching time at incident point	:	11:57 AM
5.	Fire Tender reaching time at incident Point	:	11:47 AM
6.	Ambulance reaching time at incident Point	:	11:47 AM
7.	Departure of Ambulance with patient	:	11:50 AM
8.	Ambulance reached at OHC	:	11:51:35 AM
9.	First person at Assembly Point	:	
10.	Last person at Assembly Point	:	
11.	Maintenance/ Rescue Arrangement at site	:	Immediately rescue started by fire team @ 11:48 AM
12.	Corporate Affairs team reaching on site	:	NA
13.	Liaoning officer reached at site	:	Message not received due to error in message
14.	Audibility of the scenario on PA system	:	NA
15.	Termination of Emergency	:	12:02 PM

Note: For more than one assembly point, please mention details for point 10 & 11.

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MOCK DRILL REPORT

COMMUNICATION & ACTIONS:

Action By	Information To / Action By	Remarks
First Responder	Information given to incident controller about situation / scenario.	
Site Incident Controller	Assess the site and declare emergency.	
Concern Department/ Area In-charge	Inform to POC, Security, Fire, Medical, Safety etc.	
Engineering Services	NA	Message not received due to error in message
Corporate Affairs	NA	
HR/ Admin	NA	
Safety	Discuss to mitigate catastrophic effects with incident controller and ask for any add or services required like PPE's, Ambulance etc.	
OHC	First aid given to casualties at site and mobilize ambulance at OHC for further treatment.	
Security Control Room	Controlling the traffic at main gate & scene.	
Fire Control Room Inform	Successfully rescue the causalities and started firefighting on the T-30 also simultaneously started cooling adjacent tank no. 31.	

COMMUNICATION TO MUTUAL AID GROUP
(IF REQUIRED, AS AND WHEN MUTUAL AID IS CALLED) – Not Required.

To	By Whom/ Media	Standard	Performance
IOCL		2 min. after receiving information to Emergency Control Room	
HPCL			
JINDAL SAW			
ADANI POWER			
CGPL			
HMEL			

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

RESPONSE TIME PERFORMANCE OF ACTION

Agency	Standard Time	Performance	Rating (Max. 9/ Block)	
			+VE Marks	-VE Marks
Ambulance	1-2 Min		8	
Safety	4-5 Min		9	
Fire Services	4-5 Min		9	

A. PERFORMANCE OF OHS & F SERVICES & RESCUE SERVICES

Performance	Performance	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Turn out/ response time of Fire Team	Fire team reached at site within benchmark of response time.	3	
Turn out/ response time of OHC Team	OHC team reached at site within benchmark of response time.	3	
Turn out/ response time of Safety Team and in coordination with incident controller mobilisation of personnel and resources.	Response time of Safety team is within benchmark and will coordinate with incident controller for mobilisation of personnel, resources, PPE's etc.	3	
Firefighting at the site	Immediately start the fire fighting on fire tank also cooling started nearby tank.	3	
Medical attention at the site	Immediately first aid given by medical staff.	3	
Rescue of person	Immediately rescue of casualties by fire team by using SCBA set and Fireman lift.	3	

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

B. PERFORMANCE OF MAINTENANCE DEPARTMENT

Performance	Performance	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Power shut down/ cut off	As per guided by incident controller immediate power shut off by maintenance.	3	
Immediate arrangements at the site	Maintenance staff reached at site after completion of drill as incident controller failed to communicate with LT maintenance staff (Mr. Dinesh- Cell Phone was engaged in other Call)	0	2
Mobilizing of personnel and resources		0	2
Maintenance activities being carried out at the site		0	
Clearing debris		0	
Other arrangement at required to meet emergency		0	

C. PERFORMANCE OF SECURITY SERVICES

Performance	Performance Rating	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Turnout of Security	Security team took more time than benchmark (12 min) because of non-availability of Spark arrestor for vehicle.	2	
Performance of security guards	Security guards closed the main gate & Exit lane of Liquid by passed / freed from punching easy flow of people by security team.	3	
Security officer's command & control	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter the gate.	3	
Area cordoned off	Not Applicable in this scenario.	3	
Prevent unwanted/ unauthorized entry into this area	Security officers restrict the entry of	3	

	unauthorized persons / also ensure that vehicles do not enter the gate also co-ordinate properly with incident controller.		
Closer of gates	Vehicle & man movement entry gates closed by security guard.	3	
Providing security coverage at main gate and directing concern person to the site	Done by operational person.	3	

D. PERFORMANCE OF OPERATION/ CONCERN DEPARTMENT

Performance	Performance Rating	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Immediately pass the communication message through VHF / other available media to subordinates & emergency response team.	Communication / Information on emergency conveyed to all concern by incident controller.	3	
Stopping of operation / like critical operations first & on priority basis	All operations stopped by incident controller except unloading at encl.03	3	
Emergency response of particular department at site	Response time of concern department found adequate.	3	
Support for evacuation of people at site and head count along with HR/ Admin	Evacuation being done properly by security team.	3	
Availability and response of emergency kit / equipment / Other.	Emergency kit was not mobilized at scenario for controlling the spillage.	0	
Audibility of the scenario on PA System by Persons	PA system is not available at site.	0	

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Good Observations:

1. Communication / Information on emergency conveyed to all concern by incident controller.
2. Rescue of casualties by fire team by using SCBA set and Fireman lift.
3. Exit lane of Liquid bypassed / freed from punching easy flow of people by security team.
4. Response of Emergency Agencies was satisfactory.

