

DEENDAYAL PORT AUTHORITY

(Erstwhile: DEENDAYAL PORT TRUST)



www.deendayalport.gov.in

Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038

EG/WK/4751 (EC)/part (Comp 1)/ **350**

Dated: **12/09/2023**

To,
Shri T.C. Patel,
The Unit Head, Kachchh,
Gujarat Pollution Control Board,
Paryavaran Bhavan,
Sector 10A, Gandhinagar- 382 010.

Sub: "Development of 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch (Gujarat) by M/s Kandla Port Trust Limited" – **Pointwise Compliance of the conditions stipulated in NOC (CTE- 74334) issued by GPCB reg.**

- Ref.:** 1) GPCB letter no.PC/CCA-KUTCH-1231/GPCB ID: 44000 dated 22/12/2015 (Online application Inward ID No. 78337 dated 25/2/2014).
2) Compliance Report (period up to May, 2017) submitted by KPT vide letter no. EG/WK/4751 (EC)/part (Compliance) Dated: 15/06/2017.
3) Compliance Report (period up to Nov, 2017) submitted by DPT vide letter no. EG/WK/4751 (EC)/part (Compliance)/611 Dated: 15/12/2017.
4) Compliance Report (period up to May, 2018) submitted by DPT vide letter no. EG/WK/4751 (EC)/part (Compliance)/314 Dated: 14(21)/06/2018.
5) Compliance Report (period up to March, 2019) submitted by DPT vide letter no. EG/WK/4751 (EC)/part (Compliance)/ Dated: 30(2)/03(04)/2019.
6) Compliance Report (period up to October, 2019) submitted by DPT vide letter no. EG/WK/4751 (EC)/part (Comp 1)/154 Dated: 14/11/2019.
7) Compliance Report (period up to November, 2020) submitted by DPT vide letter no. EG/WK/4751 (EC)/part (Comp 1)/Dated: 29/12/2020.
8) Compliance Report (period up to May, 2021) submitted by DPT vide letter no. EG/WK/4751 (EC)/part (Comp 1)/94 Dated: 07/10/2021.
9) Compliance Report (period up to May, 2022) submitted by DPA vide letter no. EG/WK/4751 (EC)/part (Comp 1)/223 Dated: 30/01/2023.
10) Compliance Report (period up to November, 2022) submitted by DPA vide letter no. EG/WK/4751 (EC)/part (Comp 1)/288 Dated: 20/04/2023.

Sir,

It is requested to kindly refer above cited references for the said subject.

In this connection, it is to state that, vide above referred letter, Gujarat Pollution Control Board had granted Consent to Establish (CTE- 74334) with certain specific & general conditions and validity up to 15/11/2022. In this regard, it is relevant to mention here that, DPA had already obtained Environmental & CRZ Clearance for 7 project activities from the MoEF&CC,GoI dated 19/12/2016, based on the recommendation of the Gujarat Coastal Zone Management Authority dated 1/7/2015.

.....Cont.....

Subsequently, DPA vide above referred letters had regularly submitted compliance report of the stipulated conditions to GPCB.

Now, please find enclosed herewith, compliance report of conditions stipulated in CTE Order (period up to May, 2023) along with necessary enclosures as **Annexure I**, for kind perusal & record please.

Further, as per the MoEF&CC, Notification S.O.5845 (E) dated 26.11.2018, stated that **"In the said notification, in paragraph 10, in sub-paragraph (ii), for the words "hard and soft copies" the words "soft copy" shall be substituted"**. Accordingly, we are submitting herewith soft copy of the same via e-mail ID kut-uh-gpcb@gujarat.gov.in.

This has the approval of the Chief Engineer, Deendayal Port Authority.

Thanking You.

Yours faithfully,


Manager (Env.)
Deendayal Port Authority

Encl.: As above

Copy to: Regional Officer,
Gujarat Pollution Control Board,
Regional office,
Kutch (East), Gandhidham-**370201**.
Email Id. ro-gpcb-kute@gujarat.gov.in

Annexure -1

Annexure 1

CURRENT STATUS OF WORK (up to May, 2023)

Subject: Development of 7 integrated facilities (Stage I) within existing Deendayal Authority at Kandla.

