



APSEZL/EnvCell/2016-17/041

Date: 28.11.2016

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 of "Single Point

Mooring (SPM), Crude Oil Terminal (COT) and connecting pipes at Mundra

Port, District Kachchh by M/s. Adani Ports & SEZ Limited"

Ref : Environment clearance granted to M/s Adani Ports & SEZ Ltd. vide letter dated 21st

July, 2004 bearing no. J-16011/30/2003-IA-III.

Dear Sir,

Please refer to the above cited reference for the said subject matter. In connection to the same, it is to state that copy of the compliance report for the Environmental / CRZ Clearance for the period of April – 2016 to September – 2016 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

heavan

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

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Environmental Clearance Compliance Report

of



SPM, Crude Oil Terminal and Connecting Pipes

at Mundra Port, Dist. Kutch, Gujarat of Adani Ports and SEZ Limited

Period: April-2016 to September-2016



<u>Index</u>

Sr. No.	Particulars		
1	Compliance Rep	ort	1-8
2	Annexures		
	Annexure - A	Compliance report of CRZ recommendations	9-14
	Annexure – 1	Annexure – 1 Greenbelt Development & Mangrove Afforestation Details	
	Annexure - 2	Annexure – 2 Oil Spill Contingency Plan	
	Annexure - 3	exure – 3 Summary of Environment Monitoring	
	Annexure - 4	re – 4 Various Environmental Initiatives taken	
	Annexure - 5	5 Typical Oil Spill Drill Report	
	Annexure - 6	Annexure – 6 Details on CSR activities by Adani Foundation	
	Annexure - 7	Annexure – 7 Detail information on firefighting facility	
	Annexure - 8 Environment Management Cell Organogram		192
	Annexure - 9	Detail on Budget spent for Environment Protection Measures	193

Compliance Report



From : April'16
To : September'16

Status of the conditions stipulated in Environment Clearance

MoEF	MoEF vide letter no. J-16011/30/2003-IA.III dated 21st July 2004		
Sr. No.	Conditions	Compliance Status as on 30-09-2016	
		30 03 20.0	
	pecific Condition	O I' . I	
1.	Mangrove afforestation in 25 ha of area, suitably identified in consultation with State Forest Department. The GAPL shall bear the cost of the said land as well as the cost of the plantation of mangroves and its sustenance and implant within 6 months from the date of clearance of this letter. Further, it shall be ensured that mangroves in the vicinity of the salt works are not affected due to the project.	Complied. Details of the mangrove plantation along the rail yard were submitted to the MoEF & CC along with half yearly compliance report Apr – 2013 to Sep – 2013. And there is no further change.	
2.	In addition to the mangrove plantation, GAPL should also take up massive green belt developments in 30 acres of land in and around the project in consultation with the Forest Department. Detailed plan indicating the area identified for the mangrove plantation as indicated at (i) above and for green belt development along with the financial outplay shall be provided to this ministry within 6 months from the date of receipt of this letter.	Complied. Details of the mangrove plantation along the rail yard were submitted to the MoEF & CC along with half yearly compliance report Apr – 2013 to Sep – 2013. Details of green belt developed within APSEZ and mangrove afforestation and green belt area development details are attached as Annexure – 1 .	
3.	No dredging activity shall be carried out.	Complied. Project has been completed & in operation stage.	
4.	No ground water should be tapped at the project site / within CRZ area.	Complied. Entire water requirement is sourced from Narmada water and desalination plant of M/s APSEZL.	
5.	Adequate facilities as listed in National Oil spill Disaster Contingency Plan for the Mundra Port which includes firefighting equipment of 1200 cum/hr spray capacity with 2 monitor fitted with the dolphin 2, 3, 4 and 5 oil spill dispersant foam liquid etc. should be maintained and put into operation immediately in case of oil spills.	Complied. Oil spill contingency plan is in place and implemented. Updated Oil spill contingency plan is attached as Annexure - 2.	



From : April'16

To : September'16

Status of the conditions stipulated in Environment Clearance

MOLI	vide letter no. 5-100 175072005-1A.III dated 21 3dly 2004		
Sr. No.	Conditions	Compliance Status as on 30-09-2016	
6.	The duration of construction phase of the project should be kept to a maximum of 8 months to avoid impact on marine environment and birds as suggested by NIO.	Complied. Construction completed and project is in operation.	
7.	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	Complied. The project is in operational phase. There was no habitation and fishing activity at the project location during construction.	



From : April'16

To : September'16

Status of the conditions stipulated in Environment Clearance

MOEF	MoEF vide letter no. J-16011/30/2003-IA.III dated 21st July 2004		
Sr.	Conditions	Compliance Status as on	
No.	Conditions	30-09-2016	
8.	The project proponents must make necessary arrangements for disposal of solid wastes and for the treatment of effluents / liquid wastes. It must be ensured that the effluents / liquid wastes are not discharged into the seawater.	Complied. APSEZL has adopted 5R principle for environmentally sound management of different types of wastes. Municipal Solid Waste - A well-established system for segregation of dry & wet waste is in place, by which all wet waste (Organic waste) is being segregated & utilized for compost manufacturing, compost is further used in house for horticulture purposes. 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. TSDF 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. Liquid Effluent & Sewage - It is being treated at ETP/STP plants, treated water from ETP/STP is being used for horticulture purposes. Monitoring is being carried out by NABL and MoEF&CC accredited agency. Monitoring reports for the period from April'16 to Sept.'16 are enclosed as Annexure - 3.	



From : April'16

To: September'16

Status of the conditions stipulated in Environment Clearance

MoEF	MoEF vide letter no. J-16011/30/2003-IA.III dated 21st July 2004		
Sr.		Compliance Status as on	
No.	Conditions	30-09-2016	
		Various environmental initiatives taken by APSEZ, Mundra is attached as Annexure – 4 .	
9.	The camps of labor shall be kept outside the Coastal Regulation Zone area. Proper arrangements for cooking fuel shall be made for the labor during construction phase so as to ensure that mangroves are not cut / destroyed for this purpose.	Complied. Construction Activities are completed.	
10.	Regular drills should be conducted to check the effectiveness of the on-site Disaster Management Plan. The recommendations made in the Environmental Management Plan and Disaster Management Plan, as contained in the Environmental Impact Assessment and Risk analysis reports of the project, shall be effectively implemented.	Complied. Oil spill contingency plan & Disaster Management plan is in place and implemented. Mock drills are conducted regularly. Details are attached as Annexure – 5.	
11.	The entire stretch of the pipelines shall be buried underground except at the booster pumping station, which will be properly fenced and the station would be manned round the clock. The buried lines will be protected with anticorrosive coal tar based coating. The coating will be tested by high voltage detector in accordance with prescribed standards.	Complied. Details of the pipelines installed and report on free spans, lateral displacement and cathodic protection survey is submitted to the MoEF & CC along with half yearly compliance report Apr - 2013 to Sep - 2013.	
12.	Markers shall be installed at every 30 m to indicate the position of the line. Regular patrolling of the pipelines needs to be done. This will help in identifying any activity that have the potential to cause pipeline damage or to identify small leaks whose effects are too small to be detected by instrument.	Complied. Markers are installed to indicate position of pipeline. Photographs were submitted along with half yearly compliance report Apr – 2013 to Sep – 2013. And there is no further change.	



From : April'16
To : September'16

Status of the conditions stipulated in Environment Clearance

MoEF	MoEF vide letter no. J-16011/30/2003-IA.III dated 21st July 2004			
Sr.	Conditions	Compliance Status as on		
No.	Condicions	30-09-2016		
13.	There should be display boards at critical locations along the pipeline viz. road / rail /river crossings giving emergency instructions as well as contact details of GAPL. This will ensure prompt information regarding location of accident during any emergency. Emergency Information board should contain emergency instructions in addition to contact details.	Complied. Display boards giving emergency information are placed. Photographs were submitted along with half yearly compliance report Apr – 2013 to Sep – 2013. And there is no further change.		
14.	During operation phase, proper precautions should be taken to avoid any oil spills and no oily wastes shall be discharged into the water bodies.	Complied. Inspection activities are being carried out for prevention of oil spill at SPM.		
15.	All conditions stipulated by the Forest and Environment Department, Government of Gujarat should be strictly implemented.	Complied. All the conditions stipulated by Forest and Environment Department have been complying with.		
16.	All conditions stipulated in Gujarat Pollution Control Board vide their letter No. PC/NOC/381/1039 dated 8 th January, 2002 should be implemented.	Complied. The project is in operation phase and has been granted for operations vide Consent to operate (CC&A) no. AWH 47854 valid till 2 nd December, 2016 by GPCB. APSEZL have already applied for renewal of CC&A.		
B. G	eneral Condition			
1	Construction of the proposed structures should be undertaken meticulously confirming 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 Department / Agencies.	Complied. Construction activities are completed in accordance with the prevailing laws.		
2	The project authorities should take appropriate community development and welfare measures for the villagers in the vicinity of the project site, including drinking water facilities. A separate fund should be allocated for this purpose.	Complied. The CSR Activities are planned out at group level at Mundra by Adani Foundation. Drinking water is being regularly provided to fisher folk community. Details of the CSR activity and expenditure for the period April'16 to Sept.'16 is enclosed as Annexure – 6 .		



From : April'16
To : September'16

Status of the conditions stipulated in Environment Clearance

MoEF	MoEF vide letter no. J-16011/30/2003-IA.III dated 21 st July 2004		
Sr.	Conditions	Compliance Status as on	
No.	Semental Control Contr	30-09-2016	
3	To meet any emergency situation, appropriate fire – fighting system should be installed. Appropriate arrangements for uninterrupted power supply to the environment protection equipment and continuous water supply for the firefighting system should be made.	Complied. Detail information on firefighting facility available at APSEZL is enclosed as Annexure - 7.	
4	A separate Environment Management Cell with suitably qualified staff to carry out various environment related functions should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.	Complied. 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. Executive who directly reports to the top management. Environment Management Cell Organogram is attached as Annexure - 8.	
5	The funds earmarked for environment protection measures should be maintained in a separate account and there should be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards should be reported to this Ministry's Regional Office at Bhopal.	Complied. Separate budget for the Environment Protection measures is earmarked every year. All environmental and horticulture activities are considered at group level and budget allocation is also done accordingly. Detail break up of budget spent during April'16 to Sept.'16 for Environment Protection measure attached as Annexure – 9.	
6	Full support should be extended to the officers of this Ministry's Regional Office at Bhopal and the officers of the Central and State Pollution Control Board by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.	Complied. M/s APSEZL is always extending full support to the regulatory authorities.	



From: April'16

To : September'16

Status of the conditions stipulated in Environment Clearance

MUEF	MoEF vide letter no. J-16011/30/2003-IA.III dated 21 st July 2004			
Sr.	Conditions	Compliance Status as on		
No.	Condicions	30-09-2016		
7	In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new one for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.	Point noted.		
8	This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	Point noted.		
9	This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which should be complied with.	Point noted.		
10	A copy of the clearance letter should be marked to the concerned Panchayat / local NGO, if any, from whom any suggestion / representation has been received while processing the proposal.	Complied.		
11	State Pollution Control Board / Committee should display a copy of the clearance letter at the District Industries Center and Collector's Office/ Tehsildar's Office for 30 days from the date of receipt of this letter.	This condition does not belong to project proponent.		
12	The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letter are available with the Gujarat Pollution Control Board and may also be seen at the website of the Ministry of Environment & Forests at http://www.envfor.nic.in/	Complied.		



From: April'16

To : September'16

Status of the conditions stipulated in Environment Clearance

MOLI	VIOEF VIDE LECTER NO. J-16011/30/2003-IA.III dated 21° July 2004		
Sr. No.	Conditions	Compliance Status as on 30-09-2016	
13	The project proponents should inform regional Office Bhopal as well as the Ministry, the date of financial closure and final approval of the project by the concerned authority and the date of start of work.	Complied.	
14	The project proponent will obtain Forest clearance for any stretch of land if it passes through the forest land.	Complied. Information submitted along with half yearly compliance report Apr – 2013 to Sep – 2013.	
15	So as to maintain ecological features and avoid damage to the ecosystem, movement of vehicles in the Inter Tidal Zone shall be restricted to minimum.	Complied. Construction activities are completed.	
16	Since the pipeline passes along mangrove areas and the mud flats of Mundra area, the project proponents will ensure adequate protection to mangroves.	Complied. Construction activities are completed.	
17	Budgetary break up for Environmental Management Plan for the project to be mentioned.	Complied. Separate budget for the Environment Protection measures is earmarked every year. All environmental and horticulture activities are considered at group level and budget allocation is also done accordingly. Detail break up of budget spent during April'16 to Sept.'16 for Environment Protection measure attached as Annexure – 9.	

Annexure - A



From : April'16

To : September'16

Status of the conditions stipulated under CRZ Recommendation

P(Par	P(Part1) dated 8" October 2003				
Sr. No.	Conditions	Compliance Status as on 30-09-2016			
1	The provision of the CRZ notification of 1991 and its amendments issued from time to time shall be strictly complied with by the GAPL.	Complied. Construction activities are completed and the project is in operation phase. All stipulations with respect to the CRZ notification and its subsequent amendments are complied with.			
2	This recommendation is only for those activities proposed to be commissioned before the end of the year 2008 as mentioned in the bar chart submitted by GAPL.	Point noted. Construction activities are completed and the project is in operation phase.			
3	A separate clearance shall be obtained by the GAPL for construction of the SPM No. 3 and 4, corresponding pipelines and COTs after demonstrating the compliance of the conditions, ecological upliftment activities undertaken successfully and mitigative measures implemented while developing the SPM no.1 and corresponding COT. A regional EIA shall also be commissioned immediately by the GAPL and all future development should be based on the outcome of the said regional EIA only.	SPM no. 3 and 4 are not constructed so far.			
4	Before commissioning of the construction activities, the construction design and pipeline alignment shall be validated/approved by National Institute Oceanography to ensure that there is no negative impact on the coastal morphology, hydrodynamics and ecological systems including the corals, if any. The mitigative measures as may be suggested by the NIO for this purpose shall be implemented by the GAPL.	Complied. Construction activities are completed and the project is in operation phase.			



From : April'16
To : September'16

Status of the conditions stipulated under CRZ Recommendation

ופרוא	P(Part1) dated 8''' October 2003				
Sr.	Conditions	Compliance Status as on			
No.	Condicions	30-09-2016			
5	A comprehensive EIA shall be prepared and submitted to this Department by the GAPL, before commissioning of the SPM. All the suggestions for environmental protection/management that may be given in the comprehensive EIA shall be implemented by the GAPL.	Complied. Study has been completed and report submitted to MoEF&CC. Based on the same, Environment and CRZ clearance was granted.			
6	The ground water shall not be tapped in any case to meet with the water requirements during construction and/or operation phases.	Complied. Entire water requirement is sourced from Narmada water and desalination plant of APSEZL.			
7	The GAPL shall ensure that the free flow of water in the intertidal area is not hampered due to proposed construction activities for pipeline corridor as well as other activities including the COT. Further, it shall be ensured by the GAPL that the nearby mangroves are not at all affected due to proposed development activities specifically the COT.	Complied. Construction activity is already completed. Details of culverts provided and creek system is submitted to the MoEF & CC along with half yearly compliance report Apr - 2013 to Sep - 2013.			
8	The GAPL shall take up massive mangroves plantation activities in addition 25 Ha. of area suitably identified in consultation with the office of the Principal Chief Conservator of Forests, GoG, as well as this Department. The GAPL shall bear the cost of the said land as well as the cost of the plantation of mangroves & its sustenance for a reasonable period of time.	Complied. Details of the mangrove plantation along the rail yard were submitted to the MoEF & CC along with half yearly compliance report Apr – 2013 to Sep – 2013. Details on mangroves afforestation carried out by APSEZL till date is annexed as Annexure – 1 .			
9	In addition to the mangroves plantation, the GAPL shall also take up massive greenbelt development in and around the project site in consultation with the Forest Department.	Complied. A well-established Horticulture Dept. in place with qualified Horticulture expert. Adequate plantation has been done at port area. Details of the developed green belt within APSEZ premises are attached as Annexure – 1.			



From : April'16

To : September'16

Status of the conditions stipulated under CRZ Recommendation

F(Fai	P(Part1) dated 8 th October 2003			
Sr.	Conditions	Compliance Status as on		
No.	Condicions	30-09-2016		
10	The GAPL shall provide financial contribution as many as decided by this department for any common study like carrying capacity for the Gulf of Kachchh as well as for any common facilities including Vessesl Traffic Management System in the Gulf of Kachchh, for the purpose of the environment protection/management.	Gazette notification dated 12 th April, 2013 submitted to the MoEF & CC along with half yearly compliance report Apr – 2013 to Sep – 2013.		
11	The GAPL shall provide financial support in implementation of National Green Corps scheme (being implemented in Gujarat by the GEER Foundation) in Kachchh district in consultation with Forests & Environment Department.	Point noted.		
12	The GAPL shall bear the cost of the external agency that may be appointed by the Forests and Environment Department, GoG for supervision/monitoring of their activities during construction and/or operational phases.	Point noted.		
13	The dredged material that may be generated, if any, shall be disposed of at location suitably identified in consultation with the institute of repute like NEERI/NIO after due consideration of various environmental aspects and ensuring no significant negative impacts due to the same.	Complied. Construction activities are completed and the project is in operation phase.		
14	No waste including the construction debris, oily waste from construction equipment's, untreated sewage, etc. would be disposed of in to sea/river/creek or in the CRZ areas. The treated sewage meeting with the norms fixed by the Gujarat Pollution Control Board and the reject water from RO plant if any, shall be disposed of at a point in the deep sea as may be suggested by the institute of repute like the NEERI/NIO.	Complied. Construction activities are completed and the project is in operation phase.		



From : April'16

To : September'16

Status of the conditions stipulated under CRZ Recommendation

P(Pai	Part1) dated 8'' October 2003							
Sr. No.	Conditions	Compliance Status as on 30-09-2016						
15	The Gujarat Maritime Board shall ensure that the Vessel Traffic Management System for safe navigation in the Gulf of Kachchh shall be established and commissioned before commissioning of the SPM No. 1 by the GAPL. The GAPL shall follow up for this with various stakeholders and provide financial and technical inputs for the same.	Complied. APSEZL has participated in VTMS program. Gazette notification dated 12 th April, 2013 submitted to the MoEF & CC along with half yearly compliance report Apr – 2013 to Sep – 2013.						
16	A mutual aid system for the Mundra Port region shall be developed to meet with any unforeseen circumstances or to meet with any accidental condition. The GAPL shall take a lead for this by involving other stakeholders including HPCL.	Complied with. APSEZ has Mutual aid agreement system is in place as per Disaster Management Plan.						
17	A detailed Risk Assessment and Disaster Management Plan shall be worked out before commissioning of the SPM by the GAPL and the mitigative measures shall be identified and implemented. The local Oil Spill Contingency Plan in lines with the National Oil Spill Disaster Contingency Plan for the Mundra Port shall be put in to operation immediately.	Complied. Oil spill contingency plan is in place and implemented. Mock drills are conducted regularly. Details are attached as Annexure - 5 .						
18	Proper rehabilitation scheme shall be worked out for local fisherman communities in consultation with the District Collector/the Commissioner of Fisheries, Government of Gujarat, before commissioning of the SPM and report shall be furnished to the Forests and Environment Department.	Complied. Construction activity is already completed, project is in operation phase.						



From : April'16
To : September'16

Status of the conditions stipulated under CRZ Recommendation

P(Par	P(Part1) dated 8 th October 2003					
Sr. No.	Conditions	Compliance Status as on				
19	The construction labour shall be provided	30-09-2016 Complied.				
	with adequate amenities/facilities including the water supply, sanitation and fuel to ensure that the existing environmental condition is not deteriorated by them. The camps for the construction labour shall be kept outside the CRZ area. The GAPL shall ensure that there is no confrontation amongst the local villagers and construction labour.	Construction activity is already completed, project is in operation phase.				
20	All possible social and health impacts due to the proposed development at Mundra Port shall be assessed in detail in the comprehensive EIA and a detailed management plan shall be developed to mitigate the same.	Complied. Aspects of social and health impact were studies as part of EIA and mitigative measures have been implemented.				
21	The GAPL shall work out a detailed socio- economic upliftment programme in consultation with the District Collector and District Development Officer and shall implement the same. Separate budgetary provisions shall be kept for this purpose.	Complied. Detailed socio-economic upliftment programme are planned out at group level at Mundra by Adani Foundation. Details of the social upliftment activity and expenditure from April'16 to Sept.'16 are enclosed as Annexure – 6 .				
22	An Environmental Management Cell with person having proper background shall be constituted. A separate budgetary provision shall have to be made for implementation of the Environmental Management Plan.	Complied. Separate budget for the Environment Protection measures is earmarked every year. All environmental and horticulture activities are considered at group level and budget allocation is also done accordingly. Detail break up of budget spent during April'16 to Sept.'16 for Environment Protection measure attached as Annexure – 9.				
23	Post project environmental monitoring shall be carried out regularly through a reputed institute like NEERI/NIO and report shall be submitted to the Forests and Environment Department, GoG every year.	Complied. Post project environmental monitoring is being carried out regularly through NABL and MoEF&CC accredited Laboratory. Monitoring reports for the period from April'16 to Sept.'16 are enclosed as Annexure - 3.				



From : April'16

To : September'16

Status of the conditions stipulated under CRZ Recommendation

Sr. No.	Conditions	Compliance Status as on 30-09-2016
24	No construction activities shall be carried out by the GAPL in any of the Forest areas.	Complied.
25	All necessary clearances from different Government Department/Agencies shall be obtained before commissioning any construction activities.	Complied. All necessary clearances as per prevailing laws have been already obtained. Construction activity is already completed, project is in operation phase.
26	A half yearly compliance report with respect to above mentioned conditions as well as the implementation of the suggestions/recommendations of the EIA and Risk Assessment reports shall be furnished to the Forest and Environment Department, GoG, without fail at regular interval.	period Oct'15 to Mar'16 was submitted to MoEF & CC in soft as well as hard copy vide
27	The GAPL shall also have to comply with any other condition as may be stipulated by the Forests and Environment Department, GoG, from time to time.	Point noted.



Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To : September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 1

	Total Green Zone Detail Till Up to Sep2016							
LOCATION	Area (In Ha.)	Trees (Nos.)	Palm (Nos.)	Shrubs (SQM)	Lawn (SQM)			
SVC COLONY	59.991	27939.00	6965.00	49380.00	80069.00			
PORT & NON SEZ	71.962	124946.00	18613.00	62986.78	58455.18			
SEZ	86.715	137285.00	14224.00	214389.60	19627.03			
MITAP	2.475	8168.00	33.00	1670.00	4036.00			
WEST PORT	81.342	181827.00	50221.00	24112.00	22854.15			
AGRO- PARK	7.523	17244.00	1332.00	5400.00	2121.44			
SOUTH PORT	14.078	25150.00	3430.00	3882.00	4826.97			
Samundra Township	36.083	29459.00	10505.00	20370.15	35071.67			
Productive Farming (Vadala Foder)	15.690	19336.00	0.00	0.00	0.00			
TOTAL (APSEZL)	375.86	571354.00	105323.00	382190.53	227061.44			
		67667	77.00					

Mangrove Afforestation Detail								
S. NO.	Location	FY	Area (Hectare)	Clearance Reference	Plantation/Gap Filling	Species		
A.1	Mundra Port Area (Mundra, Kutch)		24.00	Environment Clearace - Mundra (J-16011/13/95-IA.III dated 25 August 1995)	Plantation	Avicennia marina		
	Total Plantation		24.00					
B.1	Mundra Port Area (Mundra, Kutch)		25.00	Environment Clearace - Mundra (J-16011/30/2003-IA.III dated 21 July 2004)	Plantation	Avicennia marina		
	Total Plantation		25.00					
C.1		2007-08	40.00		Plantation			
C.2	Luni/Hamiramora (Mundra, Kutch)	2009-10	10.00		Gap Filling Work			
C.3		2010-11	10.00	CRZ Recommendation - Mundra	Gap Filling Work	Avicennia marina		
C.4		2011-12	95.40	(Env-10-2005-222-P dated 12 October, 2006)	Plantation	Rhizophora mucronata Ceriops tagal		
C.5		2012-13	25.40		Plantation			
C.6		2013-14-15	70.00		Gap Filling Work			
	Total Plantation (C.1+C.4+C.5)		160.80					
D.1	Kukadsar	2012-13	66.50	CRZ Recommendation - Mundra (Env-10-2005-222-P dated 12 October, 2006)	Plantation	Avicennia marina		
D.2	(Mundra, Kutch)	2013-14	10.00		Gap Filling Work	Avicennia marina		
	Total Plantation (D.1)		66.50					
E.1	Forest Area	2011-12	50.00	Forest Clearance - Mundra	Plantation	Avicennia marina		
E.2	(Mundra)	(Mundra) 2012-13 248.00 (F.No. 8		(F.No. 8-2/1999-FC (pt) dated 27 February 2009)	Plantation	Avicennia marina		
	Total Plantation (E.1+E.2)		298.00					

S. NO.	Location	FY	Area (Hectare)	Clearance Reference	Plantation/Gap Filling	Species
F.1	Jangi village	2012-13	50.00	CRZ Recommendation - Mundra (Env-10-2005-222-P dated 12 October, 2006)	Plantation	Avicennia marina
F.2	(Bhachau, Kutch)	2013-14	20.00		Gap Filling Work	Avicennia marina
	Total Plantation (F.1)		50.00			
G.1		2007-08	40.10	CRZ Recommendation - Mundra (Env-10-2005-222-P dated 12 October, 2006)	Plantation	
G.2		2008-09	10.00		Gap Filling Work	
G.3		2009-10	10.00		Gap Filling Work	
G.4		2011-12	50.00	Environment Clearance - Dahej (11-37/2007-IA-III dtd 11 November, 2008)	Plantation	— Avicennia marina
G.5	Jakhau Village (Abdasa, Kutch)	2013-14	20.00		Gap Filling Work	Rhizophora mucronata
G.6		2012-13	30.00		Gap Filling Work	— Ceriops tagal
G.7		2012-13	20.50	CRZ Recommendation - Mundra (Env-10-2005-222-P dated 12 October, 2006)	Plantation	
G.8		2012-13	200.00	Environment Clearance - Mundra (10-47/2008-IA.III dtd. 12th Jan,2009)	Plantation	
G.9		2013-14-15	50.00		Gap Filling Work	
	Total Plantation (G.1 + G.4 + G.7 + G.8)		310.60			
H.1	Sat Saida Bet (Kutch)	2014-15	250.00	Commitment with KPT for 250 Ha Tuna (By undertaking dated 3 June, 2013)	Plantation	Avicennia marina
H.2	Sat Saida Bet (Kutch)	2016-17	5.00	Commitment with KPT for 5 Ha. Bio-Diversity-Tuna.	In Progress.	Bio Diversity (Three Var.)
H.3	AKBTPL, Tuna Area	2016-17	30.00		Gap Filling Work-In Progress	Avicennia marina
	Total Plantation		255.00			

S. NO.	Location	FY	Area (Hectare)	Clearance Reference	Plantation/Gap Filling	Species
I.1		2006-07	200.00	CRZ Recommendation - Mundra	Plantation	
1.2		2007-08	100.00	(Env-10-2005-222-P dated 12 October, 2006)	Plantation	
1.3	Village Dandi (Navsari)	2007-08	100.00	Environment Clearance - Dahej (11-37/2007-IA-III dtd 11 November, 2008)	Plantation	— Avicennia marina Rhizophora mucronata — Ceriops tagal
1.4		2008-09	200.00	CRZ Recommendation - Mundra	Plantation	Ceriops tagai
1.5		2010-11	200.00	(Env-10-2005-222-P dated 12 October, 2006)	Plantation	
	Total Plantation (1.1 + 1.2 + 1.3 + 1.4 + 1.5)		800.00			
J.1	Village Talaza (Bhavnagar)	2011-12	50.00	Environment Clearance - Dahej (11-37/2007-IA-III dtd 11 November, 2008)	Plantation	Avicennia marina
J.2	Village Narmada (Bhavnagar)	2014-2015	250.00	CRZ Recommendation - Mundra (Env-10-2005-222-P dated 12 October, 2006)	Plantation	Avicennia marina
	Total Plantation (J.1 + J.2)		300.00			
K.1	Village Malpur (Bharuch)	2012-13-14	200.00	CRZ Recommendation - Dahej ENV-10-2006-71-P dtd 29th May, 2007	Plantation	Avicennia marina
K.2	Village Kantiyajal (Bharuch)	2014-15	50.00		Plantation	Avicennia marina
K.3	Village Devla Bharuch	2014-15	50.00	CRZ Recommendation - Hazira ENV-10-2012-30-E dtd 11th May,2012	Plantation	Avicennia marina
K.4	Village Devla Bharuch	2015-16	100.00		Plantation	Avicennia marina
	Total Plantation (K.1 + K.2 + K.3 + K.4)		400.00			
L.1	Village Tada Talav (Khambat, Anand)	2015-16	100.00	Environment and CRZ clearance - Mundra SEZ	Plantation	Avicennia marina
L.2	L.2 Village Tada Talav 2015-16 (Khambat, Anand)		100.00	(10-138/2008/IA.III dated 15 July 2014)	Plantation	Avicennia marina
	Total Plantation (L.1 + L.2)		200.00			
	G. Total (Plantation+ Gapfilling)		2889.90			

PHOTOGRAPHS SHOWING GREEN BELT AREA WITHIN APSEZ

❖ Within Adani Ports & SEZ



















Within Residential Township







❖ Within AMSIPL Premises









❖ Within CETP Premises











Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To: September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 2



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

Reviewed By : Capt. Rahul Agarwal Issue No. : 01 Issued On : 15.07.2016

Approved By : Capt. Sansar Chaube Revision No. : 03 Page 1 of 100

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

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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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	DISTRIBUTION LIST OF OIL SPILL CONTINGENCY RESPONSE PLAN								
SN.	Issued To	Copy No.	Date of Issue						
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1.	Chief Operating Officer	01	01/01/2014						
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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ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD. MUNDRA OIL SPILL CONTINGENCY RESPONSE PLAN

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Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 3 of 100

ADANI PORTS AND SPECIAL ECONOMIC ZONE LTD. MUNDRA

OIL SPILL CONTINGENCY RESPONSE PLAN

Section 02: Amendment Records

		CORD SHEET					
Sr. No.	Section	Sub- section	Page No.	Revision No.	Revision Date	Description of Revision	Approved
1.	Annex 3		73			Location of Oil Spill Equipment mentioned	Approved
2.	Annex 15		89			List of recycler approved by state of Gujarat	Approved
3.			97			Contingency Planning Compliance Checklist	Approved

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 4 of 100

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

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On :	15.07.2016		
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 5 of 100			

OIL SPILL CONTINGENCY RESPONSE PLAN

- **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

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 6 of 100

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

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 7 of 100		

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 Contingency Compliance Checklist

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 8 of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016	
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 9 of 100			

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

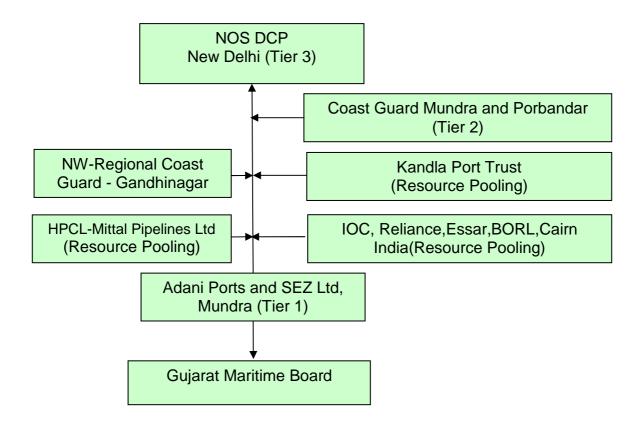
Emergency Response Team (ERT) is the nomenclature used to describe the command and control team established for an oil spill incident at the jetty or in the jetty approaches, with representatives of organisations attending as described in section 2.4.

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016	
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 10 of 100			

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)

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 11 of 100

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.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016	
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 12 of 100			

NATIONAL OIL SPILL DISASTER CONTINGENCY PLAN (NOSDCP) COAST GUARD COORDINATION CRISIS MANAGMENT GROUP MOBILISATION OF ALL RESOURCES INTEGRATION WITH DISASTER MANAGEMENT PLANS INTERNATIONAL COOPERATION REGIONAL OIL SPILL DISASTER CONTINGNECY PLAN (ROSDCP) OIL SPILL IN OFFSHORE AREAS REGIONAL LEVEL RESPONSE BY POOLING OIL SPILL RESPONSE BY POOLING RESOURCES BY RESOURCES FROM VARIOUS AGENCIES OIL COMPANIES DISTRICT OIL SPILL DISASTER CONTINGNECY PLAN (DOSDCP) PORT OIL SPILL CONTINGENCY PLAN FOR OIL HANDLING FACILITY CONTINGENCY PLAN **PORT AREAS** LOCAL CONTINGENCY PLAN FOR SHORELINE PROTECTION

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).

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 13 of 100		

OIL SPILL CONTINGENCY RESPONSE PLAN

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 m³/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 $10000 \text{ m}^3/\text{hr}$ 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 m³/hr to10000 m³/hr. In the present study, to assess the maximum risk, pumping rate of 10000 m³/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/cm² 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/cm² 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

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

Where,

Q = quantity of spill (m³/s)

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 14 of 100		

OIL SPILL CONTINGENCY RESPONSE PLAN

 C_d = coefficient of discharge (0.9)

A = Area of rupture (m²) (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 m³ 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 m³ 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 m³ 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 subsea 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.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016	
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 15 of 100			

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016	
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 16 of 100			

OIL SPILL CONTINGENCY RESPONSE PLAN

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 17 of 100

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 m³/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	•	•	•

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 18 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

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	•	•	•

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 19 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

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.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 20 of 100		of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

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

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

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

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

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

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

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

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

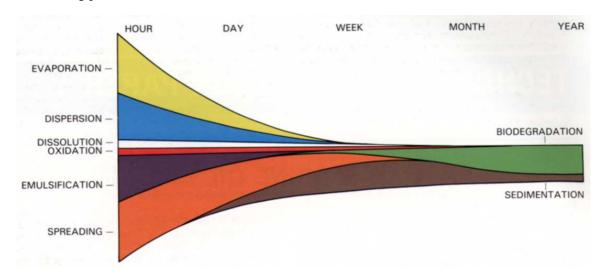
- a) **Spreading**: is one of the most significant processes during early stages of a spill is initially due to gravity. The oil spreads as a coherent slick and the rate is influenced by its activity. After a few hours, the slick begins to break-up and after this stage, spreading is primarily due to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

Reviewed By	•	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 21 of 100		of 100

- 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

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 22 of 100		of 100

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 μ g/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.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 23 of 100		of 100

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 500² 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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 24 of 100

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° 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.

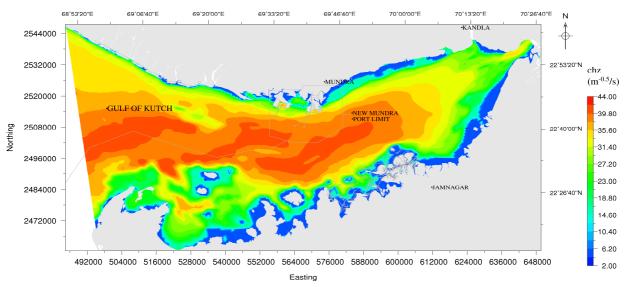


Fig.A1.4 Chezy's coefficient

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

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On : 1	5.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 25 of 100	

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	40250 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.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 26 of 100		of 100

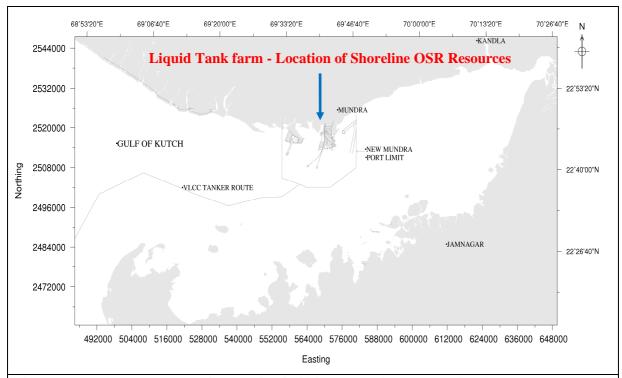
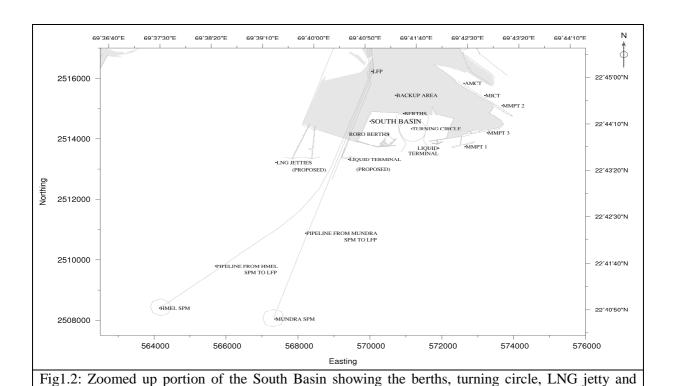


Fig.1.1 :General Arrangement of the marine facilities at Mundra port showing the VLCC route and facilities within the new Mundra port limit considered for carrying out the oil spill risk assessment studies.



Reviewed By : Capt. Rahul Agarwal Issue No. : 01 Issued On : 15.07.2016

Approved By : Capt. Sansar Chaube Revision No. : 03 Page 27 of 100

existing berths as well as SPMs.