Observer – I: Dattatray K Gore

1. The siren is not audible near T-30.
2. Maintenance personnel reached incident site after the Emergency was terminated.
3. Looking at the wind direction, cooling was required on surrounding tanks (T-19 & 20) depending upon the radiations from the fire.
4. HR & Admin team could not reach time due to message failure form POC.
5. Two fire crews entered Tank Farm / dyke wall without donning SCBA.
6. The fire team was trying to connect hose to Fire Hydrant H-18 to replenish water in Fire Tender but there were issues in coupling fitting.
7. The golf car & yo bike which are battery operated need to be checked for flame/ spark-proof enclosure to prevent any fire incident.

Observer – II: Mr Manan Bhatt

1. Immediate rescue/ emergency operation were initiated by the Liquid Staff present at the site
2. Coordination of Fire and OHC was very well done for rescue of 2 workforces (suffered in the incident)
3. Access control at the out gate was made free for evacuation of workforce at Liquid Terminal
4. Siren was not blown or not audible across Liquid Terminal

5. Means of communication should be in a language which can be understood by all (preferably Hindi or English)
6. Area was not cordoning by security team (in order to prevent unwanted staff at the location).
7. Verification needs to be carried out to ensure that the site is evacuated by entire workforce (PA system was not used for evacuation)
8. Security team were observed with non-flameproof VHF.
9. ES – LT team reached at 12:03 (after termination of drill)

Overall rating

Marks from 95 to 100 - Excellent

Marks from 90 to 95 - Very Good

Marks below 90 - Needs Improvement

VOTE OF THANKS:

Vote of the thanks by LT Head Mr. R Vijayan, Mr Dattatray Gore (OHS) & Rakesh Chaturvedi (Fire) & and him given to the special thanks to all team members of mock drill participants.

SUPPORTING STAFF:

Drill Organized By	:	Mr. Bhushan Bhatt / Mr. Rana Bambhaniya
Drill guided By	:	Mr. R Vijayan
Exercise Performance Assessor	:	Mr. Dattatray Gore / Mr. Manan Bhatt
Site incident controller	:	Mr. R Vijayan / Mr. Hitesh Bhalani
Report prepared By	:	Mr. Rana Bambhaniya / Mr. Manan Bhatt

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

COMPLIANCE REPORT FOR MOCK DRILL

Plant/ Facilities : Liquid Terminal
Date of Mock Drill : 10.04.2017

#	Recommendations	Action Taken/ Date	Date of Completion
1	Emergency Siren was blown however audibility of the same was very low which needs to be checked and rectified	Fire / LT	
2	SPOC (Single point of Contact) of Maintenance staff shall identify and common contact number should be displayed in LT control room.	LT Maint.	
3	A point was raised regarding non availability of Maintenance Engineers during night hours for handling Emergency situations. Technicians are available. It was decided that assistance from ES-CT or ES-MHS could be asked and contact nos. of shift Incharge shall displayed in LT Control.	LT	
4	Operation / Incident controller shall assess the catastrophic effects of the incident and accordingly guide the Fire team regarding requirements for cooling the adjacent tanks.	LT / Fire	
5	It was observed that text messages were floated by Port Operation Control regarding the emergency situation but it was not delivered to HR and HOS-Safety. Proper / Adequate means of Communication needs to be identified.	POC	

6	Two Firemen rescued the causality safely but they failed to assess the risk & entered Tank Farm / dyke wall without donning SCBA. Fireman should be trained on assessing the risk during rescue.	Fire	
7	The fire team was trying to connect hose to Fire Hydrant H-18 to replenish water in Fire Tender but there were issues in coupling fittings. Coupling connections needs to be looked for their functionality.	Fire	
8	The golf car & Yo-bike which are battery operated need to be checked for flame/ spark-proof enclosure to prevent any fire incident.	E&I	
9	Evacuation (whether all people from the terminal have turned out from Terminal) should be ensured by security / operations team during emergency situations.	Security / LT	
10	Security staff entered the Terminal with VHF which was not intrinsically safe. Intrinsically Safe VHF shall be used inside terminal for all the time.	Security	
11	It was observed that during emergency all the communications were happening in Gujarati / Hindi language. Means of communication should be in a language which can be understood by all (preferably Hindi or English depends)	All	
12	Checklist should be developed for emergency situations containing sequence of communications and actions for reference of Incident Controller.	LT	

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Date	:	12th July 2017
Time	:	1125 hrs.
Location	:	Liquid Terminal – Tanker Parking Area
Type/Text of the Scenario	:	Collision of Tanker & Leakage of Ethyl Alcohol

INTRODUCTION:

Security guard Mr. Amol Singh (stationed at Liquid Terminal main gate) observed that two tankers collided with each while coming out of the parking area, immediately he informed to Liquid Control room Mr. Hitesh Bhalani. Immediately Liquid in-charge informed to Fire, POC, OHC, Safety & Security. POC subsequently intimated the same through message/ call to all concern departments. Mr. K R Rao (incident controller) immediately reached the site and took control of the emergency situation.