Name of Project	Status
1. Development of oil jetty to handle liquid cargo and ship bunkering terminal at old Kandla under PP mode (jetty: 300m x 15m, approach 450 m X 10 m, back up area 5.5 HA, capacity – 3.39 MMTPA, capital dredging 1,73,660 m ³ maintenance dredging 1,56,294 m ³ (Estimated cost: 276.53 Cr.).	<p>The Concession Agreement was executed between DPA and M/s KOTPL on 16/11/2013 to implement the project on Built, Transfer & Operate (BOT- PPP) Basis by M/s KOTPL.</p> <p>The award of concession was issued on 11/12/2020 to M/s KOTPL by DPA.</p> <p>The Project is under construction phase.</p>
2. Multipurpose Cargo Terminal at Tekra off Tuna on BOT basis (T shape jetty 600m X 80 m Capacity 18MMTPA, back up area 101 Ha capital dredging 1,26,57,175 m ³ maintenance dredging 18,98,576. 25 m ³ Estimated cost: 1686.66 Cr.	<p>The Board of DPA approved the Feasibility Report in its meeting on 19.02.2021.</p> <p>The MoPSW, GoI vide communication dated 21/10/2022 has conveyed approval granted by the Cabinet Committee on Economic Affairs to the project.</p> <p>The project is under bidding stage.</p> <p><u>No construction activity has started yet.</u></p>
3. Up gradation of Barge handling capacity at Bundar basis at Kandla capacity 3.33 MMTPA back-up area 5 Ha, Estimated cost: 109.59 Cr.	<p>The up-gradation work was completed.</p>
4. Construction of Rail over Bridge at NH 8 A near Nakti Bridge (crossing of NH 8 A Estimated cost: 32.17 Cr.	<p>Construction activity has not yet started.</p>
5. Mechanization of Dry Cargo handling capacity at Kandla Port (Berth 7 and 8 capacity 7.35 MMTPA estimated cost 80.61 Cr.	<p>Mechanization work already completed.</p>
6. Strengthening of Oil jetty 1 (Estimated cost: 7.5 Cr.	<p>The strengthening work completed.</p>
7. Modification and strengthening of Cargo berth No. 6 at Kandla Port Estimated cost: 11.5 Cr.	<p>The modification & strengthening work completed.</p>

Out of a total of 7 project activities, construction activities of 4 projects (i.e. Sr. No. 3, 5, 6 & 7 mentioned in the EC & CRZ Clearance) have already been completed. Whereas construction activity of the project at Sr. No. 2 & 4 have not yet started.

For the current compliance period up to May 2023, construction activity related to project No. 1 is ongoing. The compliance report submitted by the Concessionaire M/s KOTPL is attached herewith as Annexure A.

COMPLIANCE REPORT (for the period up to May, 2023)

Subject: Compliance of conditions stipulated by the Gujarat Pollution Control Board in NOC/CTE issued for the project "**Development 7 Integrated facilities (Stage I) within the existing Kandla Port Trust limit at District Kutch (Gujarat) "**".

Reference: NOC/CTE issued by the GPCB (CTE – 74334) vide no. PC/CCA-KUTCH-1231/GPCB ID 44000 dated 22/12/2015 (outward) with validity upto 15/11/2022. DPA had obtained CTE validity extension (CTE-125870) from GPCB vide Order dated 27/04/2023 with validity up to 15/11/2025

Sr. No.	Specific Condition	Compliance
1	Kandla Port Trust shall strictly adhere to all conditions of CRZ Clearance issued by the Forest & Environment Department vide order no. ENV-10-2014-25-E dated 01/07/2015.	a) It is assured that Deendayal Port Authority (Erstwhile Deendayal Port Trust) strictly adheres to all conditions of CRZ Clearance issued by the Forest & Environment Department vide order no. ENV-10-2014-25-E dated 01/07/2015. The current compliance report up to May 2023 for the conditions stipulated in CRZ recommendation report is attached as Annexure B . b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A .
2	CTE is granted conditionally that Kandla Port Trust shall not install & commission the construction activity of the seven activities mentioned above without obtaining Environment Clearance from MoEF&CC, New Delhi.	DPA had already obtained Environmental & CRZ Clearance from the MoEF&CC, GoI, dated 19/12/2016. A copy had already been submitted to the GPCB, along with the compliance report submitted dated 15/6/2017. The construction activity was commissioned after obtaining Environment Clearance from MoEF&CC, New Delhi.
3	Kandla Port Trust shall strictly adhere to all conditions of the Terms Of Reference (TOR) (vide letter no. F. No, 11-82/2011-IA.III) by MoEF&CC, New Delhi.	Based on the EIA report prepared by the M/s Mantec Consultants Pvt. Ltd., as per TOR given by the MoEF&CC, GoI dated 4/5/2016; DPA had obtained EC & CRZ Clearance from the MoEF&CC, GoI dated 19/12/2016.
3.	Conditions under Water Act 1974.	
3.1	There shall be no industrial effluent generation from the loading and	N/A