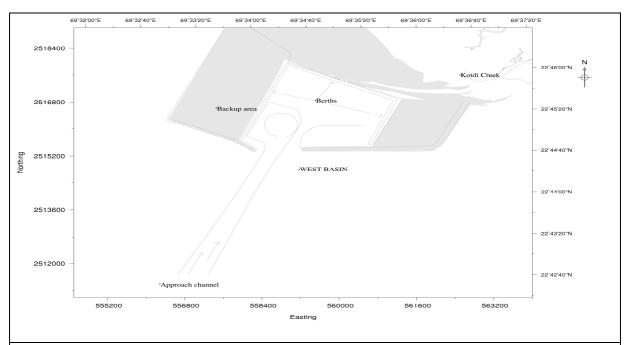
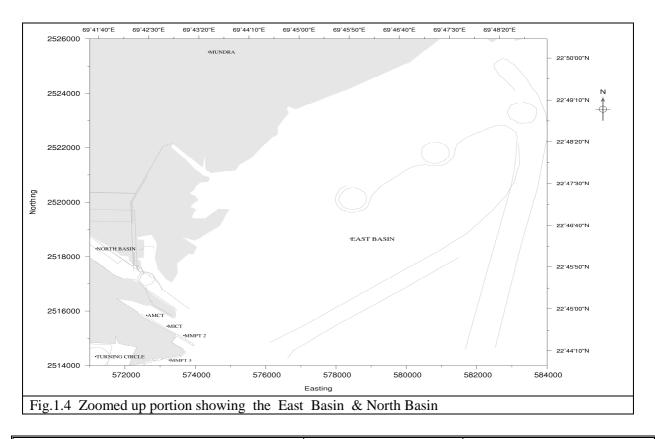


Fig.1.3 Zoomed up portion of the West Basin showing the berth locations and the approach channel for the vessels



Reviewed By : Capt.	Rahul Agarwal Issue No.	: 01	Issued On	: 15.07.2016
Approved By : Capt.	Sansar Chaube Revision N	No. : 03	Page 2	28 of 100

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/m³) 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 $(68-332 \text{ nox} 10^3/\text{l})$; av 186 no x $10^3/\text{l}$) 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 $100-789.6 \text{ nox} 10^3/\text{l}$ (av 329.4 no x $10^3/\text{l}$) and generic diversity ranged from 12-25 no (av 19 no) (Table 8.4) off Vadinar.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 29 of 100		of 100

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

	Pathfir	nder Nearshore ESSAR DP			IOC SPM			
Month	Cell count (nox10³/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

Essar SPM				Salaya Cre	ek		Gulf				
Month	Cell count (nox10³/l)	Tota gene	al era (no.)	(no.) Cell count (nox10³/l) Total genera (no		(no.)	Cell count (nox10 ³ /l)	Total genera (no.)			
Apr-10	124	1	16	198.5	18	3	211		15		
Oct											
2010	260	1	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 km². The mangrove area has increased in recent years due to extensive plantations made by the Forest Department. Mangrove cover and mudflat areas (km²) in Jamnagar, Lalpur, Khambalia and Kalyanpur Talukas estimated based on satellite data are given in Table 8.4 below:

Table 8.4: Mangrove areas (km²) along Jamnagar coast

Taluka	Mangroves	Mangroves	Tidal			
	(Dense)	(Sparse)	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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 30 of 100		of 100

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

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 m² 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/m². 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 m² with an average of 50 plants/100 m². 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/m²), 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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 31 of 100		of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

Table 8.6: Distribution of mangroves at Narara

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

^{*} no/5 $\overline{00}$ m²

As can be noticed in the above table, the plant density of *A.marina* varied from 20 - 130 plants/100 m² with a frequency of occurrence of 100% at Narara. The species like *Ceriops tagal* (7 plants/500 m²) and *Rhizophora mucronata* (2 plants/500 m² - 3 plants/100 m²) were rarely noticed. The locations N2 (85 plants/100 m²) and N4 (80 plants/100 m²) 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/m² 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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: (01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: (03	Page 32 of 100		of 100

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 $\sim 4 \text{ kg/m2}$.

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	0
8	Sargassum ilicifolium	45	C
9	Sargassum tenerimmum	60	CD
10	Gracilaria corticata	55	C
11	Gracillaria verrucosa	85	С
12	Polysiphonia platycarpa	20	0

*%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/100m³ (av 3.3 ml/100m³) and 2.2-722.7 x 10³/100m³ (av 39 x 10³/100m³), respectively while during October 2010 the zooplankton biomass and abundance ranged from 0.2 to 12.0 ml/100m³ (av 3.5 ml/100m³) and 2.5-157.8 x 10³/100m³ (av 48.4 x 10³/100m³) respectively suggesting normal secondary production off Vadinar during the monitoring period.

The average zooplankton biomass (ml/100m³), population density (nox10³/100m³) 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/100m³⁾ (B) Population density (nox10³/100m³) and (c) total groups (no) off Vadinar (April 2010 – October 2010)

Area		Pathfinder	Nearshore	ESSAR	IOC	Essar	Salaya	Gulf
				DP	SPM	SPM	Creek	
A mmi 1	Α	8.3	1.1	1.1	0.9	1.4	2.5	3.5
April 2010	В	89.9	24.6	14.4	22.7	12.7	20.4	37.4
2010	С	17	15	12	16	13	16	17
Oat	Α	4	3.9	1.5	3	5.7	-	2.1
Oct 2010	В	57.4	55.9	23.5	30.5	83.1	-	32.8
2010	С	13	11	10	10	9	-	7

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 0	1 Issued	On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 0	3 P	Page 33 of 100		of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

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/m², av 2292 no/m²) and biomass (0.1-37.2 g/m²; wet wt, av. 9.2 g/m²; 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/m² (av 1185 no/m²) and biomass from 0-67.8 g/m²; wet wt (av. 14.6 g/m²; 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	Α	11.2	4.2	13.7	10.7	6.1
2010	В	3983	1172	1292	2401	2614
	С	5	3	6	6	3
Oct	Α	11.9	16.8	15.1	-	-
2010	В	1495	904	1156	-	-
	С	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 $(0.3 - 41.0 \text{ g/m}^2; \text{ av } 8.0 \text{ g/m}^2 \text{ wet wt})$ and population density $(150-8925 \text{ no/m}^2; \text{ av } 1902 \text{ no/m}^2)$ during April 2010. In October 2010 the biomass ranged from $0.3 - 23.9 \text{ g/m}^2$ (av 7.1 g/m^2 ; wet wt) and population density ranged from $125-14975 \text{ no/m}^2$ (av 2282 no/m^2) The current data is listed (April 2010 - Oct 2010) in Table 8.10.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 34 of 100		of 100

Table 8.10 Average of subtidal macrobenthos off Vadinar during April 2010 to October 2010, (A) Biomass (g/m²) (B) Population density (no/m²) and (C) Total groups

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 35 of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 36 of 100		

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

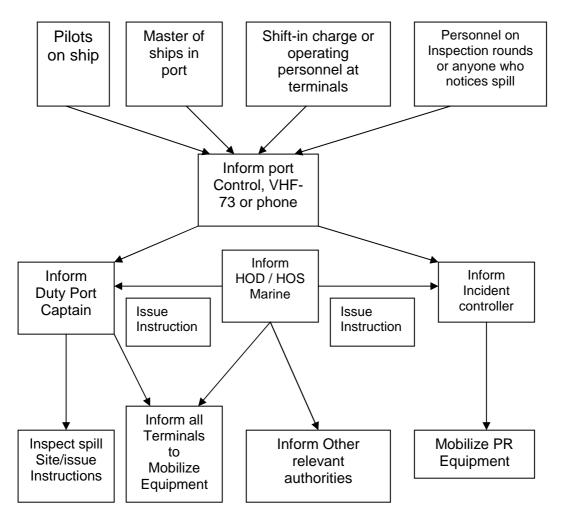
SPM handles (unloading) crude oil and pumps it to shore tank farm area through sub-sea pipeline. The impact of such spills on marine environment is on the higher side. Hence, oil spill equipments are required for combating oil in case of such spills at the marine facilities at Mundra.

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 37 of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 38 of 100		of 100

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 39 of 100		

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 40 of 100		

OIL SPILL CONTINGENCY RESPONSE PLAN

- 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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 41 of 100

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)

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 42 of 100		

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 downslope 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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 43 of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 44 of 100		

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 45 of 100		

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.

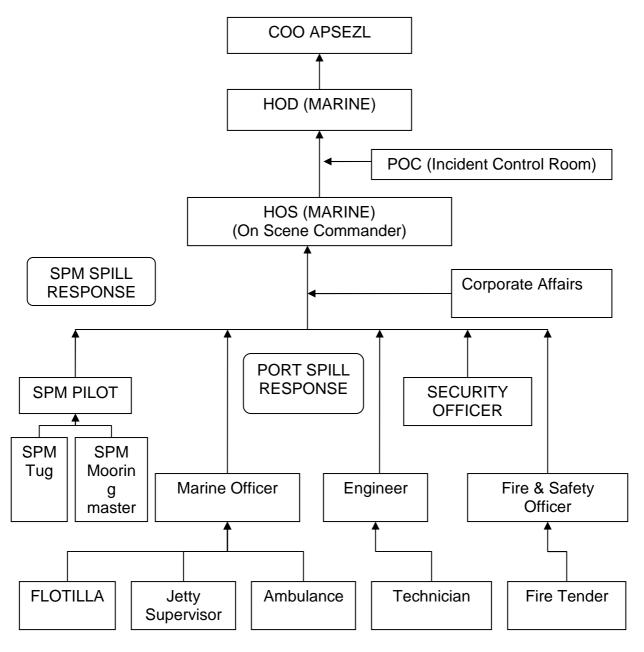
Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page	46	of 100

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



Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page	47	of 100

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	Key persons	Coast Guard
		years		
Oil spill equipment	1-5 days	Once every Year	Managers	In house
Oil	1 day	Once every year	Managers &	In house for in-depth
spillManagement			junior staff	knowledge
course				
Notification	1-2 hours	6 months	Operational	Check systems &
exercise			staff	communication
Table top	2-6 hours	12 months	Managers	Interactive discussions
Incident	6-8 hours	12 months with	All	Mock drill
		others		

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

IMO Level-1 - 36 **IMO Level-2 -** 04

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 48 of 100		

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 49 of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 50 of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 51 of 100

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.

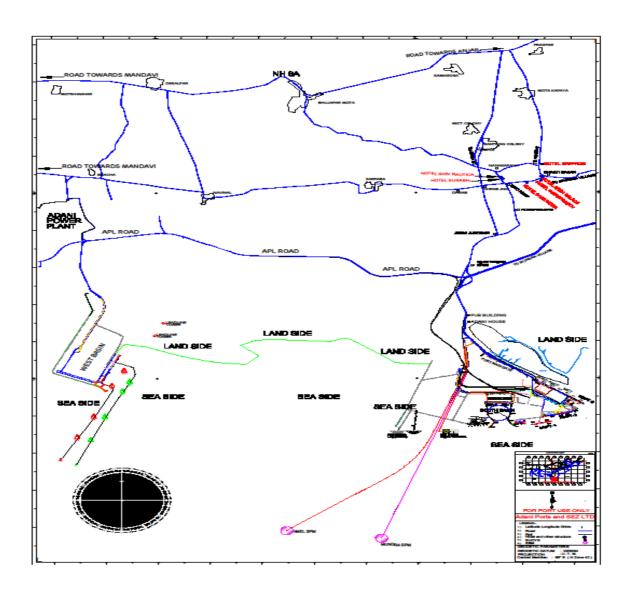
Such a report will also be prepared by the marine manager after each drill or training session and requisite modification(s) incorporated to the plan in order to enhance the overall efficacy of the same.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 52 of 100		of 100

Data Directory

Maps / Charts

1. Coastal facilities, access roads, hotels etc.

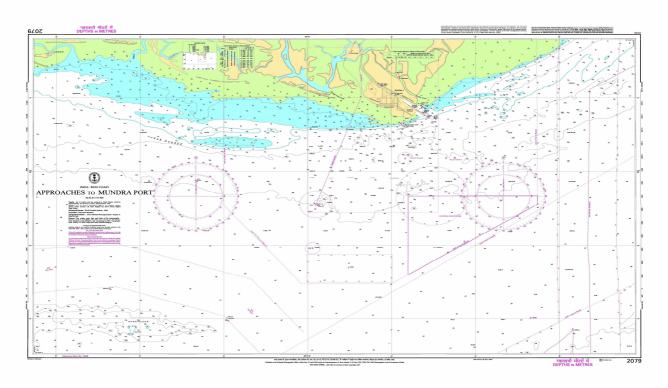


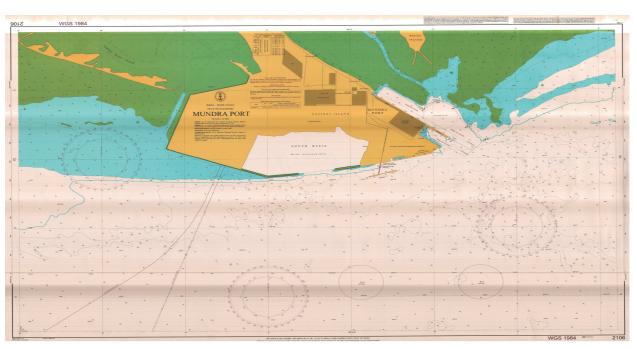
Telephones: Detailed in Annexure 4

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 53 of 100

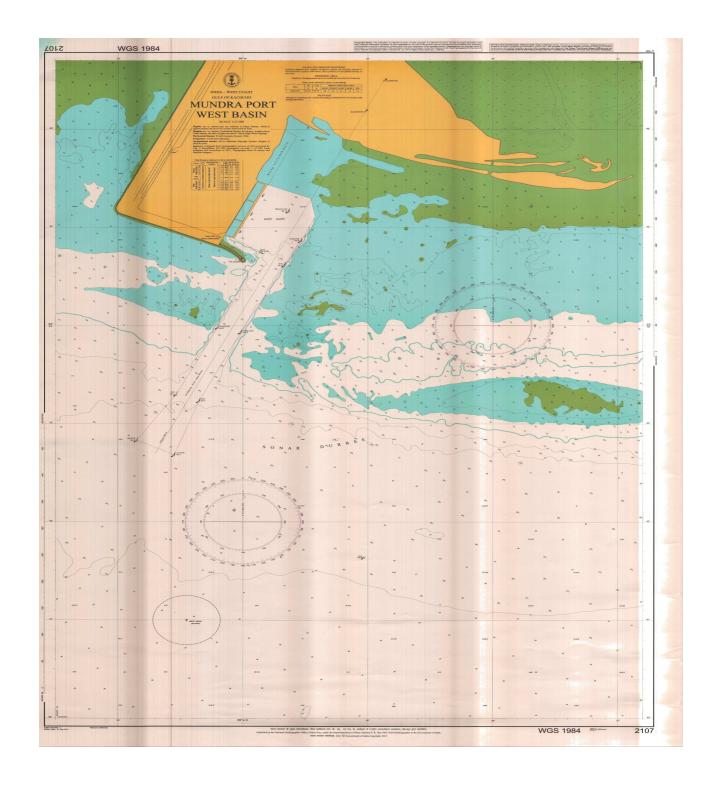
2. Coastal charts, currents, tidal information (ranges and streams), prevailing winds

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





Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016		
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 54 of 100		



Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On : 15.07.	2016	
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 55 of 100		

3. Risk locations and probable fate of oil

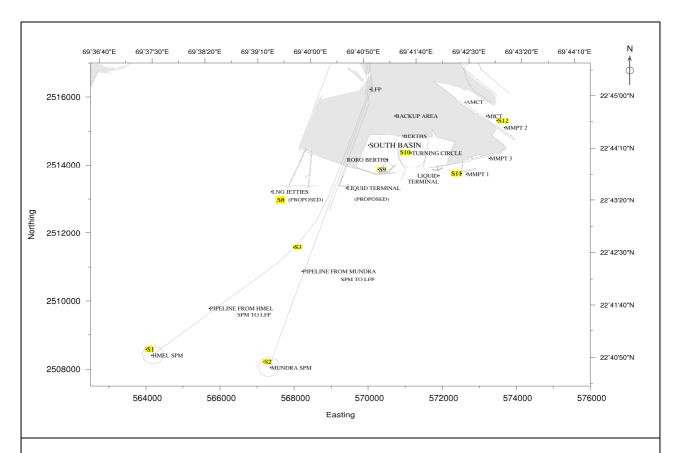


Fig.1: General layout of the Mundra port facilities of APSEZL showing the location of Spill Points for SPMs, South Basin berths, LNG jetty and existing berths

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016		
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 56 of 100		

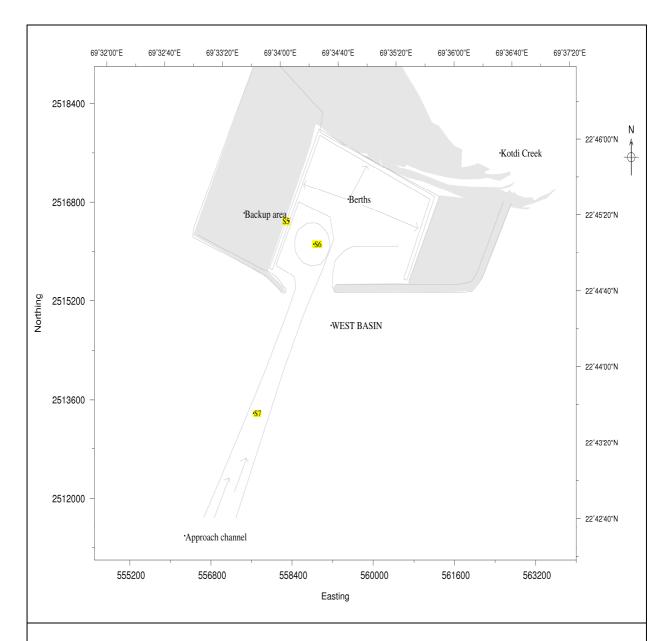


Fig.2: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for West Basin

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 57 of 100

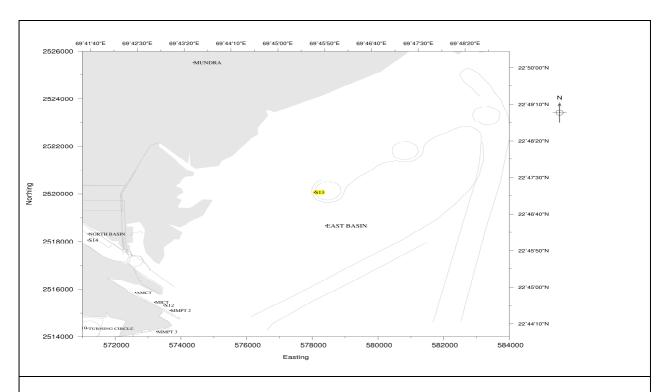
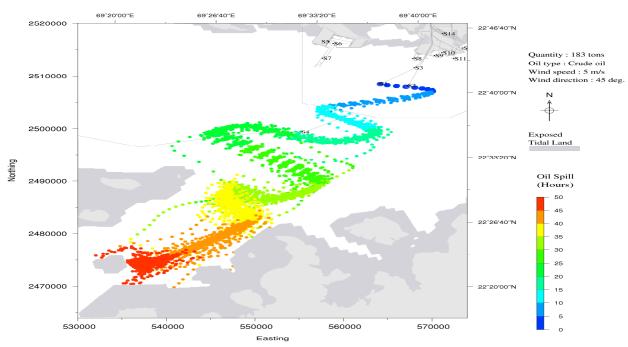
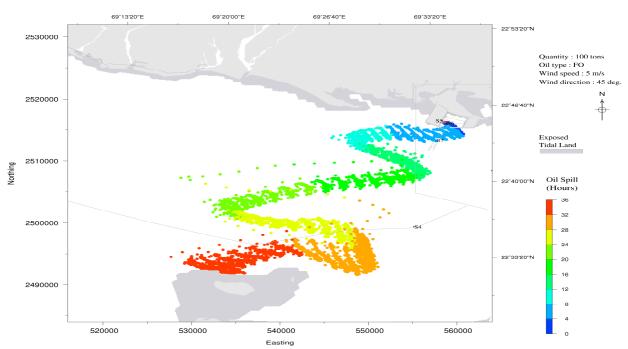


Fig.3: Zoomed up portion of Mundra port facilities of APSEZL showing the location of Spill Points for North Basin & East Basin



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

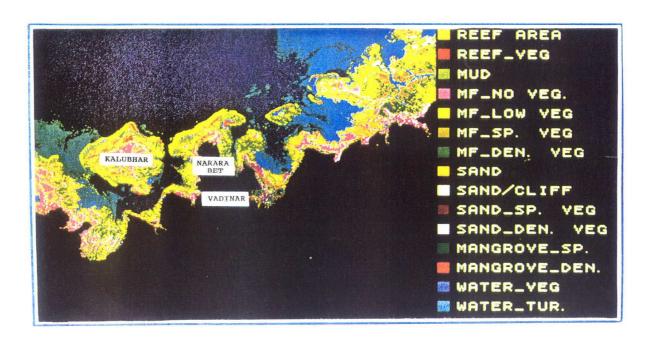
Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 58 of 100



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.

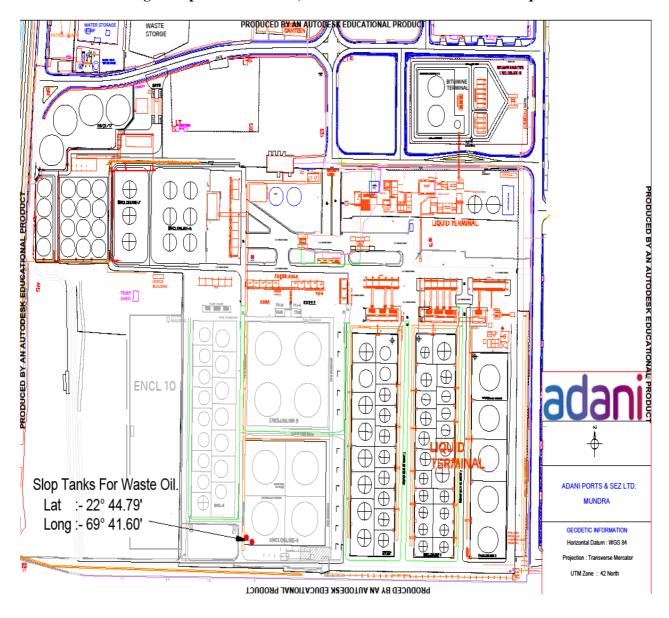
Shoreline resources for priority protection



Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 59 of 100

Oil and Waste Storage / Disposal sites

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



Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016		
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 60 of 100		

OIL SPILL CONTINGENCY RESPONSE PLAN

Sensitivity Maps/ Atlas

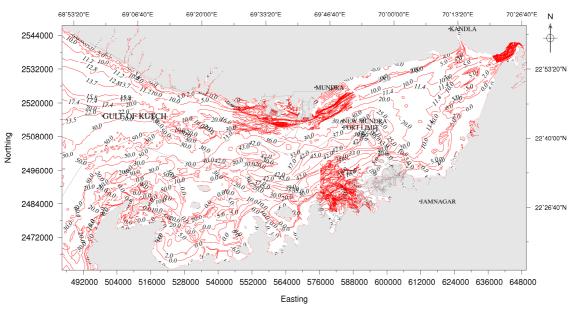


Fig.A1.1 Terrain features of study domain.

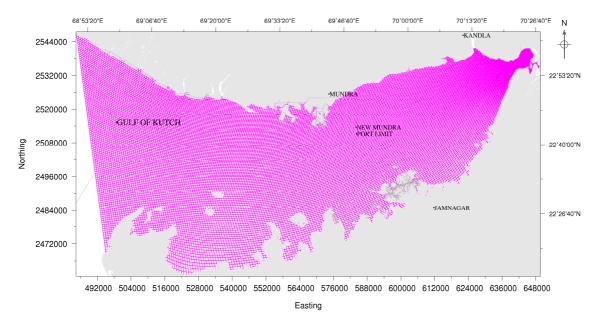


Fig.A1.2 Computational grid

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 61 of 100

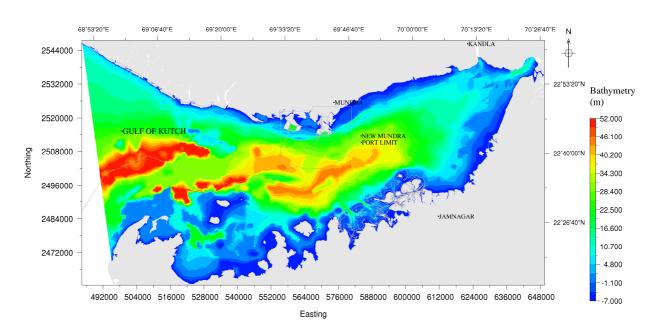


Fig.A1.3 Interpolated depth contours

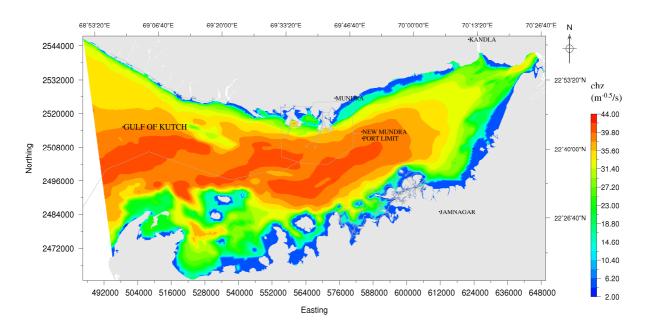


Fig.A1.4 Chezy's coefficient

Lists

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 62 of 100		of 100

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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 63 of 100		of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

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

Sl. No	Chemical	Boiling Range (° C)	Specific Heat of Liquid (J/Kg ° K)	Heat of Evaporation (x 10 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 = $> 260^{\circ}$ C

Vapor pressure = < 0.1 psia at 21° C

(c) HSD

Sp. Gr = 0.86

Pour point = 6° C - 18° C

Vapor pressure = 2.12 to 26 mm Hg at 21^0 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.

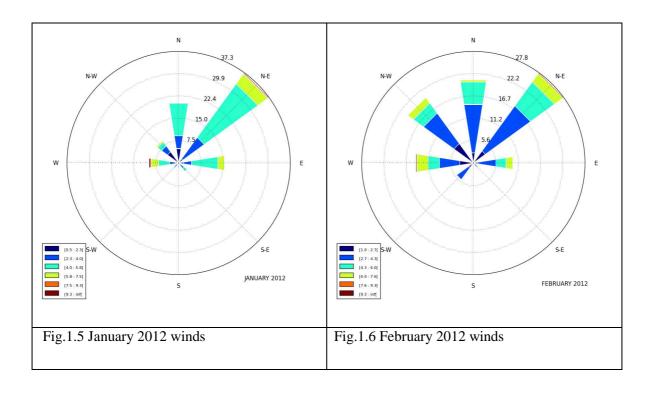
Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 64 of 100		of 100

Cyclones

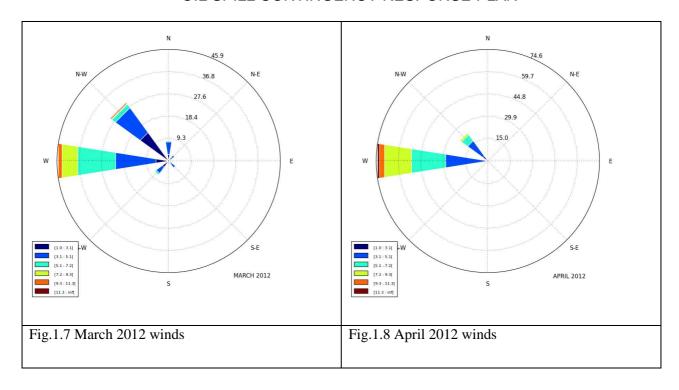
Cyclonic disturbances strike North-Gujarat, particularly the Kachchh and Saurashtra regions, periodically. These disturbances generally originate over the Arabian Sea and sometimes the Bay of Bengal. Generally during June, the storms are confined to the area North of 15°N and East of 65°E. In August, 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.

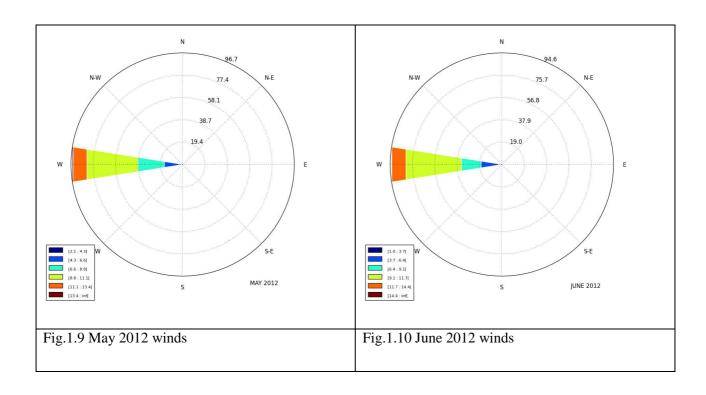
Wind

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.



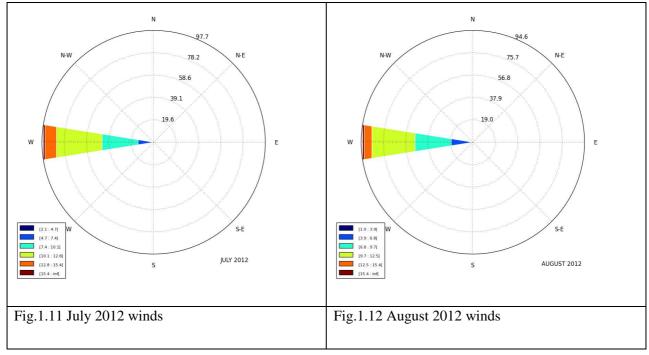
Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 65 of 100

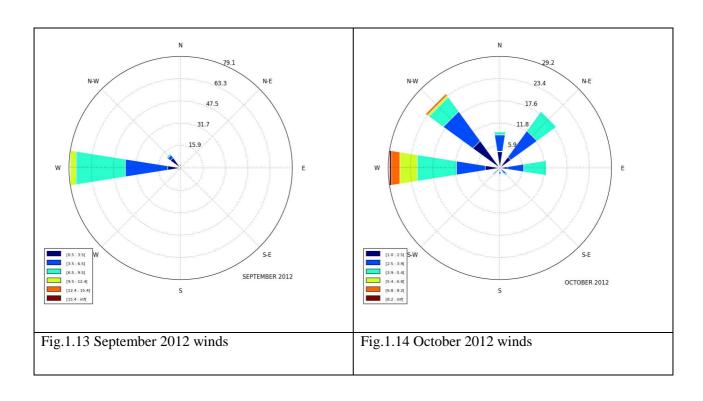




Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 66 of 100

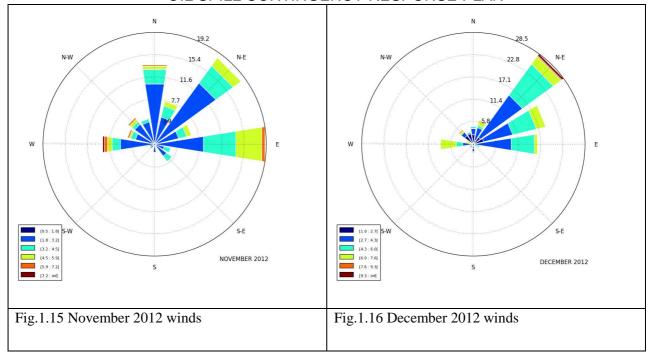
OIL SPILL CONTINGENCY RESPONSE PLAN

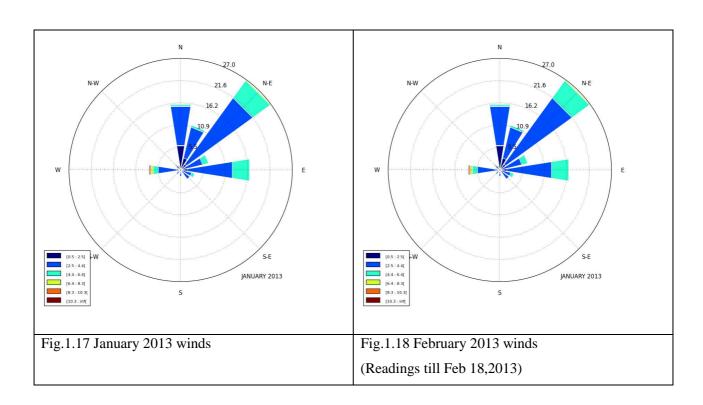




Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 67 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN





Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016	
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 68 of 100	

Tides

The tidal planes were assessed in 1998 and are as shown in Table below.

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

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

Currents

Currents in the approaches to the port are dominated by the tidal flows, with predictable variations over diurnal, monthly and annual time scales. Currents in this part of the Gulf flow parallel to the natural sea-bed contours. Currents can be relatively strong, with speeds in excess of 3.0 Knots reported at sometimes of the year. The Admiralty Chart shows currents off Navinal point to be 3.0 Knots East & West bound. It is observed that the currents are usually aligned with the bed contours and are stronger in deeper waters off the coast. The impact of future development over the existing coast-line can be determined by the change in current speed resulting from the proposed developments.

Waves

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

Design Waves at Mundra

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 69 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

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
À	Very Unstable
В	Unstable
C	Slightly Unstable
D	Neutral
E	Stable
F	Very Stable

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

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

Average ambient temperature : 30°C

Average wind speed : Wind data for the whole year 2012 is available and is used

Stability condition : F (Very Stable)

3 Information sources

This plan is prepared in accordance with:

- 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)

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 70 of 100		of 100

ANNEXURES

INI	TIAL O	L SPILL REPOR	T ANNEXURE 1
Particulars of person, office reporting			
Tel No.			
Date & time of incident			
Spill location			
Likely cause of spill			Witness
Initial response action			Ву
Any other information			
This FIR is to be sent to Marine Ma offence not to report oil pollution in This FIR is to be followed by compa	cident.		mmunication possible. It is an
Following POLREP report to the Gorequired:	overnmer	nt through nearest C	G information will also be
Identity of informant			
Time of FIR			
Source of spill			
Cause of spill			
Type of spill			
Colour code information (from CG)	1		
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)		

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 71 of 100

POLREP	ANNEXURE 2
I ()L/KI2I	

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:

Porba	undar COMDIS 1 and Coast Guard	d 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	
Addi	tional Information :	

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On : 15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 72 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

LIST OF RESOURCES AVAILABLE

Tugs Available for Oil Spill Containment

Name of Tug	Туре	ВНР	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. 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.

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 73 of 100

ANNEXURE 3

Resources / Equipment Available with APSEZL, Mundra

Item	Quantity
Canadyne Fence Boom (Reel model 7296/8496 with Power Pack, Towing bridles and Tow lines - 255 Mtrs	1 no
Eco air boom with accessories - 300 m	1 no.
Fence boom with accessories – 250 m	1 no.
Markleen inflatable containment boom Z 1100 HD – 500m	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 sets
Lamor Minimax 12 m³ skimmer	2 sets
Multi-skimmer – 10 tph with pump	4 sets
Multi-skimmer – 30 tph with pump	1 set
Power pack for skimmers with hydraulic hoses	4 nos.
Power pack - 20 KV for skimmers with hydraulic hoses	1 no.
Floating tank (25 m ³)	2 nos.
Floating tank of 25 tonnes	2 nos.
Floating tank of 5 tonnes	5 nos.
Foot pumps for floating tank	6 nos
Oil Spill Dispersants	40250 liters
Absorbent pads	1000
Portable dispersant storage tank: 1000 ltr capacity	1 no.
Portable pumps	2 nos.
Hydraulic hoses for Markleen boom reel, 10 m	2 sets
Markleen diesel hydraulic power pack – 20 KW	3 nos.
Two – way hydraulic maneuvering panel	1 no
Backpack type boom inflator with petrol engine	3 nos.
Hydraulic hoses for maneuvering panel, 5 m	1 set
Oil discharge hose, 3", 2 x 10 m	1 set
Air inflators – petrol engine (Markleen make)	2 nos.
Air inflators – petrol engine (Eco make)	1 no.
Two way hydraulic control panel with hydraulic hoses – 5 m (Markleen make)	1 set
Power pack trolley (Markleen make)	1 no.
Rachet belt (Eco make)	10 nos.
Tool box (Eco)	6 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.