LOCATION (WITH PHOTOGRAPH):

SEQUENCE OF EVENTS WITH PHOTOGRAPHS:

Incident Spot : Liquid Tanker Parking

First Responder informed to Incident Controller

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MOCK DRILL REPORT

Incident Controller Reached at Site	Security Team Reached at Site
Fire Tender Reached at Site	Fire Team Reached at Site
Ambulance Reached at Site	Maintenance Staff Reached at Site

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Mobilization Of Spill Kit, Mobile Pump Etc. At Site	Inspection of Area
Spill Kit for Collecting Spillage Material	Use of Appropriate PPE's
All Clear given by Incident Controller	Briefing

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Observer – Mr Rakesh Chaturvedi & Mr Manan Bhatt	**De-Briefing Meeting**

RESPONSE TIME:

#	Description		Exact Time
1.	First responder informed to Incident Controller	:	11:25 AM
2.	Incident controller comes on site	:	11:26 AM
3.	Declaration of Emergency	:	11:26 AM
4.	Security team reaching time at incident point	:	11:25 AM
5.	Fire Tender reaching time at incident Point	:	11:27 AM
6.	Ambulance reaching time at incident Point	:	11:26 AM
7.	Departure of Ambulance with patient	:	NA
8.	Ambulance reached at OHC	:	NA
9.	First person at Assembly Point	:	--
10.	Last person at Assembly Point	:	--
11.	Maintenance/ Rescue Arrangement at site	:	11:28 AM
12.	Corporate Affairs team reaching on site	:	-
13.	Liaoning officer reached at site	:	11:35 AM
14.	Audibility of the scenario on PA system	:	-
15.	Termination of Emergency	:	11:50 AM

Note: For more than one assembly point, please mention details for point 10 & 11.

COMMUNICATION & ACTIONS:

Action By	Information To / Action By	Remarks
First Responder	Information given to incident controller about situation / scenario.	
Site Incident Controller	Assess the site and declare emergency.	
Concern Department/ Area In-charge	Inform to POC, Security, Fire, Medical, Safety etc.	
Engineering Services	Maintenance team reached at site and discussed with incident controller about spill control, immediate mobilization of spill kit and mobile pump for spill	

	control.	
Corporate Affairs	Information was not passed	
HR/ Admin	Reach at site but not aware about what action taken.	
Safety	Discuss to mitigate catastrophic effects with incident controller and ask for any add or services required like PPE's, Ambulance etc.	
OHC	Ambulance reached at site and help for the treatment, but there is no any causality.	
Security Control Room	Controlled the traffic movement and barricade the area. Diverted the people to assembly point	
Fire Control Room	Immediate responded at the site and mobilized the fire tender and arranged stand by fire man to the control situation.	

COMMUNICATION TO MUTUAL AID GROUP
(IF REQUIRED, AS AND WHEN MUTUAL AID IS CALLED) – Not Required.

To	By Whom/ Media	Standard	Performance
IOCL		2 min. after receiving information to Emergency Control Room	
HPCL			
JINDAL SAW			
ADANI POWER			
CGPL			
HMEL			

RESPONSE TIME PERFORMANCE OF ACTION

Agency	Standard Time	Performance	Rating (Max. 9/ Block)	
			+VE Marks	-VE Marks
Ambulance	1-2 Min	**1 Min**	**9**	**-**
Safety	4-5 Min	**2 Min**	**9**	**-**
Fire Services	4-5 Min	**1 Min**	**9**	**-**

A. <u>PERFORMANCE OF OHS & F SERVICES & RESCUE SERVICES</u>

Performance	Performance	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Turn out/ response time of Fire Team	Fire team reached at site within benchmark of response time.	**3**	**-**
Turn out/ response time of OHC Team	OHC team reached at site within benchmark of response time.	**3**	**-**

Turn out/ response time of Safety Team and in coordination with incident controller mobilisation of personnel and resources.	Response time of Safety team is within benchmark and coordinated with incident controller for mobilisation of personnel, resources, PPE's etc.	3	-
Firefighting at the site	Immediately fire team reached at spot and extend the support required for spill control.	3	-
Medical attention at the site	Confirm causalities with incident controller and extend support for the same.	3	-
Rescue of person	Reached with SCBA and necessary resources	3	-

B. PERFORMANCE OF MAINTENANCE DEPARTMENT

Performance	Performance	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Power shut down/ cut off	NA Maintenance team was stand-by at the location for necessary action.	3	-
Immediate arrangements at the site	All the necessary arrangement were made and resources were mobilised immediately	3	-
Mobilizing of personnel and resources	Immediately mobilize the spill kit and mobile pump for spill control.	3	-
Maintenance activities being carried out at the site	Spill control activity done with proper/ adequate PPE's	3	-
Clearing debris	NA Spill was controlled immediately and was recovered Environment team was also present at the site.	2	1
Other arrangement at required to meet emergency	Extend electrical cable for the mobile pump connection.	3	-