	unloading activities at the Port and other ancillary operations.									
3.2	The quantity of Domestic wastewater (sewage) shall not exceed 6.4 KL/Day	a) Point noted. b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.								
3.3	The quantity of sewage shall conform to the following standards: <table><tr><td>Parameter</td><td>Permissible limit</td></tr><tr><td>BOD (5 days at 20 *C)</td><td>Less than 20 mg/lit</td></tr><tr><td>Suspended solids</td><td>Less than 30 mg/lit</td></tr><tr><td>Residual chlorine</td><td>Minimum 0.5 mg/lit</td></tr></table>	Parameter	Permissible limit	BOD (5 days at 20 *C)	Less than 20 mg/lit	Suspended solids	Less than 30 mg/lit	Residual chlorine	Minimum 0.5 mg/lit	a) For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure C. b) For Project at Sr. No. 1 which is under construction, kindly refer the monitoring report submitted by the Concessionaire M/s KOTPL along with the compliance report attached herewith as Annexure A.
Parameter	Permissible limit									
BOD (5 days at 20 *C)	Less than 20 mg/lit									
Suspended solids	Less than 30 mg/lit									
Residual chlorine	Minimum 0.5 mg/lit									
3.4	Sewage shall be disposed of through a septic tank /soak pit system.	a)For completed projects (modification/ strengthening/ up-gradation of existing facilities), Sewage is being treated in the STP of Kandla (1.5 MLD). The treated sewage from STP of DPA are utilized for plantation / Gardening. b) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.								
3.5	The unit shall install a flow meter at utilities for measuring category-wise (category as given in the water cess act – 1977 schedule II) consumption of water.	Point noted								
4	Conditions Under Air Act 1981.									

4.1	There shall be no use of fuel; hence shall be no flue gas emission from storage handling activity and other ancillary operations.	Not applicable.																				
4.2	The applicant shall provide portholes, ladder, platform etc. at chimney (s) for monitoring the air emission and shall be open for inspection to and for use of Boards staff. The chimney(s) vents attached to various sources of emission shall be designed by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.	Not applicable																				
4.3	<p>The concentration of the following parameters in the ambient air within the premises of the industry shall not exceed the limits specified hereunder as per national Ambient Air Quality Emission Standards issued by the Ministry of Environment and Forest dated 16th November 2009.</p> <table><tr><th>Sr. No.</th><th>Pollutant</th><th>Time-weighted Average</th><th>Concentration in Ambient air in $\mu\text{g}/\text{M}^3$</th></tr><tr><td>1</td><td>Sulphur Dioxide (SO₂)</td><td>Annual 24 Hours</td><td>50 80</td></tr><tr><td>2</td><td>Nitrogen Dioxide (NO₂)</td><td>Annual 24 Hours</td><td>40 80</td></tr><tr><td>3</td><td>Particulate Matter (Size less than 10 μm) OR PM₁₀</td><td>Annual 24 Hours</td><td>60 100</td></tr><tr><td>4</td><td>Particulate Matter (Size less than 2.5 mm) OR PM_{2.5}</td><td>Annual 24 Hours</td><td>40 60</td></tr></table>	Sr. No.	Pollutant	Time-weighted Average	Concentration in Ambient air in $\mu\text{g}/\text{M}^3$	1	Sulphur Dioxide (SO ₂)	Annual 24 Hours	50 80	2	Nitrogen Dioxide (NO ₂)	Annual 24 Hours	40 80	3	Particulate Matter (Size less than 10 μm) OR PM ₁₀	Annual 24 Hours	60 100	4	Particulate Matter (Size less than 2.5 mm) OR PM _{2.5}	Annual 24 Hours	40 60	<p>a) For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure C.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer the monitoring report submitted by the Concessionaire M/s KOTPL along with the compliance report attached herewith as Annexure A.</p>
Sr. No.	Pollutant	Time-weighted Average	Concentration in Ambient air in $\mu\text{g}/\text{M}^3$																			
1	Sulphur Dioxide (SO ₂)	Annual 24 Hours	50 80																			
2	Nitrogen Dioxide (NO ₂)	Annual 24 Hours	40 80																			
3	Particulate Matter (Size less than 10 μm) OR PM ₁₀	Annual 24 Hours	60 100																			
4	Particulate Matter (Size less than 2.5 mm) OR PM _{2.5}	Annual 24 Hours	40 60																			
3.4	The concentration of Noise in ambient air within the premises of the industrial unit	a) For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports																				