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	÷	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page	74	of 100

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	02838-61115
		Head Marine	02838-255727
		Pollution Response Officer	02838-255730
		Port Control	02838-255761 / 289170 (Fax)
2.	Kandla Port Trust	Chairman	02836-233001 / 234601
		Dy. Conservator	02836-223585 / 220235
		Harbor Master	02836-270201
		Signal Station	02836-270194 / 549
3	Indian Oil Corporation,	CM (Ops)	02838- 222194
	Mundra	Manager (Ops)	02838- 222197
		Control Room	02838- 224444
4	Indian Oil Corporation,	DGM (Ops)	02833-256527
	Vadinar	Manager Tech Services	02833-256464
		Port Control	02833-256555
5	Reliance Petroleum Ltd	Marine Chief	0288-4013607
	Jamnagar	Senior Port Captain	0288-4013750
		Port Control	0288-4012600 / 4012610
6	The Commanding Officer	ICGS, Mundra	02838 - 271402 & 03 (Tel)
	Indian Coast Guard Station,	Station Ops Officer	02838 – 271404 (Fax)
	Mundra		
7	The Commander	COMCG (NW)	079-23243241 (Tel)
	Coast Guard Region (North	Regional Ops & Plans Officer	079-23243283 (Fax)
	West), Gandhinagar		
8	The Commander	COMDIS-1	0286-2214422 (Tel)
	No.1 Coast Guard District	District Ops & Plans Officer	0286-2210559 (Fax)
	(Guj), Porbandar		
9	The Commander	COMCG (W)	022-24376133 (Tel)
	Coast Guard Region (West)	Regional Ops & Plans Officer	022-24333727 (Fax)
	Mumbai		
10	The Officer-in-Charge	PRT (W)	022-23722438 (Tel)
	Coast Guard Pollution	Officer-in-Charge	022-23728867 (Fax)
	Response Team (West), Mumbai		
11	Gujarat Maritime Board	Vice Chairman & CEO	079-23238346 / 23238363
11	Oujarat Maritille Doard	Chief Nautical Officer	079-23234716
		Chief Nautical Officer	017-23234110

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 75 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

12	Ministry of Environment	Director (Environment)	079-23252154 / 23251062
	Govt. of Gujarat		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.		
D.1 (O.	Bescription / contact person / designation	Landline	Mobile	
01	Capt. Sansar Chaube, Head – Marine & PFSO, APSEZL	02838 - 255727	91 9925223674	
02	Capt. Rahul Agarwal, Dy PFSO, APSEZL	02838-255947	91 9687678479	
03	Capt. Pankaj Kumar Sinha, Dy. PFSO, APSEZL	02838 -255730	91 7574894206	
04	Mr.Cherian Abraham, Dy. PFSO - (AICTPL & CT-4)	91-2838 - 255733	9189800 48850	
05	Capt. Kumar Paritosh, Dy. PFSO, AMCT	02838 - 255733	91 9879104839	
06	Mr. Vilsan Kurian, Dy.PFSO, MICT	02838 – 252015	91 9879104805	
07	Capt. Srinivas Kaki, Dy. PFSO, West Basin, APSEZL	02838 - 255963	91 9879203556	
08	Marine control, APSEZL	02838 - 255333 / 255761	91 9825228673	
09	Port Operation center, APSEZL	02838 –255762	91 9825000949	
10	Port security Control, APSEZL	02838 – 289322	91 9825000933	
11	Head - Security, APSEZL	02838 – 289947	91 9099005727	
12	Head - Health, safety & Environment, APSEZL	02838 - 255777 91 7574894383		
13	Head - Fire Dept. APSEZL	02838 – 255857	91 7069083035	
14	Occupational Health Centre	02838 - 255710	91 8980015070	

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 76 of 100

Marine Officer/ SPM Mooring master ANNE					
Responsibilit	 Observe or receive report of oil or chemica Initiate measures to prevent/ reduce further Maintain communication with other all vertical 	r spillage			
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				

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 77 of 100		of 100

	MARINE MANAGER / On Scene Co	mmander 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. Submit personal log to HOD – Marine			
Actions	Attend debrief			

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 78 of 100

	SPM Pilot	ANNEXURE 7
Responsibilit	o Room/ OSC as 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	

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 79 of 100		of 100

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 80 of 100

OIL SPILL PROGRESS REPORT			ANNEXURE 9	
Incident Name:				
Updated by:				
Date:		Time (le	ocal):	
Summary of Incident R	esponse Operations:			
Summary of Incident R	esponse Resource Utiliza	ution:		
Number of Aircraft:			Number of Vessels:	
Dispersant Used:		Liters	Length of Booms in	Use: m
Number of Recovery Dev	vices:		Number of Storage	Devices:
Sorbent Used:		kg	Bio-remediation Us	ed: kg
Number of Personnel:			Number of Vehicles	::
Specialist Equipment	•			
Oil Spill Balance Sheet:				
Total amount of oil spille	ed:			Tons
Total amount of oil recov	vered:			Tons
Outstanding amount of sp	pilled oil:			Tons
Mass balance:				
Estimated Natural Weath	ering:			Tons
Mechanically agitated:				Tons
Chemically dispersed:				Tons
Skimmer recovered:				Tons
Sorbent recovered:				Tons
Manually recovered:				Tons
Bio-remediated:				Tons
Other:				Tons

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 81 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

Eme	rgency Response Log	ANNEXURE 10
Page Number:		Date:
Name:		Position:
Contact Number		Signature:
Time	Activity Completed:	

Control Room Officer

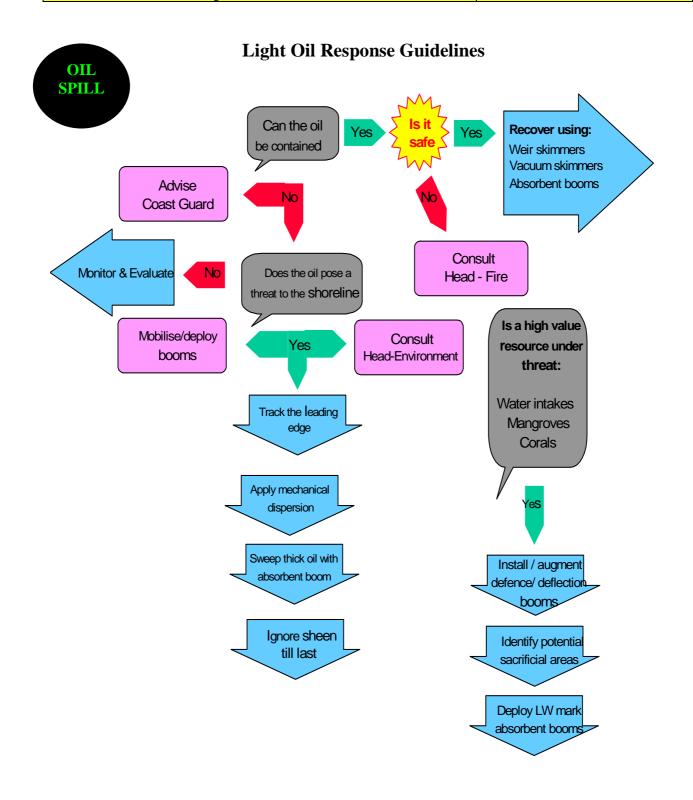
HOD – Marine

Reviewed By : Capt. Rahul Agarwal	Issue No.	: (01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 82 of 100		of 100

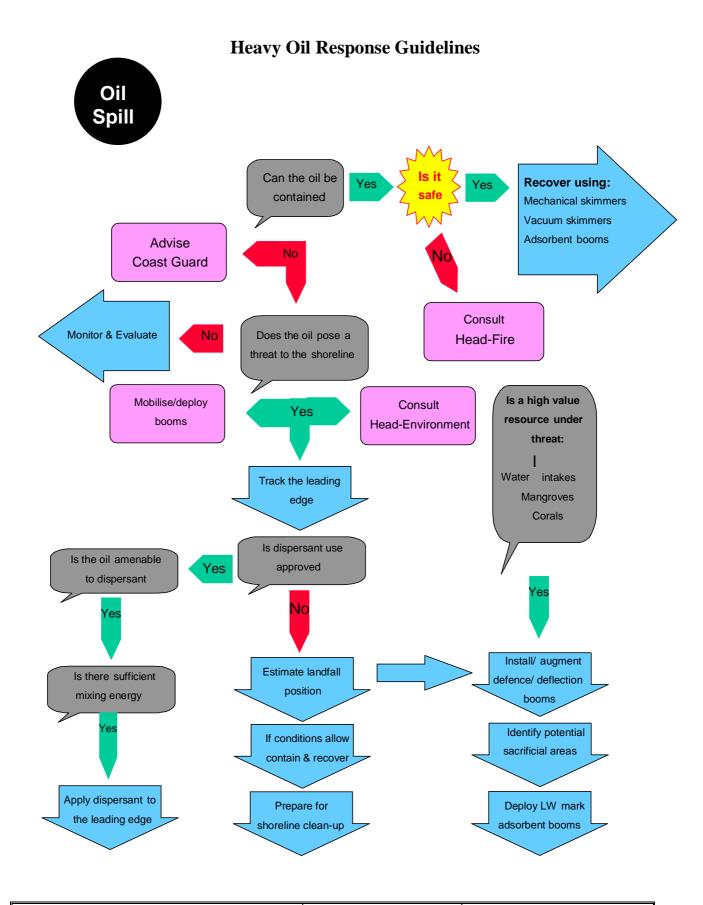
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A: 'API > 45 (Specifi	ic gravity s	0.8)					B: Pour poin	it °C				
B. Pour paint *C	me i	100					C: Viscosity	@ 10-	20°C:	betwee	n 4 Cst	and sem
C: Viscosity @ 10-2			100				D: % boiling	below	200%	: betw	een 20 a	and 50%
D: % boiling below 2 E: % boiling above 3							E: % boiling	above :	370°C	betwe	en 15 a	nd 50%
a. to training above 3	VU.C. DEW	veen 20 a	10 0%				100	10000=				
	A B	C	D	ε			Low pour poir	nt 46°C	122	1	- 6	1
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Arabian Super Light	51 -39	2 @ 2010					Arabian Extra Li	ght	38	-30	3 @ 15	
Cossack	48 -18	2 @ 200	51	18			Azeri		37	-3	8 @ 201	
Curlew	47 -13	2 @ 2010	57	17			Brent		38	-3	7 € 10	
	54 4-63	1@100	81	0			Draugen		40	-15	4 @ 201	
	52 -13			8			Dukhan		41	-49	9@15	
	52 -62	2.5 @ 10	C 60	11			Liverpool Bay		45	-21	4 @ 201	C 42
Terengganu condensate		0.5 @ 20	C >95	0			Sokol (Sakhalin)	1	37	-27	4 @ 201	C 45
Wollybutt	49 -53	28 20 0	55	4			Rio Negro		35	-5	23 @ 10	°C 29
	58	0.5@15	7	0			Umm Shaif		37	-24	10 € 10	°C 34
	45 -55	2 @ 15 0	50	0			Zakum		40	-24	68 100	36
Naptha 5	55	0.5 @ 151	C 100	0			Marine Gas oil (MGO)	37	-3	5@15%	C
								and and				
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witelainio me	191115									19	Semi-sol	THE PERSON
self-the periods	Charles Street						Amna		36		NAME OF TAXABLE PARTY.	10.00
							Beatrice		38	18	32 @ 15	C 25
		ic gravil	ty 0.85-	0.95)		Beatrice Bintulu		38 37	18 19	32 @ 15° Semi-sol	C 25
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A: "API 17.5~35 E: Pour point "C E: Viscosity @ 10	(Specifi 0-20°C:	betwe	en 8 CS	t and	semi	solid	Beatrice Bintulu Escravos Sarir		38 37 34 38	18 19 10 24	32 @ 15° Semi-soli 9 @ 15°C Semi-soli	C 25 id 24 C 35 id 24
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A: "API 17.5~35 I: Pour point "C I: Viscosity @ 10 I: % boiling belo	(Specifi 0-20°C ow 200°	betwe	en 8 CS veen 10	t and	semi:	solid	Beatrice Bintulu Escravos Sarir		38 37 34 38 40	18 19 10 24 6	32 @ 15° Semi-soli 9 @ 15°C Semi-soli	C 25 id 24 C 35 id 24
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A: "API 17.5-35 E: Pour point "C E: Viscosity @ 16 9 % boiling above ow pour point <6" laska North Slope	(Specification (Speci	betwe C: betw D betw B	en 8 CS veen 10 reen 30 C	t and and a and 6	semi : 35% 55% D 32	E 41	Beatrice Bintulu Escravos Sarir Statfjord		38 37 34 38 40	18 19 10 24 6	32 @ 15° Semi-soli 9 @ 15°C Semi-soli	C 25 id 24 C 35 id 24
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API 17.5-35 Pour point *C Viscosity @ 10 % boiling abov bw pour point <6* laska North Slope rabian Heavy rabian Medium rabian Light	(Specification (Speci	B -18 -40 -21 -40	en 8 CS ween 10 een 30 C 32 @ 1 55 @ 1 25 @ 1 14 @ 1	t and and 6 and 6 S°C S°C S°C S°C	35% 35% 55% D 32 21 22 25	E 41 56 51 45	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3	oils	38 37 34 38 40 40	18 19 10 24 6	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C	PC 25 id 24 C 35 id 24 C 38
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API 17.5-35 Pour point *C Viscosity @ 10 % boiling belo % boiling above w pour point <6* laska North Slope rabian Heavy rabian Medium rabian Light entry Light light light light light light light light	(Specification (Speci	B -18 -40 -21 -40 -11 -36 -32	c 32 e1 55 e1 25 e1 25 e1 15 e1 15 e1	t and and 6 src src src src src src	D 32 21 22 25 26 24 26	E 41 56 51 45 30 48 43	Group 4 A: "API <17.5 (SB: Pour point >3 C: Viscosity @ 10	oils pecific g	38 37 34 38 40 gravity	18 19 10 24 6 >0.95) o	32 @ 15" Semi-soli 9 @ 15" Semi-soli 7 @ 10" CSt and se	PC 25 id 24 C 35 id 24 C 38
API 17.5-35 Pour point C Viscosity @ 10 % boiling above w pour point <6 lasks North Slope rabian Heavy rabian Medium rabian Light enny Light lasks Light last last last last last last last las	(Specification of Specification of Speci	B -18 -40 -21 -40 -11 -36 -32 -57	en 8 CS veen 10 een 30 C 32 €1 55 €1 25 €1 25 €1 15 €1 80 €1	t and	D 32 21 22 25 26 24 26 21	E 41 56 51 45 30 48 43 55	Group 4 A: "API <17.5 (SB: Pour point >3 C: Viscosity @ 10 D: % boiling belo	oils pecific g orc 1-20°C; tow 200°C ve 370°C	38 37 34 38 40 gravity between C: less : grea	18 19 10 24 6 >0.95) o en 1500 e than 25% ter than	32 @ 15" Semi-soli 9 @ 15" Semi-soli 7 @ 10" CSt and se % 30%	C 25 id 24 C 35 id 24 C 38
A: API 17.5-35 Pour point C Viscosity @ 10 % boiling belo % boiling abov ow pour point <6 lasks North Slope rabian Heavy rabian Medium rabian Light enny Light anian Heavy anian Light hafji rri	(Specification of the control of the	B -18 -40 -21 -40 -11 -36 -32 -57 -12	en 8 CS veen 10 een 30 C 32 e1 55 e1 25 e1 25 e1 25 e1 15 e1 80 e1 18 e1	t and	D 32 21 22 25 26 24 26 21 32	E 41 56 51 45 30 48 43 55 38	Group 4 A: "API <17.5 (SB: Pour point >3 C: Viscosity @ 10 D: % boiling about	oils pecific g 0°C 1-20°C: 1 bow 200°C ve 370°C	38 37 34 38 40 gravity betwee C: less E grea	18 19 10 24 6 >0.95) o en 1500 e than 25% ter than	32 @ 15°C Semi-soli 9 @ 15°C Semi-soli 7 @ 10°C	C 25 id 24 C 35 id 24 C 38 C 38
A: "API 17.5-35 E: Pour point "C E: Viscosity @ 10 E: % boiling above ow pour point <6" lasks North Slope rabian Heavy rabian Medium rabian Light onny Light anian Heavy anian Light on tight on	(Specification of Specification of Speci	B -18 -40 -21 -40 -11 -36 -32 -57 -12 -27	en 8 CS veen 10 een 30 C 32 e1 55 e1 25 e1 25 e1 15 e1 80 e1 18 e1 10 e1	t and and e and e sec sec sec sec sec sec sec sec sec se	D 32 21 22 25 26 24 26 21 32 32	E 41 56 51 45 30 48 43 55 38 39	Group 4 A: "API <17.5 (SB: Pour point >3 C: Viscosity @ 10 D: % boiling belo	oils pecific g orc 1-20°C; tow 200°C ve 370°C	38 37 34 38 40 gravity between C: less : grea	18 19 10 24 6 >0.95) o en 1500 c than 259 ter than	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15°C 10	C 25 id 24 C 35 id 24 C 38
A: "API 17.5-35 E: Pour point "C E: Viscosity @ 16 E: % boiling above ow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light enny Light anian Heavy anian Light intinum der Horse a Juana Light	(Specification of the control of the	B -18 -40 -21 -40 -11 -36 -32 -57 -12 -27 -42	en 8 CS veen 10 veen 30 C 32 €1 55 €1 14 €1 25 €1 15 €1 80 €1 18 €10 10 €16	t and	D 32 21 22 25 26 24 26 21 32 32 24	E 41 56 51 45 30 48 43 55 38 39 45	Group 4 A: "API <17.5 (SB: Pour point >3 C: Viscosity @ 10 D: % boiling bekee: % boiling about Bachaquero 17	oils pecific g O'C 3-20°C: 1 ow 200°C A 16	38 37 34 38 40 eravity betwee C: less : grea B -29	18 19 10 24 6 >0.95) o than 25; ter than C 5,000 @ Semi -s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15°C 10 olid 4	C 25 id 24 C 35 id 24 C 38
A: "API 17.5-35 A: Pour point "C C: Viscosity @ 10 C: % boiling above ow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light comy Light safii ri nunder Horse a Juana Light oil	(Specification of the control of the	B -18 -40 -11 -36 -32 -57 -12 -27 -42 -9	en 8 CS veen 10 veen 30 C 32 e1 55 e1 25 e1 25 e1 14 e1 15 e1 18 e1 10 e1 500 e1	t and and 6 sic	D 32 21 22 25 26 24 26 21 32 32 32 24 24	E 41 56 51 45 30 48 43 55 38 39 45 35	Group 4 A: "API <17.5 (SB: Pour point >3 C: Viscosity @ 10 D: % boiling about 8 Bachaquero 17 Boscan	oils pecific g 0°C 1-20°C: 1 ow 200°C ve 370°C A 16 10	38 37 34 38 40 40 betwee C: less c: grea 8 -29 15	18 19 10 24 6 >0.95) o en 1500 c than 259 ter than	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C ** ** ** ** ** ** ** ** **	C 25 iid 24 C 35 iid 24 C 38 E 60 80 54
A: "API 17.5-35 A: Pour point "C C: Viscosity @ 10 C: % boiling belo A: % boiling above ow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light comy Light anian Light nafi munder Horse a Juana Light oil	(Specification of the control of the	B -18 -40 -11 -36 -32 -57 -12 -27 -42 -9	en 8 CS veen 10 veen 30 C 32 €1 55 €1 14 €1 25 €1 15 €1 80 €1 18 €10 10 €16	t and and 6 sic	D 32 21 22 25 26 24 26 21 32 32 32 24 24	E 41 56 51 45 30 48 43 55 38 39 45	Group 4 A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling beld E: % boiling about	oils pecific g 0°C 1-20°C: 1 50w 200°C 4 16 10 33	38 37 34 38 40 40 gravity betwee C: less : grea 8 -29 15 43	18 19 10 24 6 >0.95) o en 1500 c than 25's ter than C 5,000 @ Semi -s Semi -s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C ** ** ** ** ** ** ** ** **	C 25 iid 24 C 35 iid 24 C 38 E 60 80 54
A: "API 17.5-35 E: Pour point "C E: Viscosity @ 10 E: % boiling belo E: % boiling abov ow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light enny Light enny Light ennian Light initial Light on June Horse a Juana Light oil O 180	(Specification of the control of the	B -18 -40 -11 -36 -32 -57 -12 -27 -42 -9	en 8 CS veen 10 veen 30 C 32 e1 55 e1 25 e1 25 e1 14 e1 15 e1 18 e1 10 e1 500 e1	t and and 6 sic	D 32 21 22 25 26 24 26 21 32 32 32 24 24	E 41 56 51 45 30 48 43 55 38 39 45 35	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling beld E: % boiling about Bachaquero 17 Boscan Cinta Handil Merey Nile Blend	oils pecific g O'C 3-20°C: 1 ow 200°C ve 370°C A 16 10 33 33	38 37 34 38 40 40 eravity betwee C: less : grea 8 -29 15 43 35	18 19 10 24 6 >0.95) o en 1500 o than 25° ter than C 5,000 @ Semi -s Semi -s Semi -s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C ** ** ** ** ** ** ** ** **	C 25 id 24 C 35 id 24 C 38 E 60 80 54 33 70
A: "API 17.5-35 A: Pour point "C C: Viscosity @ 10 C: Viscosity @ 10 C: We boiling above ow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light enny Light anian Light interior aunder Horse a Juana Light oil O 180 Igh pour point >5'	(Specification of the control of the	B -18 -40 -21 -40 -11 -36 -32 -57 -12 -27 -42 -9 10-30	en 8 CS veen 10 veen 30 C 32 @ 1 55 @ 1 25 @ 1 25 @ 1 14 @ 1 15 @ 1 80 @ 1 10 @ 1 500 @ 1 14 @ 1 1,500 - 3,	t and and 6	D 32 21 22 25 26 24 26 21 32 32 32 24 24 24	E 41 56 51 45 30 48 43 55 38 39 45 35 -	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling belof E: % boiling about Bachaquero 17 Boscan Cinta Handil Merey Nile Blend Pilon	oils pecific g o'C 3-20°C: 1 16 10 33 33 17 34 14	38 37 34 38 40 40 eravity betwee C: less C: grea 8 -29 15 43 35 -21 33 -3	18 19 10 24 6 >0.95) o en 1500 o than 259 iter than 5,000 @ Semi-s Semi-s Semi-s Semi-s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15"C 10 olid 4 olid 10 olid 23 15"C 7 olid 13 olid 2	emi-solid E 60 80 54 33 70 59 92
A: "API 17.5-35 A: Pour point "C C: Viscosity @ 10 C: Viscosity @ 10 C: % boiling belo A: % boiling above yow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light cony Light anian Light rii nunder Horse a Juana Light coll O 180 ligh pour point >5' sbinda	(Specification of Control of Cont	B -18 -40 -21 -40 -11 -36 -32 -57 -12 -27 -42 -9 10-30	en 8 CS veen 10 veen 30 C 32 e 1 55 e 1 25 e 1 25 e 1 15 e 1 15 e 1 10 e 1 10 e 1 1500 e 1 14 e 1 1500 e 3 1 1500 e 3 1 1500 e 3 1	t and	D 32 21 22 25 26 24 26 21 32 32 32 24 24 15°C	E 41 56 51 45 30 48 43 55 38 39 45 35 -	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling belof E: % boiling about Bachaquero 17 Boscan Cinta Handil Merey Nile Blend Pilon Shengli	oils pecific g orc 3-20°C: 1 ow 200°C ve 370°C A 16 10 33 33 17 34 14 24	38 37 34 38 40 40 betwee C: less : grea 8 -29 15 43 35 -21 33 -3 21	18 19 10 24 6 >0.95) o en 1500 (than 25° tter than 5,000 @ Semi -s Semi -s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15"C 10 olid 4 olid 10 olid 23 15"C 7 olid 13 olid 2 olid 9	emi-solid E 60 80 54 33 70 59 92 70
A: "API 17.5-35 A: Pour point "C C: Viscosity @ 16 D: % boiling belo A: % boiling above Ow pour point <6' laska North Slope rabian Heavy rabian Medium rabian Light conny Light anian Light haffi itunder Horse a Juana Light oil O 180 ligh pour point >5' abinda oco	(Specification of Control of Cont	B -18 -40 -21 -40 -11 -36 -32 -27 -42 -9 10-30	en 8 CS veen 10 veen 30 C 32 e 1 55 e 1 25 e 1 25 e 1 25 e 1 15 e 1 80 e 1 10 e 1 10 e 1 1500 e 3 14 e 1 1500 e 3 Semi-sc Semi-sc	t and	D 32 21 22 25 26 24 26 21 32 32 32 34 24 15°C	E 41 56 51 45 30 48 43 55 38 39 45 35 -	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling belof E: % boiling about Bachaquero 17 Boscan Cinta Handil Merey Nile Blend Pilon Shengli Taching	oils pecific g orc 3-20°C: 1 ow 200°C ve 370°C A 16 10 33 33 17 34 14 24 31	38 37 34 38 40 40 betwee C: less : grea 8 -29 15 43 35 -21 33 -3 21 35	18 19 10 24 6 >0.95) o en 1500 (c than 25° tter than 5 Semi - 5 Semi - 5 Se	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15"C 10 olid 4 olid 10 olid 23 olid 9 olid 9 olid 12	emi-solid E 60 80 54 33 70 59 92 70 49
A: "API 17.5-35 B: Pour point "C C: Viscosity @ 10 D: % boiling belo D: % boiling above ow pour point <6' laska North Slope rabian Heavy rabian Heavy rabian Light enny Light enny Light enny Light hafi iri hunder Horse a Juana Light roll O 180 ligh pour point >5' abinda oco amba	(Specification of the control of the	B -18 -40 -21 -40 -11 -36 -32 -57 -12 -27 -42 -9 10-30	en 8 CS veen 10 veen 30 C 32 e 1 55 e 1 25 e 1 25 e 1 15 e 1 80 e 1 10 e 10 500 e 1 14 e 10 1,500 - 3,	t and	D 32 21 22 25 26 24 26 21 32 32 32 24 24 15°C	E 41 56 51 45 30 48 43 55 38 39 45 35 - 56 46 54	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling about Bachaquero 17 Boscan Cinta Handil Merey Nile Blend Pilon Shengli Taching Tia Juana Pesado	oils pecific g O'C 3-20°C: 1 ow 200°C ve 370°C A 16 10 33 33 17 34 14 24 31 12	38 37 34 38 40 40 between C: less C: less C: grea 8 -29 15 43 35 -21 33 -3 -21 35 -1	18 19 10 24 6 >0.95) o en 1500 c than 259 ter than 5 Semi -s Semi -s Semi -s Semi-s Semi-s Semi-s Semi-s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15"C 10 olid 4 olid 10 olid 23 olid 2 olid 9 olid 9 olid 9 olid 12 olid 3	E 60 80 54 33 70 59 92 70 49 78
A: "API 17.5-35 B: Pour point "C C: Viscosity @ 10 D: % boiling belo D: % boiling above Ow pour point <6' Lisaka North Slope Li	(Specification of Control of Cont	B -18 -40 -21 -40 -11 -36 -32 -27 -42 -9 10-30	en 8 CS veen 10 veen 30 C 32 e 1 55 e 1 25 e 1 25 e 1 25 e 1 15 e 1 80 e 1 10 e 1 10 e 1 1500 e 3 14 e 1 1500 e 3 Semi-sc Semi-sc	t and	D 32 21 22 25 26 24 26 21 32 32 32 34 24 15°C	E 41 56 51 45 30 48 43 55 38 39 45 35 -	Beatrice Bintulu Escravos Sarir Statfjord A: "API <17.5 (S B: Pour point >3 C: Viscosity @ 10 D: % boiling belof E: % boiling about Bachaquero 17 Boscan Cinta Handil Merey Nile Blend Pilon Shengli Taching	Oils pecific g O'C 3-20°C: 1 ow 200°C A 16 10 33 33 17 34 14 24 31 12 33	38 37 34 38 40 40 eravity betwee C: less F grea 8 -29 15 43 35 -21 35 -1 46	18 19 10 24 6 >0.95) o en 1500 o than 255 tter than 5,000 @ Semi-s Semi-s Semi-s Semi-s Semi-s Semi-s Semi-s Semi-s Semi-s	32 @ 15" Semi-soli 9 @ 15"C Semi-soli 7 @ 10"C CSt and se % 30% D 15"C 10 olid 4 olid 10 olid 23 olid 2 olid 9 olid 9 olid 9 olid 12 olid 3	E 60 80 54 33 70 59 92 70 49 78 70

Reviewed By : Capt. Rahul Agarwal	Issue No.	: (01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: (03	Page	83	of 100

Response Guidelines ANNEXURE 12



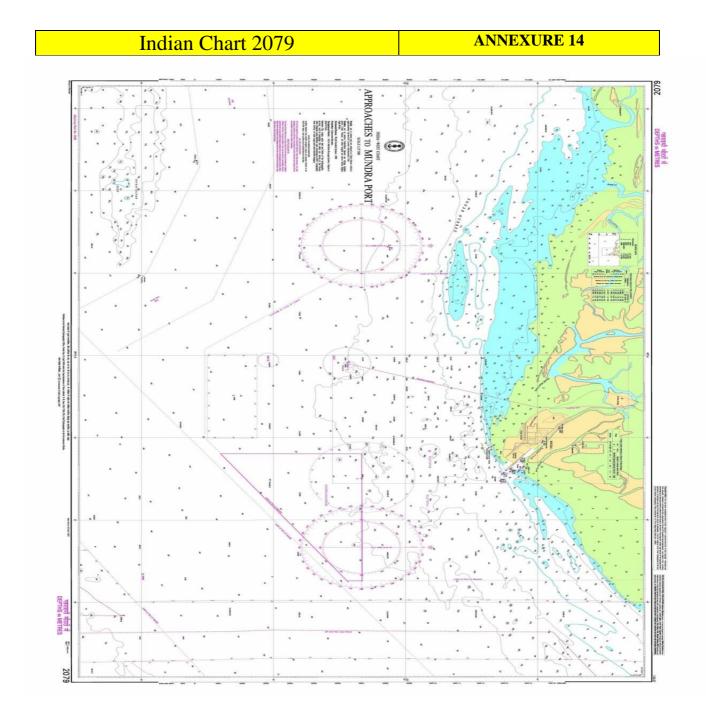
Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page	84	of 100



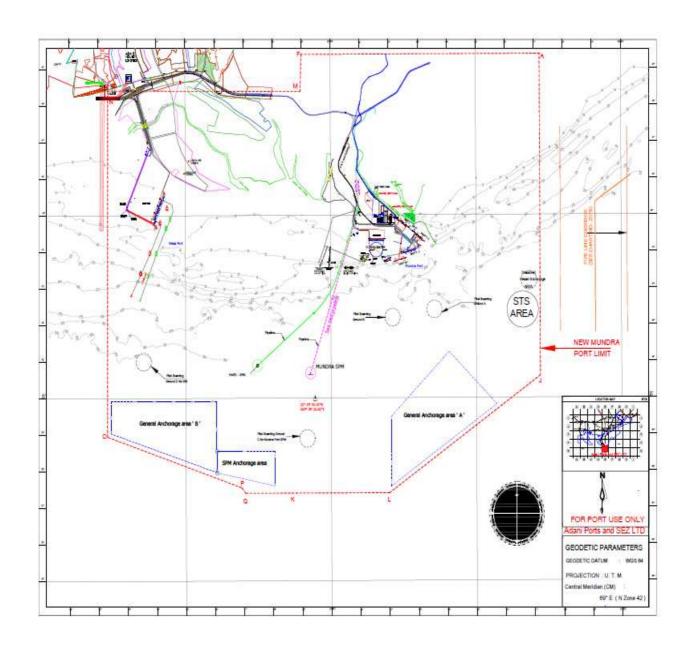
Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 85 of 100

			Site	te Specific Health and Safety Plan				ANNEXURE 13						
				Ass	essmen	t F	orm							
1. APPLIES TO S	ITE:													
2. DATE :				3. TIN	IE:				4. INC	IDE	NT:			
5. PRODUCT(S):	I.								Į.		(At	tach MSDS)	
6. Site Characteriz	ation	•												
6a. Area		Open wa	ter	□ Ins	shore wate	r		River / (Creek		Salt m	narsh		udflats
		Shorelin	e	□ Sa	nd			hingle			Intake	Channel		
6b. Use		Comme	cial	□ Inc	dustrial		□ P	ublic			Gover	nment	□ Re	ecreational
		Resident	ial	□ Ot	her									
7. Site Hazards														
□ Во	at safet	y			☐ Fire,	exp	losion,	in-situ	burn			lips, trips ar	nd falls	
□ Ch	emical	hazards			☐ Heat	stre	SS					team and ho	t water	
□ Dru	ım han	dling			☐ Heli	copte	er oper	ations				ides		
		t operati	ons		☐ Lifti	ng					□ T ₁	renches, exc	cavation	S
☐ Electrical hazards				☐ Motor vehicles				□ V	isibility					
☐ Fatigue			□ Noise				☐ Weather							
□ Others						l/burie		ies			ork near w	ater		
				☐ Pumps and hoses										
8. Air Monitoring			_					I			I			1
			LEL			Benze	ene		□ F	I ₂ S			Other	
9. Personal Protec	tive Eq	uipmen	t T											
☐ Foot Protection							_	Cove						
☐ Head Protection	1			☐ Impervious suits										
☐ Eye Protection									onal Floata	ation				
☐ Ear Protection							-	Resp						
☐ Hand Protection	1							Othe	r					
10. Site Facilities ☐ Sanitation					☐ First	A : d					П D ₀	contaminat	i	
11. Contact details					☐ FIISt	Alu					⊔ ре	Contaminat	1011	
Doctor	•						Ph	one						
☐ Hospital							_	one						
☐ Fire								one						
□ Police								one						
□ Other							_	one						
12. Date Plan Con	pleted													
13. Plan Complete														

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page	86	of 100



Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 87 of 100



Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 88 of 100

List of recycler approved by state of Gujarat	ANNEXURE 15

Ministry of Environment & Forest & Climate Change (MoEFCC), New Delhi has published a Gazattee notification vide no S.O 1996(E) dated 13/08/2010 as the fourth amendment in the hazardous waste (M,H&TM) rules 2008 and has came into force from 13/08/2010. List of Registered Used Oil/Waste Oil Recyclers Granted by GPCB. Capacity E-mail ID Srunder Sch -No Aadi Oil Pvt. Ltd., Waste oil 27000 KLPA 1 25/01/2011 to oil@aadigroup.in / gaurang.sathwara@aadioil.com SUR NO-24/01/2016 141, Paiki, Mundra, SEZ, Ta-Mundra. Dist- Kutch 2 03-12-2012 to Waste oil 18000 KLPA alicidoil@yahoo.com Alicid organic Industries Ltd., Plot no: 208, Hanuman 02-12-2017 Henduva, opp. Gujcomasol, Nr. Khari River, Highway, Post: Palavasana, Mehsana-2 3 Karim Corporation, 14/10/2011 to Used oil 78 KLPA karim.corporation@yahoo.c 157/35-C, Good luck 13/10/2013 market, Opp. Chandola lake, Narol road, Ahemdabad - 380028 4 Deepak Petrochem Ltd., 18/11/2011 to Waste Oil/ 50,400 KLPA deepak petrochem@yahoo. 56/2, rameshwar road, vill. 17/11/2015 Used oil co.in Vasenti, nr. Baska, tal. Halol, panchmahal-389350 Waste Oil 12000 KLPA 5 Concept Petrochem, 15/11/2011 to conceptpetrochem@yahoo. S.No. 249A, Plot No: 41/A, 14/11/2016 co.in Vasna Iyava, Vill. Sanand, Dist. Ahmdabad Karam petroleum product 29/11/2011 to Used oil 420 KLPA 6 karamhusainkhan@yahoo.c p.ltd., Plot 23/10/2016 no.1915,gidc,sarigam,ta:umbergaon, dist-valsad, Gujarat 7 Mazda Industrol. 1. Used oil 1. 4320 KLPA 13/01/2012 to rukshadmaster@gmail.com Plot No.- 349 Vill- Sahol 2. Waste oil 2.4800 KLPA 12/01/2017 Bharuch 8 Alka Enterprises, 19/01/2012 to 1. Used oil 1.3600 KLPA alkaenterprises.ahd@gmail. Plot No.- 10, Panjetini 18/01/2017 2. Waste oil 2.7800 KLPA com/ Estate, Opp. P.W.D. Stores. alka.enterprises@ymail.co Danilimda Ahmedabad 9 Jodhpur Oil Industries, 13/02/2012 to Used oil 2880 KLPA jpoil 714@yahoo.in/ Panjetani Estate Opp 12/02/2017 irfany1812@gmail.com PWDStores. Near Chandola Lake Danilibmda, Ahmedabad 3420 KLPA 10 Bombay Oil Company, 13/02/2012 Used bombayoilco@yahoo.in Sur-362,363,366,487. Paiki, Plot No-14 & 24 Vill-Vatwa, Ta. Dascroi. Ahmedabad

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 89 of 100

11	Tawakkal Traders,	27/02/2012 to	Used oil	2040 KLPA	tawakkal.traders14@yahoo.
	Plot no-15, jagannath	26/02/2017			com
	maharaj farm, nr- sikandar				
	market, danilimda,				
	Ahmedabad				
12	Amafhh Petroleum,	30/03/2012 to	Used oil	3000 KLPA	aromapetrochem@gmail.co
	60, GIDC, Vartej,	29/03/2017			m
12	Bhavnagar	11/00/2012	1 77 1 1	1 7200 IZI DA	1: 1 1:1626 1
13	Shree Bhagwati Petrochem,	11/09/2012 to	1. Used oil	1. 5280 KLPA	himanshugohil63@gmail.c
	Plot no. 3, Survey Np. 211, Sihor-Ghanghli Road, Vill.	10/09/2017	2. Waste oil	2. 3120 KLPA	om
	Ghanghli, Ta. Sihor,				
	Bhavnagar				
14	Shana Petrochem,	17/09/2012 to	Used oil	3960 KLPA	shanapetrochem@yahoo.co
	Opp. PWD stores, nr. Eagle	05/12/2017	00000	0,00 112111	m
	traders, chandola lake,				
	narol road, Ahemdabad -				
	382028				
15	Jawrawala Petroleum,	18/09/2012 to	1. Used oil	1. 4800 KLPA	jawrapetro@yahoo.co.in
	Plot No:200/33, B/H	17/09/2017	2. Waste oil	2. 9000 KLPA	
	Kashiram				
	Textile Mill, Narol,				
16	Ahmedabad - 382405 Jay Yogeshwar Petro	25/09/2012 to	Used oil	1500 KLPA	ive meta@yehoo eem
10	Chemicals, s.no. 200, block	24/09/2017	Used on	1300 KLPA	jys_moto@yahoo.com
	no.157, plot no 2/2, vill.	24/09/2017			
	Malpartal. Ghogha, distt.				
	Bhavnagar				
17	Aroma Petrochem,	30/03/2012 to	Used oil	3000 KLPA	aromapetrochem@gmail.co
	60, GIDC, Vartej,	29/03/2017			m
	Bhavnagar				
18	Suraj barrel supply co.,	19/11/2012 to	Used oil	2700 KLPA	suraj_barrel786@yahoo.in
	Opp. D.W.D, nr. Goodluck	15/02/2017			
	barrel market, chandola				
	lake,narol highway,				
19	ahemdabad -380028 Suzlon Enterprise,	29/11/2012 to	1. Used oil	1. 3600 KLPA	alicidoil@yahoo.com
17	Plot No.3488/2, Phase-IV,	28/11/2017	2. Waste oil	2. 18000 2. 18000	ancidon e yanoo.com
	GIDC, Chhatral, Ta-Kalol,	20/11/2017	2. Waste off	KLPA	
	Gandhinagar				
20	Alicid Oraganic Ltd.,	03/02/2012 to	1. Used oil	1. 3600 KLPA	alicidoil@yahoo.com
	Plot no: 208, Hanuman	02/02/2017	2. Waste oil	2. 18000	,
	Henduva, opp. Gujcomasol,			KLPA	
	Nr. Khari River, Highway,				
	Post: Palavasana, Mehsana	04/46/2017		040 777 77	
21	Shana oil process,	01/12/2012 to	Used oil	910 KLPA	shanaoilprocess@yahoo.co
	New good Market, opp.	30/11/2017			m
	P.W.D. Stores, Chandola				
	lake,Narol road, Ahmedabad – 28				
	Amneuavau – 20				
L	<u>I</u>	I .	<u> </u>	I .	<u>I</u>