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

C. PERFORMANCE OF SECURITY SERVICES

Performance	Performance Rating	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Turnout of Security	Security team reached at site within benchmark of response time.	3	-
Performance of security guards	Security guards closed the main gate & barricade the area near by incident spot.	3	-
Security officer's command & control	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter the gate. Announcement through PA/ mike was required to clear all the drivers in the vicinity.	2	1
Area cordoned off	Immediate barricade the area nearby incident spot. Barricading was required to be extended as it was alcohol	2	1
Prevent unwanted/ unauthorized entry into this area	Security officers restrict the entry of unauthorized persons / also ensure that vehicles do not enter at the parking area also co-ordinate properly with incident controller.	3	-
Closer of gates	Vehicle & workforce movement at entry gates was monitored and restricted.	3	-
Providing security coverage at main gate and directing concern person to the site	Done by security guard.	3	-

D. PERFORMANCE OF OPERATION/ CONCERN DEPARTMENT

Performance	Performance Rating	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Immediately pass the communication message through VHF / other available media to subordinates & emergency response team.	Communication / Information on emergency conveyed to all concern by incident controller.	3	-
Stopping of operation / like critical	All outside operations	3	-

operations first & on priority basis	were stopped by incident controller.		
Emergency response of particular department at site	Response time of concern department found adequate.	**3**	**-**
Support for evacuation of people at site and head count along with HR/ Admin	Evacuation done along with OHS and Security Team. HR person was not aware about the role (as was new) and hence head count was done along with operation and security.	**1**	**2**
Availability and response of emergency kit / equipment / Other.	Emergency kit was mobilized at scenario for controlling the spillage.	**3**	**-**
Audibility of the scenario on PA System by Persons.	PA system or other arrangement were not available at the site	**0**	**3**

Good Observations:

1. Response time of the emergency services was very quick and good
2. Resources were also mobilised immediately
3. Response time of maintenance team was quick.
4. Use of non-sparking tools was used by maintenance team during the drill to control the spill.
5. Use of appropriate PPE's was observed

Observer – I & II:

- No siren was blown during the emergency (availability of manual siren to be checked when drills are planned in outside premises)
- Unwanted/ unauthorised people were found near/ too close to the emergency location
- Wind direction was not taken into account while mobilizing resources.
- LEL and Air was not monitored to have extra precaution in place.
- Route of emergency vehicles was blocked.
- Mobile phone were used at the emergency location
- Barrication was done to close to the location. Depending upon the cargo and scenario barrication to be done in consultation with Incident Controller
- Lack of awareness on the role/ action to be taken during emergency was observed e.g. HR/ Admin, extra maintenance staff, immediate actions at the locations (to be covered during training program)
- Identification of incident controller and observer was not observed.

ADANI PORTS & SPECIAL ECONOMIC ZONE LIMITED

MOCK DRILL REPORT

Overall Rating

Overall rating of the mock drill conducted at is 86.

Marks from 95 to 100 - Excellent
Marks from 90 to 95 - Very Good
Marks below 90 - Needs Improvement

VOTE OF THANKS:

Mr. K R Rao, Mr. Rakesh Chaturvedi and Mr. Manan Bhatt thanked all the staff involved in the drill. Mr. K R Rao also thanked OHS, fire, security, maintenance and environment team for their immediate response. It was also decided to conduct such drills at evening/ night time.

SUPPORTING STAFF:

Drill Organized By : Mr. Bhushan Bhatt and Mr. Rana Bambhaniya

Drill Guided By : Mr. K R Rao

Exercise Performance Assessor : Mr. Rakesh Chaturvedi and Mr. Manan Bhatt

Site Incident Controller : Mr. K R Rao (along with Mr. Hitesh Bhalani)

Report Prepared By : Mr. Manan Bhatt and Mr. Rana Bambhaniya

COMPLIANCE REPORT FOR MOCK DRILL

Plant/ Facilities : Liquid Terminal
Date of Mock Drill : 12.07.2017

#	Recommendations	Action Taken/ Date	Date of Completion
1	No siren was blown during the emergency	OHS & IC	
2	Unwanted/ unauthorised people were found near/ too close to the emergency location	Security/ OHS & IC	
3	Wind direction was not taken into account while mobilizing resources	Liquid – Ops & Maintenance	
4	LEL and Air was not monitored	Liquid – Ops & Maintenance	
5	Route of emergency vehicles was blocked	Security & IC	
6	Mobile phone were used at the emergency location	Security/ OHS & IC	
7	Barrication was done to close to the location. Depending upon the cargo and scenario barrication to be done in	Security/ OHS & IC	

	consultation with Incident Controller		
8	Lack of awareness on the role/ action to be taken during emergency was observed e.g. HR/ Admin, extra maintenance staff, immediate actions at the locations	TT & OHS	
9	Identification of incident controller and observer was not observed	OHS & IC	

MOCK DRILL REPORT

DATE : 07th April2015
TIME : 15:00 Hrs
LOCATION : (CT-3)
SCENARIO : Evacuation Mock drill In case of any emergency.