	<p>shall not exceed the following levels:</p> <p>Between 6 A.M. and 10 P.M.:75dB (A)</p> <p>Between 10 P.M. and 6 A.M.: 70 dB(A)</p>	<p>are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure C.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer the monitoring report submitted by the Concessionaire M/s KOTPL along with the compliance report attached herewith as Annexure A.</p>
5	Conditions Under Hazardous Waste	
5.1	<p>The applicant shall provide temporary storage facilities for each type of hazardous waste as per the hazardous waste (management, handling & transboundary movement) Rule, 2008, as amended from time to time.</p>	<p>a) DPA has appointed GPCB authorised vendors for the management and recycling of hazardous waste as per the Hazardous Waste Management Rule, 2008 and its subsequent amendments.</p> <p>Further, DPA has appointed GEMI, Gandhinagar for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is in progress.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
5.2	<p>The applicant shall obtain membership of a common TSDF site for disposal of Hazardous waste as categorised in Hazardous Waste (Management, Handling & transboundary Movement) Rules, 2008, as amended from time to time.</p>	Not applicable
6	General Conditions	

6.1	Any change in personnel, equipment or working conditions as mentioned in the consent form/order should immediately be intimated to this Board.	<p>a) Point noted.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6.2	The waste generator shall be totally responsible for (i.e. collection, storage, transportation and ultimate disposal) of the waste generated.	<p>a) DPA has entered into 'Selling Agency' agreement with M/s. MSTC (Govt. of India Enterprise), Vadodara on 04/01/2022 for collection, transporting and disposal of scrap, surplus items, unserviceable equipment etc.</p> <p>Further, DPA has appointed GEMI, Gandhinagar for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is in progress.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6.3	Records of waste generation, its management and annual returns shall be submitted to Gujarat Pollution Control Board in Form – 4 by 31 st January of every year.	<p>a) DPA regularly submitted annual return Hazardous waste in Form IV to the Gujarat Pollution Control Board. The annual return for the year 2022-23 is attached herewith as Annexure D.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6.4	In case of any accident the same shall be submitted in form – 5 to Gujarat Pollution Control Board.	<p>a) Point Noted</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6.5	The applicant shall comply with the relevant provision of "Public liability	Not applicable

	insurance act – 91”.	
6.6	Unit shall take all concrete measures to show the tangible result in waste generation reduction, avoidance, reuse and recycling. Action taken in this regard shall be submitted within 03 months and also along with form 4.	<p>a) The waste generated has been disposed of by selling out to registered recyclers/reprocessors. DPA regularly submitted the annual return of hazardous waste in Form IV to the GPCB.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6.7	Industry shall have to display on – line data outside the main factory gate with regard to the quantity and nature of hazardous chemicals being handled in the plant, including wastewater and air emissions and solid hazardous waste generated within the factory premises.	<p>a) Point Noted.</p> <p>Further, DPA invited tender for 'Online Continuous Ambient Air Quality Monitoring (CAAQM) For the Period of Three Years at Deendayal Port Authority'. The same is under evaluation stage.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6.8	Adequate plantation shall be carried out all along the periphery of the industrial premises in such a way that the density of plantation is at least 1000 trees per acre of land and a green belt of 10 meters width is developed.	<p>a) DPA entrusted work of green belt development in and around Port area to the Forest Department, Gujarat at a cost of Rs. 352 lakhs (Area 32 hectares). The work is completed.</p> <p>Further, DPA has appointed Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-I)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE], dated 31st May, 2022. The final report submitted by GUIDE, Bhuj is attached herewith as Annexure E.</p> <p>Moreover, DPA and BOT operator will carry out plantation as per the condition.</p>

		b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.
6.9	The applicant shall have to submit the returns in prescribed form regarding water consumption and shall have to make payment of water cess to the Board under the water (prevention & control of pollution) Cess Act-1977.	<p>a) DPA regularly submitted the Environmental Statement in Form V. The annual return for the year 2022-23 is attached herewith as Annexure F.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>

Annexure -A



Kandla Oil Terminal Private Limited

Registered Office: "NEELADRI", 3rd Floor, No. 9, Cenotaph Road, Alwarpet, Chennai - 600 018.
Tel: +91-44-4590 2222, 4590 2299, Fax: + 91-44-4590 2200, URL : www.imc.net.in CIN: U60200TN2013PTC092551

KRO/KOTPL/13072023

Jul. 13, 23

The Superintending Engineer (Design)
Deendayal Port Authority
Administrative -Office
Gandhidham
Kutch 370 201

Dear Sir,

Sub. : Development of Oil Jetty to handle Liquid Bulk and Ship bunkering Terminal at Old Kandla ("Project").-
Half Yearly EC & CRZ Compliance report

The half-yearly compliance reports for the KOTPL project for the period from December 2022 to May 2023 are enclosed. (EC, CRZ & CTE)

We would appreciate your acknowledgment of receipt of these documents.