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 90 of 100

22	W D 1	20/11/2012 ·			
22	Virat Petroleum,	29/11/2012 to	Used oil	7200 KLPA	viratpetroleum9786@gmail
	Plot No.19 D, Mahagujarat	28/11/2017			.com
	Ind.Estate, Vill moriya, Ta				
	Sanand, Ahmedabad				
23	Navkar Enterprise,	09/02/2010 to	Waste Oil	4800 KLPA	navkar.ent05@gmail.com
	Block no. 185/186, vill.	08/02/2015			
	Chachrvadi, vasna, tal.				
	Sanand,				
	distt. Ahemdabad - 382210				
24	One-Ten Impex,	3/10/2013 to	1. Used oil	1. 2400 KLPA	onetenimpex@gmail.com
2-	Survey No.72-P1,	2/10/2018	2. Waste oil	2. 3600 KLPA	oneteninpex@gman.com
	Trapaj-364240, Alang	2/10/2016	2. Waste on	2. 3000 KLI A	
	1 0				
	Road, Ta-Talaja, Dist-				
2.5	Bhavnagar	10/10/2010	1 77 10"	1 200 111 D.1	
25	Shana oil process,	13/12/2013 to	1. Used Oil	1. 300 KLPA	shanaoilprocess@yahoo.co
	New good Market, opp.	12/12/2018	2. Waste	2. 610 KLPA	m
	P.W.D. Stores, Chandola		Oil		
	lake, Narol road,				
	Ahmedabad - 28				
26	Power Gold Petrochem Pvt.	30/12/2013 to	1. Waste	1. 10800	powergold99@gmail.com
	Ltd., Plot No.508/B/2, S.	29/12/2018	Oil	KLPA	
	No.436, Por – Utiya Road,		2. Used Oil	2. 2400 KLPA	
	Por,Vadodara				
27	A N Lubricants,	26/02/2014 to	1. Used oil	1. 6000 KLPA	anlubricant@gmail.com
2,	Plot no. 45, GIDC,	25/02/2019	2. Waste oil	2. 6000 KLPA	umuorieani e ginam.eom
	Bhatporeichhapore-	25/02/2019	2. Waste on	2. 0000 REF 71	
	nr. GAIL colony,				
	Bhatpore, Tal. Choryaci,				
	Dist.Surat - 394510				
20		00/02/2010 4-	Wests O'l	20020 IZI DA	
28	Navkar Enterprise,	09/02/2010 to	Waste Oil	20820 KLPA	navkar.ent05@gmail.com
	Block no. 185/186, vill.	08/02/2015			
	Chachrvadi, vasna, tal.				
	Sanand,				
	distt. Ahemdabad - 382210	22/02/22:::			
29	Priyansi Corporation,	25/03/2014 to	1. Used oil	1. 2400 KLPA	priyansicorpo@gmail.com
	Shed no- c-1,805 to	24/03/2019	2. Waste oil	2. 2880 KLPA	
	806,GIDC,				
	Bamanbore, Ta- Chotila,				
	Di-Surendranagar				
30	United Shipping Company,	09/04/2014 to	1. Used oil	1. 1200 KLPA	rajesh@unitedgroupindia.c
	Plot No-69 & 70,	08/04/2019	2. Waste oil	2. 6000 KLPA	o.in
	Gadhidham, Kutch				
31	Amar Hydrocarbon Pvt	10/04/2014 to	1. Used oil	1. 3600 KLPA	amarhydrocarbon@gmail.c
	Ltd.,	09/04/2019	2. Waste oil	2. 18900	om
	Plot No.36, Sr. No.165/1 to			KLPA	
	180, 1 & 2, Tal. Sanand,				
	Dist.Ahmedabad				
32	Karim Corporation,	13/05/2014 to	Used oil	84 KLPA	karim.corporation@yahoo.c
22	157/35-C, Good luck	12/05/2014 to	O SCU OII	OT IXLI A	om
	market,	12/03/2017			OIII
	Opp. Chandola lake, Narol				
	* *				
	road, Ahemdabad - 380028				

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 91 of 100		of 100

22	G 11 1 D / 1		1	1440 IZI DA	
33	Goodluck Petroleum,	06/06/2014 to	Used oil	1440 KLPA	manojmakwana27@gmail.c
	Plot No.118, GIDC,	05/06/2019			om
	Limdi Highway Road,				
	Ta-Limdi, Dist-				
	Surendranagar				
34	Jawarawala Petroleum,	09/07/2014 to	1. Used oil	1. 4800 KLPA	jawrapetro@yahoo.co.in
	Plot No:200/33, B/H	08/07/2019	2. Waste oil	2. 9000 KLPA	
	Kashiram				
	Textile Mill, Narol,				
	Ahmedabad - 382405				
35	Western India Petrochem	25/07/2014 to	1. Used oil	1. 3660 KLPA	wipci@yahoo.com
	Industry, Plot No-50, 51,	24/07/2019	2. Waste oil	2. 11100	Transfer of the second
	GIDC Estate, Village			KLPA	
	Gozaria, Dist-				
	Mehsana				
36	Shibl Lubricant, Block	25/07/2014 to	Used oil	7200 KLPA	shibllubricant@gmail.com
	no.90, Plot No.1-2-3,	24/07/2019			8
	Karanj, Modvan				
	Patia, Mandvi, Surat				
37	R K Steel, Pl-No-21 GIDC	30/07/2014 to	Used oil	4320 KLPA	rksteel_gujarat.co
3,	Estate Ph-1	29/07/2019	C SCG OII	1320 112111	The teel_gajaranee
	Narmadanagar, Bharuch	25/07/2015			
38	Atlas organics Pvt Ltd.,	13/08/2014 to	Waste Oil	21600 KLPA	atlasorganics@yahoo.com
30	Opp: PWD Store,	12/08/2019	waste on	21000 KLI A	attasorganics@yanoo.com
	Nr. Chandola Lake,	12/06/2019			
	Danilimda,				
	Ahmedabad-28				
39		02/00/2014 +=	1. Used Oil	1 0200 1/1 4	maliama ahamal@wahaa aam
39	M/s.Reliance Barrel Supply	03/09/2014 to		1. 8280 KLA	reliancebarrel@yahoo.com
	co., 200/34, B/H-Kashiram	02/09/2019	2. Waste	2. 9000 KLA	
	Mill, Narol, Ahmedabad-		Oil		
10	382405	25/00/2014	1 77 1 1	1 2160 1/1 DA	
40	Noorani Enterprise,	25/09/2014 to	1. Used oil	1. 2160 KLPA	nooranienterprise99@gmail
	Plot No.57/58, GIDC,	24/09/2019	2. Waste oil	2. 2820 KLPA	.com
	Matar, Ta-Dist: Kheda				
41	Star International	29/09/2014 to	Used oil	3150 KLPA	starintpet@gmail.com
	Petroleum,	28/09/2019			
	Plot No.175, Vill-hahWadi,				
	Narol-Vasna Road, Narol,				
	Dist-Ahmedabad				
42	Unity Petroleum Co.,	10/10/2014 to	Used oil	600 KLPA	unitypetro_hamid@yahoo.c
	Opp: PWD Store,	09/10/2019			om
	Nr. Chandola Lake,				
	Danilimda,				
	Ahmedabad-382405				
43	M/s. A One Lube Refinery,	15/10/2014 to	Used oil	3120 KLPA	Brishol@gmail.com
	Plot No.458, New GIDC,	14/10/2019			_
	Nasilpore, Dist. Navsari				
44	M/s.Oasis Industries,	20/10/2014 to	Used oil	2700 KLPA	oasisindustry1@gmail.com
	Plot No.267/P-1, Katpur	19/10/2019			, 18
	Marhaniya Road,				
	Patan-384365, Ta-Dist:				
	Patan,				
		<u> </u>	I	L	<u> </u>

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 92 of 100		of 100

1.	1.500	45/40/2014			•
45	ABC Organics & Chemicals, Plot no. 605, GIDC Estate, Panoli, Bharuch	17/12/2014 to 16/12/2019	Used oil	1500 KLPA	abcorganicschemicals@yah oo.com
46	Jay Yogeshwar Petro Chemicals, s.no. 200, block no.157, plot no 2/2, vill. Malpartal. Ghogha, distt. Bhavnagar	17/12/2014 to 16/12/2019	Used oil	1500 KLPA	jys_moto@yahoo.com
47	M/s R.R. Industries, Plot no. 19, GIDC, Matar, Kheda	23/12/2014 to 22/12/2019	Used Oil	2880 KLPA	rrindustries61093@gmail.c om
48	M/s Power Petrochem, Plot no. 33, Raja Rao Industrial Area, Navagam, Dist. Rajkot	23/12/2014 to 22/12/2019	1. Used Oil 2. Waste Oil	1. 2160 KLPA 2. 2820 KLPA	powerpetrochem@yahoo.c om / gondaliyaalpesh@yahoo.in
49	M/s. Welknown Industries Plot No. 43, S.No 396, New Ahmedabad Industiral Estate, Bavala – Sarkhej highway, Moraiya, Sanand, Ahmedabad.	30/012015 to 29/01/2020	1. Used Oil	600 KLPA	mslakdia@yahoo.com
50	M/s.Ashish Coating Technologies Pvt Ltd., Plot No.431, GIDC Vaghodia, Dist. Vadodara-391760	11/02/2015 to 10/02/2020	Paint Sludge	120 KLPA	aashish.brd.@actpl.co.in
51	M/s. Vadiawala Industries, Plot No.24, New Ahmedabad Industrial Estate, Bavla – Sarkhej Highway, Vill-Moraiya, Tal- Sanand, Dist: Ahmedabad	18/02/2015 to 17/02/2020	1. Used Oil	2400 KLPA	
52	M/s. Hindustan Oils Industries, Shed No.282, A-I, Sec-III, Kandla SEZ, Gandhidham- 370210, Dist-Kutch	27/03/2015 to 26/03/2020	1. Used Oil	12000 KLPA	hindoilkan@yahoo.com
53	Navkar Enterprise, Block no. 185/186, vill. Chachrvadi, vasna, tal. Sanand, distt. Ahemdabad - 382210	01/04/2015 to 31/03/2020	Waste Oil	2082KLPA	navkar.ent05@gmail.com
54	M/s. Alicid Organic IndustriesLtd Plot No.208, Hanuman Henduva,Opp. Gujcomasol, Near Khari River, Highway, Post: Palavasana,	03/02/2015 to 02/02/2017	1. Used Oil 2. Waste Oil	1. 1800KLPA 2. 3600 KLPA	alicidoil@yahoo.com

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page	93	of 100

55	M/s. Rajasthan Petroleum,	15/04/2015 to	Used oil	6000KLPA	rajasthanpetoleum@yahoo.com
	115-A/2/2, Shree Hari Saw	14/04/2020			
	Mill Compound,				
	Narol Road, Opp-Bombay				
56	Concept Petrochem,	15/11/2011 to	Waste Oil	12000 KLPA	rajasthanpetoleum@yahoo.com
	S.No. 249A, Plot No: 41/A,	14/11/2016			
	Vasna Iyava, Vill. Sanand,				
	Dist. Ahmdabad				
57	Shine Petrochem,	28/04/2015 to	Waste Oil	12000 KLPA	conceptpetrochem@yahoo.
	Survey No.21, Vill: Jakshi-	27/04/2020			co.in
	382150, Ta: Viramgam,				
	Dist:Ahmedabad				
58	M/s. Aman Petroleum,	29/06/2015 to	Waste Oil	1350 KLPA	
	Plot No.34, (Sr. No.163),	28/06/2020			
	Opp: PWD Store,				
	NR. Bhavna Textiles,				
	Chandola Highway,				
	Dist-Ahmedabad				
59	M/s. R. V. Biocoal,	03/07/2015 to	Waste Oil	26250 KLPA	rvibiocoal@ymail.com
	Survey No.205/P, National	02/07/2020			
	Highway – 8B,				
	Alakh Hotel, Vill – Gomta,				
	Ta– Gondal,				
	Dist: Rajkot-360311				

Reviewed By	:	Capt. Rahul Agarwal	Issue No.	:	01	Issued On : 15.07.2016
Approved By	:	Capt. Sansar Chaube	Revision No.	:	03	Page 94 of 100

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

Reviewed By : Capt. Rahul Agarwal	Issue No.	:	01	Issued On	:	15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page	95	of 100

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: 15 Jul 2016

Reviewed By : Capt. Rahul Agarwal	Issue No. : 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No. : 03	Page 96 of 100

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
Ris	k 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)

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 97 of 100

18	Do the sensitivity maps indicate area to be	Yes	(Ref. OSCRP 2.6)
10	protected on priority		
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)
Pre	paredness		
24	whether any containment equipment is available	Yes	(Def OCODD Assess 7)
25	Whether any recovery equipment is available		(Ref. OSCRP Annex 3)
26	Whether the facility is beginned to available	Yes	(Ref. OSCRP Annex 3)
	Whether the facility is having any temporary storage capacity	Yes	(Ref. GSCRP 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		Dark its alf i
55	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

Reviewed By : Capt. Rahul Agarwal	Issue No.	: 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	: 03	Page 98 of 100

			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.				
Act	ion 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		List of approved recycler of Gujarat state is included in annexure 15.				
		Yes	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				

Reviewed By : Capt. Rahul Agarwal	Issue No.		01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No.	:	03	Page 99 of 100

OIL SPILL CONTINGENCY RESPONSE PLAN

	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

Special Econ

HOD Marine

knowledge of belier

Date: 15 Jul 2016

Chief conservator/Installation manager

VERIFIED

Date:

(District commander ICG) or his representative

Date:

(Regional commander ICG) or his representative

Reviewed By : Capt. Rahul Agarwal	Issue No. : 01	Issued On : 15.07.2016
Approved By : Capt. Sansar Chaube	Revision No. : 03	Page 100 of 100



Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To: September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 3



Recognised by MoEF, New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

"HALF YEARLY ENVIRONMENTAL MONITORING REPORT"

FOR



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

MONITORING PERIOD: OCTOBER 2015 TO MARCH 2016

PREPARED BY:



POLLUCON LABORATORIES PVT.LTD.

544, BELGIUM TOWERS, RING ROAD, SURAT – 395 003
PHONE/FAX – (+91 261) 2455 751, 2601 106, 2601 224.
E-mail: pollucon@gmail.com web: www.polluconlab.com

T 0820 - 821

ISO 9001:2008

ISO 14001:2004

OHSAS 18001:2007

H. T. Shah Lab Manager





Recognised by MoEF. New Delhi Under Sec. 12 of Environmental (Protection) Act-1986

MARINE WATER MONITORING SUMMARY REPORT

RESULTS OF MARINE WATER [M1 LEFT SIDE OF BOCHA CREEK - N 22°45'183" E 069°43'241"]

		IXESU	-10 01 1	IVITILE	AAVIFI	L	IOIDE	<u> </u>	IA CILL	11 11 22	. 10 100	L 003			
SR.	TEST	UNIT		er 2015		er 2015		er 2015		y 2016		y 2016		2016	Test Method
NO.	PARAMETERS	OIII	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	
1	рН		8.08	8.19	8.14	8.18	7.96	8.04	8.02	8.08	8.13	8.17	8.07	8.0	IS3025(P11)83 Re.02
2	Temperature	°C	29	30	28	29	28	29	29	30	28	29	29	30	IS3025(P9)84R e.02
3	Total Suspended Solids	mg/L	24	18	16	22	18	20	18	24	18	20	14	20	IS3025(P17)84 Re.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	5.6	5.0	5.0	4.6	5.6	5.2	5.2	4.4	5.2	4.8	5.4	4.4	IS3025(P38)89 Re.99
6	Salinity	ppt	40.54	41.17	39.80	41.08	41.40	41.80	39.72	41.13	39.78	40.08	40.28	40.98	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)5 520D
8	Nitrate as NO ₃	mg/L	0.67	0.73	0.63	0.72	0.50	0.73	0.64	0.7	0.64	0.70	0.32	0.51	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.06	0.071	0.058	0.069	0.022	0.035	0.052	0.067	0.057	0.072	0.026	0.041	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH₃	mg/L	0.72	0.88	0.80	0.99	0.98	1.13	0.76	0.97	0.81	0.98	1.21	1.35	IS3025(P34)88 Cla.2.3
11	Phosphates as PO ₄	mg/L	0.63	0.78	0.75	0.83	0.04	0.1	0.02	0.04	0.73	0.81	0.81	0.96	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.45	1.69	1.47	1.77	1.6	1.91	1.463	1.73	1.51	1.75	1.56	1.91	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	49870	50560	47580	48670	46980	47860	47480	48720	46850	47770	47580	48220	IS3025(P16)84 Re.02
15	COD	mg/L	29	38	9	19	19	24	10	20	9	14	19	33	APHA(22 nd Edi) 5520-D Open Reflux



H. T. Shah Lab Manager





Recognised by MoFI	F New Delhi Under Ser	12 of Environmental	(Protection) Act-1986
Recognised by Moei	r. New Dellii Under Sec	12 of Environmental	Trotechoni Act-1900

16	Oxidisable Particular Organic Carbon	%	0.68	0.48	0.44	0.38	0.53	0.47	0.46	0.4	0.45	0.39	0.56	0.50	SOP – PLPL - 07
Α	Flora and Fauna			•	•	•	•			•		•		•	
17	Primary productivity	mgC/L /day	2.02	0.90	1.91	0.42	2.70	1.46	2.91	1.84	2.02	0.22	2.13	0.33	APHA (22nd Edi) 10200-J
В	Phytoplankton														
18.1	Chlorophyll	mg/m³	1.81	0.42	2.18	0.53	2.67	0.90	2.30	0.70	2.69	0.45	2.70	0.45	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m ³	0.072	1.348	0.203	1.727	BDL*	1.030	0.091	1.868	0.948	2.121	0.95	2.125	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	186	45	232	54	252	110	208	66	225	79	264	68	APHA (22 nd Edi) 10200-H
			Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	
			hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	
			Asterionell	Fragillaria	Biddulphia	Fragillaria	Coscinodi	Coscinodi	Pinnularia	Cocconeis	Navicula	Synedra	Asterionell	Fragillaria	
			a sp.	sp.	sp.	sp.	scus sp.	scus sp.	sp.	sp	sp.	sp.	a sp.	sp.	
			Navicula	Asterionell	Fragillaria	Synedra	Gomphon	Nitzschia	Gyrosigm	Navicula	Coscinodi	Nitzschia	Biddulphia	Coscinodi	
			sp.	a sp.	sp.	sp.	ema sp.	sp.	a sp	sp.	scus sp.	sp.	sp.	scus sp.	
			Nitzschia	Coscinodi	Gomphon	Nitzschia	Gyrosigm	Gomphon	Biddulphia	Fragillaria	Thallasion	Coscinodi	Navicula	Rhizosole	
			sp.	scus sp.	ema sp.	sp.	a sp.	ema sp.	sp.	sp.	ema sp.	scus sp.	sp.	nia sp.	
			Coscinodi	Cyanophy	Rhizosole	Gomphon	Pleurosig	Skeletone	Pinnularia	Cyanophy	Gomphon	Fragillaria	Synedra	Biddulphia	
			scus sp.	ceae	nia sp.	ema sp.	ma sp.	ma sp.	sp.	ceae	ema sp.	sp.	sp.	sp.	
	Name of Group		Rhizosole nia sp.	Oscillatori a sp.	Cymbella sp.	Cyanophy ceae	Navicula sp.	Thallasion ema sp.	Cyanophy ceae	Oscillatori a sp.	Pinnularia	Tabellaria sp.	Nitzschia sp.	Navicula sp.	
	Number		Pinnularia	Spirulina	Thallasiosi	Spirulina	Synedra	Cyanophy	Spirulina	Spirulina	sp. Tabellaria	Cyanophy	Gomphon	Synedra	APHA (22 nd Edi)
18.4	and name of group		sp.	Sp.	ra sp.	Sp.	sp.	ceae	Sp.	sp.	Sp.	ceae	ema sp.	Sp.	10200-H
	species of each		Amphipro	Green	Cyanophy	Oscillatori	Pinnularia	Microcysti	Green	эр. -	Synedra	Oscillatori	Pleurosig	Cyanophy	10200 11
	group		ra sp.	Algae	ceae	a sp.	sp.	s sp.	Algae		sp.	a sp.	ma sp.	ceae	
			Cyanophy	Chlorella	Anabaena	Green	Cyanophy	Oscillatori	Spirogyra		Asterionell	Green	Rhizosole	Oscillatori	
			ceae	sp.	sp.	Algae	ceae	a sp.	sp.		a sp.	Algae	nia sp.	a sp.	
			Oscillatori	Spirogyra	Oscillatori	Chlorella	Oscillatori	Green			Cyanophy	Chlorella	Fragillaria	Green	
			a sp.	sp.	a sp.	sp.	a sp.	Algae			ceae	sp.	sp.	Algae	
			Anabaena		Nostoc	Hydrodict	Nostoc	Chlorella			Spirulina	Pediastru	Skeletone	Chlorella	
			sp.		sp.	yon sp.	sp.	sp.			sp.	m sp.	ma sp.	sp.	
			Green		Green		Anabaena	Pandorina			Oscillatori		Cyanophy	Hydrodict	
			Algae		Algae		sp.	sp.			a sp.		ceae	yon sp.	
			Hydrodict		Chlorella		Green	Pediastru			Green		Oscillatori	Pediastru	
	l	1	yon sp.		sp.		Algae	m sp.			Algae		a sp.	m sp.	

9-D

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1		l	Chlorella		Hydrodict		Ankistrod		nvnommen		Hydrodict		Green		
			sp.		yon sp.		esmus sp.				yon sp.		Algae		
			•		Pediastru		Chlorella				Chlorella		Chlorella		
			Volvox sp.		m sp.		sp.				sp.		sp.		
							Pandorina						Pediastru		
							sp.						m sp.		
							Ulothrix						Scenedes		
							sp.						mus sp.		
С	Zooplanktons	1	T	ı		T	1				ı		ı	T	
19.1	Abundance (Population)	no/m²	275	100	240	80	425	150	170	40	275	100	167	33	APHA (22 nd Edi) 10200-G
			Copepods	Copepods	Copepods	Polychaet es Worms	Copepods	Echinoder ms	Isopods	Polychaet es Worms	mysids	Nematode s	Polychaat e worms	Polychaat e worms	
			Crustacea	Platinelmi	Decapods	Crustacea	Decapods	Rotifers	Gastropod	Crustacea	Polychaet	Gastropod	Echinoder		
	Name of Group		ns	nths	Decapous	ns		Rouleis	S	ns	e worms	S	ms		
19.2	Number and name of group species of each group		Cyclops	Crustacea ns	Ostracods	Gastropod s	Gastropod s	Barnades	Decapods	Platinelmi nths	Gastropod s		Decapods		APHA (22 nd Edi)
19.2				Decapods		Crustacea ns		Polychaet e worms		Nauplius Iarvae	Rotifers	Nauplius larvae		Isopods	
	group		Gastropod s		Krill		Cyclops		1		Decapods		Mysids		
			Rotifers		Barnades										
19.3	Total Biomass	ml/10 0 m ³	91	18	87.8	8.4	76.3	12.1	55	7	97	17	96.87	2.14	APHA (22 nd Edi) 10200-G
D	Microbiological Par	rameters													
20.1	Total Bacterial Count	CFU/ ml	1840	1580	1480	1020	1780	1520	1390	1120	1490	1030	1690	1510	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)9 221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Ed i.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.	TECT DADAMETEDS		October 2015	November 2015	December 2015	January 2016	February 2016	March 2016	To de Marillo d
NO.	TEST PARAMETERS	UNIT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	Test Method
1	Organic Matter	%	0.62	0.50	0.48	0.57	0.52	0.51	FCO:2007
2	Phosphorus as P	mg/kg	144	127	140	131	119	137	APHA(22 nd 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	%	5.59	4.85	5.05	4.90	4.85	5.23	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	188	200	189	193	209	177	AAS 3111B
5.3	Manganese as Mn	mg/kg	860	689	709	702	687	919	AAS APHA 3111 B
5.4	Iron as Fe	%	2.12	4.07	3.95	4.68	4.07	2.79	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	50	51.96	52.09	52.06	51.87	57.97	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	32	37.96	39.13	39.73	37.45	36.01	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	139	143	137	140	144	155	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	1.18	1.54	1.63	1.50	1.60	1.68	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	Benthic Organisms								
6.1	Macrobenthos		Polychaete worms Isopods Decapods Mysids	Polychaete worms Mysids Decapods	Polychaete worms Echinoderms Mysids Isopods	Polychaete worms Echinoderms Decapods Mysids	Polychaete worms Mysids Isopods	Prawns Mysids Decapods Echinoderms	APHA (22 nd Edi) 10500-C
6.2	MeioBenthos		Copepods Ostracodes	Foraminiferans Nematodes Ciliates	Nematodes Hydrozoans	Nematodes Ciliates	Nematodes	Nematodes Ciliates	APHA (22 nd Edi) 10500-C
2	Population	no/m²	440	357	440	396	314	385	APHA (22 nd Edi) 10500-C

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

SR.	TEST	UNIT	Octobe	er 2015	Novemb	er 2015	Decemb	er 2015	Januar	y 2016	Februa	ry 2016	March 2016		Test Method
NO.	PARAMETERS	UNII	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	
1	pH		8.20	8.32	7.81	7.74	7.99	8.03	7.77	7.59	7.89	8.08	7.98	8.05	IS3025(P11)83 Re.02
2	Temperature	°C	29	30	28	29	28	29	29	30	29	30	29	30	IS3025(P9)84R e.02
3	Total Suspended Solids	mg/L	20	28	20	30	22	40	22	34	18	24	18	20	IS3025(P17)84 Re.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.0 3Edition2.1								
5	Dissolved Oxygen	mg/L	5.6	4.8	5.2	4.8	5.4	5	5	4.6	5.6	4.6	5.4	4.8	IS3025(P38)89 Re.99
6	Salinity	ppt	40.81	41.62	41.5	42.8	42.6	43.5	42.36	43.12	39.5	40.72	41.82	42.26	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)5 520D								
8	Nitrate as NO ₃	mg/L	0.535	0.76	0.46	0.67	0.67	0.89	0.49	0.704	0.61	0.671	0.525	0.633	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.064	0.043	0.027	0.056	0.069	0.049	0.029	0.059	0.047	0.034	0.029	0.059	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH₃	mg/L	0.342	0.480	0.47	0.530	0.42	0.53	0.503	0.61	0.379	0.444	0.465	0.535	IS3025(P34)88 Cla.2.3
11	Phosphates as PO ₄	mg/L	0.166	0.152	0.306	0.23	0.041	0.048	0.316	0.268	0.245	0.154	0.312	0.26	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	0.941	1.283	0.95	1.256	1.15	1.46	1.022	1.368	1.036	1.149	1.019	1.227	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	1.0	BDL*	1.2	BDL*	1.0	BDL*	0.8	BDL*	0.8	BDL*	0.17	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	49220	49630	36700	38100	43920	46750	37460	38380	46860	47280	48360	49250	IS3025(P16)84 Re.02
15	COD	mg/L	14	16	19	22	14	19	17	20	9	14	14	19	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic	%	0.83	0.34	0.38	0.52	0.8	0.3	0.4	0.5	0.55	0.43	0.6	0.5	SOP – PLPL - 07

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1	Carbon	ĺ		ĺ											
Α	Flora and Fauna														
17	Primary productivity	mgC/L /day	1.80	0.76	2.25	0.45	3.15	0.90	2.76	0.245	2.70	0.67	1.688	0.585	APHA (22nd Edi) 10200-J
В	Phytoplankton														
18.1	Chlorophyll	mg/m³	1.789	0.481	1.922	0.641	2.210	0.720	1.644	0.246	2.964	0.828	2.964	0.134	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m³	0.547	1.314	0.134	1.300	0.045	1.350	0.096	1.282	BDL*	1.303	BDL*	1.493	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	163	40	152	38	190	44	174	52	236	68	214	45	APHA (22 nd Edi) 10200-H
			Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	
			hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	
			Navicula	Tabellaria	Asterionell	Thallasiosi	Asterionell	Fragillaria	Rhizosole	Nitzschia	Navicula	Synedra	Achnanth	Amphora	
			sp.	sp.	a sp.	ra sp.	a sp.	sp.	nia sp.	sp.	sp.	sp.	es sp.	sp.	
			Nitzschia	Amphora	Cheatocer	Pinnularia	Cymbella	Coscinodi	Coscinodi	Biddulphia	Coscinodi	Fragillaria	Amphora	Biddulphia	
			sp.	sp.	ous sp.	sp.	sp.	scus sp.	scus sp.	sp.	scus sp.	sp.	sp.	sp.	
			Gyrosigm	Melosira	Cymbella	Synedra	Pleurosig	Cocconeis	Gomphon	Navicula	Pinnularia	Thallasion	Biddulphia	Cyclotella	
			a sp.	sp.	sp.	sp.	ma sp.	sp.	ema sp.	sp.	sp.	ema sp.	sp.	sp.	
			Cocconeis	Diploneis	Pinnularia	Tabellaria	Skeletone	Cymbella	Cymbella	Pleurosig	Fragillaria	Coscinodi	Cocconeis	Nitzschia	
			sp.	sp.	sp.	sp.	ma sp.	sp.	sp.	ma sp.	sp.	scus sp.	sp.	sp.	
			Surirella	Cyanophy	Thallasiosi	Cyanophy	Thallasion	Navicula	Synedra	Cyanophy	Tabellaria	Green	Melosira	Pinnularia	
	Name of Group		sp.	ceae	ra sp.	ceae	ema sp.	sp.	sp.	ceae	sp.	Algae	sp.	sp.	
	Number		Pinnularia	Anabaena	Skeletone	Microcysti	Tabellaria	Cyanophy	Tabellaria	Bacillariop	Pleurosig	Pandorina	Synedra	Skeletone	
18.4	and name of group		sp.	sp.	ma sp.	s sp.	sp.	ceae	sp.	hyceae	ma sp.	sp.	sp.	ma sp.	APHA (22 nd Edi)
	species of each		Cheatocer	Microcysti	Cyanophy	Oscillatori	Fragillaria	Anabaena	Cyanophy	Anabaena	Achnanth		Nitzschia	Green	10200-H
	group		ous sp.	s sp.	ceae	a sp.	sp.	sp.	ceae	sp.	es sp.		sp.	Algae	
			Mastagloi	Green	Microcysti	Green	Cyanophy	Oscillatori	Oscillatori	Microcysti	Skeletone		Coscinodi	Ankistrod	
			ca sp.	Algae	s sp.	Algae	ceae	a sp.	a sp.	s sp.	ma sp.		scus sp.	esmus sp.	
			Cyanophy	Volvox sp.	Oscillatori	Ulothrix	Microcysti	Nostoc	Microcysti	Green	Synedra		Green	Chlorella	
			ceae	Cainaguna	a sp.	Sp.	s sp.	sp.	s sp.	Algae	Sp.		Algae	Sp.	
			Microcysti	Spirogyra	Spirulina	Chlorella	Oscillatori	Green	Green	Spirogyra	Cyanophy		Chlorella	Pandorina	
			s sp. Oscillatori	sp.	sp. Green	sp.	a sp. Green	Algae Chlorella	Algae Pandorina	sp. Scenedes	ceae Oscillatori		sp. Ulothrix	Sp.	
					Algae		Algae		Sp.		a sp.			Cyanophy ceae	
			a sp. Green		Chlorella		Ankistrod	sp. Pandorina	Ulothrix	mus sp.			sp.	Anabaena	
			Algae		sp.		esmus sp.	Sp.	sp.		Microcysti s sp.		Volvox sp.	Sp.	
			Ulothrix		Hydrodict		Chlorella	Scenedes			Green		Cyanophy	Oscillatori	
			sp.		yon sp.		sp.	mus sp.	Volvox sp.		Algae		ceae	a sp.	
	L		<i>3</i> ρ.		yon sp.		<i>3</i> ρ.	mus sp.			Aiguc		ccac	u sp.	

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			Oedogoni um sp.		Pediastru m sp.		Pediastru m sp.				Volvox sp.		Microcysti s sp.		
			Spirogyra sp.				Volvox sp.				Pandorina sp.		Nostoc sp.	-	
											Pediastru m sp.		Spirulina sp.		
С	Zooplanktons														
19.1	Abundance (Population)	no/m²	225	75	233	50	320	120	214	66	252	25	250	33	APHA (22 nd Edi) 10200-G
			Copepods	Crustacea ns	Copepods	Copepods	Copepods	Ostracods	Copepods	Crustacea ns	Nematode s	Gastropod s	Echinoder ms	Copepods	
	Name of Group		Polychaet es	Siphonop hores	Decapods	Polychaet es Worms	Krill	Crustacea ns	Polychaet es	Siphonop hores	Decapods		Rotifers	Nematode s	
19.2	Number and name of group species of each		Ostracods		Polychaet es Worms	Decapods	Molluscan s		Ostracods		Echinoder ms		Decapods		APHA (22 nd Edi) 10200-G
	group		Rotifers		Ostracods		Snails		Rotifers		Foraminif erans		Ostracods		
			Gastropod s		Crustacea ns		Rotifers		Gastropod s				Crustacea ns		
			Decapods						Decapods				Gastropod s		
19.3	Total Biomass	ml/10 0 m ³	89	11	92.5	8.4	79.6	11	64	08	88	34	112	28.5	APHA (22 nd Edi) 10200-G
D	Microbiological Par														
20.1	Total Bacterial Count	CFU/ ml	1790	1410	1660	1140	1580	1370	1720	1350	1800	1470	2010	1780	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)9 221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Ed i.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)

6 -b

H. T. Shah Lab Manager





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RESULTS OF SEDIMENT ANALYSIS [M2 MOUTH OF BOCHA & NAVINAL CREEK – N 22°44'239" E 069°43'757"]

SR.			October 2015	November 2015	December 2015	January 2016	February 2016	March 2016	
NO.	TEST PARAMETERS	UNIT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	Test Method
1	Organic Matter	%	0.682	0.46	0.67	0.503	0.476	0.545	FCO:2007
2	Phosphorus as P	mg/kg	169	156	157	150	155	161	APHA(22 nd 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	%	5.39	5.40	5.21	5.0	5.19	5.43	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	137	162	145	157	163	111	AAS 3111B
5.3	Manganese as Mn	mg/kg	705	599	807	545	597	758	AAS APHA 3111 B
5.4	Iron as Fe	%	2.21	1.98	2.07	2.21	1.98	2.19	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	38.77	24.4	36.64	28.15	24.28	53.97	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	109	50.54	80.91	52.59	50.81	41.78	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	138	142	119	139	143	154	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	1.32	1.38	1.11	1.33	1.38	2.28	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	Benthic Organisms								
6.1	Macrobenthos		Polychaete worms Amphipods Decapods Krill	Echinoderms Polychaete worms Isopods	Echinoderms Isopods Decapods	Isopods Decapods Echinoderms	Mysids Echinoderms Isopods	Polychaete Worms Crabs Isopods Decapods	АРНА (22 nd Edi) 10500-С
6.2	MeioBenthos		Nematodes Foraminiferans Hydrozoa	Foraminiferans Copepods Nematodes Bryozoans	Foraminiferans Copepods Ciliates	Foraminiferans Hydrozoa	Foraminiferans Bryozoans	Nematodes Bryozoans	АРНА (22 nd Edi) 10500-С
2	Population	no/m²	503	433	397	518	440	433	APHA (22 nd Edi) 10500-C

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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.	TECT DADAMETERS	LINITT	Noveml	per 2015	Januar	y 2016	Februa	ry 2016	March	2016	Test Method
NO.	TEST PARAMETERS	UNIT	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	
1	pH		7.77	8.18	7.83	8.2	7.8	8.22	8.0	7.88	IS3025(P11)83Re.02
2	Temperature	°C	28	29	29	30	28	29	29	30	IS3025(P9)84Re.02
3	Total Suspended Solids	mg/L	20	24	22	26	20	23	24	28	IS3025(P17)84Re.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03Edition2.1
5	Dissolved Oxygen	mg/L	5.2	4.8	5.6	4.6	5.18	4.8	5.4	4.8	IS3025(P38)89Re.99
6	Salinity	ppt	41.1	42.7	41.6	42.5	41.0	42.6	42.84	43.06	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)5520D
8	Nitrate as NO ₃	mg/L	0.32	0.43	0.37	0.45	0.305	0.442	0.355	0.432	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.016	0.025	0.013	0.023	0.015	0.025	0.02	0.025	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.6	0.69	0.58	0.67	0.592	0.69	0.819	0.93	IS3025(P34)88Cla.2.3
11	Phosphates as PO ₄	mg/L	0.58	0.73	BDL*	BDL*	0.577	0.731	0.558	0.78	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	0.92	1.14	0.913	1.143	0.912	1.151	1.194	1.388	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	50890	51360	51500	51110	50280	51480	51066	51580	IS3025(P16)84Re.02
15	COD	mg/L	14	28	16	30	9	28	24	28	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.3	0.2	0.27	0.19	0.3	0.2	0.32	0.22	SOP – PLPL - 07
Α	Flora and Fauna										
17	Primary productivity	mgC/L/d ay	2.13	0.67	1.96	0.55	1.8	0.11	2.63	0.45	APHA (22nd Edi) 10200-J
В	Phytoplankton										
18.1	Chlorophyll	mg/m³	2.296	0.507	1.560	0.118	3.02	0.401	2.77	0.401	APHA (22 nd Edi) 10200- H

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18.2	Phaeophytin	mg/m ³	BDL*	1.549	0.524	2.48	BDL*	1.794	BDL*	2.141	APHA (22 nd Edi) 10200- H
18.3	Cell Count	Unit x 10 ³ /L	241	58	182	22	284	63	199	35	APHA (22 nd Edi) 10200-H
			Bacillariophyc eae	Bacillariophyce ae	Bacillariophyc eae	Bacillariophyc eae	Bacillariophyc eae	Bacillariophyc eae	Bacillariophyc eae	Bacillariophyc eae	
			Biddulphia sp.	Cyclotella sp.	Coscinodiscus sp.	Fragillaria sp.	Navicula sp.	Fragillaria sp.	Nitzschia sp.	Nitzschia sp.	1
			Cheatocerous sp.	Nitzschia sp.	Synedra sp.	Pinnularia sp.	Nitzschia sp.	Navicula sp.	Navicula sp.	Navicula sp.	
			Cyclotella sp.	Skeletonema sp.	Nitzchia sp.	Naviculla sp.	Synedra sp.	Coscinodiscus sp.	Coscinodiscus sp.	Fragillaria sp.	
			Fragillaria sp.	Melosira sp.	Thallasiosira sp.	Gyrosigma sp.	Coscinodiscus sp.	Gyrosigma sp.	Pinnularia sp.	Gyrosigma sp.	
			Rhizosolenia sp.	Gyrosigma sp.	Rhizosolenia sp.	Cyanophyceae	Skeletonema sp.	Synedra sp.	Thallasiosira sp.	Pinnularia sp.	
Name of Grou	Name of Group Number		Thallasiosira sp.	Cyanophyceae	Tabellaria sp.	Spirulina sp.	Asterionella sp.	Asterionella Cyanophyceae Cyclotella		Synedra sp.	APHA (22 nd Edi)
18.4	and name of group species of each group		Tabellaria sp.	Oscillatoria sp.	Cyanophyceae	Oscillatoria sp.	Gomphonema sp.	Nostoc sp.	Gomphonema sp.	Green Algae	10200-H
			Cyanophyceae	Green Algae	Pediastrum sp.	Green Algae	Pinnularia sp.	Green Algae	Fragillaria sp.	pediastrum sp.	
			Microcystis sp.	Pandorina sp.	Hydrodictyon sp.	Chlorella sp.	Cyanophyceae	Pandorina sp.	Green Algae	Chlorella sp.	
			Nostoc sp.	Scenedesmus sp.	Green Algae	Desmids	Oscillatoria sp.	Volvox sp.	Ankistrodesm us sp.	Cyanophyceae	
			Spirulina sp.	-	Spirogyra sp.		Microcystis sp.		Chlorella sp.	Oscillatoria sp.	
			Green Algae	-	Chlorella sp.		Green Algae		Pandorina sp.	-	
			Chlorella sp.		Nostoc sp.		Ankistrodesm us sp.		Cyanophyceae		
			Hydrodictyon sp.				Hydrodictyon sp.		Oscillatoria sp.		
			Pediastrum sp.						Lyngbya sp.		