INTRODUCTION:
Assuming that Mr. Bhavesh Dave (Shift incharge) got a Message from POC, there is emergency and Ct-3 likely needs to be vacated. He informed immediately the emergency situation to CT -3 towers Control @ 1500 Hrs. Simultaneously informed to OHC, Fire, and Safety & Security. POC subsequently intimates the same through message or telephonic to all concern departments.

LOCATION (WITH PHOTOGRAPH): CT-3

SEQUENCE OF EVENTS (WITH PHOTOGRAPHS AND TIME):

Person coming out from the jetty to assembly point by bus:

Ct-3 Mock drill

Evacuated person assembled at the assembly point :

Instruction given at the assembly point:

Action carried out by bhavesh Dave:

CALLING TIME OF THE DRILL

Drill commenced	: 15:00 Hrs
Informed Port Control	: 15:01 Hrs
Called OHC Assistance	: 15:03 Hrs
Called to fire service assistance	: 15:04 Hrs
ERT assistance	: 15:04 Hrs
Safety	: 15:05 Hrs
Engineering Ct-3	: 15:05Hrs

Responding:

Shift Manager rushed the spot	: 15:05Hrs
Ambulance arrived at the spot	: 15:09 Hrs
QHS Department	: 15:10 Hrs
Fire tender reached at the scene	: 15:03 Hrs
Security personnel	: 15:07 Hrs
All Man Power assembled	: 15:23 Hrs
All clear (inform to POC control room)	: 15:30 Hrs

Total number of person working inside the AICTPL-CT-3:

Concern Person work inside the CT-3	Actual Man power of CT-3	Assembled man power CT-3
Superintendent	1	1
Wharf and yard supervisor.	1	1
Driver LMV/HMV	22	22
Security	7	7
RTGC Opt.	21	21
QC	2	2
Checker	22	22
Gate operator	08	08
Surveyor	4	4
Canteen	10	10
ITV supervisors	2	2
Engineering person	52	52
Lasher	15	15
Total	167	167

AREA OF IMPROVEMENT:

- One QC boom was in down condition. (Action to be taken by the operation by imparting training to the concern person).

- No siren facility available inside the Ct-3 wharf and office area.(Action to be taken by the K.P.parmar)

GOOD OBSERVATION:

- Quick response of yard checker and yard supervisor.
- Good response and immediate action by the Fire team and medical team
- Good response and immediate action by the Security team.

VOTE OF THANKS:

Vote of the thanks by Mr. Bhavesh Dave & Mr Nitin Mehta, Mr. Cherian and Mr. Sudarpal and Vinod Rajput given to the special thanks to all team members of mock drill participants.

SUPPORTING STAFF:

Operation & egg CT-3	:	Mr. Bhavesh Dave Paulson joseph Hari deshani
Fire Team	:	Mr. Viren Arya (In charge) & Firemen Staff
Medical Team	:	Mr. Gulam (Medical Assistant)
Security Team	:	Mr. Sanjay rathod (ERT) and Security Guards
QHSE Team	:	Mr. Vinod Rajput (Shift In charge)
Observation Team	:	Mr. Manan Bhatt (QHSE) Mr. Nitin N. Mehta (Head QHSE)

Drill Organized By : Mr. Paulson joseph
Drill guided By : Mr. Vinod Rajput
Exercise Performance Assessor : Mr. Vinod Rajput
Site incident controller : Mr. Cherian abhram
Report prepared By : Mr. Vinod Rajput/ Paulson joseph

SUMMARY (OPTIONAL – BUT FOR INTERNAL REFERENCE): Action to be carried out as per our EAP. Is as below.

Expected action As per the DMP Detailed Event.	Action taken	Remarks
Site Main Controller : - Shall ensure all possible assistance to personnel affected for medical attention and hospitalization as appropriate	Has been informed by site incident controller	Done and very well performed
Site Incident Controller Shall immediately assess the scale of emergency and report to Site Main Controller for instructions/ directions and Shall liaise with other heads of department for their support	We informed to authority for assistance.	Performed very well - Informed the concern for mitigation action