Yours sincerely,

For Kandla Oil Terminal (P) Limited

(Authorized Signatory)

CC: Independent Engineer, IITM

Encls.:

1. EC Compliance report
2. CRZ Compliance report
3. CTE Compliance report
4. Monitoring Data sheet
5. Ambient Air (Six Months)
6. Noise Monitoring (Six Months)
7. Drinking Water Report (Six Months)
8. Construction Activities Photographs



Subject: Point-wise Compliance Status Report for Environmental clearance for Developing integrated facility within the existing Kandla Port at Kandla, Dist: Kutch by M/s. Kandla Port Trust Limited – Reg.

Ref No: - Environmental Clearance vide Letter No- F. No. 11-82/2011-IA III dated 19.12.2016

Sr. No.	EC Conditions	Compliance Status
PART A – SPECIFIC CONDITIONS		
I	Construction activity shall be carried out strictly according to the provisions of CRZ Notification 2011 No. construction work other than those permitted in coastal Regulation Zone Notification Shall be carried out in Coastal Regulation Zone area	It is assured that no activity other than those permissible in Coastal Regulation Notification shall be carried out in the CRZ area.
ii	The project proponent shall ensure that there shall be no damage to the existing mangrove patches near the site and also ensure the free flow of water to avoid damage to the mangroves.	It is assured that due care shall be taken to protect existing mangrove patches near the site and also the free flow of water to avoid damage to the mangroves.
iii	The project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site, and free flow of water is maintained.	It is assured that no creeks or rivers shall be blocked due to any activities at the project site, and the free flow of water shall be maintained.
iv	The shoreline should not be disturbed due to dumping. Periodical study on shoreline changes shall be conducted, and mitigation carried out, if necessary. The details shall be submitted along with the six-monthly monitoring reports.	No shoreline is disturbed due to dumping.
v	The foreshore facilities shall be set up in the stable/low or medium eroding site as demarcated in the shoreline change map by NCSCM. Further, NCSCM shall be authorized to monitor the project during the	Ongoing construction is in line with and strictly adhering to EC-CRZ conditions issued pertaining to this project.





Sr. No.	EC Conditions	Compliance Status
	construction and operation phases so as to ensure that the foreshore facilities cause minimum or no impact to the geomorphological systems.	
vi	The PP should take measures to ensure that construction materials/debris (mortar, cementing material, etc.) do not fall into the water. Construction materials including labor camps should be located at an adequate distance from CRZ areas.	It is assured that the construction activities are being carried out, with due care that the construction material /debris does not fall into the water. Further, it is also assured that construction waste will be collected at a designated location before sending to the disposal site.
vii	Dredged materials should be analyzed for the presence of contaminants and also to decide the disposal options. Monitoring of dredging activities should be conducted, and the findings should be shared with the Gujarat SPCB and the Regional office of the Ministry.	The project is under construction stage, and no dredging activity carried out to date.
viii	PP in consultation with GCZMA should prepare a regional strategic impact assessment report with a special focus on the region where the PP started construction without permission. The cost towards this study should be borne by the PP	Not Applicable
ix	A comprehensive and integrated conservation plan including a detailed bathymetry study and protection of creeks/mangrove area including buffer zone, mapping of coordinates, running length, HTL, and CRZ boundary should be put in the place. The plan should take note of all the conditions of approvals granted to all the project proponents in this area, and the reported cases of the disappearance of mangroves	DPA has appointed the Gujarat Institute of Desert Ecology, Bhuj for the said work.





Sr. No.	EC Conditions	Compliance Status
	near the project site. The preservation of the entire area to maintain the fragile ecological conditions should be a part of the plan in relation to the creek and mangrove conservation.	
x	The commitments made during the Public Hearing and recorded in the minutes shall comply with by letter and spirit. A hard copy of the action taken shall be submitted to the ministry.	Not Applicable
xi	All the conditions stipulated in the earlier clearance including the recommendations of the Environment Management Plan, and Disaster Management Plan shall be strictly complied with.	Noted
xii	Disposal sites for excavated material should be so designed that the revised land use after dumping and changes in the land use pattern does not interfere with the natural drainage.	It is assured that; construction waste will be collected at a designated location before sending to the disposal site. Also, the land use pattern will not interfere with the natural drainage.
xiii	PP shall install a continuous automatic ambient air quality monitoring system (24x7) for all relevant parameters at two locations to monitor the ambient air quality status of the project area. Data should be transferred online to CPCB and SPCB websites.	The Environmental Monitoring Reports following CPCB guidelines and as submitted by NABL accredited laboratory is enclosed as Annexure
xiv	The groundwater shall not be tapped within the CRZ areas by the PP to meet the water requirement in any case.	Water requirement will be met through GWSSB or private tankers. No ground water shall be tapped.
xv	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central	Noted, the project is under the construction stage.