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19.1	Abundance (Population)	no/m²	233	67	216	28	217	68	125	25	APHA (22 nd Edi) 10200-G
			Copepods	Copepods	Ctenophores	Nematodes	Polychaete worms	mysids	Decapods	Nematodes	
			Decapods	polychaete worms	Rotifers	polychaete worms	Decapods	Nematodes	Mysids	Echinoderms	
	Name of Group Number		Ostracods		Mysids	Copepods	Nematodes	Decapods	Bivalves		ADLIA (22nd E-1:)
19.2	and name of group species of each group		Chaetognathe s		Bivalves		Echinoderms		Rotifers		APHA (22 nd Edi) 10200-G
			Ctenophores								
			Krill								
			Cyclops								
19.3	Total Biomass	ml/100 m ³	96.5	8.9	84	7.6	86	21	42.54	3.04	APHA (22 nd Edi) 10200-G
D											
20.1	Total Bacterial Count	CFU/ml	1640	1120	1590	1220	1630	1100	1720	1560	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)9221-D
20.3	Ecoli	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS:1622:1981Edi.2.4(2 003-05)
20.4	Enterococcus	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS: 15186:2002
20.5	Salmonella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS: 5887 (P-3)
20.6	Shigella	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	IS: 1887 (P-7)
20.7	Vibrio	/ml	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.	TEGT DADAMETERS		November 2015	January 2016	February 2016	March 2016	
NO.	TEST PARAMETERS	UNIT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	Test Method
1	Organic Matter	%	0.60	0.57	0.586	0.542	FCO:2007
2	Phosphorus as P	mg/kg	146	140	141	152	APHA(22 nd Edi) 4500 C
3	Texture		Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	
4	Petroleum Hydrocarbon	mg/kg	BDL*	BDL*	BDL*	BDL*	PLPL-TPH
5	Heavy Metals						
5.1	Aluminum as Al	%	5.20	5.40	5.39	5.45	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	160	168	165	141	AAS 3111B
5.3	Manganese as Mn	mg/kg	810	850	819	905	AAS APHA 3111 B
5.4	Iron as Fe	%	2.22	2.3	2.23	2.13	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	54	58	54.58	50.55	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	34.0	32.0	34.2	35.8	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	136	130	133	135	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	1.32	1.29	1.33	17.98	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	Benthic Organisms						
6.1	Macrobenthos		Echinoderms Polychaete worms Isopods Decapods	Polychaete worms Bivalves Echinoderms Decapods	Polychaete worms Mysids	Crabs Amphipods Echinoderms	АРНА (22 nd Edi) 10500-С
6.2	MeioBenthos		Ostracods	Ctenophores	Nematodes Ostracods Foraminiferans	Ostracods Foraminiferans	АРНА (22 nd Edi) 10500-С
2	Population	no/m²	377	368	317	337	APHA (22 nd Edi) 10500-C

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

SR.	TEST		Octobe	er 2015	Novemb	er 2015	Decemb	er 2015	Januar	y 2016	Februa	ry 2016	March	2016	
NO.	PARAMETERS	UNIT	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFAC E	воттом	SURFACE	воттом	SURFACE	воттом	Test Method
1	pH		7.98	8.13	7.98	8.14	8.01	8.12	7.69	8.17	7.99	8.17	7.92	8.03	IS3025(P11)83R e.02
2	Temperature	°C	29	30	29	30	29	30	28	29	29	30	29	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	24	30	19	22	16	20	20	24	20	22	26	28	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	5.8	4.8	5.2	4.4	5.4	4.8	5	4.6	5.2	4.4	5.66	5.24	IS3025(P38)89R e.99
6	Salinity	ppt	39.82	40.54	42.8	43.4	42.2	43.6	42.2	43	42.6	43.2	42.66	43.18	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)55 20D
8	Nitrate as NO ₃	mg/L	0.36	0.39	0.46	0.55	0.33	0.2	0.49	0.6	0.47	0.56	0.32	0.18	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.051	0.065	0.054	0.07	0.059	0.077	0.052	0.067	0.054	0.07	0.056	0.084	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.702	0.776	0.74	0.82	0.91	1.15	0.72	0.8	0.74	0.879	0.95	1.117	IS3025(P34)88Cl a.2.3
11	Phosphates as PO ₄	mg/L	0.248	0.352	0.18	0.17	0.02	0.11	0.068	0.089	0.168	0.159	0.086	0.095	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.12	1.238	1.254	1.44	1.3	1.42	1.262	1.467	1.266	1.513	1.33	1.385	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	46890	48030	53670	54820	52990	54280	52910	54310	52990	53640	52670	53880	IS3025(P16)84R e.02
15	COD	mg/L	24	28	14	18	14	19	16	20	14	19	19	24	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.82	0.46	0.82	0.38	0.8	0.43	0.8	0.36	0.8	0.36	0.63	0.47	SOP – PLPL - 07
Α	Flora and Fauna						·	·							
17	Primary productivity	mgC/L /day	1.688	0.788	2.36	0.563	3.03	1.46	2.852	0.844	2.13	0.563	2.138	0.428	APHA (22nd Edi) 10200-J
В	Phytoplankton														

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18.1	Chlorophyll	mg/m ³	1.789	0.587	1.816	0.721	2.48	0.69	1.692	0.505	3.204	0.721	3.2	0.721	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m ³	0.23	1.207	0.24	1.03	BDL*	1.36	0.34	1.190	ND	1.615	BDL*	1.61	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	189	41	214	68	326	82	192	48	296	76	201	44	APHA (22 nd Edi) 10200-H
			Bacillariop Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop								
			hyceae hyceae	hyceae	hyceae	hyceae	hyceae								
			Pleurosigm	Navicula	Asterionell	Coscinodis	Amphora	Cymbella	Pleurosig	Navicula	Navicula	Synedra	Nitzschia	Synedra	
			a sp.	sp.	a sp.	cus sp.	sp.	sp.	ma sp.	sp.	sp.	sp.	sp.	sp.	
			Coscinodis	Nitzschia	Biddulphia	Pleurosigm	Asterionell	Fragillaria	Coscinodis	Nitzschia	Synedra	Melosira	Synedra	Navicula	
			cus sp.	sp.	sp.	a sp.	a sp.	sp.	cus sp.	sp.	sp.	sp.	sp.	sp.	
			Nitzschia	Fragillaria	Gomphone	Nitzschia	Coscinodis	Melosira	Nitzschia	Fragillaria	Coscinodis	Fragillaria	Coscinodis	Biddulphia	
			sp.	sp.	ma sp.	sp.	cus sp.	sp.	sp.	sp.	cus sp.	sp.	cus sp.	sp.	
			Thallasion	Pinnularia	Rhizosoleni	Fragillaria	Fragillaria	Nitzschia	Thallasion	Pinnularia	Thallasiosir	Navicula	Navicula	Gomphone	
			ema sp.	sp.	a sp.	sp.	sp.	sp.	ema sp.	sp.	a sp.	sp.	sp.	ma sp.	
			Pinnularia	Cyanophyc	Pinnularia	Navicula	Gomphone	Cyanophyc	Pinnularia	Cyanophy	Asterionell	Coscinodis	Thallasiosir	Skeletone	
			sp.	eae	sp.	sp.	ma sp.	eae	sp.	ceae	a sp.	cus sp.	a sp.	ma sp.	
			Cyanophyc	Anabaena	Skeletone	Cyanophyc	Skeletone	Oscillatoria	Cyanophy	Anabaena	Fragillaria	Cyanophyc	Surirella	Pleurosigm	
	Name of Group		eae	sp.	ma sp.	eae	ma sp.	sp.	ceae	sp.	sp.	eae	sp.	a sp.	
18.4	Number and name of group		Oscillatoria	Oscillatoria	Nitzschia	Anabaena	Cyclotella	Microcystis	Oscillatori	Oscillatori	Gomphone	Nostoc sp.	Cymbella	Rhizosoleni	APHA (22 nd Edi)
10.4	species of each		sp.	sp.	sp.	sp.	sp.	sp.	a sp.	a sp.	ma sp.	Nostoc sp.	sp.	a sp.	10200-H
	group		Spirulina	Green	Navicula	Oscillatoria	Cyanophyc	Nostoc sp.	Spirulina	Green	Melosira	Green	Biddulphia	Green	
	3 ***		sp.	Algae	sp.	sp.	eae	Nostoc sp.	sp.	Algae	sp.	Algae	sp.	Algae	
			Green	Ankistrode	Cocconeis	Spirulina	Microcystis	Green	Green	Ankistrod	Skeletone	Chlorella	Green	Chlorella	
			Algae	smus sp.	sp.	sp.	sp.	Algae	Algae	esmus sp.	ma sp.	sp.	Algae	sp.	
			Chlorella	Pandorina	Cyanophyc	Green	Oscillatoria	Chlorella	Chlorella	Pandorina	Cyanophyc		Ankistrode	Scenedes	
			sp.	sp.	eae	Algae	sp.	sp.	sp.	sp.	eae		smus sp.	mus sp.	
			Volvox sp.		Oscillatoria	Oedogoniu	Green	Hydrodicty	Volvox sp.		Microcystis		Hydrodicty	Ulothrix	
			VOIVOX 3p.		sp.	m sp.	Algae	on sp.	· ·		sp.		on sp.	sp.	
			Ankistrode		Anabaena	Pediastrum	Ankistrode	Scenedes	Ankistrod		Oscillatoria		Pandorina		
			smus sp.		sp.	sp.	smus sp.	mus sp.	esmus sp.		sp.		sp.		
			Ulothrix		Green		Chlorella	Volvox sp.	Ulothrix		Green		Cyanophyc		
			sp.		Algae		sp.	νοινολ 3μ.	sp.		Algae		eae		
					Ankistrode		Pandorina				Volvox sp.		Microcystis		
					smus sp.		sp.						sp.		
					Oedogoniu		Scenedes				Pediastrum	-	Oscillatoria		

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					m sp.		mus sp.				sp.		sp.		
					Pediastrum								Spirulina		
					sp.								sp.		
С	Zooplanktons	1	1	T	1	Ī	Ī		Ī	1	Ī	T	T	T	
19.1	Abundance (Population)	no/m²	350	75	275	50	300	160	310	68	267	50	333	100	APHA (22 nd Edi) 10200-G
			Copepods	Copepods	Ctenophor es	Copepods	Copepods	Crustacean s	Cyclops	Decapods	Gastropod s	Polychaete worms	Chaetogna thes	Copepods	
			Krill	Decapods	Ostracods	Decapods	Polychaete worms	Gastropod s	Copepods	Polychaet e worms	Nematode s	Nematode s	Gastropod s	Mysids	
	Name of Group Number		Decapods		Gastropod s		Crustacean s	Nematode s	Nematode s	Ostracods	Echinoder ms		Crustacean s	Crustacean s	ADUA (Oond E.II)
19.2	and name of group species of each		Chaetogna thes		Decapods		Nematode s				mysids		Copepods	Nematode s	APHA (22 nd Edi) 10200-G
	group		Cyclops		Polychaete worms		Mysids						Nematode s		
			Rotifers				Rotifers								
			Ctenophor es												
19.3	Total Biomass	ml/100 m ³	97	8.2	97.4	7.8	62.4	7.4	110	10.8	44	11	102	42.5	APHA (22 nd Edi) 10200-G
D	Microbiological Para		1	T	1	Ī	•		Ī	1	Ī	1	1	T	
20.1	Total Bacterial Count	CFU/m I	2130	1870	1560	1220	1700	1580	1610	1280	1530	1210	1740	1620	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)92 21-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)

H. T. Shah Lab Manager





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

SR.			October 2015	November 2015	December 2015	January 2016	February 2016	March 2016	
NO.	TEST PARAMETERS	UNIT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	Test Method
1	Organic Matter	%	0.46	0.51	0.42	0.63	0.52	0.42	FCO:2007
2	Phosphorus as P	mg/kg	178	192	175	150	194	166	APHA(22 nd 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	%	5.19	5.08	5.41	5.62	5.09	5.28	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	165	146	119	129	147	144	AAS 3111B
5.3	Manganese as Mn	mg/kg	885	798	856	809	795	910	AAS APHA 3111 B
5.4	Iron as Fe	%	2.4	2.82	1.75	2.66	2.87	2.54	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	49.97	52	57.99	44.19	53.98	54	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	43.97	48	43.98	40.22	48.97	60	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	166	190	160	189	190	170	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	1.96	1.88	1.87	0.91	1.88	2.0	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	Benthic Organisms								
6.1	Macrobenthos		Echinoderms Decapods Isopods	Polychaete worms Echinoderms Isopods	Echinoderms Mysids Isopods	Echinoderms Polychaete worms Mysids	Decapods Echinoderms Isopods	Polychaete Worms Crabs Anthozoans	APHA (22 nd Edi) 10500-C
6.2	MeioBenthos		Nematodes Foraminiferans	Nematodes Foraminiferans	Nematodes Foraminiferans Hydrozoa	Nematodes Foraminiferans Ciliates	Hydrozoa Nematodes	Copepods Ciliates	APHA (22 nd Edi) 10500-C
2	Population	no/m²	314	314	433	481	385	440	APHA (22 nd Edi) 10500-C

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

SR.	TEST		Octobe	er 2015	Novemb	er 2015	Decemb	or 2015	lanuar	y 2016	Februar	ry 2016	March	2016	
NO.	PARAMETERS	UNIT	SURFACE	воттом	SURFACE	BOTTOM	SURFACE	BOTTOM	SURFACE	ВОТТОМ	SURFACE	ВОТТОМ	SURFACE	BOTTOM	Test Method
1	рН		8.02	8.11	7.87	7.7	8.02	8.17	7.45	7.32	7.72	7.88	8.03	7.89	IS3025(P11)83R e.02
2	Temperature	°C	29	30	29	30	28	29	28	29	29	30	29	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	24	32	18	24	12	16	20	26	19	25	18	22	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1								
5	Dissolved Oxygen	mg/L	5.8	4.6	5.6	4.6	5.2	4.8	5.4	4.4	5.6	4.4	5.8	5.2	IS3025(P38)89R e.99
6	Salinity	ppt	38.2	39.37	39.55	40.8	40.6	41.2	40.12	41.06	39.5	40.72	38.18	38.26	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)55 20D								
8	Nitrate as NO ₃	mg/L	0.627	0.704	0.616	0.677	0.64	0.69	0.582	0.628	0.625	0.686	0.587	0.633	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.047	0.039	0.047	0.035	0.047	0.031	0.044	0.03	0.461	0.034	0.032	0.022	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.277	0.397	0.378	0.443	0.3	0.4	0.396	0.465	0.386	0.444	0.447	0.558	IS3025(P34)88Cl a.2.3
11	Phosphates as PO ₄	mg/L	0.158	0.171	0.247	0.157	0.026	0.096	0.158	0.048	0.259	0.154	0.304	0.136	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	0.951	1.14	1.041	1.155	1	1.12	1.022	1.123	1.474	1.164	1.066	1.213	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	2	BDL*	0.8	BDL*	0.6	BDL*	0.6	BDL*	BDL*	BDL*	3.8	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	47860	48320	36800	37300	44260	45590	37330	37530	46860	48220	47560	48110	IS3025(P16)84R e.02
15	COD	mg/L	14	19	9	14	9	19	10	16	9	14	10	19	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.58	0.46	0.56	0.42	0.58	0.46	0.6	0.4	0.53	0.43	0.64	0.5	SOP – PLPL - 07
Α	Flora and Fauna								-	-					
17	Primary productivity	mgC/L /day	1.463	0.788	1.688	0.563	1.57	0.45	1.913	0.338	2.13	0.563	2.11	0.36	APHA (22nd Edi) 10200-J
В	Phytoplankton														

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18.1	Chlorophyll	mg/m ³	1.922	0.721	1.816	0.614	2.08	0.9	2.27	0.98	2.77	0.163	2.77	0.163	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m ³	0.134	0.737	0.614	1.274	0.179	0.98	BDL*	0.84	BDL*	BDL*	BDL*	BDL*	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	196	52	145	32	222	58	159	62	195	35	245	38	APHA (22 nd Edi) 10200-H
			Bacillarioph	Bacillarioph	Bacillariop										
			yceae	yceae	hyceae										
			Gomphone	Asterionella	Amphipror	Coscinodis	Navicula	Navicula	Navicula	Coscinodis	Navicula	Nitzschia	Navicula	Fragillaria	
			ma sp.	sp.	a sp.	cus sp.	sp.	sp.	sp.	cus sp.	sp.	sp.	sp.	sp.	
			Pleurosigma	Cyclotella	Biddulphia	Nitzschia	Synedra	Fragillaria	Nitzschia	Nitzschia	Nitzschia	Navicula	Synedra	Asterionell	
			sp.	sp.	sp.	sp.	sp.	sp.	sp.	sp.	sp.	sp.	sp.	a sp.	
			Nitzschia	Cymbella	Pleurosig	Pleurosig	Nitzschia	Gomphone	Fragillaria	Fragillaria	Synedra	Fragillaria	Asterionell	Coscinodis	
			sp.	sp.	ma sp.	ma sp.	sp.	ma sp.	sp.	sp.	sp.	sp.	a sp.	cus sp.	
			Synedra sp.	Gyrosigma	Skeletone	Navicula	Coscinodis	Pleurosig	Coscinodis	Thallasion	Coscinodis	Rhizosolen	Coscinodis	Melosira	
			Syricula sp.	sp.	ma sp.	sp.	cus sp.	ma sp.	cus sp.	ema sp.	cus sp.	ia sp.	cus sp.	sp.	
			Rhizosoleni	Pinnularia	Pinnularia	Gomphone	Thallasion	Coscinodis	Thallasion	Navicula	Biddulphia	Pleurosig	Fragillaria	Pinnularia	
			a sp.	sp.	sp.	ma sp.	ema sp.	cus sp.	ema sp.	sp.	sp.	ma sp.	sp.	sp.	
			Surirella sp.	Cocconeis	Cocconeis	Cyanophyc	Pleurosig	Cyanophyc	Skeletone	Green	Rhizosolen	Cyanophyc	Pinnularia	Skeletone	
	Name of Group		Surireila sp.	sp.	sp.	eae	ma sp.	eae	ma sp.	Algae	ia sp.	eae	sp.	ma sp.	
18.4	Number and name of group		Tabellaria	Green Algae	Cyclotella	Oscillatori	Cyclotella	Oscillatori	Green	Ankistrode	Thallasiosi	Oscillatori	Skeletone	Cyanophyc	APHA (22 nd Edi)
10.4	species of each		sp.	Green Algae	sp.	a sp.	sp.	a sp.	Algae	smus sp.	ra sp.	a sp.	ma sp.	eae	10200-H
	group		Biddulphia	Oedogoniu	Cyanophyc	Green	Skeletone	Lyngbya	Chlorella	Chlorella	Cheatocer	Microcystis	Tabellaria	Anabaena	
	3 ***		sp.	m sp.	eae	Algae	ma sp.	sp.	sp.	sp.	ous sp.	sp.	sp.	sp.	
			Cyanophyce	Hydrodictyo	Anabaena	Pandorina	Cyanophyc	Green	Pandorina	Cyanophyc	spirulines	Green	Cocconeis	Spirulina	
			ae	n sp.	sp.	sp.	eae	Algae	sp.	eae	sp.	Algae	sp.	sp.	
			Microcystis	Scenedesm	Oscillatori		Anabaena	Chlorella	Cyanophyc	Oscillatori	Cyanophyc	Pandorina	Gomphone	Oscillatori	
			sp.	us sp.	a sp.		sp.	sp.	eae	a sp.	eae	sp.	ma sp.	a sp.	
			Oscillatoria		Spirulina		Nostoc sp.	Pediastru	Microcystis		Melosira		Cyanophyc	Green	
			sp.		sp.		Nostoc sp.	m sp.	sp.		sp.		eae	Algae	
			Green Algae		Green		Oscillatori	Pandorina	Oscillatori		Oscillatori		Microcystis	Chlorella	
			dicen Aigae		Algae		a sp.	sp.	a sp.		a sp.		sp.	sp.	
			Chlorella sp.		Ankistrode		Green		Nostoc sp.		Green		Oscillatori	Pandorina	
			Ciliorella sp.		smus sp.		Algae		NUSLUC SP.		Algae		a sp.	sp.	
			Ulothrix sp.		Chlorella		Ankistrode		·		Chlorella		Spirulina	Pediastru	
			Glottilix sp.		sp.		smus sp.				sp.		sp.	m sp.	
			Scenedesm		Pediastru		Pandorina				Scenedes		Green		

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		ĺ	us sp.		m sp.		sp.				mus sp.		Algae		
					Volvox sp.		Scenedes				Pandorina		Ankistrode		
					volvox sp.		mus sp.				sp.		smus sp.		
С	Zooplanktons														
19.1	Abundance (Population)	no/m²	250	50	200	50	275	100	180	40	188	56	283	67	APHA (22 nd Edi) 10200-G
			Copepods	Gastropods	Copepods	Polychaete worms	Nematode s	Decapods	Decapods	Copepods	Gastropod s		Copepods	Gastropod s	
	Name of Group		Krill	Polychaetes Worms	Decapods	Gastropod s	Gastropod s	Cyclops	Crustacea ns	Decapods	Echinoder ms	Gastropod s	Polychaete worms	Polychaete worms	
19.2	Number and name of group species of each		Polychaetes Worms		Ostracods		Crustacea ns	Nematode s	Isopods		Krill	Decapods	Gastropod s		APHA (22 nd Edi) 10200-G
	group		Siphonopho res		Gastropod s		Mysids		Polychaete worms		Cyclops		Crustacea ns		
			Rotifers		Crustacea ns				Gastropod s		Polychaete worms		Mysids		
			Cyclops						-						
									-						
19.3	Total Biomass	ml/100 m ³	75	15	85	0.7	45.2	7.4	89.5	2.4	48	3.5	116	63.5	APHA (22 nd Edi) 10200-G
D	Microbiological Para														
20.1	Total Bacterial Count	CFU/m I	1650	1370	1740	1480	1620	1430	1680	1420	1700	1400	1890	1420	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)92 21-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.			October 2015	November 2015	December 2015	January 2016	February 2016	March 2016	
NO.	TEST PARAMETERS	UNIT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	Test Method
1	Organic Matter	%	0.701	0.64	0.629	0.73	0.65	0.619	FCO:2007
2	Phosphorus as P	mg/kg	189	180	162	189	181	163	APHA(22 nd Edi) 4500 C
3	Texture		Sandy	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	%	5.6	5.79	5.61	5.17	5.77	5.66	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	120	119	121	89.98	117	112	AAS 3111B
5.3	Manganese as Mn	mg/kg	760	729	745	687	728	822	AAS APHA 3111 B
5.4	Iron as Fe	%	2.45	2.41	2.32	2.57	2.4	2.9	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	48.32	48.21	47.57	50.33	48.18	44.88	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	52.52	54.52	49.82	56.37	54.48	32.76	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	166	179	167	183	178	173	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	2.02	2.02	2.06	1.9	2.04	1.66	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	BDL*	BDL*	BDL*	ND	BDL*	AAS APHA- 3112 B
6	Benthic Organisms								
6.1	Macrobenthos		Echinoderms Decapods Isopods Chaetognaths	Isopods Polychaete worms Echinoderms	Crabs Bivalves Echinoderms	Echinoderms Crustaceans Molluscans	Polychaete worms Mysids Decapods	Echinoderms Crabs Bivalves	APHA (22 nd Edi) 10500-C
6.2	MeioBenthos		Gastrotriches Bryozoans Ostracodes	Bryozoans Copepods	Hydrozoa Nematodes	Copepods Foraminiferans	Ciliates Nematodes	Foraminiferans Copepods Hydrozoa	APHA (22 nd Edi) 10500-C
2	Population	no/m²	337	440	377	387	440	503	APHA (22 nd Edi) 10500-C

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

SR.	TEST	LINITT	Octob	er 2015	Novemb	er 2015	Decemb	er 2015	Januar	y 2016	Februa	ry 2016	March	2016	Took Makked
NO.	PARAMETERS	UNIT	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	Test Method
1	рН		7.94	8.08	7.94	7.66	8.02	8.13	7.80	7.44	7.66	7.94	8.03	8.07	IS3025(P11)83R e.02
2	Temperature	°C	29	30	30	31	28	29	30	30	30	31	29	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	14	16	16	22	17	23	14	20	16	24	16	20	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1								
5	Dissolved Oxygen	mg/L	5.8	4.6	5.4	4.8	5.2	4.6	5.2	4.6	5.4	4.6	5.4	4.8	IS3025(P38)89R e.99
6	Salinity	ppt	39.37	40.18	38.19	39.3	38.42	39.26	38.68	39.71	38.2	39.3	38.22	38.86	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)55 20D								
8	Nitrate as NO₃	mg/L	0.616	0.857	0.46	0.75	0.52	0.78	0.413	0.674	0.457	0.747	0.355	0.479	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.067	0.053	0.026	0.021	0.037	0.49	0.029	0.024	0.028	0.021	0.015	0.028	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.203	0.342	0.22	0.38	0.15	0.31	0.232	0.4	0.213	0.388	0.335	0.577	IS3025(P34)88Cl a.2.3
11	Phosphates as PO ₄	mg/L	0.545	0.446	0.17	0.162	0.19	0.17	0.267	0.082	0.168	0.159	0.263	0.285	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	0.886	1.252	0.707	1.15	0.71	1.59	0.674	1.098	0.696	1.156	0.705	1.084	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	1.4	BDL*	2.2	BDL*	1	BDL*	1.8	BDL*	2.2	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	44020	44680	46800	33500	46930	47460	46400	47020	44660	45120	43708	44260	IS3025(P16)84R e.02
15	COD	mg/L	24	14	28	24	24	19	22	18	28	24	24	28	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.48	0.8	0.76	0.58	0.82	0.52	0.64	0.4	0.76	0.58	0.638	0.472	SOP – PLPL - 07
Α	Flora and Fauna														
17	Primary productivity	mgC/L /day	2.138	0.563	1.913	0.787	1.91	0.56	2.02	0.675	1.575	0.787	1.98	0.383	APHA (22nd Edi) 10200-J
В	Phytoplankton														



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18.1	Chlorophyll	mg/m ³	2.00	0.507	2.296	0.988	1.22	0.26	2.75	0.74	2.67	0.481	2.11	0.500	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m ³	0.053	1.287	BDL*	0.9	0.75	1.39	BDL*	1.14	ND	1.83	BDL*	2.09	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	202	56	184	48	180	20	147	34	268	55	274	71	APHA (22 nd Edi) 10200-H
			Bacillariop	Bacillarioph	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	
			hyceae	yceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	
			Biddulphia	Fragillaria	Gyrosigma	Achnanthe	Asterionell	Nitzschia	Gomphone	Biddulphia	Navicula	Gyrosigma	Biddulphia	Fragillaria	
			sp.	sp.	sp.	s sp.	a sp.	sp.	ma sp.	sp.	sp.	sp.	sp.	sp.	
			Navicula	Biddulphia	Cheatocer	Biddulphia	Navicula	Fragillaria	Nitzschia	Cocconeis	Synedra	Achnanthe	Melosira	Nitzschia	
			sp.	sp.	ous sp.	sp.	sp.	sp.	sp.	sp.	sp.	s sp.	sp.	sp.	
			Fragillaria	Pleurosigma	Fragillaria	Cheatocer	Synedra	Rhizosolen	Navicula	Rhizosolen	Gomphone	Navicula	Pinnularia	Navicula	
			sp.	sp.	sp.	ous sp.	sp.	ia sp.	sp.	ia sp.	ma sp.	sp.	sp.	sp.	
			Cymbella	Thallasione	Pinnularia	Cocconeis	Rhizosolen	Coscinodis	Fragillaria	Coscinodis	Skeletone	Synedra	Tabellaria	Tabellaria	
			sp.	ma sp.	sp.	sp.	ia sp.	cus sp.	sp.	cus sp.	ma sp.	sp.	sp.	sp.	
			Rhizosolen	Pinnularia	Nitzschia	Rhizosolen	Melosira	Cyclotella	Coscinodis	Navicula	Thallasiosi	Coscinodis	Nitzschia	Coscinodis	
			ia sp.	sp.	sp.	ia sp.	sp.	sp.	cus sp.	sp.	ra sp.	cus sp.	sp.	cus sp.	
			Coscinodis	Cyanophyce	Pleurosigm	Cyanophyc	Skeletone	Rhizosolen	Asterionell	Nitzschia	Skeletone	Cyanophyc	Navicula	Asterionell	
	Name of Group		cus sp.	ae	a sp.	eae	ma sp.	ia sp.	a sp.	sp.	ma sp.	eae	sp.	a sp.	
18.4	Number and name of group		Skeletone	Oscillatoria	Cyanophyc	Microcystis	Coscinodis	Cyanophyc	Green	Green	Cyanophyc	Oscillatoria	Coscinodis	Pinnularia	APHA (22 nd Edi)
10.4	species of each		ma sp.	sp.	eae	sp.	cus sp.	eae	Algae	Algae	eae	sp.	cus sp.	sp.	10200-H
	group		Asterionell	Spirulina sp.	Microcystis	Oscillatoria	Cyanophyc	Oscillatoria	Chlorella	Chlorella	Microcystis	Green	Skeletone	Cyanophyc	10200 11
			a sp.	Spiruinia sp.	sp.	sp.	eae	sp.	sp.	sp.	sp.	Algae	ma sp.	eae	
			Green	Lyngbya sp.	Oscillatoria	Nostoc sp.	Oscillatoria	Nostoc sp.	Pandorina	Ankistrode	Oscillatoria	Volvox sp.	Fragillaria	Oscillatoria	
			Algae	Lyrigbya sp.	sp.		sp.	140300С 3р.	sp.	smus sp.	sp.	voivox sp.	sp.	sp.	
			Ankistrode		Spirulina	Green	Nostoc sp.	Green	Cyanophyc	Cyanophyc	Green		Cyanophyc	Nostoc sp.	
			smus sp.		sp.	Algae		Algae	eae	eae	Algae		eae	'	
			Chlorella		Green	Pandorina	Green	Chlorella	Oscillatoria	Microcystis	Chlorella		Microcystis	Green	
			sp.		Algae	sp.	Algae	sp.	sp.	sp.	sp.		sp.	Algae	
			Pandorina		Ankistrode	Spirogyra	Ankistrode	Hydrodicty	Spirulina				Oscillatoria	Chlorella	
			sp.		smus sp.	sp.	smus sp.	on sp.	sp.				sp.	sp.	
			Desmids		Pediastru		Chlorella	Pediastru					Spirulina	Pandorina	
					m sp.		sp.	m sp.					sp.	sp.	
			Cosmariu				Pandorina	Pandorina					Green		
			m sp.				sp.	sp.					Algae		
			Closterium				Scenedes						Chlorella		

9-D

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			sp.				mus sp.						sp.		
													Ankistrode		
													smus sp.		
С	Zooplanktons		Т	T		Т	Т			T		Т			
19.1	Abundance (Population)	no/m ²	300	125	140	60	175	50	160	80	150	75	317	33	APHA (22 nd Edi) 10200-G
			Copepods	Polychaetes Worms	Copepods	Polychaete worms	Echinoder ms	Bivalves	Mysids	Polychaete s Worms	Polychaete worms	Nematode s	Copepods	Snails	
			Crustacea ns	Chaetognat hes	Decapods	Ostracods	Nematode s	Decapods	Isopods	Echinoder ms	Nematode s	Polychaete worms	Decapods	Echinoder ms	
	Name of Group		Decapods		Ostracods	Decapods	Isopods	Nematode s	Echinoder ms		Hydrozoan s		Gastropod s	1	
19.2	Number and name of group species of each		Polychaete s		Ctenophor es		Decapods		Gastropod s		Echinoder ms		Echinoder ms	1	APHA (22 nd Edi) 10200-G
	group		Krill		Gastropod s		Gastropod s		-				Foraminife rans	1	
			Ostracods		-				1				1	I	
			Crustacea ns												
			Rotifers												
19.3	Total Biomass	ml/10 0 m ³	101	46	82.5	7.4	48.52	8.72	99.6	3.9	91.2	3.5	139	4.68	APHA (22 nd Edi) 10200-G
D	Microbiological Para														
20.1	Total Bacterial Count	CFU/m I	1970	1680	1680	1260	1890	1600	1520	1290	1670	1250	2050	1900	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)92 21-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 [M7 EAST PORT N 22°47'120" E 069°47'110"]

SR. NO.	TEST PARAMETERS	UNIT	November 2015	Test Method
SR. NO.	TEST PARAMETERS	UNII	SEDIMENT	rest Method
1	Organic Matter	%	0.6	FCO:2007
2	Phosphorus as P	mg/kg	143	APHA(22 nd Edi) 4500 C
3	Texture		Sandy Loam	
4	Petroleum Hydrocarbon	mg/kg	BDL*	PLPL-TPH
5	Heavy Metals		·	
5.1	Aluminum as Al	%	5.34	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	134	AAS 3111B
5.3	Manganese as Mn	mg/kg	790	AAS APHA 3111 B
5.4	Iron as Fe	%	2.48	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	43.1	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	42	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	188	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	1.08	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	AAS APHA- 3112 B
6			·	
			Polychaete worms	
6.1	Macrobenthos		Echinoderms	APHA (22 nd Edi) 10500-C
			Isopods	
			Nematodes	
6.2	MeioBenthos		Foraminiferans	APHA (22 nd Edi) 10500-C
			Copepods	
2	Population	no/m²	385	APHA (22 nd Edi) 10500-C

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

SR.	TEST			er 2015	Novemb	er 2015	Decemb	er 2015	Januar	y 2016	Februa	ry 2016	March	2016	
NO.	PARAMETERS	UNIT	SURFAC E	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	Test Method
1	рН		8.1	8.16	8.02	8.23	8.03	8.28	7.78	8.02	8.04	8.24	8.08	8.04	IS3025(P11)83R e.02
2	Temperature	°C	29	30	28	29	28	29	29	30	28	29	29	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	18	22	20	28	22	26	22	30	22	30	18	22	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1
5	Dissolved Oxygen	mg/L	5.6	4.8	5.6	4.8	5.4	4.6	5.4	4.6	5.6	4.8	5.8	4.4	IS3025(P38)89R e.99
6	Salinity	ppt	39.82	40.54	44.6	45.8	43.96	44.88	44.2	45.6	44.4	45.6	43.94	44.28	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)55 20D
8	Nitrate as NO ₃	mg/L	0.443	0.52	0.54	0.66	0.33	0.58	0.52	0.64	0.564	0.655	0.556	0.602	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.497	0.638	0.02	0.029	0.032	0.022	0.019	0.025	0.021	0.03	0.037	0.051	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.684	0.748	0.62	0.7	0.59	0.52	0.6	0.65	0.062	0.703	0.819	0.95	IS3025(P34)88Cl a.2.3
11	Phosphates as PO ₄	mg/L	0.447	0.479	0.19	0.15	0.027	0.041	0.048	0.089	0.19	0.15	0.844	0.903	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.624	1.906	1.18	1.389	0.96	1.13	1.1	1.272	1.205	1.388	1.412	1.603	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	0.4	BDL*	1	BDL*	0.88	BDL*	1.2	BDL*	1	BDL*	2	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	43460	45020	51990	53890	48830	49690	52090	54680	50890	52760	52540	53020	IS3025(P16)84R e.02
15	COD	mg/L	19	24	18	24	19	24	20	22	19	28	28	33	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.38	0.24	0.48	0.62	0.63	0.76	0.46	0.6	0.48	0.64	0.63	0.44	SOP – PLPL - 07
Α	Flora and Fauna													-	
17	Primary productivity	1.19	0.45	1.35	0.338	1.12	0.33	1.236	0.348	1.688	0.45	2.813	0.495	1.193	APHA (22nd Edi) 10200-J