and assistance and shall ensure continual reporting of situation to Site Main Controller and shall recommend calling for external resources as appropriate.		
HOS – Administration Shall report to Site Incident Controller immediately and assist him as directed.	2 nos.of buses reported at the side.. Bus reported from the adani. House.	-----transport facility provided by the admin team.
HOD – Human Resources Shall report immediately to Site Incident Controller and assist him as directed.	------	Head count by the shift in charge.
HOD – Corporate Affairs Shall report immediately to Site Incident Controller and assist him as directed.	-------	-------
HOD/ HOS – Engineering Services Shall report immediately to Site Incident Controller and assist him as directed.	Good response of shift in charge and engineering team	Every one participated in the drill.
HOD/ HOS – Commercial shall ensure availability of materials required by the Site Incident Controller.	----	----
HOD/ HOS – Finance & Accounts shall report immediately to Site Incident Controller and assist him as directed.	----	----
HOD/ HOS – Security shall instruct the security personnel to occupy pre-determined post for controlling security of installation.	Shall close the gate and control the man & vehicle movement.	Security restricted entry of the gate for labors and vehicles movement assembly point near Ct-3 main gate.
HOS – Fire Services will normally function as an advisor to the Site Incident Controller.	Fire staff shall reached to site for attending emergency.	Done – reached immediately and attend the emergency.
HOD/ HOS – Safety shall report at Emergency Control Center	Shall assist Site Main Controller with necessary information, support and resources.	Safety officer reached at site and guided the situation.
HOS – Occupational Health Center Contact Site Main Controller.	Reported at site.	Medical staff immediately reached with ambulance.

Date	:	24.08.2017
Time	:	16:00 Hrs
Location	:	AMCT- STS 01
Type/Text of the Scenario	:	We assumed that One Lasher of M/s Zenith Ent Mr.Rajni fall In Sea while getting down from vessel gangway. Immediately Deck Checker informed wharf supervisor details to tower control through VHF and to Shift Superintendent Mr. RadhaKrishana .Tower control immediately informed to Fire, Medical, Security, OHC Ambulance, Safety, POC team.

INTRODUCTION:

Mock drill was decided and Pre-Meeting was conducted at 15:00 hrs with Duty superintendent, terminal Manager and, Yard supervisors, Planner, Security Team, OHC staff and Tower controllers. Scenario and execution plan was decided in the meeting.

Fig 1- Deck Checker informed to wharf sup and tower control regarding the incident

LOCATION (WITH PHOTOGRAPH):

EQUENCE OF EVENTS (WITH PHOTOGRAPHS AND TIME):

Fig 2- Lasher Sup Mr.Ajay Through the lifeboya for immediate action and help.

Fig 3- Security & ERT Arrived at site and Shift manager explain about the incident

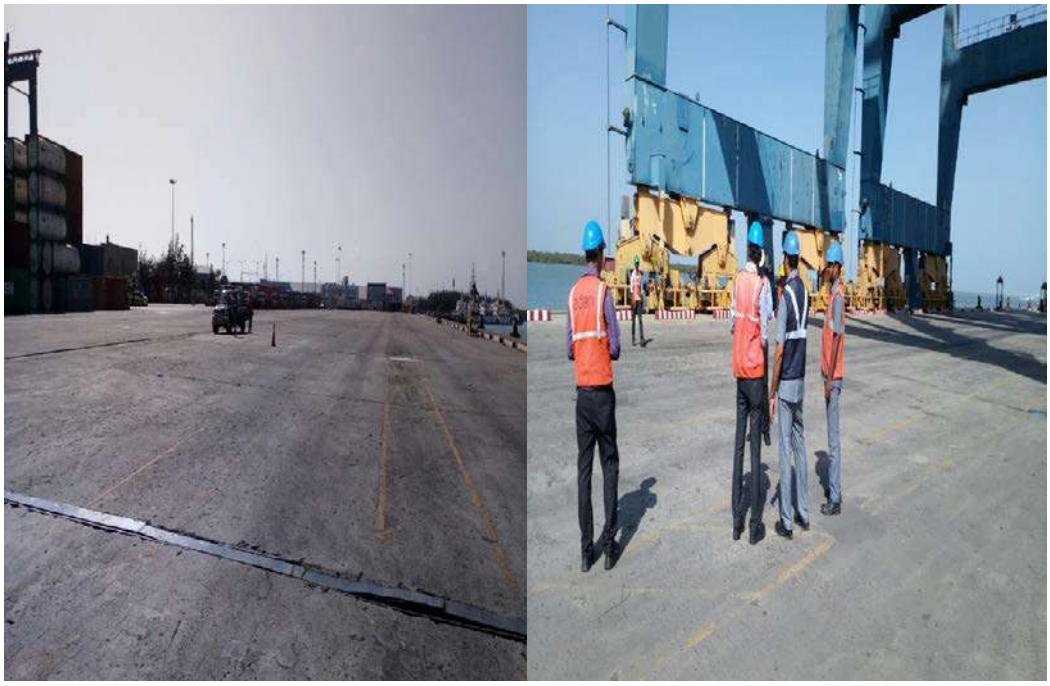


Fig 4- Lasher identified and removed from the Sea with help of lifebuoy

Fig 5- Arrival of Ambulance at Site and check the vicim condition

Fig 6- OHC staff shift the victim to hospital

Fig 7- call off the mock drill and briefing the situation to staff

Fig 8- Vote of thanks by Mr. Jignesh bhatt a& Mr. Vinod Rajput

RESPONSE TIME:

#	Description		Exact Time
1.	First responder informed to Incident Controller	:	16:01 Hrs
2.	Incident controller comes on site	:	16:03 Hrs
3.	Declaration of Emergency	:	16:00 Hrs
4.	Security team reaching time at incident point	:	16:03 Hrs
5.	Fire Tender reaching time at incident Point	:	Not Reported
6.	Ambulance reaching time at incident Point	:	16:04 Hrs
7.	Departure of Ambulance with patient	:	NA
8.	Ambulance reached at OHC	:	NA
9.	Rescue Arrangement at site	:	16:04 Hrs