Sr. No.	EC Conditions	Compliance Status
	or State Pollution Control Board and under the Environment (Protection) Act, 1986.	
xvi	All the operational areas will be connected with the network of liquid waste collection corridors comprising of stormwater, oily waste and sewage collection pipelines.	Noted, the project is under the construction stage.
xvii	Automatic /online monitoring system (24x7) monitoring devices) for water pollution in respect of flow measurement and relevant pollutants in the treatment system to be installed. The data to be made available to the respective SPCB and in the Company's website.	Noted
xviii	Marine ecology shall be monitored regularly also in terms of seaweeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves, and other marine biodiversity components as part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro, and mega floral and faunal components of marine biodiversity.	DPA appointed the Gujarat Institute of Desert Ecology, Bhuj for Regular Monitoring of Marine Ecology.
xix	Measures should be taken to contain, control, and recover the accidental spills of fuel and cargo handles.	Noted, the project is under the construction stage.
xx	All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the RO, MoEF&CC along with half yearly compliance report.	--





Sr. No.	EC Conditions	Compliance Status
xxi	Ships/barges shall not be allowed to release any oily bilge waste or ballast water in the sea. Any effluents from the Jetty which have leachable characteristics shall be segregated and recycled/disposed of as per SPCB guidelines.	Noted, the project is under the construction stage.
xxii	The location of DG sets and other emission-generating equipment shall be decided keeping in view the predominant wind direction so that emissions do not affect nearby residential areas. Installation and operation of DG sets shall comply with the guidelines of CPCB.	Not Applicable
xxiii	All the mechanized handling systems and other associated equipment such as hoppers, belt conveyors, stackers cum reclaimers shall have integrated dust suppression systems. Dust suppression systems shall be provided at all transfer points.	Not applicable, as this project is for the handling of liquid cargo.
xxiv	No product other than permitted under the CRZ notification, 2011 shall be stored in the CRZ area.	It is hereby assured that only products permitted under the CRZ Notification, 2011 shall be stored in the CRZ area.
xxv	It shall be ensured by the Project Proponent that the activities do not cause disturbance to the fishing activity, movements of fishing boats and destruction of mangroves during the construction and operation phase.	It is assured that, due care will be taken so that the activities do not cause disturbance to the fishing activity, movement of fishing boats and destruction to mangroves.
xxvi	As proposed, a green belt over an area of 36.8 ha shall be developed with at least 10-meter-wide green belt on all sides along the periphery of the project area, in the downward direction, and along roadsides etc. Selection of plant species shall be as per	Noted.





Sr. No.	EC Conditions	Compliance Status
	the CPCB guidelines in consultation with the DFO.	
xxvii	Mangrove plantation in an area of 100 ha. shall be carried out by KPT within 2 years in a time bound manner. Action taken report shall be submitted to the Regional Office of MoEF &CC.	Not Applicable
xxviii	Municipal solid wastes and hazardous wastes shall be managed as per the Municipal Solid Waste Rule, 2016 and Hazardous Waste Management Rule, 2016.	Noted.
xxix	The Project Proponent shall take up and earmark adequate funds for socio-economic development and welfare measures as proposed under the CSR program. This shall be taken up on priority.	Noted, the project is under the construction stage.
xxx	The project proponent shall set up a separate environmental management cell for the effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.	An NABL accredited laboratory with expert manpower has assigned the work of monitoring to comply and safeguard under the compliance conditions. The Environmental Monitoring Reports are enclosed herewith as Annexure
xxxI	The funds earmarked for the environment management plan shall be included in the budget, and this shall not be diverted for any other purposes.	Noted
xxxii	The proponent shall abide by all the commitments and recommendations made in the EIA/EMP report and also during their presentation to the EAC.	Noted, the project is under the construction stage.
xxxiii	The company shall prepare an operating manual in respect of all activities. It shall cover all safety & environmental related issues and systems. Measures to be taken for protection. One set of	Noted, the project is under the construction stage.