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		3													
В	Phytoplankton														
18.1	Chlorophyll	mg/ m³	1.842	0.614	1.762	0.614	1.73	0.61	2.016	0.598	1.602	0.214	1.549	0.506	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/ m³	0.12	1.199	0.294	1.33	0.97	1.64	0.14	2.06	1.03	1.78	0.844	2.366	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ / L	178	32	220	51	188	31	164	30	212	45	236	54	APHA (22 nd Edi) 10200-H
			Bacillarioph	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	
			yceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	
			Biddulphia	Nitzschia	Asterionell	Fragillaria	Asterionell	Fragillaria	Asterionell	Biddulphia	Navicula	Skeletone	Asterionell	Navicula	
			sp.	sp.	a sp.	sp.	a sp.	sp.	a sp.	sp.	sp.	ma sp.	a sp.	sp.	
			Pinnularia	Pinnularia	Gyrosigma	Gomphone	Biddulphia	Nitzschia	Nitzschia	Navicula	Gyrosigma	Synedra	Biddulphia	Nitzschia	
			sp.	sp.	sp.	ma sp.	sp.	sp.	sp.	sp.	sp.	sp.	sp.	sp.	
			Thallasiosir	Fragillaria	Pinnularia	Navicula	Nitzschia	Biddulphia	Navicula	Thallasiosir	Skeletone	Navicula	Navicula	Biddulphia	
			a sp.	sp.	sp.	sp.	sp.	sp.	sp.	a sp.	ma sp.	sp.	sp.	sp.	
			Cheatocero	Thallasiosir	Synedra	Nitzschia	Rhizosoleni	Navicula	Synedra	Nitzschia	Coscinodis	Coscinodis	Nitzschia	Melosira	
			us sp.	a sp.	sp.	sp.	a sp.	sp.	sp.	sp.	cus sp.	cus sp.	sp.	sp.	
			Asterionell	Cyclotella	Skeletone	Skeletone	Thallasion	Cyanophyc	Asterionell	Cyclotella	Pinnularia	Cyanophyc	Rhizosoleni	Green	
	Name of Group		a sp.	sp.	ma sp.	ma sp.	ema sp.	eae	a sp.	sp.	sp.	eae	a sp.	Algae	
	Number		Cyanophyc	Green	Tabellaria	Cyanophyc	Skeletone	Oscillatoria	Green	Green	Pleurosigm	Nostoc sp	Skeletone	Chlorella	APHA (22 nd Edi)
18.4	and name of group		eae	Algae	sp.	eae	ma sp.	sp.	Algae	Algae	a sp.	1403t0c 3p	ma sp.	sp.	10200-H
	species of each		Anabaena	Pandorina	Gomphone	Oscillatoria	Cyclotella	Microcystis	Pandorina	Chlorella	Cyanophyc	Oscillatoria	Tabellaria	Volvox sp.	10200 11
	group		sp.	sp.	ma sp.	sp.	sp.	sp.	sp.	sp.	eae	sp.	sp.	voivox sp.	
			Microcystis	Chlorella	Cyanophyc	Spirulina	Cyanophyc	Nostoc sp.	Cyanophyc	Scenedes	Microcystis		Synedra	Cyanophyc	
			sp.	sp.	eae	sp.	eae	,	eae	mus sp.	sp.		sp.	eae	
			Spirulina	Ulothrix	Oscillatoria	Green	Anabaena	Green	Spirulina		Oscillatoria		Green	Oscillatoria	
			sp.	sp.	sp.	Algae	sp.	Algae	sp.		sp.		Algae	sp.	
			Green	Volvox sp.	Oedogoniu	Pandorina	Oscillatoria	Chlorella	Microcystis		Green		Pandorina	Lyngbya	
			Algae	voivox sp.	m sp.	sp.	sp.	sp.	sp.		Algae		sp.	sp.	
			Scenedesm		Green	Scenedes	Nostoc sp.	Hydrodicty	Anabaena		Chlorella		Chlorella		
			us sp.		Algae	mus sp.	wostoc sp.	on sp.	sp.		sp.		sp.		
					Hydrodicty		Green	Pandorina			Pediastrum		Scenedes		
					on sp.		Algae	sp.			sp.		mus sp.		
					Pandorina		Ankistrode				Ankistrode		Cyanophyc		

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1					sp.		smus sp.				smus sp.		eae		
					Pediastrum		Pandorina						Nostoc sp.	-	
					sp.		sp.						•		
							Pediastrum						Spirulina		
							sp.						sp.		
							Ulothrix sp.								
С	Zooplanktons														
19.1	Abundance (Population)	no/ m²	375	50	280	100	200	80	398	67	240	80	300	67	APHA (22 nd Edi) 10200-G
			Copepods	Ostracods	Copepods	Copepods	Decapods	Nematode s	Echinoder ms	Molluscans	Gastropod s	Polychaete worms	Copepods	Echinoder ms	
			Krill	Decapods	Decapods	Decapods	Ostracods	Mysids	Decapods	Decapods	Nematode s	Nematode s	Gastropod s	Gastropod s	
	Name of Group		Isopods		Ostracods	Isopods	Krill	Barnades	Copepods		Decapods	Molluscans	Polychaete worms		
19.2	Number and name of group		Decapods		Rotifers		Crustacean s		Isopods		mysids		Foraminife rans		APHA (22 nd Edi) 10200-G
	species of each group		Crustacean s		Ctenophor es		Echinoder ms		Gastropod s				Barnades		
			Rotifers		Chaetogna thes										
			Chaetognat hes												
19.3	Total Biomass	ml/1 00 m ³	78	22	83.8	5.7	68.9	9	55	10	78	3.6	126	4.59	APHA (22 nd Edi) 10200-G
D	Microbiological Para														
20.1	Total Bacterial Count	CFU /ml	1540	1220	1860	1340	1690	1500	1750	1280	1820	1350	1650	1750	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)92 21-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 [M8 RIGHT SIDE OF BOCHA CREEK – N 22°45'987" E 069°43'119"]

SR.	TECT DADAMETERS	LINITT	October 2015	November 2015	December 2015	January 2016	February 2016	March 2016	To at Marth a d
NO.	TEST PARAMETERS	UNIT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	Test Method
1	Organic Matter	%	0.569	0.53	0.51	0.52	0.579	0.462	FCO:2007
2	Phosphorus as P	mg/kg	170	200	170	198	202	165	APHA(22 nd 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	%	5.33	5.00	5.09	5.6	5.01	5.25	AAS APHA 3111 B
5.2	Total Chromium as Cr ⁺³	mg/kg	87.99	98	101	102	98.57	93.99	AAS 3111B
5.3	Manganese as Mn	mg/kg	735	880	829	770	879	747	AAS APHA 3111 B
5.4	Iron as Fe	%	2.13	2.8	2.42	2.6	2.87	2.27	AAS APHA(22 nd Edi)3111 B
5.5	Nickel as Ni	mg/kg	38.98	50	43.98	48	51.97	32.94	AAS APHA(22 nd Edi)3111 B
5.6	Copper as Cu	mg/kg	43.97	54	47.98	52	54.58	46.41	AAS APHA(22 nd Edi)3111 B
5.7	Zinc as Zn	mg/kg	162	160	48.57	174	162	154	AAS APHA(22 nd Edi)3111 B
5.8	Lead as Pb	mg/kg	1.99	2.2	147	1.8	2.27	2.02	AAS APHA(22 nd Edi)3111 B
5.9	Mercury as Hg	mg/kg	BDL*	BDL*	BDL*	BDL*	BDL*	BDL*	AAS APHA- 3112 B
6	Benthic Organisms								
6.1	Macrobenthos		Echinoderms Decapods Isopods	Mysids Isopods Echinoderms Polychaete worms	Polychaete worms Echinoderms Decapods Isopods	Crabs Ostracods Gastrotriches	Polychaete worms Mysids	Polychaete Worms Echinoderms Crabs	АРНА (22 nd Edi) 10500-С
6.2	MeioBenthos		Gastrotriches Copepods Ostracodes	Copepods Ostracods Ciliates	Nematodes Foraminiferans	Isopods Nematodes Decapods	Nematodes Ostracods Foraminiferans	Nematodes Hydrozoa	АРНА (22 nd Edi) 10500-С
2	Population	no/m ²	503	317	385	508	318	433	APHA (22 nd Edi) 10500-C

H. T. Shah Lab Manager SURAT-3



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RESULTS OF MARINE WATER [M11 MPT T1 JETTY N 22°42'278" E 069°43'450"]

SR.	TEST	UNIT	Octobe	er 2015	Novemb	er 2015	Decemb	er 2015	Januar	y 2016	Februa	ry 2016	March	2016	T M I J
NO.	PARAMETERS	UNII	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	Test Method
1	pH		8.02	8.11	7.91	7.66	8.02	8.33	7.62	7.27	7.66	7.91	7.89	7.93	IS3025(P11)83R e.02
2	Temperature	°C	29	30	29	30	29	30	28	29	29	30	29	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	14	20	18	22	19	25	20	24	19	23	14	22	IS3025(P17)84R e.02
4	BOD (3 Days @ 27 °C)	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03 Edition2.1								
5	Dissolved Oxygen	mg/L	5.8	4.8	5.2	4.6	5.8	4.8	5.6	4.8	5	4.4	5.8	5	IS3025(P38)89R e.99
6	Salinity	ppt	40.3	41.6	41.7	42.53	39.88	40.98	42.1	42.93	41.6	42.54	42.38	42.88	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)55 20D								
8	Nitrate as NO ₃	mg/L	0.474	0.673	0.81	0.93	0.67	0.87	0.689	0.903	0.793	0.915	0.649	0.943	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.027	0.049	0.077	0.08	0.079	0.081	0.08	0.085	0.075	0.078	0.041	0.053	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.64	0.64	0.41	0.581	0.69	0.79	0.489	0.605	0.407	0.574	0.558	0.689	IS3025(P34)88Cl a.2.3
11	Phosphates as PO ₄	mg/L	0.279	0.361	0.78	0.88	0.075	0.089	0.083	0.144	0.777	0.868	0.095	0.108	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.141	1.369	1.29	1.59	1.45	1.74	1.258	1.593	1.275	1.567	1.248	1.685	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	0.2	BDL*	2.2	BDL*	1.8	BDL*	1.7	BDL*	2.1	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	47980	49710	33800	35000	40830	42620	34120	35330	48150	49630	51590	51620	IS3025(P16)84R e.02
15	COD	mg/L	14	18	22	24	24	28	18	20	20	24	14	19	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.44	0.62	0.94	0.44	0.78	0.49	0.88	0.4	0.9	0.4	0.696	0.472	SOP – PLPL - 07
Α	Flora and Fauna														
17	Primary productivity	mgC/L /day	1.913	0.563	2.58	0.338	2.47	0.33	2.172	0.666	1.91	0.45	2.363	0.63	APHA (22nd Edi) 10200-J
В	Phytoplankton											·			

- O-D

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18.1	Chlorophyll	mg/m ³	1.816	0.908	2.216	0.561	2.35	0.32	2.584	0.489	2.67	0.24	2.67	0.24	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m ³	0.24	1.148	BDL*	1.103	BDL*	1.86	0.12	0.998	0.04	1.909	0.04	1.9	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	210	63	210	53	314	162	246	72	276	65	251	46	APHA (22 nd Edi) 10200-H
			Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	Bacillariop	
			hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	hyceae	
			Nitzschia	Synedra	Asterionell	Biddulphia	Navicula	Fragillaria	Skeletone	Biddulphia	Asterionell	Fragillaria	Navicula	Nitzschia	
			sp.	sp.	a sp.	sp.	sp.	sp.	ma sp.	sp.	a sp.	sp.	sp.	sp.	
			Navicula	Gyrosigma	Coscinodis	Cocconeis	Nitzschia	Gomphone	Synedra	Pinnularia	Navicula	Nitzschia	Asterionell	Rhizosolen	
			sp.	sp.	cus sp.	sp.	sp.	ma sp.	sp.	sp.	sp.	sp.	a sp.	ia sp.	
			Cymbella	Thallasiosi	Gomphone	Fragillaria	Coscinodis	Asterionell	Navicula	Pleurosigm	Synedra	Asterionell	Skeletone	Pleurosigm	
			sp.	ra sp.	ma sp.	sp.	cus sp.	a sp.	sp.	a sp.	sp.	a sp.	ma sp.	a sp.	
			Cymbella	Pinnularia	Pinnularia	Synedra	Fragillaria	Rhizosolen	Rhizosolen	Green	Coscinodis	Navicula	Rhizosolen	Skeletone	
			sp.	sp.	sp.	sp.	sp.	ia sp.	ia sp.	Algae	cus sp.	sp.	ia sp.	ma sp.	
			Gomphone	Navicula	Thallasion	Cyanophyc	Gomphone	Cyanophyc	Coscinodis	Pandorina	Nitzschia	Gyrosigma	Cymbella	Fragillaria	
			ma sp.	sp.	ema sp.	eae	ma sp.	eae	cus sp.	sp.	sp.	sp.	sp.	sp.	
			Coscinodis	Nitzschia	Fragillaria	Microcystis	Skeletone	Microcystis	Gomphone	Pediastru	Cymbella	Cyanophyc	Thallasiosi	Cyanophyc	
	Name of Group		cus sp.	sp.	sp.	sp.	ma sp.	sp.	ma sp.	m sp.	sp.	eae	ra sp.	eae	
10.4	Number		Rhizosolen	Green	Cyanophyc	Oscillatoria	Rhizosolen	Oscillatoria	Green	Cyanophyc	Skeletone	Oscillatoria	Cyclotella	Oscillatoria	APHA (22 nd Edi)
18.4	and name of group species of each		ia sp.	Algae	eae	sp.	ia sp.	sp.	Algae	eae	ma sp.	sp.	sp.	sp.	10200-H
	group		Green	Ulothrix	Anabaena	Green	Cyanophyc	Nectos	Spirogyra	Lyngbya	Cyanophyc	Microcystis	Cyanophyc	Spirulina	
	3. 5.44		Algae	sp.	sp.	Algae	eae	Nostoc sp.	sp.	sp.	eae	sp.	eae	sp.	
			Scenedes	Chlorella	Oscillatoria	Hydrodicty	Anabaena	Green	Hydrodicty	Microcystis	Oscillatoria		Anabaena	Green	
			mus sp.	sp.	sp.	on sp.	sp.	Algae	on sp.	sp.	sp.		sp.	Algae	
			Hydrodicty		Spirulina	Pandorina	Microcystis	Chlorella	Scenedes		Microcystis		Microcystis	Ankistrode	
			on sp.		sp.	sp.	sp.	sp.	mus sp.		sp.		sp.	smus sp.	
			Spirogyra		Green	Pediastru	Oscillatoria	Pandorina	Desmids		Nostoc sp.		Nostoc sp.	Scenedes	
			sp.		Algae	m sp.	sp.	sp.	Desirius		Nostoc sp.		Nostoc sp.	mus sp.	
			Desmids		Ankistrode		Green	Pediastru	Cosmariu		Green		Green		
			Desirilus		smus sp.		Algae	m sp.	m sp.		Algae		Algae		
			Cosmariu		Chlorella		Ankistrode				Chlorella		Chlorella		
			m sp.		sp.		smus sp.				sp.		sp.		
					Hydrodicty		Chlorella				Pediastru		Pandorina		
					on sp.		sp.				m sp.		sp.		
							Hydrodicty				Ulothrix				

9-0

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							on sp.				sp.				
							Volvox sp.				Scenedes mus sp.				
С	Zooplanktons														
19.1	Abundance (Population)	no/m²	250	100	250	75	367	100	208	80	250	75	183	50	APHA (22 nd Edi) 10200-G
			Chaetogna thes	Gastropod s	Copepods	Copepods	Polychaete worms	Nematode s	Copepods	Decapods	Polychaete worms	Gastropod s	183	50	
			Krill	Decapods	Decapods	Polychaete worms	Echinoder ms	Gastropod s	Gastropod s	Ostracods	Echinoder ms	Echinoder ms	Copepods	Copepods	
	Name of Group Number		Ostracods	Nematode s	Polychaete worms	Gastropod s	Amphipods		Crustacea ns		Molluscans		Ostracods	Decapods	ADUA (22nd E.4:)
19.2	and name of group species of each		Cyclops		Ctenophor es		Krill		Cyclops	-	mysids		Echinoder ms	Gastropod s	APHA (22 nd Edi) 10200-G
	group		Crustacea ns		Krill				Polychaete s				Molluscans		
			Polychaete s		Crustacea ns					-			Rotifers		
19.3	Total Biomass	ml/100 m ³	79.6	21	82.9	10.4	80.24	12.1	89	26	79	23	124	19.6	APHA (22 nd Edi) 10200-G
D	Microbiological Para														
20.1	Total Bacterial Count	CFU/m I	1820	1690	1860	1440	1840	1680	1820	1580	1850	1430	2120	2440	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)92 21-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.	TECT DADAMETERS	LINITT	Octobe	er 2015	Novemb	er 2015	Decemb	er 2015	Januar	y 2016	Februa	ry 2016	March	2016	To at Matha d
NO.	TEST PARAMETERS	UNIT	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	SURFACE	воттом	Test Method
1	pH	1	7.89	8.16	7.82	7.74	7.92	8.02	7.36	7.3	7.74	7.82	7.93	7.89	IS3025(P11)83Re .02
2	Temperature	°C	29	30	28	29	28	29	29	30	28	29	29	30	IS3025(P9)84Re. 02
3	Total Suspended Solids	mg/L	20	24	24	30	20	26	20	26	20	24	16	20	IS3025(P17)84Re .02
4	BOD (3 Days @ 27 °C)	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	IS 3025 (P44)1993Re.03E dition2.1								
5	Dissolved Oxygen	mg/L	5.8	4.8	5.2	4.8	5.2	4.8	5	4.6	5.2	4.8	5.6	4.4	IS3025(P38)89Re .99
6	Salinity	ppt	40.12	41.08	41.7	42.3	39.6	40.2	41.3	42.1	41.6	42.2	41.58	42.22	APHA (22 nd Edi) 2550 B
7	Oil & Grease	mg/L	BDL* BDL*	BDL*	BDL*	BDL*	APHA(22 nd Edi)55 20D								
8	Nitrate as NO ₃	mg/L	0.474	0.581	0.508	0.61	0.56	0.7	0.612	0.689	0.503	0.625	0.355	0.51	IS3025(P34)88
9	Nitrite as NO ₂	mg/L	0.044	0.068	0.075	0.097	0.084	0.09	0.07	0.089	0.072	0.097	0.069	0.092	IS3025(P34)88 NEDA
10	Ammonical Nitrogen as NH ₃	mg/L	0.591	0.702	0.81	0.9	0.5	0.59	0.838	0.931	0.814	0.889	0.689	0.707	IS3025(P34)88Cl a.2.3
11	Phosphates as PO ₄	mg/L	0.117	0.139	0.16	0.189	0.13	2.03	0.063	0.062	0.15	0.186	0.158	0.181	APHA(22 nd Edi) 4500 C
12	Total Nitrogen	mg/L	1.1	1.351	1.39	1.607	1.15	1.39	1.52	1.709	1.389	1.61	1.113	1.309	IS3025(P34)88
13	Petroleum Hydrocarbon	mg/L	BDL*	BDL*	1.8	BDL*	1.2	BDL*	1.4	BDL*	1.7	BDL*	BDL*	BDL*	PLPL-TPH
14	Total Dissolved Solids	mg/L	47980	48710	38400	35500	47290	48260	38030	36380	45980	46720	48810	49690	IS3025(P16)84Re .02
15	COD	mg/L	24	28	19	24	14	24	18	22	19	24	24	28	APHA(22 nd Edi) 5520-D Open Reflux
16	Oxidisable Particular Organic Carbon	%	0.74	0.4	0.7	0.38	0.63	0.41	0.63	0.37	0.71	0.39	0.48	0.32	SOP – PLPL - 07
Α	Flora and Fauna														
17	Primary productivity	mgC/L/ day	2.138	0.338	2.25	0.788	2.25	0.22	1.762	5.8	2.47	0.9	2.31	0.54	APHA (22nd Edi) 10200-J
В	Phytoplankton														



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18.1	Chlorophyll	mg/m ³	1.896	0.534	2.163	0.454	1.3	0.64	1.672	0.444	2.51	0.481	2.57	0.49	APHA (22 nd Edi) 10200-H
18.2	Phaeophytin	mg/m ³	0.142	1.428	BDL*	1.602	0.74	1.11	0.236	1.182	0.22	1.83	0.219	1.83	APHA (22 nd Edi) 10200-H
18.3	Cell Count	Unit x 10 ³ /L	208	60	223	62	178	70	218	54	286	38	228	51	APHA (22 nd Edi) 10200-H
			Bacillariop												
			hyceae												
			Amphipror	Navicula	Asterionell	Biddulphia	Asterionell	Fragillaria	Nitzschia	Navicula	Navicula	Synedra	Asterionell	Fragillaria	
			a sp.	sp.	a sp.	sp.	a sp.	sp.	sp.	sp.	sp.	sp.	a sp.	sp.	
			Navicula	Synedra	Cocconeis	Cocconeis	Biddulphia	Nitzschia	Pinnularia	Melosira	Synedra	Nitzschia	Navicula	Navicula	
			sp.												
			Nitzschia	Melosira	Fragillaria	Gyrosigma	Coscinodis	Skeletone	Synedra	Coscinodis	Cyclotella	Coscinodis	Nitzschia	Thallasiosi	
			sp.	sp.	sp.	sp.	cus sp.	ma sp.	sp.	cus sp.	sp.	cus sp.	sp.	ra sp.	
			Fragillaria	Cheatocer	Pinnularia	Pinnularia	Gyrosigma	Asterionell	Gomphon	Fragillaria	Pleurosig	Fragillaria	Gomphon	Coscinodis	
			sp.	ous sp.	sp.	sp.	sp.	a sp.	ema sp.	sp.	ma sp.	sp.	ema sp.	cus sp.	
			Pinnularia	Coscinodis	Rhizosolen	Thallasiosi	Nitzschia	Cyanophy	Thallasiosi	Skeletone	Skeletone	Tabellaria	Gyrosigma	Nitzschia	
			sp.	cus sp.	ia sp.	ra sp.	sp.	ceae	ra sp.	ma sp.	ma sp.	sp.	sp.	sp.	
			Synedra	Rhizosolen	Skeletone	Cyanophy	Rhizosolen	Oscillatori	Amphipror	Asterionell	Fragillaria	Cyanophy	Rhizosolen	Pleurosig	
			sp.	ia sp.	ma sp.	ceae	ia sp.	a sp.	a sp.	a sp.	sp.	ceae	ia sp.	ma sp.	
	Name of Group Number		Skeletone	Green	Thallasion	Microcystis	Thallasiosi	Nostoc sp.	Skeletone	Green	Cheatocer	Oscillatori	Skeletone	Cyanophy	APHA (22 nd Edi)
18.4	and name of group		ma sp.	Algae	ema sp.	sp.	ra sp.	Nostoc sp.	ma sp.	Algae	ous sp.	a sp.	ma sp.	ceae	10200-H
	species of each group		Biddulphia	Pandorina	Cyanophyc	Green	Cyanophyc	Green	Biddulphia	Ankistrode	Biddulphia	Green	Fragillaria	Oscillatori	
	op out of out of group		sp.	sp.	eae	Algae	eae	Algae	sp.	smus sp.	sp.	Algae	sp.	a sp.	
			Cyanophy	Ulothrix	Oscillatori	Chlorella	Microcystis	Chlorella	Cyanophy	Volvox sp.	Rhizosolen	Chlorella	Cyanophy		
			ceae	sp.	a sp.	sp.	sp.	sp.	ceae	VOIVOX Sp.	ia sp.	sp.	ceae		
			Anabaena	Volvox sp.	Nostoc sp.	Hydrodicty	Oscillatori	Pandorina	Oscillatori		Cyanophy	Pediastru	Oscillatori		
			sp.	volvox sp.	•	on sp.	a sp.	sp.	a sp.		ceae	m sp.	a sp.		
			Oscillatori		Microcystis	Pandorina	Nostoc sp.	Ankistrode	Green		Spirulina		Microcystis		
			a sp.		sp.	sp.		smus sp.	Algae		sp.		sp.		
			Nostoc sp.		Green		Green		Volvox sp.		Oscillatori		Green		
					Algae		Algae		•		a sp.		Algae		
			Green		Ankistrode		Ankistrode		Chlorella		Green		Chlorella		
			Algae		smus sp.		smus sp.		sp.		Algae		sp.		
			Chlorella		Chlorella		Chlorella				Hydrodicty		Pandorina		
	1	1	sp.	1	sp.		sp.			1	on sp.		sp.		
			Ulothrix		Hydrodicty		Pediastru				Chlorella		Scenedes		

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			sp.		on sp.		m sp.				sp.		mus sp.		
			Ankistrode smus sp.				Scenedes mus sp.								
							Volvox sp.								
С	Zooplanktons														
19.1	Abundance (Population)	no/m²	300	125	280	60	250	50	290	116	275	100	267	17	APHA (22 nd Edi) 10200-G
19.2	Name of Group Number and name of group species of each group		Copepods	Polychaete s	Copepods	Ctenophor es	Polychaete worms	Copepods	Muds skipper	Snails	mysids	Nematode s	Polechaet e worms	Gastropod s	APHA (22 nd Edi) 10200-G
			Nematode s	Chaetogna thes	Ctenophor es	Copepods	Echinoder ms	Molluscans	Bivalves	Copepods	Polychaete worms	Gastropod s	Crustacea ns		
			Decapods	Copepods	Krill	-	Amphipod s	-	Nematode s		Gastropod s		Molluscans		
			Hydrolod		Daphnia		Isopods		Hydrolod		Nauplius larvae		Decapods		
			Gastropod s		Ostracods		Decapods		Ostracods		Decapods		Copepods		
			Ostracods		Gastropod s				Gastropod s				Gastropod s		
19.3	Total Biomass	ml/100 m ³	86.9	6.2	91.2	10.8	10.24	30.1	80.6	8.4	97	17	132	3.24	APHA (22 nd Edi) 10200-G
D	Microbiological Parameters														
20.1	Total Bacterial Count	CFU/ml	1550	1230	1720	1360	1500	1310	1840	1580	1490	1030	2780	1820	IS 5402:2002
20.2	Total Coliform	/ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	APHA(22 nd Edi)92 21-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)

H. T. Shah Lab Manager





Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To: September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 4

1. GHG emission reduction initiatives at APSEZ, Mundra

1.1 Tug Speed Reduction Program:

The objective of Tug speed reduction (TSR) program was to reduce fuel consumption and subsequent reduction in greenhouse gas emission like carbon dioxide (CO_2) & other emission like SO_2 & NO_x by slowing Tug speeds during regular visit to SPM (Single Point Mooring) station for anchorage of Crude Oil vessel.

Reduced tug speeds demand less power from the main engine, which in turn reduces nitrogen oxide NOx, $SO_2 \& CO_2$ emissions. Tugs have two types of engines: main engines and auxiliary engines. Main

engines are used for tug propulsion through the ocean.

Auxiliary engines spin electrical generators that provide power for a tug. Non-propulsion needs such as lights, navigation computers, bow thrusters, air conditioning, satellite communications, etc.

Overall, 31 ton of fuel consumption and $97.8\ tCO_2$ were reduced per year due to the TSR initiative at APSEZ, Mundra.



1.2 E- RTG Technology for cranes:

The work-horse of the container handling industry is the Rubber Tired Gantry (RTG) crane. For over 50 years, these heavy duty cranes have been a staple at ports worldwide. Typically powered by diesel engines, these cranes require constant maintenance and fuel management to remain operational. In

addition to costs, ports have begun to feel the pressure to become more "Green" by local authorities and governments. Under this initiative, all the diesel operated cranes were converted to electric mode using the e-RTG technology. This conversion has helped achieve the following benefits:

- 95% savings of diesel consumption
- Reduction of operation costs up to 70%
- Reduction of maintenance costs (diesel generators) up to 70%
- Significant reduction of greenhouse emissions & noise pollution
- Automated aisle entry/exit for increased productivity



Figure : E-RTG installed at Container Terminal

2. Waste Management initiatives at APSEZ, Mundra

2.1 Sustainable Waste Management:

APSEZ, Mundra is committed to minimize the disposing of waste, it's impact on the environment and to ensure that waste is managed in an environmental friendly and safe manner. Therefore, in collaboration with "Let's Recycle" APSEZ segregates the waste (generated from operational activities and received from ships calling at the port) and sends for recycling.

Most of the solid waste generated in the company is recyclable. Focusing on Dry Waste Collection/segregation and sending to authorizing recyclers. All waste management facilities are compliant with the safety and environmental standards and ensure effective and efficient recycling.

2.2 Zero Waste Initiatives (ZWI) Concept

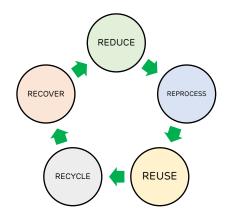
There is a common responsibility to first reduce generation of waste, then focus on reuse and recycle of waste for another use and finally recover to derive the valuable materials out of waste. No waste should be disposed to nature.

Good Environment Management practices require focus on 5R (Reduce – Reprocess – Reuse – Recycle

 Recover) principles rather than mere disposal of wastes back to nature which pollute and degrade environment.

In Nature, there is nothing like "Waste". So as an environmentally responsible organization, APSEZ has put up efforts to become a Zero Waste company by adopting 5R practices of sustainable handling and management for each kind of waste.





APSEZ has taken initiative to make Mundra port a "Zero Waste Port". To achieve this milestone, various sources of waste and their sustainable waste management techniques were identified. A detailed waste inventory was prepared. Having understood the entire concept of "Zero Waste Initiatives", a firm commitment was given by the top management to implement the sustainable waste management techniques.

2.3 Material Recovery Facility for Management of Solid Waste:

APSEZL have established Material Recovery Facility for environmentally sound management of Dry Solid Waste. Presently manual sorting is being done for sorting of different types of solid waste, sorted out different stream of recyclable material is being sent to recycling like Paper, Plastic, Cardboard, PET Bottles, Glass etc. Whereas remaining non-recyclable waste is bailed and sent to cement plant for Coprocessing as RDF (Refused Derived Fuel).



View of Material Recovery Facility





Sorting of Recyclable Material from MSW







Bailed waste ready for Recycling & Resource Recovery

Bailing Facility for Management of Dry Waste

2.4 Organic Waste Composting Facility:

APSEZL have established Organic Waste Composting Facility for environmentally sound management of organic waste generated from canteens. This facility enables to convert organic waste in rich organic compost, which is being used for in-house Horticulture purpose

Food/Vegetable Waste





Manure to Plant



2.5 Hazardous Waste Management:

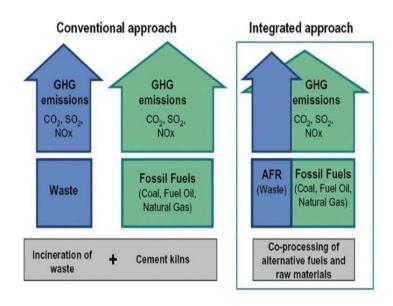


Hazardous Waste Storage Facility

APSEZL have established designated facility for storage of various types of Hazardous Waste. Recyclable hazardous waste like used oil/ waste oil & E-Waste is being stored separately, which is being regularly sent to authorised recyclers for recycling & recovery.

APSEZL have taken various initiatives under zero waste initiative for diverting hazardous waste from incineration/landfill to Co-Processing. APSEZL have done tie up with cement plant for disposal of Pig Waste, Oily contaminated cotton waste & tank bottom sludge through co-processing.

Benefit of adopting Co-processing (Integrated Approach) over Conventional Approach (TSDF/Landfill)



3. Water Management initiatives at APSEZ, Mundra

Waste water generated from various operational area from Port & SEZ is being treated at respective Sewage Water Treatment Plant & Effluent Treatment Plant. Treated water from all STP/ETP is being fully utilised for Horticulture purpose.

Detail of various STP/ETP's available at APSEZL, Mundra.

Sr. No	Location	Capacity	Technology
1	CETP	2.5 MLD	Aerobic Digestion
2	Shantivan Colony STP	350 KLD	Aerobic Digestion
3	Shantivan Colony STP	250 KLD	Aerobic Digestion
4	Adani House STP	150 KLD	MBBR
5	Old Admin STP	30.0 KLD	Aerobic Digestion
6	Samudra Township STP	2.0 MLD	MBR
7	Adani Hospital STP	30.0 KLD	Aerobic Digestion
8	Liquid Terminal ETP	265 KLD	Aerobic Digestion
9	West Port STP	55.0 KLD	FAB

Water Treatment Facilities at APSEZL, Mundra













Water Maker Machine (Water from Atmospheric Air)

APSEZL, Mundra is located in the arid region of Gujarat state. Recognising the importance of water & our long time plan for circular economy, as a part of Sustainable Environmental initiatives APSEZL, Mundra have identified innovative technology of Atmospheric Water Generator, which generates pure & hygienic drinking water from atmospheric air.

Recently APSEZL, Mundra have commissioned 02 nos. of Water Maker Machine of capacity 120 Ltr/Day & 250 Ltr/Day, which is scattering drinking water requirement at port & residential township.

Working Principle:

The Water Maker Atmospheric Water Generator is a humidity and temperature driven machine. This machine totally depends on the level of humidity in the air and the temperature to produce water. Ideally, the humidity level should be at least 40% or above and temperature ranging from 25°C to 32°C to achieve the machine's optimum performance. In places with lower humidity level, the machine will still produce water but not as quickly, nor as much as in places with high level of humidity. Because Water Maker works by converting the humidity in the air into water, this unit also acts as an effective dehumidifier. To remove dust particles and other unwanted impurities WATERMAKER uses the various type of in built water filters. To ensure high quality drinking water, WM-250 utilizes multiple filtration technologies. The water you drink from the WATERMAKER is free from contamination, viruses, bacteria and harmful chemicals.







Water Maker Machine at Township

4. Fugitive Dust Control initiatives at APSEZ, Mundra



Mechanised Coal Handling System with closed conveying



Wagon Loading & Truck Loading silo



Wind Screen of 16.0 mtr. Height



Mobile Canon mist & water sprinkling vehicle



Adequate distance between two heaps with fixed fire fighting & water sprinkling



Dry Fog Dust Suppression System



Greenbelt around coal handling area



Road side greenbelt



Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To : September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 5

OIL SPILL DRILL REPORT								
Particulars of person, office reporting	CAPT. SANSAR CHAUBE , HOD MARINE APSEZ MUNDRA							
Tel No.	9925223674							
Date & time of incident	22.07.2016							
Spill location	1 NM NE of IOCL SPM							
Likely cause of spill	FLOATING HOSE DAMAGED	Witness –Tanker Seaman & Diver						
Initial response action	Stopped pumping and valve closed	By- Duty Diver on board Dol- 11						
Any other information	Spillage is stopped							

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	GM MARINE (APSEZ)
Time of FIR	22 / 1308 HRS
Source of spill	CARGO LINE (HOSE)
Cause of spill	Hose burst
Type of spill	Crude Oil
Colour code information (from CG)	Brown
Radius of slick	300 mtr
Tail	500 mtr
Volume	3.3 m3 approx
Quantity	4.4 Ton Appx
Weather	SW'ly x 16-18 knts
Tide / current	Flood / 1 knt
Density	
Layer thickness	1.5 mm approx.
Air / Sea temp.	31 C / 25 c
Predicted slick movement	Easterly towards bocha island
Size of spill classification (Tier 1, 2 or 3)	Tier 1

Reviewed By	:	Capt. Anubhav Jain	Issue No.	:	01	Issued On	:	01/12/2014
Approved By	:	Capt. Sansar Chaube	Revision No.	:	02		Page 7	'2 of 90

D	n	П	P	F	C

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	
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	

Reviewed By	:	Capt. Anubhav Jain	Issue No.	:	01	Issued On	:	01/12/2014
Approved By	:	Capt. Sansar Chaube	Revision No.	:	02		Page 7	72 of 90

Page Number: 1	of 1	Date: 22.07.2016					
Name: Arpan		Position: Radio Officer					
Contact Number	r: 9712086710	Signature:					
Time	Activity Completed:						
1308	Oil Spill reported near 700 mtr	s NE of IOCL SPM					
1309	Informed to HOD, HOS Marine						
1309	SPM vessel informed to stop ca	0 0 .					
1310	and Duty diver to close all valve						
	IOCL receiving terminal inform						
1313	Dol 11 cast off from SPM moori	ing buoy					
1315	Dol 7 casted off from Tug Berth	n					
1317	Dol 8 casted off from Tug Bert	h					
1320	Dol 16 casted off from Tug Ber	th					
1322	Dol 11 reported reached in area	3					
1328	Dol 11 started lowering Canady	ne Fence Boom					
1339	Dol 11 Canadyne Fence boom rigged and Skimmer lowered and commenced cleaning up operation.						
1350	Dol 11 reported continue recovering oil spillage through skimmer						
1425	Dol 11 reported recovered 4.5 m3 of oil spill						
1435	Oil spillage is under control all normal						
1438	Drill Called off						

Reviewed By	:	Capt. Anubhav Jain	Issue No.	:	01	Issued On	:	01/12/2014
Approved By	:	Capt. Sansar Chaube	Revision No.	:	02		Page 7	72 of 90













Reviewed By	:	Capt. Anubhav Jain	Issue No.	:	01	Issued On	:	01/12/2014
Approved By	:	Capt. Sansar Chaube	Revision No.	:	02		Page 7	2 of 90



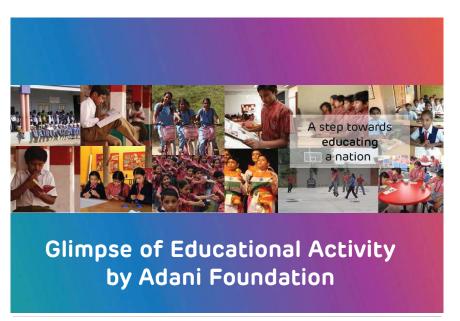
Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To: September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 6



adani

adani



Education:

- Mind power and Goal settings Training in Government School Bhujpur and Tunda Wandh about 95 students took part in it.
- Inauguration of Satellite Leaning Centre/Adami Education Development Centre in June 2016.
- 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 of Balwadi are now able to read write and speak A B C, Drawing very well.
 Moreover they are also teaching other fellow students. Regular Mother's meet organized on various topics.
- Science Exhibition organized at Zarpara(Chacha). Total-87 Students had benefited
- Arrangement of Transportation Facilities for School Going Children from Bandar to respective villages. Presently We have made arrangements for Luni Bandar-53 Students and Bavadi Bandar-44 & Sekhadiya-7 Total-104 Students are being benefited.
- 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.
- Training organized for Balvadi teachers and helpers at "Timba Ashram Shala, Surat".
 Main objective of the training was "SARJAN": New useful craft work from Waste materials and natural materials, Learning by Music, new initiatives to engage small kids, entertainment from Balgeet and plays etc. Total 8 Balvadi Teachers and Helpers have taken part.