TOWER CONTROL RESPONSE TIME

Sr No.	Particulars	Information provided	Service Received
1	First responder to Tower control	15:59 Hrs	NA
2	Tower control has informed to Medical	16:01 Hrs	16:03 Hrs
3	Tower control has informed to Safety department	16:03 Hrs	16:05 Hrs
4	Tower control has informed to Fire Department	16:02 Hrs	Not Reported
5	Tower control has informed to Security	16:03 Hrs	16:06 Hrs
6	Tower control Informed to POC	16:00 Hrs	16:02 Hrs

COMMUNICATION & ACTIONS:

Action By	Information To/Action By	Remarks
First Responder	Wharf Sup Informed to tower control regarding the scenario	
Site Incident Controller	Site Incident controller discussed with security team and OHC team for victim rescue and condition of victim	
Concern Department/ Area In-charge	Inform to POC, Security, Fire, Medical, Safety etc.	
Engineering Services	NA	
Corporate Affairs	NA	
HR/ Admin	NA	
Safety	Guided the wharf supervisor for recue to victim	
OHC	Reached the site with ambulance and medical staff	
Security	Controlling the traffic at in gate and stop the traffic movement in main road.	
Fire Control Room Inform	Not Reported at Site	

COMMUNICATION TO MUTUAL AID GROUP
(IF REQUIRED, AS AND WHEN MUTUAL AID IS CALLED)

To	By Whom/ Media	Standard	Performance
IOCL		Not Required	
HPCL			
JINDAL SAW			

ADANI POWER			
CGPL			
HMEL			

RESPONSE TIME PERFORMANCE OF ACTION

Agency	Standard Time	Performance	Rating (Max. 9/ Block)	
			+VE Marks	-VE Marks
Ambulance	Response was good and they reached within 2 minutes	Good	7	
Safety	Response was good and they reached within 2 minutes	Help for resources	7	
Fire	Not Reported at Site			
Security	Response was good and they reached within 3 minutes	Control the traffic and monitoring	7	

A. <u>PERFORMANCE OF OHS Team</u>

Performance	Performance	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Identified the Person and through the life boya for help the victim	Excellent work done by the lasher supervisor and wharf supervisor	**3**	
Turn out/ response time of OHC Team	Response was good and they reached within 2 minutes	**3**	

Turn out/ response time of Safety Team and in coordination with incident controller mobilisation of personnel and resources.	Response time of Safety team is within benchmark.	**3**	
Medical attention at the site	Very good support	**3**	

B. PERFORMANCE OF SECURITY SERVICES

Performance	Performance Rating	Rating (Max. 3 per Block)	
		+VE Marks	-VE Marks
Turnout of Security	Security team reached at spot within 03 minutes.	**3**	
Performance of security guards	Security guards barricaded the area and stopped the traffic movement in main road.	**2**	
Security officer's command & control	Security officers Ensure that vehicles do not enter the incident location.	**3**	
Prevent unwanted/ unauthorized entry into this area	Security officers restrict the entry of unauthorized persons	**3**	
Closer of gates	Security officers controlled the traffic at both gates	**3**	
Providing security coverage at main gate and directing concern person to the site	Excellent	**3**	

Observer – I Mr. Vinod Rajput) (General Observation)

Observer – II (Mr. Jignesh Bhatt)(Performance of Employees at the Site (Company/ Visitors))

1. **Overall rating**

Marks from 95 to 100 - Excellent

Marks from 90 to 95 - Very Good

Marks below 90 - Needs Improvement

COMPLIANCE REPORT FOR MOCK DRILL

Plant/ Facilities : AMCT
Date of Mock Drill : 25.08.2017

#	Recommendations	Department	Date of Completion
1	Lifebuoys training required for staff how to react while emergency	CT Training	
2	Lifebuoys Rope always kept with properly	Operation	
3	Emergency response training to be required	CT safety	

Name & Signature of Concern HOD:

VOTE OF THANKS:

Vote of the thanks to AMCT Operation team, Mr Jignesh Bhatt, Mr. Mr. Vinod Rajput and Nikhil Dangariya (OHS) Fire, Security & Medical Staff and special thanks to all team members of mock drill participants.