Sr. No.	EC Conditions	Compliance Status
	the environmental manual shall be made available at the project site. Awareness shall be created at each level of management. All the schedules and results of environmental monitoring shall be available at the project site office.	
xxxiv	Corporate Social Responsibility.	
	<p>a. The Company shall have a well-laid-down Environment Policy approved by the Board of Directors.</p> <p>b. The Environment Policy shall prescribe standard operating processes/procedures to bring into focus any infringements/deviations/ violations of the environmental or forest norms/ conditions.</p> <p>c. The hierarchical system or Administrative Order of the company to deal with environmental issues and for ensuring compliance with the environmental clearance conditions shall be furnished.</p> <p>d. To have proper checks and balances, the company shall have a well-laid-down system of reporting non-compliances/ violations of environmental norms to the board of Directors of the company and/or shareholders or stakeholders at large.</p>	Noted.
B. GENERAL CONDITIONS:		
(i)	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board (SPCB), State Government, and any other statutory authority.	The project authorities assure to strictly adhere to the stipulations





Sr. No.	EC Conditions	Compliance Status
(ii)	Full support shall be extended to the officers of this Ministry/ Regional Office at Bhopal by the project proponent during the inspection of the project for monitoring purposes by furnishing full details and an action plan including action is taken reports in respect of mitigation measures and other environmental protection activities.	Full support shall be extended to the regulatory officers during the inspection and furnishing required project details.
(iii)	A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bhopal regarding the implementation of the stipulated conditions.	Noted.
(iv)	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary, in the interest of the environment and the same shall be complied with.	Noted.
(v)	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated have not complied with the satisfaction of the Ministry.	Noted.
(vi)	In the event of a change in the project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change.	Noted.
(vii)	The project proponents shall inform the Regional Office as well as the Ministry, of the date of financial closure and final approval of the project by the concerned authorities and the	Noted.





Sr. No.	EC Conditions	Compliance Status
	date of start of land development work.	
(viii)	A copy of the clearance letter shall be marked to the concerned Panchayat/local NGO, if any, from whom any suggestion/representation has been made or received while processing the proposal.	Complied
(ix)	A copy of the environmental clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional Office, District Industries centre and Collector's Office/Tehsildar's office for 30 days.	Complied
11	These stipulations would be enforced among others under the provisions of the Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.	Noted. The Environmental Monitoring Reports are enclosed herewith as Annexure
12	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	Noted, the project is under the construction stage. Due statutory clearances applicable, will be taken during the course of respective project stages as per the condition stipulated.
13	The project proponent shall advertise in at least two local	Complied





Sr. No.	EC Conditions	Compliance Status
	Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at http://www.envfor.nic.in . The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bhopal.	
14	This Clearance is subject to a final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs Union of India in Writ Petition (Civil) No. 460 of 2004 as may be applicable to this product.	Noted.
15	The status of compliance with the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent on its website.	Noted.
16	Any appeal against this Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	Noted.
17	A copy of the clearance letter shall be sent by the proponent to the concerned Panchayat, Zilla Parishad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom	Complied





Sr. No.	EC Conditions	Compliance Status
	suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	
18	The proponent shall upload the status of compliance with the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEFCC, the respective Zonal Office of CPCB and the SPCB.	Noted.
19	The environmental statement for each financial year ending 31 st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEFCC by e-mail.	Noted





Kandla Oil Terminal Private Limited

Subject: Point-wise Compliance Status Report for CRZ clearance for Developing integrated facility within the existing Kandla Port at Kandla, Dist: Kutch by M/s. Kandla Port Trust Limited – Reg.

Ref No: - GCZMA CRZ recommendation vide Letter No- ENV-10-2014-25-E Cell dated 01.07.2015