Contents

- Education Initiatives
- Community Health Initiatives
- Sustainable Livelihood Initiatives
- Rural Infrastructure Development Initiatives
- Adani Skill Development Initiatives
- CSR Budget
- Media Corner

Adani Vidhya Mandir Bhadreshwar: Shaping Lives





























Glimpse of Community Health Activity by Adani Foundation

Adani Vidhya Mandir Bhadreshwar : Shaping Lives

- School Educational Activities:
- > Second semester annual exam started from 2nd April 2016.
- > Starting of new academic year of std.-10th on 18th April 2016.
- > Books Exhibition on behalf of "Pustak Din" celebrated by Students of Std:1 to 9
- > Elocution competition was organized of std. 8 & 9 on the eve of "Gujarat sthapna divas"
- > Remedial class continue from 1st week of May
- > Environment Day celebration by Rally and Street play,
- 2ndInternational Yoga Day Celebration
- > Open House Meeting of Std.-10 IN July 2016.
- > Kitchen garden Concept as a part of education
- > Exposure tour of Std:- 3 & 4 as a part of education at Adipur (Pataliya Hanuman, Shinay) in July 2016
- > Essay Competition of Std:- 7 to 9 & Mathematics quiz competition of 7 to 10
- > Science fair organized by Govt. at Nana bhadia village, Near Mandvi, our two students participated in this fair with "Modern traffic signal" module in Aug. 2016
- > Average Students Strength:- 377 Out of 396
- > Oral test surprise examination of Std:-1 to 10.
- > " World Ozone day " celebration.
- House visit of Irregular Students.
- Students & Teachers participated in Svachhata Abhiyan organized by Govt. & Mrs. Chhaya ben Gadhavi (Chairman DEC-Kutch bhuj), TDO & Mamlatdar, Mundra were present in this program)

adani

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

Community Health: Mundra

	Mobilevan OPD April to Sep-2016								
Month	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Total		
OPD	2714	2873	2947	3262	3,197	4,384	19,157		

	Rural Clinic OPD April to Sep-2016								
W	onth	16-Apr	16-May	16-Jun	16-Jul	16-Aug	16-Sep	Total	
01	PD	2764	2505	3055	3550	3,712	3,659	19,245	

Senior	Senior Citizen Scheme									
Month	OPD	IPD								
April	674	3								
May	648	0								
June	695	3								
July	754	3								
Aug,	782	33								
Sep.	810	12								
Total	4363	54								

Poor Patients Support: 384
Patients had been supported for treatment of illness.

Mobile Dispensaries & Rural Clinics					
During this six month, total 19157 patients					
were provided with free Health Care					
Services by Mobile Dispensaries at 26					
villages and 6 Fisherfolk settlements .					
19245 patients benefitted by the medical					
services at Rural Clinics at 11 locations.					

Health Cards to Senior Citizens

During the month, total 4417 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.

	- Mining Charles of Charles April (2001) 2015					
- CHE		Constitution and				
- George	(Caribity) mobile desires	Gerfferri Entrebun				
My.			550			
60g) -	Parand Chairm Chairman Classical		769			
_CED	· Badd-Mydrof-Gradens	- Carbalbasi-Servers				
- 600B	Annual Committee and a second	· Caracadord-Canado				
	Total		533			

Overview: "Suposhan Project"

Selected Sangini Detail					
No	Detail of Village & Sangini				
1	Total Block Villages	61			
2	Total selected sangini village cover	55			
3	Pending Villages	06			
4	Total Anganwadi in Mundra	104			
5	Total cover Anganwadi	93			
6	Pending Anganwadi	11			



"Suposhan Project"

HB Testing & Anthropometric Study Training & Meeting Agenda & discussion details.

- Introduction sessions for Sangini & project.
- Base line basic Survey & Anthropometry study experience sharing to each other.
- Guidance by CDPO & Team members (ICDS, Mundra) aware about Anthropometric study basic & important tools use in time of study.
- Training for HB Testing & Anthropometric study through growth chart & MUSC Tap. HB Testing Machine & Information sharing about Growth Monitoring through Growth Chart & Adolescent group formation for HB Testing.
- Discussed about Group formation for Mother & Adolescent girl.
- Distribution for Weight Machine, Measurement tap, MUSC Tap, IEC Material



Community Health All Project Data at Adani Hospital -Total OPD & IPD for April to October-2016

Name of Dep.	Sr.Ci	tizen	Medica	l support		itrition nild	Physio camp	Dialysis Project	Total
Month	OPD	IPD	OPD	IPD	OPD	IPD	OPD	OPD	
April	674	3	112	5	3	0	16	31	844
May	648	0	57	1	0	0	2	37	745
June	695	3	60	1	7	2	0	35	803
July	754	3	61	6	2	1	0	43	870
Aug,	782	33	172	13	0	0	0	47	1047
Sep.	810	12	149	21	0	0	0	45	1037
Oct.	866	5	126	6	0	0	10	46	1059
Total	5229	59	737	53	12	3	28	284	6405

GAIMS: Health is Wealth



OPD/IPD Data April-16 to Oct-16					
Month	OPD	IPD			
April	16221	2130			
May	15652	2223			
Jun	15420	2232			
July	16819	2396			
Aug	18494	2597			
Sep	19121	2575			
Oct	17919	2471			





Glimpse of Sustainable Livelihood Initiatives by Adani Foundation

Community Health: Mundra Overview



GAIMS: Health is Wealth

- Total 5547 Patients received Special Care and Coordination upto Oct 16 at GKGH regarding Hospital, Lab, OPD Department, Ward and Pharmacy Service.
- During six months Different 225 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 24 Schools Covered and 5692 Students has been benefited in camp.
- In this six months Total 304 dead bodies were shifted to different villages in Kutch District.

	Mobile Health care unit at Bitta						
No	Village	Population	Total Patients				
1	Bitta	1149	96				
2	Nani Dhrufi	504	126				
3	Moti Dhufi	472	48				
4	Bharapar	243	22				
5	Bavanipar	733	146				
6	Hamirpar	241	39				
7	Balapar	67	48				
8	Khanay	521	111				
	Total	3930	636				

Safe Child Project/ School Health Checkup				
No of School	Covered	No.of Student	Covered	
	24	23236	5692	

Death Body Van and Hospital Death Data							
Sr No.	Month	AF Van	Relative.	Death in GKGH			
1	April	51	21	72			
2	May	46	88	134			
3	Jun	52	51	103			
4	July	51	64	115			
5	Aug	50	65	115			
6	Sep	54	18	72			
	Total	304	321	an ⁶²⁵			

Sustainable Livelihood Programme

Agriculture Programme with KVK

- We have initiated Programme for Awareness of Farmers in collaboration of KVK. Outreach is approximate 15 farmers at 1 villages
 - Subject: Kitchen Garden Kit Awareness and Soil Health cards analysis
- Date Palm Marketing Linkages: more than 700 Kg Selling at Adani Residential Colonies, Ahmedabad and Surat.
- During six months we have given 43,797 mann fodder worth Rs.95.00 Lacs approximately.
- Organic farming Related Demonstration for "Jivamrut" at Zarpara
- Brief Introduction of Bio gas plant and give knowledge for application process. Give
 information about Tissue culture Date palm demonstration. Planning & Implementation
 of NPK fertilizer use for date palm which is received highest rate in this year. Feedback
 for Fodder Demonstration work
- Visited 30 Farmers and discussed about results of Jivamutra and Kitchen Garden Feedback & "Agri Asia" Agriculture Technology Exhibition
- Animal Hostel visit Himatnagar and Gauchar Development workshop attended by Jayram Rabari and Karsan Gadhavi







Sustainable Livelihood Programme

Women Empowerment Programmes

- * Meeting with the women group at Various Village.
 - Point Discussed:
 - ■To maintain regular Group Register
 - •To practice of Personal loan and group loan register
 - *To regular of Monthly meetings Tharay
- Saheli Mahila Gruh Udyog
 - Washing Powder 2140 kg Rs. 1.60 Lacs
 - Phynayle 500 liter Rs.0.15 Lacs
 - Non woven bags Rs. 0.35 Lacs
 - Fresh Food Rs.O.11 Lacs
- Total Sale: Rs. 2.21 Lacs
- "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 three 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).
- In September, by Joint efforts of Taluka Health Office, ICDS and Adani Foundation has organized Taluka Level Seminar on Beti Vadhavo Seminar in which Chhaya ben Gadhvi (Chairman, Jilla Education Board) remained present. We greeted 187 baby girls of Mundra Taluka.





Fisherfolk Amenities

Coordinatio

- Our intervention for Randh Bandar is started after serioes of meeting with leaders as well as
 individual fisherman. Water tank work and electrical connection work is in progress. At Juna
 bandar Pagadiya road and shelter work is in progress,
- · Zarpara Chacha individual toilet construction for 60 House hold is completed
- Exposure visit arranged at fishermen friends of Juna bandar village, Mundra to Veraval RC of ICAR-CMFRI. The presentation and lecture delivered on "Sea cage farming of finfishes and shellfishes" by Dr. Suresh Kumar Mojjada during the exposure visit was very useful to our fisher folk and meaningful.
- Safety awareness program for fisherman community was organized on 16th Sep 2016 in coordination with Indian coast guard, Air force and Fisheries department. Commandant Pradip Kumar did live demo for using different equipment like boya, ring and life jackets for safety purpose. Mr. Mukesh Saxena had given information about coastal safety and measures
- Support in preparation of SEZ Entry pass including form filling at Navinal-43 & Chacha Zarpara-68 & Zarpara village- 11 Total-122 pass
- Polyculture is our pilot project for alternative livelihood for fisherman in coordination with GUIDE.
- Training was arranged at Adani house to create awareness for the projects and steps of implementation.
- After providing training, within seven days fabrication of cage on actual site was started.
 Cage fabrication was done by fisherman of Juna Bandar under expert guidance of scientist of GUIDE. One cage is ready and floating on water.



Fisherfolk Amenities

Man-days Painting Labour									
Name of Fishermen	Year-2015-16	16-Apr	16-May	16-Jun	16-Jul	16-Aug	16-Sep	Apr to Aug Year-16-17 Total	Order Amount Rs.
Vagher Talab Osman	2969	70	0	278	115	115	200	948	3262568
Vagher Abbas Suleman	2961	240	400	268	185	70	168	1535	3417469
Vagher Mubark Iliyas	1090	150	40	160	232	145	150	987	1903536
Total	7020	460	440	706	532	330	518	2986	8583573

Mangroves plantation and maintenance : 2960 man days employment given till date









	Man-days							
Sr.	Name of Fishermen	Village	Jul	Aug	Sep	Oct	Total	Order Amount Rs
1	Mubarak Alimamad Vagher	Shekhadiya	167	167			334	100200
2	Abdul Satar Jam	Shekhadiya	167	167			334	100200
3	Ismail Hajibhai Jam	Shekhadiya	167	167			334	100200
4	Sidhik Hasan Reliya	Luni	216	216			432	129600
5	Latif Suleman Manjaliya	Luni	183	183			366	109800
6	Jakab Hasan Manjaliya	Luni	290	270	115	60	735	340000
7	Manek Jakariya Suleman	Bhadreswar	292	308			600	180000
	To	tal	1482	1478	115	60	3075	1060000
	la bene announced 40 Benedities Siebennes en ancienties Laboure							

We have supported 42 Pagadiya Fisherman as a painting Labour.

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:

- 1. Mota Bhadiya- village pond deepening
- Mota Bhadiya- cd pond deepening
- Dhrub- Pond deepening and bund strengthen
- Mundra- Paver block in road sides at Pipleshwar way.
- Mundra, Baroi, Goersama and Luni- Svachhata Abhiyan
- Mundra- Fixing of sitting chair 3 Nos in police station
- Bharadi Mata Mandir- Supply of solar light 5 Nos
- Shekhadia- Road strengthen work of Pagadiya fisherman way. Shekhadia- Murrum filling in crematorium of fisherman
- 10. Old bander- Re-painting work in toilet blocks, Balwadi
- 11. Luni bander- Soak pit cleaning work
- 12. Modhava- crematorium wall
- 13. Moti Bhujpur- Construction of road near river
- 14. Luni bander- Approach road for Pagadiya fisherman
- 15. Siracha- Shed and compound wall in Samajwadi



adani







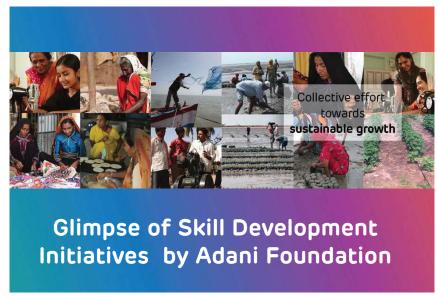
Sustainable Livelihood Programme

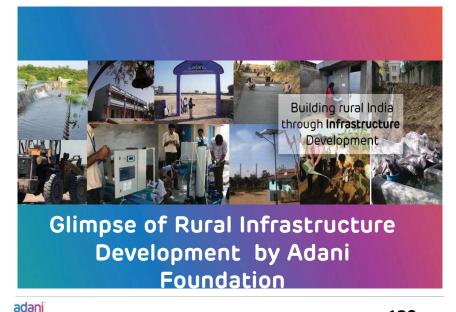
Pantion Scheme for Widows, Senior Citizen and Handicapped from Government

- · 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, 59 widows and 39 Senior citizens and 2 handicapped total 100 members got benefitted from the approval of pension certificate. The financial benefit of the senior citizen Yojana is Rs. 400 per month and the widow scheme is of Rs. 900 per month. (Total direct financial benefit: Rs. 51100)









Visitors

- Mr. Michael Stephen, Mr. David Moor & Ms. Allison
 Joyce, Journalist Team from Australia along with
 MR. Jeyakumar Janakaraj (CEO Australia Port)
 Visited Juna bandar for Adani Foundation Activity
 & Discussion with Fisher folk Group.
- Visit of Mr. Naren Karunakaran-The Economics
 Times on 28th June, 2016-visited Luni bandar and
 discussed with local fisherman about Mangrove
 plantation work at Luni site. He also visited Juna
 bandar & Discussed with Fisher folk Group for
 activities of CSR by Adani Foundation.
- Visit of Mr. Sudhakar B.- Head HR Energy Business- visited at Junabadar for Adani Foundation Activity & dissuasion with Fisher folk Group.
- Visit of auditors of OeEB Bank for review of CSR
 Activities at Juna Bandar. Presentation and
 information sharing was arranged at Adani House.





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 Nana Kapaya, Adani Ports, Zarpara and Mundra

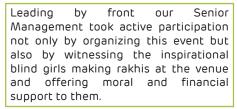
	Course wise status, 1st April 2016 to 30th September 2016							
	Soft Skill training							
Sr. No.	Course Name	Location	Male	Femal e	No.of students			
1	IT Basic Computer	ASDC Mundra	10	1	11			
2	IT Basic Computer	ASDC Mundra	6	3	9			
3	Tally Erp9.	ASDC Mundra	4	2	6			
4	IT Basic Computer	ASDC Mundra	2	2	4			
5	Vocation Training	Zarpara Gov.High School	59	36	95			
6	Basic Computer-RTG student	ASDC Mundra	16	0	16			
7	Basic Computer-RTG student	ASDC Mundra	8	0	8			
		Total - A	105	44	149			
	Techn	ical Training						
1	Mobile Repairing	ASDC Mundra	12	0	12			
2	Stitching & Bagging Machine Operator	APSEZ	7	0	7			
3	Beauty Parlour	Nana Kapaya	0	24	24			
4	Beauty Parlour	ASDC Mundra	0	21	21			
5	Checker Cum RTG Crane Operator	APSEZ	14	0	14			
6	Tailoring	ASDC Mundra	0	18	18			
7	Tailoring	ASDC Mundra	0	13	13			
		Total - B	33	76	109			
		Grand Total A + B =	138	120	258			

"Tamaso Maa Jyotirgamaya"... From Darkness Lead Us to Light



"Best Example of Hindu Muslim Unity"

Fisherman leader of Navinal Anwar bhai created best example of Hindu Muslim unity by tying Rakhi from differently abled girls from Andh Kanya Prakash Gruh, Ahmedabad. Not only that, They gave donation to institute... This shows binding of our team so deeply and socially with fisherman community...





Adani Skill Development Center: Mundra









183

Important Events

- "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
 three 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). By Joint efforts of Taluka Health Office, ICDS and Adani Foundation has
 organized Taluka Level Seminar on Beti Vadhavo Seminar in which Chhaya ben
 Gadhvi (Chairman, Jilla Education Board) remained present. We greeted 14 baby girls
 of Mundra Taluka.
- With objective of curb malnutrition amongst Children, Adolescent girls and Women in our CSR villages and to reduce malnutrition and anaemia amongst adolescent girls and pregnant & lactating women by 70% in three year which will result for reducing IMR and MMR – Adani Foundation started Project Suposhan in Eleven States where Adani group is working. With combined efforts of Adani Foundation health team, ICDS and Child malnourishment treatment centre of GoG, we have organized Suposhan Camp in which we have identified 45 malnourished children and started intervention as per their illness.

Important Events

Samanvay - A Seminar was organized to define social responsibility with the perspective of Development on September 20, 2016 at Adani House, Auditorium, Port road, Mundra, Kutch.

More than 35 Organizations namely Agakhan Rural Support Programme, Kutchh Navnirman Abhiyan. Vivekanand Research & Training Institute (VRTI), Navchetan Andhjan Mandal, Welspun Limited, Coastal Gujarat Power Limited, Ashapura group of industries, Sarv Seva Sangh, Kutch Mahila Vikas Sangathan (KMVS), Arid Community & Technology, SETU, Sahjeevan Trust, Veerayatan and Yusuf Meher Ali Centre (YMC) etc. took part in this Seminar.

The Chief Guest: Shri Apurva Oza (CEO, Agakhan Rural Support Programme) and other Distinguished guests were:

Mr. Lalji Prajapati, Navchetan Andhajan Mandal

Shri Lalbhai Rambhiya, Head CSR AARTI Group of Industries

Shri Ramesh Gor, Coordinator, Vivekanand Research & Training Institute

Smt. Raginiben Vvas (Head-CSR, Ashapura group of Industries)

Dr. Punam Gupta (Welspun Limited)

Smt. Lataben Sachdey, KMVS

Shri Pradio Ghosal (Head - CSR, CGPL)

Dr. Yogesh Jadeja, Arid Community & Technology

Shri Dharmendra Kumar, Director, YMC

Shri Jadavjibhai Shethia, from Sarva Seva Sangh

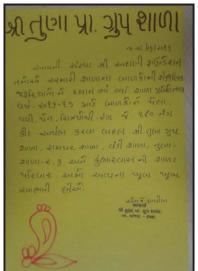
CSR Budget

Adani Foundation, CSR Budget - Mundra								
(April-2016 to September-2016)								
Sr. No.	Program	Budget 2016-17	Expenditure					
311 1101	i rogram	Dooget Loto 17	Apr.16 to Sept.16					
A.	Admin Expense	136.44	62.54					
В.	Education							
(i)	Education Initiative	49.40	12.28					
(ii)	Adani Vidya Mandir- Bhadreshwar	125.78	46.19					
(iii)	Shanti Vihar (Project Udaan)	303.26	109.53					
	Sub Total	478.44	168.00					
C.	Community Health	271.18	62.37					
D.	Sustainable Livelihood Development	240.90	117.97					
E.	Rural Infrastructure Development	408.24	105.30					
	GRAND TOTAL	1535.20	516.18					

Important Events

- We had organized Model Making Competition among Technical Students of Kutchh District
 in Aug 2014. Three Winners of the Competition constructed replica of their model at Nana
 Kapaya, Baroi and Gundala Village under guidance of Engineers Team of Adani Foundation Which
 will be used as Medical Center at Gundala and Nana Kapaya and residence for poorest of poor at
 Baroi Village. Launching of Booklet of process documentation and Certification of
 Students organized on 9th July 2016.
- Adani Foundation, Mundra organized Cricket Tournament, "Adani Premiere League" among fishermen community to promote healthy sportsmanship and harmonically transparent community relationship among fisher folk of Mundra and Anjar Taluka from 13.07.2015 to 23.07.2015. The Adani Premiere League by Adani Foundation started on 13.07.2016 at Shantivan Colony Cricket Ground. Total 44 Teams of 12 villages and 528 Fisherman participated. Teams from Villages Zarpara, Navinal, Shekhadia, Modhava, Salaya, Mundra, Tragadi, Luni, Sanghad, Gundiyali, Bhadreshwar & Vandi (Tuna) participated with great enthusiasm.
- Safety awareness program for fisherman community was organized on 16th Sep 2016 in coordination with Indian coast guard, Air force and Fisheries department. Commandant Pradip Kumar did live demo for using different equipment like boya, ring and life jackets for safety purpose. Mr. Mukesh Saxena had given information about coastal safety and measures.
- Adani Foundation Mundra has organized "Panjo Medavo" Programme on 27th Aug 2016 Saturday Evening. Total 170 local people including Sarpanch, village leaders and NGO working for welfare of community including media.
- Adani Vidya Mandir gives momentum to "Swachchh Bharat" movement at Bhadreshwar in coordination with government schools of Bhadreshwar. Total 450 Students participated in drive Several activities were carried out during the day that marked the uniqueness of this day.

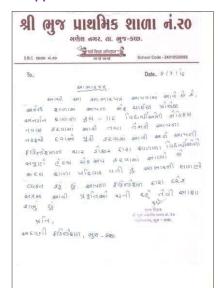
Appreciations Letters





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Appreciations Letters





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Media Coverage

KARESZ I pro-so-so n esseus op આવે રાયદાશપરમાં બાળકો માટે સર્વરોગ નિદાન કેમ્પ

ભૂજ,તા. ૪ : તાલુકાના રાયધલપર મધ્યે અદાશી કાઉન્ડેશન દારા બાળકો માટે સર્વરોગ નિદાન કેમ્પ તા. પ/ર સોમવારના યોજાશે. ગામની પ્રાથમિક શાળાના ખાળકો માટેના સર્વરોગ નિદાન કેમ્પમાં જ કે क्षनश्य डोस्पिटयना तथीयो સેવા આપશે અને જિલ્લા પંચાયતના મેડિકલ ઓક્સિર છે. પાંકે સહિતના અધિકારીઓ ઉपरांत भुष ता. पं. प्रमुख કુંકુલેન ચાવડા ઇપસ્થિત ઓંધો





લક્ષ્મીપર (તરા) ગામે ચોજાચેલા મેડિકલ કેમ્પમાં ૩૦૦ દર્દી આવ્યા

અદાશી કાઉન્ડેશન અને કે.વી.એમ.એરા. દ્વારા કરાવેલું ભાવોજન

Appreciations Letters







રામનગરીમાં મેડિકલ કેમ્પમાં 325 દર્દીએ લીધો લાભ

પર્યાવરણ દિન નિમિત્તે કરાયું ઇકોફેન્ડલી બેગનું વિતરણ

ભારકર ન્યૂઝ, ભુજ

અદાણી કાઉનેશન દારા એના.સી.ડી

ક્લિનીક ભુજ તથા એસ.ઓ.એલ. વિલ્ફન્સ વિલેજીસના સહયોગથી તથા એન.સી.ડી. ક્લિનીકમાંથી ભુજ શહેરના સમનગરી વિસ્તારમાં ડો.રાજેશ ખરેટ દ્વારા દર્દીને નિ:ગુલ્ક જનરલ મેડિકલ કેમ્પનું તપાસાયા હતા. યોગ્ય નિદાન આયોજન કર્યું હતું, કેમ્પમાં 324 અને સારવાર કરાઇ હતી, કેમ્પને

લાભાર્યીઓએ આરોગ્ય સેવાનો સફળ બનાવવા માટે SOS વિલ્ડ્ન લાભ લીધો તથા એન.સી.ડી. વિલેજીસ તરફથી મિતેષ પંચાલ ક્લિનીક દ્વારા 200 લોકોના બ્લા અંકિત ચૌહાણ, તરૂણાર્મન શર્મા પ્રેશર તથા ડાયાબિટીસનું ચેકઅપ તથા સ્થાનિક આગેવાનોનો સહયોગ કરાયું હતું. વિશ્વ પર્યારવલ મળ્યો હતો. અદાલી કાઉન્ટેશનના દિનની ઉજવણી નિમિત્તે કેમ્પના આરોગ્યના પ્રોજેક્ટ ઓફિસર લાભાર્થીઓને ઇકોકેન્ડલી લેગનું કિશોરભાઇ ચાવળ તેમજ સ્ટાક

વિતરણ કરાયું હતું. રામજુભાઇ બરારીયા, મયુરભાઇ ોલ્ડા કરાયું હતું. - સમજનાઇ નશાસના, નયુરનાઇ કેમ્પમાં ડો.એસ.એસ.ત્રિપાર્ટી, ગરવા, અંજનામેન આદિર તથા ડો.રાહુલ પટેલ, ડો.કિચ્મા એન.સી.ડી. સેલમાંથી ધર્મેન્દ્રભાઇ ડોલીયા તથા ડો,પ્રદિય મકવાણા ગઢવી જહેમત ઉઠાવી હતી,





કેમ્પમાં ૩૨૪ દર્દીએ લાભ લીધો

શહેરના રામનગરીમાં સદાશી १त. ६२ वेर.को.वेर.व तक्वीणे आवोपन इरावुं

સા કરવા છે. સત સાર વિપાડી, છે. રાહુલ પટેલ, હે દિલ્લા હેલ્લા હતા હે. ક્રદીય મકરાશા હવા સેનાસી હૈ ક્રિલિયાથી છે. રાજા મારે દાર દર્શિલને તપાસવામાં આગ હતા તેમજ ચોલ્ય નિકાન અને સારકાર સરવામાં આગા હતા.

KERSES 1

VEHICLE AS NOW - SE 95, d. 17 : dgid भारतार विभिन्न एक शिला પંચાયત સારાં ગ શાળા, આપથી હોસ્પિક-ભૂજ અને अधारुव परमेश के कुमान वंपाल प्रथमीयो ता. १५ना

ध्यांजानं साम सीयो दर्श

ોપની હતાં, જેનો ૪૦૦ મારાંગ વિભિન્નુ દીવ માગરાદિત મુખ પ્રેકાલમન રોંપની કરવતા દહીએ અ નો જો દીવ સાગાલ જિ.વે. સમુખ કોઇ ભાગને માં ધાર્યાને માંધાર્થીયાં, ભુજ તા.પં. સભુજ કુંમુન પાલા, રિ.પં. માંધામ હાય પ્રમુખ ફેલન પાયદ હાય હજા પાયેલીન રાહોડ क्षरं र विवर्धनं यू, मारपा विका उपकृत मांज्यात परवा, विका मारेजन क्षतिन

હરિકોના ૧૯૧૧ દરિયાઇ અદિવા, દુક્તા તાપ સામ

વાર વેલાન્ય કરવાલ્યા કરવાલા કરવાલા તે વારત તે વારત વારત વારત વારત કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કર વારતી કુલિ કરવાલા વારત વારત કરવા સ્ટેક્સ વારત કરવા સ્ટેક્સ કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કર મહિલાતી તા. છે. 1 ત્રાંથી વારત સામે કરવાલા તે આ પ્રવાસ સ્ટિક્સ કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કરવાલા કરવાલ લાલા હાર કાર્યું કરે. આ કાર્યું લાકો એક લાગામાં કુલ કરામાં માતા ત્રાપ્ત કરતો માતા કરતો છે. લાય દિવિષ્ટ નિયાન તથીએ. એવા હેતુ કાલ આ ક્યાં વેલાવા. સ્ત્રીરાંગ નિયાન તમીએ કરી. આપર અને સ્ત્રીરનો. કાર તલાક અને સારકારથી. ફોલાનું કિ.પ.. અલગા. હતી. ૧૮ મારકોની ત્યાર કિ.પ. અલગા. સીમતે

को बात पार प्रधान परिवर्त । विकास ने पार्ट्य कुंद्र । अस्ति कियाने तो ६८६ : परिवर्धकार प्रधान कर्या अस्ति तिकास पार्ट्यकार विकास । विकास ने परिवर्त । विकास कर्या क्षित । विकास कर्या क्षित । विकास कर्या क्षा क्ष

Media Coverage

દેશ-પરદેશની આજકાલ

એસ.ઓ. એસ.ચિલ્ડન્સ વિલેજસના સંયક્ત ઉપક્રમે વિશ્વ મહિલા દિવસ ઉજવણીના ભાગરૂપે ભુજોડી મધ્યે આરોગ્ય જાગૃતિ કાર્યક્રમનું આયોજન કરવામાં આવ્યું હતું. જેનું મુખ્ય હેતુ વર્તામાન સમયમાં નવા નવા રોગોનું પ્રમાણ ખુબ ૧ વધત, જાય છે. જેમાં લોકોન જાગતતા વધે અને પ્રિએન્ટીવ કેર બહેનો હાજર રહી હતી.

આ કાર્યક્રમમાં સ્વાઈનફલ, માહિતી આપવામાં આવી હતી. ફાઉન્ડેશનના પ્રોજેક્ટ ઓફિસર વર્ષ તે હતો. જેમાં ભુજોડી અને એઈડ્સ, કેન્સર જેવા રોગો અંગે આ ઉપરાંત કેન્સર થવાના કારણો કિશોરભાઈ ચાવડાએ પ્રાસંગીક તેમની આસપાસના સાત જેટલા. જાણકારી આપવામાં આવી હતી. કેન્સર થયા પછી રાખવાની ()દબોધન કર્યં હતું. આ કાર્યક્રમની ગામોમાંથી બહોળી સંખ્યામાં કર્યા રોગમાં શું કરવું, શું તકેદારી તકેદારી અને કેન્સરની સારવાર પૂર્વતૈયારી અંક્તિ ચૌહાણ, મિતેશ રાખવી વગેરે અંગે વિંગતવાર અંગે માહિતી અને માર્ગદર્શન પંચાલએ કરી હતી.

આપવામાં આવ્યું હતું. જેમાં ઈ.એન.ટી. સર્જન ડો. નરેન્દ્ર હિરાણી નાક, ગળ અને બહેનોમાં થતા ખાસ પ્રકારના કેન્સરો વિશે ઉપ્રથમવંક માહિતી આપી હતી. આ કાર્યક્રમમાં એસ.ઓ.

એસ.ના આસિ. ડાયરેક્ટર હિમાંશભાઈ ત્રિવેદીએ ડોકટર અને સાથી કાર્યકર્તાઓનો પરિચય અને કાર્યક્રમના હેતુ વિશે માહિતી આપી હતી. અદાશી



ભુજ તાલુકાના ભુજોડી ગામ મધ્યે આરોગ્ય જાગૃતિ કાર્યક્રમનું આયોજન

અદાણી ફાઉન્ડેશન તથા એસ.ઓ.એસ (Save our Soul) ચિલ્ડ્રનસ વિલેજીર ના સંયુક્ત ઉપક્રમે વિશ્વ મહિલા દિવસ ઉજવણીના ભાગરૂપે આયોજન

adani

Media Coverage

૨૦૦ દર્દીઓનું બ્લડ પ્રેશર તથા ડાયાબિટીશનું ચેક્અપ

મુજ,તા.૧૨ તથા ડાયાબિટીસનું ચેકઅપ કરાયું હતું. ફાઉન્ડેશન દારા આ તકે તમામ દર્દીઓને ઈકોફેડલી એન.સી.ડી. ક્લિનિક ભુજ તથા બેગનું વિતરણ કરાયું હતું. કેમ્પમાં ડો.

એસ.એસ. ત્રિપાઠી, ડો. રાહુલ પટેલ, ડો. કિચ્મા ડોલિયા, ડો. પ્રદીપ અંકિત ચૌહાણ, તરણાબેન શર્મા તથા સ્થાનિક આગેવાનોએ સહકાર આપ્યો હતો. કાઉન્ડેશનના આરોગ્ય

એસ.ઓ.એસ. ચિલ્ડુન્સ વિલેજીસના પ્રોજેક્ટ ઓફિસર કિશોર ચાવડા તેમજ સહયોગથી ભુજ શહેરના રામનગરી સ્ટાકગણ રામજી બરારિયા, મયુર વિસ્તારમાં વિનામૂલ્યે મેડિકલ કેમ્પનું ગરવા, મહેશ બાપોદરા, વનીતાર્બન આયોજન કરવામાં આવ્યું હતું. દબાસિયા, અંજનાબેન આહિર, કેમ્પમાં ૩૨૪ દર્દીઓએ આરોગ્ય એન.સી.ડી. સેલના ધર્મેન્દ્ર ગઢવી, ઉદય

સેવાનો લાભ લીધો હતો. એન.સી.ડી. ચોધરી, ગોવર્ધન ચોધરી વગેરેએ ક્લિનિક દ્વારા ૨૦૦ લોકોના બ્લડપ્રેશર જહેમત ઉઠાવી હતી.



મકવાણા, એન.સી.ડી. ક્લિનિકના . રાજેશ ખરેટે દર્દીઓને તપાસી ભજ શહેરના રામનગરી વિસ્તારમાં સારવાર આપી હતી. એસ.ઓ.એસ. નિઃશુલ્ક જનરલ મેડીકલ કેમ્પ યેલ્ડ્રન વિલેજસના મિતેષ પંચાલ,





ઓફિસર), ડો. રાહુલ પટેલ (મેડીકલ ઓફિસર, ડો. કિખા ડોલીયા (મેડીકલ ઓફિસર), ડો. પ્રદિપમકવાણા (મેડિકલ ઓફિસર)

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ભુજ | અદાણી કાઉન્ડેશન તથા ગુજરાત અદાણી ઈન્સ્ટિટયટ ઓફ મેડિકલ સાયન્સિસના સંયુક્ત ઉપક્રમે મુન્દ્રા તાલુકાના ટુંડા અને વાંઢમાં નિ:શુલ્ક આરોગ્ય ચકાસણી કેમ્પનું આયોજન કરવામાં આવ્યું હતું. 205 જેટલા દર્દીએ લાભ લીધો હતો. 6 દિવસ ચાલેલા કેમ્પમાં ડો. ડેનિશ રોજિવાડિયા, ડો. ડી.બી. દવે. ડો. દેવન જોગલ, ડો. રાજેશ ખરેટ ઉપાધ્યાય, ડો. ગરવિના ગામિત, દ્વારા દર્દીઓને તપાસવામાં આવ્યા હતો. આ કેમ્પમાં સી.બી.સી., આર.બી.એસ., એલ.એફ.ટી. જેવા લેખના ટેસ્ટ અને યુરીના ટેસ્ટ તથા ઇ.સી.જી.



Friday, July 22, 2016 हेश-परदेशनी अल्पान e e

અદાણી ફાઉન્ડેશન દ્વારા ભુજને શાળામાં ચોજાચો પરિસંવાદ

ભજ: વરસાદી વાતાવરલ કારણે મહારથી દાતા અને પાણીજન્ય રોડ . વાની સંભાવના ખુબ જ વધી જાય છે. તે અટકાવવા માટે કેવા પ્રકારની કાયછ રાખવી તેમજ રોછાંદા જીવનમાં અંગત સ્વચ્છતા અંગેની માહિત પંચાના તેતુસર અદાલી કાર્દાન્ટેપ્રાન દ્વારા ભૂજ મધ્યે માનુકાયા કન્ય રવાલય - ભૂજ ખાતે આરોગ્ય જાગૃતિ અંતર્ગત ' અંગા સ્વચ્છેતા પરિચલ અને પરિસવાદન' નું આવેજબ કરવામાં આવ્યું હતું. આ ઉપરાંત તાજેતરમાં ભુજ તાલુકાના અનેક ગામોમાં કમળાના દઈઓની બહોળી સંખ્યા જેવા . કપે છે, આપી કમળો ન ઘાયતેના માટે શું કાળછ રાખવી તેમની માહિત . છેન્ટેલન દ્વારા આપવામાં આવી હતી. આ કાર્યક્રમમાં લાળાના મિન્સિયાલ . નેલાલેન પ્રામી, ગેઈમાં છા.કે. જનરલ હોસ્પિટલના મેડીકલ ઓફીસ .એક.એક. રિપાર્કી, અંદાવી કાઉન્ડેશનના પ્રોપેક્ટ ઓફિસર દિયોર ભાઈ ચાવલ તેમજ સ્ટાફ મયુરભાઈ વરવા, રામજભાઈ બસરીયા અને શાળાન શિષકગહે હાજરી આપી હતી. આ કાર્યક્રમમાં કુલ ૧૨૯ વિદાર્થીઓ ગત સ્વચ્છતા અને આરોગ્ય લક્ષી માર્ગદર્શન મેળવ્યું હતું. આ કાર્યક્રમનું ચાલન શાળાના શિલા પ્રભેશ પંડપાએ કર્ય હતું.