SUPPORTING STAFF:

Operation	**:**	Mr. RadhaKrishna, Ishwarsinh Gohil and Mayank M
Medical Team	**:**	Mr. Sanjay (Medical Assistant)
QHSE Team	**:**	Mr. Vinod Rajput and Nikhil Dangariya
Observation Team	**:**	Mr. Vinod, Mr. Jignesh Bhatt & Mr. Nikhil Dangariya

Drill Organized By : Mr.Radhakrishna Mr. Nikhil Dangariya

Drill guided By : Mr. Nikhil Dangariya/ Mr. Vinod Rajput

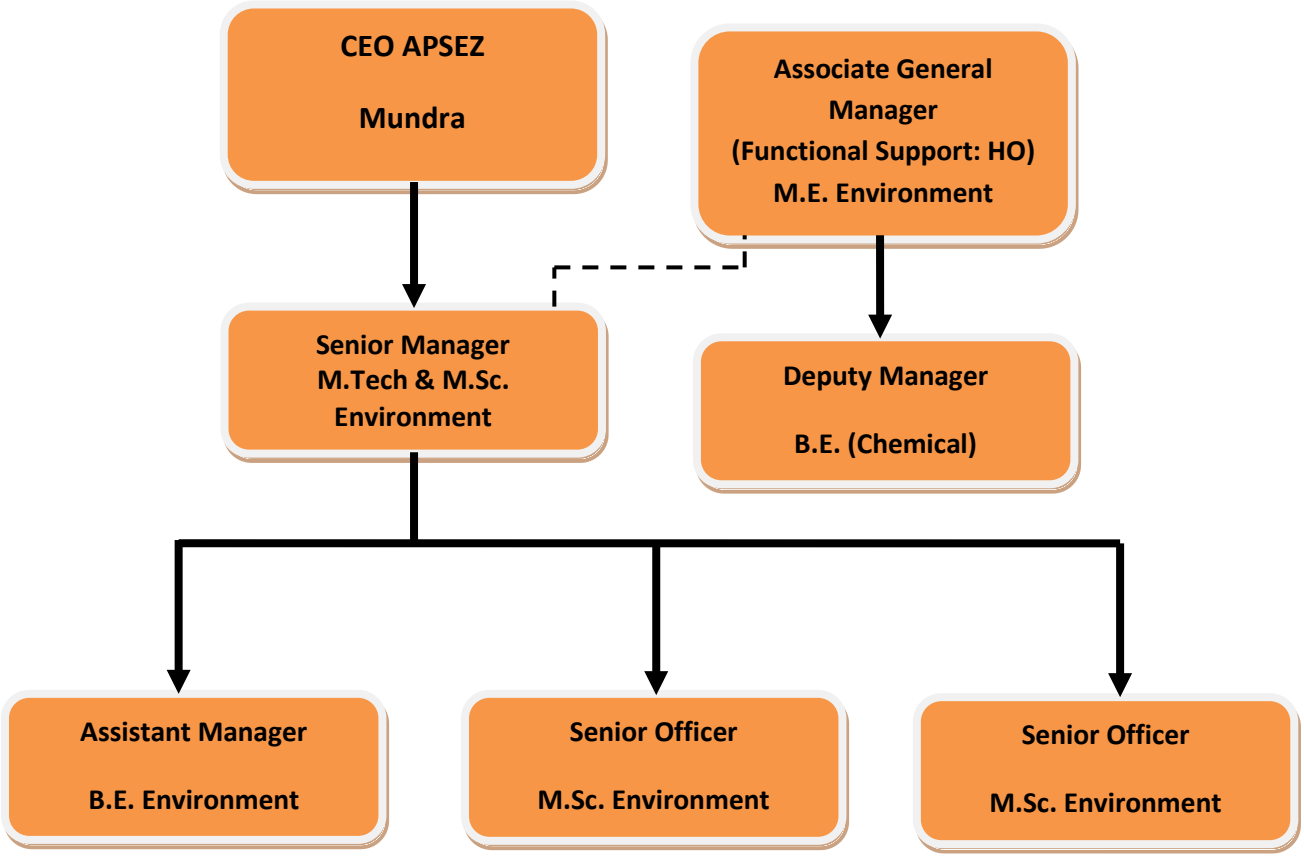
Exercise Performance Assessor : Mr. Nikhil Dangariya

Site incident controller : Mr.Radhakrishna

Report prepared By : Mr. Nikhil Dangariya/ Mr. Vinod Rajput

Annexure – 10

Organogram of Environment Management Cell, APSEZ, Mundra



Annexure – 11

Cost of Environmental Protection Measures

Sr. No.	Activity	Cost incurred (INR in Lakh)			Budgeted Cost (INR in Lakh)
		2015 – 16	2016 – 17	2017 – 18	2017 – 18
1.	Environmental Study / Audit and Consultancy	45.45	36.78	9.00	21.00
2.	Legal & Statutory Expenses	3.30	4.76	9.48	16.00
3.	Environmental Monitoring Services	26.80	27.95	12.00	36.00
4.	Hazardous / Non Hazardous Waste Management & Disposal	34.56	12.52	31.9	90.84
5.	Environment Day Celebration	7.18	6.71	2.68	10.00
6.	Treatment and Disposal of Bio-Medical Waste	1.22	1.27	0.75	1.44
7.	Mangrove Plantation, Monitoring & Conservation	73.64	72.38	60.0	60.0
8.	Other Horticulture Expenses	434.72	555.00	494.0	556.5
9.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	18.18	61.50	39.89	69.35
10.	Expenditure of Environment Dept. (Apart from above head)	135.90	131.83	22.83	104.91
	Total	**837.73**	**910.70**	**682.53**	**966.04**