Thursday, 349-28, 2019



ince self inself

કેમ્પ ચોજાયો : ૨૩૦ની તપાસ ગુજ, લા. ૨૭ : મહીવી મહીતી માપી મહીવમાં પ્રય રાકદાદેશ શરૂમાં મળામાં સંભાગ સભાવો માત્રહે. માત્ર્યા હતા મળે તેમને તમા મતાં રહેલ દર્વનાં લાવદેવી. આપી હતી. દવાની વેલે. પ્રકારની દવા મને પડ્ડી વામાં લું તો જયાર માં મહોગ સમારી કરે દેશ માલ અને **અદારી ફાઉન્ડેશનનું** મેલવામાં કાઉન્ટેશન

મુક્ષની મહાલી કાર્ડ-રેસન **આસોપન : સ્થળ પર** પત્રમભગાડ લેટલીમા, છે. સીલા કેકેપન સહોતારી เป็น ก็รุ่ง อาร์สป์ भने तेनन के अर्थने के हार हवा महत्व पूरी पडाश के क्वीत महत्वार्थी भने के steel as any other acres anni ana ani an Aframandia di An da dil Mi

મામ લાક લીકા મના નામાં મામાને સાથ પર જ તમામ સમાવાદ પર હવેલા મને પણ દરામાં માળું હતું. જેમાં ૨૩૦ દરામી કાઈનોકન હસકરી વરવામાં ક્યુરી યોધિકાઇકન્દર સર્વને લાક માર હતી. પાલમાં મધ્યામાં મારી હતી, ત્રીકે કેલ મધી હતી. કાલમાં માં પ્રત્યે શાળાના મારાવે. તથા થઇને તપાસની તથા દોત્ર. સિંદલે ભારતીયના લાતિયેન માં કાર્યા પ્રાપ્ય અરલ સ્ત્રિકાશ માં અને સ્ત્રીમાં કો અને અંખના કોરાવા, તેલા કે તેલાવાના, સુરત કોરાવાન, હું કે એક્સક કારણભારાએ અના જાતિવાલાથા ૩૪ જૂલ્લન, કેન્યાયન, ઉપાયીભ સ્ત્રાની સેલાધેન કાફિએની (યોડીસ) કિલાલીઓની કરીએ ભારત સંભાવેની

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पुर क क | क्षेत्रकारों को बीज तक | प्रतिकार करोते सुकते public water steel the same beliefund was det up were સમૃત્યું, માં મોર્ગ મુખ્ય છે. કાર માંખ દાર માં પ્રાથમિક પ્રાથમાં તુવાની જ્યાર્થિક અને પ્રાથમિક પ્રામિક પ્રાથમિક પ્રામિક પ્રાથમિક
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સુથરી ગામે નિઃશુલ્ક મેડીકલ કેમ્પમાં ૨૦૨ દર્દીઓએ લાબ લીધો

અદાણી ફાઉન્ડેશન તથા ગુજારત અદાણી ઈન્સ્ટિ. ઓફ મેડીકલ સાયન્સીસ દારા યોજાયો કેમ્પ

તથા ગુજરાત અદાવી ઈનિસ્ટયુટ ઑફ મેડીકલ સાયન્લીસ દારા વાન ૧૯૧૬ કાલ્પવાન તેને પ્રાથમ (૧૯૧૬ કાલ્પવાન તેને વિદ્યાર્થ (૧૯૧૬ વર્ષ) ના ગીતીને, છે. દાનુ પહેલ પ્રયાન તેમ અન્ય આવેલ ત્રામાર્થ ભાગતા ત્રામાં (૧૯૧૯ નો લીક્સ), છે. ત્રામાન લેક્સ માને લેક્સ ત્રામાર્થ ભાગતા ત્રામાં (૧૯૧૯ નો લીક્સ), છે. ત્રામાન લેક્સ પ્રયોગ કાર્યો સ્થાન ત્રામાર્થ ભાગતા લેક્સ ત્રામાં ભાગતા (૧૯૧૯), ત્રામાં આદિસ્થાર્થ (૧૯૧૯), ત્રામાં ભાગતા ત્રામાં આદિસ્થાર્થ (૧૯૧૯), ત્રામાં ત્રામાં (૧૯૧૯), ત્રામાં (૧૯૯), ત્રામાં (૧૯૯), ત્રામાં (૧૯૯), ત્રામાં (૧૯૯), ત્રામાં (૧૯૯), ત્રામાં

હતું. આ કેમ્પમાં ૨૦૨ લ્ડીઓએ. આંગ્રોસ્ટ્રીસ્ટ) તથા એન સી. ઉ. કિશોરબાઈ ચાલા તેમજ સ્ટાર લાભ લીપો હતો. આ પૈયરોત : શિલીકસોથી તો. રાજેલ બરેટ મહેશબાઈ બાયોદસ,વનીતામેન એન સી.ડી. કલિબીક શસ્ટ ૮૦ (ચેલીકલ ઓફીસ્ટ) ફારાદર્દીઓને : દબાસીયા તથા એન સી.ડી. લોકોના જ્લા: પેશર તથા ત્રાપાસવામાં આવ્યા હતા તેવજ સેલમાંથી વિપુલનાઈ દેવમોરડી, ગ્રાથભીટીસનું ચેકઅપ કરવામાં યોગ્ય નિદાન અને સારવાર ગોળવેનભાઈ ચોપરીએ જહેમન આવ્યું હતું.આ કેમ્પમાં દો. કરવામાં આવી હતી.આ કેમ્પને ઉદ્યવી હતી.

અબડાસાના સુથરીમાં વિનામૂલ્યે નિદાન તથા સારવાર કેમ્પ યોજાયો ૨૦૦ દર્દીઓએ આરોગ્ય કેમ્પનો લાભ લીધો

જુજ, નદરજ અદાવા કાઉન્ડેશનના આરાગ્ય પ્રાજક્ટ અદાવા કાઉન્ડેશન તથા ગુજરાત ઓફિસર કિશાર ચાવદા, સ્ટાકના આદાવા ઈન્સ્ટિટ્યુટ ઓક મેડિકલ પ્રહેશ બાપોદરા વનિક્રાબેન દબાસિયા. હાઈસ્કૂલના ભૂતપૂર્વ વિદ્યાર્થી મંડળના સહયોગથી અબદાસા તાલુકાના સુવરી ગામે વિનામુલ્લે આરોગ્ય કેમ્પન્

નાયોજન કરવામાં આવ્યું કેમ્પનો સુઘરી તેમજ બાસપાસના ગામડાઓના ૨૦૦ દર્દીઓએ લાગ લીધો

હતાં. ઉપરાંત એન.સી.ડી. ક્લિનિક એન.સી.ડી. સેલના વિપૃત્ર દેવમુરારિ. દારા ૮૭ લોકોના ધ્લા પ્રેશર તથા ગોલધન સોધરી ઉપસ્થિત રહ્યા હત ડાયાબિટીસનું ચેકઅપ કરવામાં આવ્યું કેમ્પમાં ઉપસ્થિત મહેમાનોએ વિદ્યાર્થી હતું. કેમ્પમાં કો. એસ.કે. ત્રિપાઠી, કો. મંડળ કારા કરવામાં આવતી પ્રવૃત્તિને રાહુલ પટેલ. દો. નિયંત્રાબેન ભાદરક્ષ, બિસ્ટલી હતી. સુરેશ કુબાવત, સ્થાનિક હાર્દિક મહેતા, એન.સી.ડી. ક્લિનિકના દો. રાજેશ ખરેટે દર્દીઓની તપાસથી ભૂતપૂર્વ વિદ્યાર્થી મંત્ર્યે આયોજનો કરી સારવાર આપી હતી. આ તકે સફળ બનાવવા જહેમત ઉઠાવી હતી.

સુથરી ગામે નિ:શલ્ક મેડિકલ કેમ્પમાં 202 દર્દી

ચકાસાયા

ભારકર ન્યૂઝ. ભુજ અદાશી ફાઉન્ડેશન તથા ગુજરાત અદાણી ઇન્સ્ટિટ્યુટ ઓફ મેડિકલ સાયન્સીસ દ્વારા સુથરી હાઇસ્કૂલના ભૂતપૂર્વ વિદ્યાર્થી વિકાસ મંડળના સહયોગથી અબડાસા તાલુકાના સુથરી ગામે નિઃશુલ્ક મેડિકલ હેલ્થ કેમ્પને આયોજને કરવામાં આવ્યં હતં. જેમાં 202 દર્દીની ચકાસણી થઇ હતી. 87 લોકોના બ્લડપ્રેસર તથા ડાયાબિટીસનું ચેક-અપ કરાયું હતું. આ કેમ્પમાં ડો. એસ.એસ. ત્રિપાઠી, ડો. રાહુલ પટેલ, ડો. નિયંતાબેન ભાદરકાં, હાર્દિકભાઇ મહેતા તથા એન.સી.ડી. ક્લિનિકમાંથી ડો. રાજેશ ખરેટ દ્વારા દર્દીઓને તપાસવામાં આવ્યા હતા.

ટુંડા અને વાંઢમાં છ દિવસીય નિઃશુલ્ક મેડિકલ કેમ્પ યોજાયો

અદાણી ફાઉન્ડેશન તથા ગુજરાત અદાણી ઈન્સ્ટિટ્યૂટ ઓફ મેડિકલ સાયન્સિસના સંયુક્ત ઉપક્રમે મુન્દ્રા તાલુકાના ટુંડા અને વાંઢમાં પ્રાથમિક શાળા ખાતે છ દિવસીય વિનામૃલ્યે મેડિકલ ચેકઅપ કેમ્પનું આયોજન કરાયું હતું. જેનો ૨૦૫ દર્દીઓએ લાભ લીધો હતો. કેમ્પમાં તબીબો ડેનિશ રોજીવાડિયા, ડી.બી. દવે, દેવેન જોગલ, રાજેશ ખરેટ, દેવેન ગોસ્વામી, કૃતિકા ઉપાધ્યાય, ગરવિના ગામિત દ્વારા દર્દીઓની તપાસણી તથા સારવાર કરાઈ હતી. કેમ્પમાં સી.બી.સી., આર.બી.એસ., એલ.એફ.ટી. જેવા લેબના ટેસ્ટ અને યુરીનના ટેસ્ટ તથા ઈ.સી.જી. કરાયા હતા, જેમાં ઉત્સવ દવે, ચંદ્રિકાબેન પંચાલ, સુરેન્દ્ર બીલુનિયાએ સેવા આપી હતી. અદાણી ફાઉન્ડેશનના આરોગ્ય પ્રોજેક્ટ ઓફિસર કિશોર ચાવડા, મનહર ચાવડા તેમજ સ્ટાફગણ અંકિત પટેલ, યુવરાજસિંહ જારેજા મહેશ બાપોદરા વનિતાબેન દબાસિયા, અંજનાબેન આહિર તથા લાખાભાઈ રબારી વગેરે જહેમત ઉઠાવી હતી.

adani

Media Coverage



ભુજની શાળાઓમાં અદાવી કાઉન્ડેશન દ્વારા યોજાયેલા આરોગ્ય

ભુજની છ શાળાના ૧૩૧૧ છાત્રની આરોગ્ય તપાસણી કેમ્પોમાં કરાઇ

वारीनांशन दांश से व सार्शन પ્રોજે કટ અંતર્ગત આ મહિના કાઉન્ડેશન તરફથી કરવામાં દરમિયાન ભુજ શહેરની અલગ આવી હતી. આ ક્રમ્પો દરમ્યાન અલગ ૬ સરકારીશાળાઓ.

પ્રા. શાળા. દાવલવાડી રીલાકેશન **ફાઉન્ડેશન દ્વારા આચોજન** વાંચાઇ. ਲੇਤ ચાઇલ્ડ ਰળે અદાણી

પા.શાળા સંજોગનગર પા.શાળા अने पाटवारी प्रा. शाणाओं मां આરોગ્ય તપાસલી કાર્યક્રમો યોજાયા હતા. આ કેમ્પોનો મુખ્ય હેતુ બાળકોમાં તંદુરસ્તી જળવાઈ રહેં અને ખાસું કોઈ મોટી બિમારીના ભોગન બને તે હતો. આ કેમ્પો દરમિયાન વધુ સારવાર અને નિદાનની જરૂરીયાત હોય तेवा विधाधीओने गेएमा, छ. डे. ४न२७ सोस्पिटलमां रीटर

સંપર્ભ સારવાર અદાવી કુલ ૧૩૧૧ વિદ્યાર્થીઓ એ

પ્રાંશાળા, વાણીયાવાડ પ્રાશાળા,ભીડ ગેટ આંખ, દાંત અને પ્રાથમિક

આરોગ્યની તપાસ કરવામાં આવી હતી. પ્રાથમિક तड्वीक्वाणा ४३रीयातमह બાળકોને સ્કૂલમાં જ દવાઓ આપવામાં આવી હતી.

અદાવી કાઉન્ડેશનન આરોગ્યના પ્રોજેક્ટ ઓફિસર કિશોરભાઈ ચાવડા,તેમજ સ્ટાક મયુરભાઈ ગરવા, મહેશ બાપોદરા, વનિતા દબાસીયા, અંજના આહીર જહેમત ઉઠાવી હતી.



લુણીના માછીમાર બાળકોને સ્કોલરશીપ વિ અંદાણી ફાઉન્ડશેન દ્વારા દ્યો. લ્થી ૧૨ના ૩૩ વિદ્યાર્થીઓને શિષ્યવૃત્તિના ચેક અપાયા

તાલકના હશી લ પ્રેમ જ તાલ siver anapair अ्थनः सम्बद्धिः शत्रामां । ોકેજ કશાએ અભાર

લ્ટીયન મજનાનાંગ પ્રથ હેશે. આ રાર્થકમમાં ભાવકોન વકીએ તઘ મકીમાં અગેવન સેલમાં ભારત રાષ્ટ્ર વાલા કરો વંજારીમાં, માદમભાઈ વંજારીય તથ અન્ય આવેલનો વર્ષો હાજ

વર અગગ અભાર મટે પ

nefs, hecs, sechine loose

ત્રમાર મહિલસીપિકારલ કુઠ કરિલાઈએ નિવાઈએએ. અની હતી. આ સેવાસીખી માદીપાર સુદારના પાયકોન્સ. ૧ મીર મોલીયાએલા વૃહ્યુંક, ઉદ્દાં હતા. માં દર્પોમને પ્રત્ય તાંધમાં આવેલ કરવામાં આવું વાનિ છુલાદી માટેલેલાય પંદર રામનો વેકાશદિભુતના આપતો જાણદીનામાં ચારાને શીલાપોર્ટને આ લગામીય ઘડી માણીમાર બનાવવા. માટે. ચંદાશી હાર વસ્ત્રીના ક્ષેત્રભાવી છે. અદલી કાન્દ્રિમ, મુજના ૧૫ વિરદાના જણાવ્યું હતું કે, ક્ષે અમુદાભા લાગ દેખ અન્યાસ કાન્દ્રિમાના વિષય મોતાઈ, આ કર્યામાં કચાકેલવાએ પ્રથમ વર્ષ તથા બીજા વર્ષમાં ચોકાબાઈ સારાંના હતા છેક પ્રથમિક દ્વારા અનિક માટે કોટાઈ રહ્યા છે. આ અગાં ઉપર ૧૫માર, રેઇ ગોધલ તો

શ્રીલાહવામાં માટે ક્યારોને અભ્યાલ પ્રતાર વિદ્યાર્થિનો આવવામાં અને. સમુદ્રભાવભાગીક્ષણમાં આવ્ય આદિય પરિવિધિને પ્રતારે સમય સ્ટક્ર્ક તેમથ ૧૦૦ ટક્ક લાયુક્તને ૧૦ ટક્ક એક્સાલિક સમર એક્સોમાંને આ પ્રતારે એક એમ એ. વર્ષી રહ્યા કે આવ્યક સરીક સાળ કહ્યા. આ એક વુધનાલી અમેટે કરવામાં આવ્યું કુલ રામ મે લાગ છવાન હવાર સાહિસુલના આવારે અને પ્રમાણે તારે તેમણે મારે વેચા મારે મા શું. જે અંતર્યત પો. હવી ધરતાં, પોલકોની કોલદેશીય અપવામાં માથકિયા અદદાશિક છે છતા હવા માના મળતા વિજયી ગુલામ શાને અને આપર માન્યો હતો. ઉઠેલી હતી.

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લીગમાં સલાયાની બિસ્મિલ્લાહ ટીમ વિજેતા

કાઉન્દ્રેશન દારા મુંદરા તાલુકાનાં નાના કથાયાના શાંતિવન ક્રિકેટ **ળાળા કપાચામાં અદાણી** ગ્રાઉન્ડ ખાતે અદાળી પ્રીમિયર લીગ ક્રિકેટ ટ્રનમિન્ટનું આયોજન ફાઉ.**ા આચોજનમાં** વજેતા ટીમને ઉપસ્થિત સ્ક્રિક ટ્રનમિન્ટનું આયોજન

અને નવીનાળને ૯૮ રન સુધી ખેલાઊઓને અભિનંદન પાઠવ્યા સિવિ સીમિત રાખી હતી. હારુન હતા. અદાગી કાઉન્ડેશનના હતો.

મુંદરા, તા. ૨૮ : માછીમાર અલીમામદ સમેજા મેન ઓકધ આ ગોવાનો, અદાગી, પબ્લિક સમુદાય રમતબમતમાં આગળા મેચ, શાનદાર પ્રદર્શન બદલ સ્કૂલના પ્રાધાનાચાર્ય અનોય વર્ષ તેવા હેતુસર અદાગી હનીક ઈશાક ભુસરમેન ઓક્ષ્ય શુકલા, જૂનસેવા સંસ્થા,

લીધ કિંદ ટ્રન્નિન્દનું આયોજન કરાવ તેનું જે છે. તેનું અને કરાવ તેનું જ કર્યા તેનું અને કરાવ તેનું જ કર્યા તેનું અને કરાવ તેનું તેનું તેનું તેનું અને કરાવ તેનું
ક્યાના કરામ છતા ભુત્રસના હવાના શાખ આપા હતા. અંગ્રંગ્યનપા કરવા અન્યસ્થ્ય અપોવાનીમાં વિસ્તિકારા ખૂતરાના મામલતાકા કરિયા હતું. અંગ્રંગ્યના વિસ્તિકારા પૂર્વના મામલતાકા કરિયા હતું. સાઈક આંધા નવી મામલે હતું. સાઈમાર આપોવાનો વર્તી યોધા લાગ્ર સમય કીમે પ્રદેશના વિસ્તિક સ્થાં પ્રવાસ સમય કીમે પ્રદેશના વાર્ય સ્થાં સમય કામ કામલે મામલે મામલે કામ કામલે કામ સિવિલ વિભાગે સહયોગ આપ્યો

વાઈસ પ્રેસિડેન્ટ મુકેશ સકલેનાએ

વગેરે ઉપસ્થિત રહ્યા હતા. વિજેતા ટીમને ઉપસ્થિત

દેશ-પરદેશની આપ્રકાલ

Sunday, July 31, 2016

અદાણી ફાઉન્ટેશન દ્વારા રોફ ચાઇલ્ડ પ્રોજેક્ટ અંતર્ગત વધુ સારવારની જરૂરીયાતવાળા બાળ દરીઓને જી.કે.માં રીફર કરાયા www.dowed.comprise.com

લેક સાર્વાદ કોર્યાંટ પોતાન પર હતી. આ કેમો દરમિયાન કર પીના દર્શિયા જુદ શહેરી 13/1 વિપાર્ટિનેને લખકોપ લગ વાર લાકો કાળવા, જેવા કુલોલ, ઉલાં, જ મેર્પ સ્ટ્રેક્સ્પ પ્ર. શવ, તરા અંત, ડાંડ અને પ્રાથમિ રવાની વિદેશન પ્રાપ્ય માંગની લાકા લખે અને પશ્ચિમ કરા, માં, માં તે, તો, તો, તો, કર્યો ના કોંગ્યો a an arana an mhaismirani એ પ્રદેશી પ્ર. શામાં કે પામે સમામાં લઈ છી. માંત્ર તાલી લોકોનું માં તેમ લીક આંભારત્માનું હું જ કો. ભાર હોર્દિક

volication

સુરતી જેવાઈ કરે અને પાક કો મોલિયાં લાયેલમાં રમાં મીલ ત્યા કરવું છ માં આવે માં દર્શન સુ કારવા અને નિશનન reference laube ર્વામાં કાર્યા કરવા કરવા છે. રેકા પ્રવર્ષ માત્રા છત. ત

रेभी रेपूर्व सरधर बात

ALREADY WAS DE करत तेश विश्व पत વેજુત્તાનો મહારાષ્ટ્રો HE PHY ACT HOUR માં મહિલ ક્ષિરમાં बार तेशा राज शहरवाई લા, મોદ પરાંત, એક જારીય, મજન મહિલાં અ



લેકેટનો ડેમાં કરી સમલવ આપી. ભાઇઓને દરિયાઇ માર્ગ તેમલ ચાલીયાર આગેવાનો તેમલ અદાવી.

હતી અને લાઇક જેકેટને કાવગ દિનારા પર કોઇ કોકાસ્પદ વ્યક્તિ કાઇનેકાનના સમ્પો હાજ રહ્યા હતા

દરિયામાં જતી વખતે સાથે રાખવા કે વસ્તુ નજરે પો., તો તે અંગે તેમજ કાર્યક્રમને સફળ બનાવવા

ભલાવલ કરી હતી, જેથી ઇમર્જની મંત્રીયત વિભાગને જાલ કરવાની સૌએ પૂરતો સહયોગ આપ્યો હતો.

મુન્દ્રામાં માછીમારો દરિયાઈ સુરક્ષા અંગે માહિતગાર થયા

જૂના બંદર ખાતે માછીમારો માટે માર્ગદર્શક કાર્યક્રમ યોજાયો

મુન્દ્રા,તા.૧૮ વગેરે સાથે રાખવા જણાવ્યું હતું. મુકેશ મન્દ્રામાં જના બંદર પર માછીમાર સક્સેનાએ માછીમાર ભાઈઓને વસાહતના ટ્રેનિંગ સેન્ટર ખાતે એરકોર્સ દરિયાઈ માર્ગે કે કિનારા પર કોઈ (નલિયા) અને કોસ્ટગાર્ડ તેમજ મત્સ્યોદ્યોગ વિભાગ તથા અદાણી કાઉન્ડેશનના સહયોગથી માછીમાર ભાઈઓ માટે દરિયાઈ સુરક્ષા અંગે 📲 માર્ગદર્શન કાર્યક્રમ યોજાયો હતો.

એરફોર્સના વીંગ કમાન્ડન્ટ ડી.એસ. ગીલે એરફોર્સના વિવિધ હવાઈ સંસાધનોની કામગીરી અંગે માહિતી કે લાઈસન્સ. રજિસ્ટેશનની નકલ સભ્યો ઉપસ્થિત રહ્યા હતા.

આપી હતી. ઉપરાંત માછીમારોને હવાઈ શંકાસ્પદ વ્યક્તિ કે વસ્તુ નજરે પડે તો તે ખતરાથી અવગત કરાવી તે અંગે જે.તે અંગે સંબંધિત વિભાગને જાણ કરવાશીખ સરક્ષા વિભાગને જાણ કરવા અપીલ આપી હતી. એરકોર્સના નીરજકમાર. કરી હતી. કોસ્ટગાર્ડના પ્રદીપકુમારે કોસ્ટગાર્ડના આલોકકુમાર તથા ચેતન માછીમારોને રીંગ બોયા અને લાઈક પ્રકાશ, મત્સ્યોદ્યોગ વિભાગના કાનજી જેકેટનો ડેમો કરી જરૂરી આધારો જેવા મહેશ્વરી અને અદાણી ફાઉન્ડેશનના

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Media Coverage







પ્રતિભાઓને પ્રોત્સાહીત કરવા મુન્દ્રા તેમજ આજબાજની ૪નતા પણ બહોળી સંખ્યામાં જોડાય તેવી સંસ્થાની લાગણી છે

મુન્દ્રાઃ દ્રષ્ટિહિન વ્યક્તિના જીવનના કેળવણી દ્વારા જ્ઞાન અને આશાના અજવાળા પાથરી અને તેઓ ક્ષમાર્જેના એક જવાબદાર નાગરીક તરીકે કામ કરી શકે તે હેતુથી મેમનગર, અમદાવાદ સ્થિત અંધ કન્યા પ્રકાશગૃહ ટ્રસ્ટ છેલ્લા ૬૦ વર્ષથી કાર્યરત છે. વર્તમાન સમયમાં લગભગ ૨૦૦ જેટલી દ્રષ્ટિહીન બાળાઓને વિવિધ જીવન ઉપયોગી તાલીમ આપવામાં આવે છે. આ તાલીમમાંથી શીખી અને તેમાંથી પ્રેરાઈ તેઓ અકલ્પનીય બનાવટો બનાવે છે.આ વર્ષે રક્ષાબંધનના અવસરે આ સંસ્થા દ્વારા સુંદર અને ક્લાત્મક રાખડીઓ બનાવવામાં આવી છે. આ કલાને પ્રોત્સાહીત કરવા અને પ્રતિભાઓની કંદર કરવા અદાણી ફાઉન્ડેશને આ સંસ્થાને મુન્દ્રામાં આમંત્રિત કરી અને અદાણીના કર્મચારીઓ, પરિવારજનો તેમજ મુન્દ્રા તથા આજબાજની જનતાને લાભ મળે તે માટે કંપની તેમજ કોલોનીમાં પ્રદર્શનનું આયોજન કર્યું છે. જેમ આ બાળાઓ પ્રત્યક્ષ રાખડીઓ બનાવે છે અને ઈચ્છક વ્યક્તિ તે રાખડી નજીવા ભાવે ખરીદી શકે છે.

તા. ૧૨ ઓગષ્ટના રોજ અદાશી શાંતિવન કોલોની ખાતે બપોરે 3 થી દ વાગ્યા સધી આ પ્રદર્શનનં આયોજન કરેલ છે જેમાં કર્મચારી, પરિવારજનો ઉપરાંત મુન્દ્રા તેમજ આજુબાજુની જનતા પણ બહોર્ળી સંખ્યામાં જોડાય તેવી સંસ્થાની લાગણી છે.

Media Coverage

મુસ્લિમ હાઈસ્કૂલમાં આરોગ્ય જાગૃતિ કાર્યક્રમ યોજાયું



ભજના સહયોગથી ભજની ધી મોબીલાઈઝર કે.એચ.ડાભી મેડિકલ ઓફિસ૨ હતું.

અદાણી કાઉન્ડેશન, જનરલ હોસ્પિટલ, ગરવા જી.કે.જનરલ હોસ્પિટલ મયુર, મેમણ આરીક કોમ્યુનીટી મસ્લિમ એજપકેશન એન્ડ કાઉન્ડેશનને આવકાર્યા હતા. વેલકેર સોસાયટી સંચાલિત અદાણી કાઉન્ડેશનની ટીમ ઉચ્ચત્તર માધ્યમિક શાળામાં ' દ્વારા 'આરોગ્ય જાગૃતિ' માટે કઈ આરોગ્ય જાગૃતિ' કાર્યક્રમ તકેદારી લેવી જોઈએ એ અંગે યોજાયું હતું. કાર્યક્રમની PPT દ્વારા નિદર્શન કર્યું હતું. શરૂઆતમાં શાળાના આચાર્ય કાર્યક્રમનું સંચાલન શાળાના જસબખાન આઈ. ટાંકે ડો. મ.શિ. સરકી મસ્તકાએ કર્ય

અદાણી દ્વારા ભુજની શાળાઓમાં આરોગ્ય કેમ્પ



અદાણી કાઉન્ડેશન તથા ગેઈમ્સ દ્વારા સેક ચાઈલ્ડ પ્રોજેક્ટ અંતર્ગત ભુજ શહેરની અલગ અલગ સરકારી શાળાઓ ભીમરાવ નગર શાળા, હાચીસ્થાન પ્રા. શાળા, હાથીસ્થાન કન્યા પ્રા. શાળા, શિવનગર પ્રા. શાળા, જદરા પા. શાળા, આઝાદ નગર શાળાઓમાં તપાસણી કાર્યક્રમનું આયોજન લીધો જેમાં બ્લડ ગ્રૂપ ટેસ્ટ, કરવામાં આવ્યું હતું.

આ કેમ્પનો મુખ્ય હેત બાળકોમાં તંદરસ્તી જળ વાઈ રહે અને ખાસ કોઈ મોટી બિમારીના ભોગન બને તેમની તપાસણી કરવામાં આવી હતી. આ ઉપરાંત આ કેમ્પો દરમ્યાન

વધ સારવાર અને નિદાનની જરૂરીયાત લાગી વિદ્યાર્થીઓને અદ્યાણી જી.કે.જનરલ હોસ્પિટલમાં રીકર કરવામાં આવ્યા હતા. હોસ્પિટલમાં બાળકોની સંપર્ણ સારવાર અદાણી કાઉન્ડેશન તરકથી કરવામાં આવી છે.

આ કેમ્પો દરમ્યાન કુલ ૧૩૧૦ વિદ્યાર્થીઓએ લાભ ઊંચાઈ, વજન તથા આંખ, દાંત અને પ્રાથમિક આરોગ્યની તપાસ કરવામાં આવી હતી તથા પ્રાથમિક તકલીકવાળા જરૂરીયાનમંદ બાળકોને સ્કુલમાં જ દવાઓ આપવામાં આવી હતી.

Media Coverage



ના વિક્રોલ મામ્યાદાન મા કહેવા દાવિષ્ય (લાપોરાદી) વર્લીયાર્ટ ફોટના પ્રસાનની તેમ કોને તેમી કાર્યલ માર્ચ લાકેન્ટરમાં આપ્રોનાની પાંચી બાલી કોનેના કોન્ટરના કરે હોય છે. non ign alle U gine flame flame adell'and all i unes alle mas di villy audichien as que una, que gine madighables મહત્વકારના માત્ર કરે પાંત કરિકામ વર્ષા માત્રે કરેલા મહત્વના કેંગાકેટ કરવા પણ છે. દુકિકરી વર્ષ સાંચાનમાં માત્ર મહિલાઓમાં કેલા કેંગા કેંગા માત્ર કરી છે. મહિલામાં કેંગા કુલ ફેંગા કુક કરા કે કારા કેલામાં મુખ્ય મેં માત્ર વો મા માં આનેલીક લાંભુ શામાર : કેલાકોન ઉ.દી.), જાન પોત સાંદર ક્લિકોમાં લેલા દાંદરારા ભળીત તેવા માં આંબાનો મન્દીત લોકોના ફારત સન્તાનું અંદમોનાવામાં પ્રાથ મધીમ કરવાં મળુંલા કરીનોએકો તી પોતાન કોનામાં છાં, પેસ્ટાઈસ્ટાઈનેન પોતા મોડિય પરાયાના વર્ષા બીના 🔻 મને કર્યાં છે. તેમ પેસાઇને તી

Thursday, October 06, 2016 विविध संस्थाओं साथे डराष्ट्र गोविं नवनी મેળું હતું દુ. માંગલ જેવા હેલા હતા. લાગલન ભેગલન માળવ લાગ લાગ લાગ પ્રચાન થયો લાગ — ભરિષ્યમાં મેળિયા પાંચલન ત્યાર્થ મુખ્યત્વ ભિને દુ. છા. લાગ્યલનાં પ્રથમિત ન વચ્ચાર્યનું હતું. માગશ હતી સાહેદા કરાય ત્યાર્થ મુખ્યત્વે અને સ્તરિકા માં કાર્યોલ માર્કોની આપી કે કિલના વચ્ચાર્યાલા માર્કીનો સાહિત કરી

'બેટી વધાવો' વિષય પર સેમીનારનું આયોજન



તાલુકા તેલ્લ હતી. ઇ પ ર ા ન અદાસી કાઇન્ટેશનના પાતાને રૂા. ૫૦૦૦/ ના ઓકીસ-પુદરા, અદારાધિ આ કાર્યક્રમમાં જિલ્લા તીરાઇદીનખાનસાહે એ પક્તિએને દીકરીને વધાવો પંચવર્યીય એન્ય આપવામાં ત્રારા કુટર, આતાર કે અને પાયલ કિલ્લ લીકીના અહવિંદન પારના હતા. અને પાયો રુલા મુધ્યે આવ્યા હતા વર્ષ ૧૪ અ.ઈ.લી રોલના લડ્ડાન વેરોનલીકાયમેન સાલીને તાલુક હેલા સોકિસર હતે અને દેવામેન નામીએ મીટીમોને માણી લઇનોલન ઇપ્પોનુદા મ્યેનદીન ૩૦ કાર્યમને વિરાદલ જાલાનું હો,માલકાહેનેદીકી વચાર્ય પુદાર તાલુકામાં મદાશી. તરાથી હેલ કંદ અપમામ સપ્ટેમ્બર ૨૦૧૮ના રોજ ભેરી હતું કે દિકરીને અભાગ ન સંગીનારનું પ્રેક્ષ્ટરાન કરી ફાઇલેશન દ્વારા ચાલતા ભેરી આવી હતી. આ કાર્યક્રમમાં હેલ્પમાં દારા જેના સાથે કહ્યું કે કિરાન અગળ ન વેશાનાનું પ્રજનાન કરી. સારા મહતા ધાલા લક્ષ્ય થયાં નહીં આ કાર્યમા ત્યાં અને માને દર વર્ષના કિરી અભા છે, ક્યુંક હતા અંત્રાવા અનું કે વધાનો કાર્યમાં ફર્યાનની રૂપેયા કરા છે. છેલી એનો સારા સાંત્રીનાનું આપેલન દ્વારા હોંદી હાત વિકારો લાકનો અને હતો. તહાર પ્રયાભાના માર્ગ હતી અને આવી રહેતી. કાર્યમનું સામન આવું હતું આ કાર્યમાં હોંદી હતા કે કહ્યામાંથીના ઉપાયુખાંથી દાવામાં કરિતેના હતો અપ્યાણ થી આવાની સંભીનનના સામન દારૂપાંત 'ઇપીસના હૃતીયાર્થને કિરી ફરી અહીં અને હી. હી.મી.એ. પાંચે લેટને વધામાં નારાથીને કર્યા કર્યા કર્યા કરિતે સામને અને કરિતે સામને આ કરિતે કરિતા કરિતા કરિતે કરિતે કરિતે કરિતે કરિતે કરિતા કરિતા કરિતે કરિતે કરિતે કરિતે કરિતે કરિતા કરિતે કરિતે કરિતે કરિતે કરિતે કરિતે કરિતે કરિતા કરિતે કરિતે કરિતે કરિતે કરિતે કરિતે કરિતા કરિતે કરિતે કરિતે કરિતા કરિતે કરિતા
મુન્દ્રામાં અદાણી દ્વારા બેટી

તાલુકા હેલ્થ ઓફિસ-મુન્દ્રા, અદાણી પ્રેઝન્ટેશન કરી ભૂણ હત્યા અટકાવવા

ફાઉન્ડેશન અને આઈ. સી.ડી.એસ.ના સંયુક્ત ઉપક્રમે મુન્દ્રા મધ્યે તા. 📹 30 સપ્ટેમ્બર ૨૦૧૬ના રોજ બેટી વધાવોના વિષય પર સેમિનારનું આયોજન કરવામાં આવ્યું હતું. આ કાર્યક્રમની શરૂઆત ઉપસ્થિત મહાનુભાવોના

પાઠવ્યા હતા. તાલુકા હેલ્થ ઓફિસર આવી હતી.



શિક્ષણ સમિતિના ચેરમેન છાયાબેન ડી.પી.ઓ. જસવંતીબેને દીકરી તુલસીનો ગઢવીએ કાર્યક્રમને બિરદાવતા જણાવ્યું ક્યારો કહી બિરદાવી હતી. અદાણી હતું કે, દીકરીને અબળા ન સમજો, ફાઉન્ડેશનના પંક્તિબેને દીકરીને વધાવો દીકરી સબળા છે, દીકરી માતા-પિતાના અને પઢાવો પર ભાર મુકયો હતો રાકળ તરળળા છે, દાકરા નાતા-પતાળા અને પહારા પર ભાર મુકલા હતા વહાલભો દરિયો છે. બલાહુમારીના આ પ્રત્યેગે બે દીકરીની બે માતાને રૂ. સુશીલાબેને દીકરી રૂપ્તે સમાજની મૂડી ૫૦૦૦ ના પંચવણીય બોન્ડ આપવામાં કહી બિરદાવી હતી. મુન્દ્રાના મૌલાના આવ્યા હતા તથા ૧૪ બેટીઓને અદાણી ઈમરાન સીરાઉદીન ખાને આશીર્વચન ફાઉન્ડેશન તરફથી હેલ્થ કિટ આપવામાં



Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To: September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 7



Annexure - 7

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 O3 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.

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Adani Ports and Special Economic Zone Limited, Mundra.

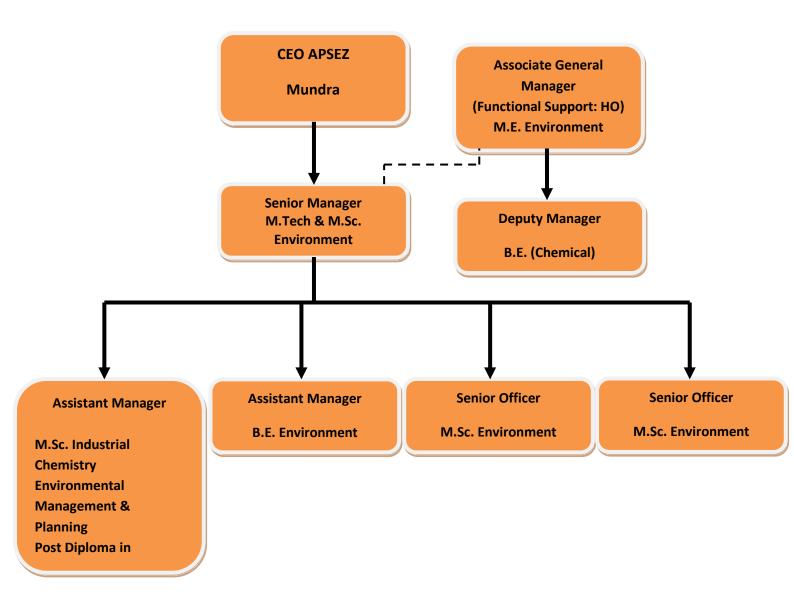
From : April,16

To: September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 8

Annexure – 8 Organogram of Environment Management Cell, APSEZ, Mundra





Adani Ports and Special Economic Zone Limited, Mundra.

From : April,16

To : September,16

Status of the conditions stipulated in Environment and CRZ Clearance

ANNEXURE - 9

ENVIRONMENTAL PROTECTION EXPENDITURES

(April'16 to September'16)

Sr. No.	Activity/ Category	Expenditure (INR) in Lacs
1.	Environmental Study / Audit and Consultancy	158.14
2.	Legal & Statutory Expenses	7.39
3.	Environmental Monitoring Services	15.48
4.	Hazardous Waste Management & Disposal	7.50
5.	Environment Day Celebration	6.54
6.	Treatment and Disposal of Bio-Medical Waste	0.69
7.	Mangrove Plantation	30.00
8.	Mangrove Monitoring & Conservation	20.26
9.	Horticulture Expenses	498.00
10.	O&M of Sewage Treatment Plant and Effluent Treatment Plant (including STP, ETP of Port & SEZ & Common Effluent Treatment Plant)	41.43
11.	Expenditure of Environment Dept. (Apart from above head)	112.47
Total Environmental Expenditures in Rs. (INR)		897.9