S. No.	CRZ Conditions	Compliance Status
SPECIFIC CONDITIONS		
1.	The provisions of the CRZ notification of 2011 shall be strictly adhered to by the KPT. No activity in contradiction to the provisions of the CRZ Notification shall be carried out by the KPT.	It is assured that no activity in contradiction to the Provisions of the CRZ Notification shall be carried out.
2.	The KPT shall have to ensure that there shall not be any damage to the existing mangrove area.	It is ensured that due care shall be taken to protect the existing mangrove area.
3.	The KPT shall prepare an emergency plan to protect existing mangroves in case of any eventuality/accident	Not Applicable
4.	The KPT shall have to make a provision that mangrove areas get proper flushing water and free flow of water shall not be obstructed.	It is assured that provisions shall be made that mangrove area get proper flushing water and free flow of water shall not be obstructed.
5.	The KPT shall have to abide by whatever decision taken by the GCZMA for violations of CRZ notification 2011	Decisions taken by the GCZMA for violations of CRZ Notification, 2011, will be abided by.
6.	There shall not be violations of the order dated 9-12-2013 passed by the National Green Tribunal, and accordingly, there shall be no mangrove destruction taking place in the KPT area.	It is hereby assured that due care shall be taken to protect the existing mangrove area.
7.	No dredging, reclamation or any other project-related activities shall be carried out in the CRZ area categorized as CRZ I (i), and it shall have to be ensured that the mangrove habitats and other ecologically important and significant areas, if any, in the region are not affected due to any of the project activities.	Noted
8.	The KPT shall participate financially in installing and operating the Vessel Traffic Management System in the Gulf of Kachchh and shall also take the lead in preparing and operational sing the Regional Oil Spill Contingency plan in the Gulf of Kachchh.	Not Applicable
9.	The KPT shall strictly ensure that no creeks or rivers are blocked due to any activity at Kandla.	It is assured that no creeks or rivers shall be blocked due to any activity at Kandla.





S. No.	CRZ Conditions	Compliance Status
10.	Mangrove plantation in an area of 100 ha. shall be carried out by the KPT within 2 years in a time-bound manner on the Gujarat coastline either within or outside the Kandla Port Trust area, and a six-monthly compliance report along with the satellite images shall be submitted to the Ministry of Environment and Forests as well as to this Department without fail.	Not Applicable
11.	No activities other than those permitted by the competent authority under the CRZ Notification shall be carried out in the CRZ area.	It is assured that only activities permitted by the competent authority under the CRZ Notification shall be carried out in the CRZ area.
12.	No groundwater shall be tapped for any purpose during the proposed expansion/modernization activities.	Water requirements will be met through GWSSB or private tankers. No groundwater shall be tapped.
13.	All necessary permissions from different Government Departments/agencies shall be obtained by the KPT before commencing the expansion activities.	Noted
14.	No effluent or sewage shall be discharged into the sea/creek or in the CRZ area, and it shall be treated to conform to the norms prescribed by the Gujarat Pollution Control Board and would be reused/recycled within the plant premises.	No waste water generation during the construction phase
15.	All the recommendations and suggestions given by Mantec Consultants Pvt. Ltd. New Delhi in their Comprehensive Environment Impact Assessment report for conservation/protection and betterment of the environment shall be implemented strictly by the KPT.	Noted
16.	The construction and operational activities shall be carried out in such a way that there is no negative impact on mangroves and other coastal/marine habitats. The construction activities and dredging shall be carried out only under the constant supervision and guidelines of the Institute of National repute like NIOT.	It is assured that construction activities are being carried out under constant supervision. Guidelines of the Institute of national repute like NIOT.
17.	The KPT shall contribute financially to any common study or project that may be proposed by this Department for environmental management/conservation /improvement for the Gulf of Kutch.	Not applicable
18.	The construction debris and/or any other type of waste shall not be disposed of into the sea, creek, or in CRZ areas. The debris	It is assured that construction debris and/ or any other waste shall not be disposed of into the sea, creek, or CRZ





S. No.	CRZ Conditions	Compliance Status
	shall be removed from the construction site immediately after the construction is over.	areas, and the debris shall be removed from the construction site immediately after the construction is over.
19.	The construction camps shall be located outside the CRZ area, and the construction labour shall be provided with the necessary amenities, including sanitation, water supply and fuel, and it shall be ensured that the environmental conditions are not deteriorated by the construction labours.	No construction camps on the site. Only Local laborers are involved.
20.	The KPT shall regularly update their Local Oil Spill Contingency and Disaster Management plan in consonance with the National Oil Spill and Disaster Contingency Plan and shall submit the same to this Department after having it vetted through the Indian Coast Guard.	Project is in construction phase.
21.	The KPT shall bear the cost of the external agency that may be appointed by this Department for supervision/ monitoring of proposed activities and the environmental impacts of the proposed activities.	Not applicable
22.	The KPT shall take up massive greenbelt development activities in and around Kandla and also within the KPT limits.	Not applicable
23.	The KPT shall have to contribute financially for taking up the socio-economic upliftment activities in this region in consultation with the Forests and Environment Department and the District Collector/ District Development officer.	Not applicable
24.	A separate budget shall be earmarked for environmental management and socio-economic activities, and details thereof shall be furnished to this Department as well as MoEF,GOI. The details with respect to the expenditure from this budget head shall also be furnished.	Noted
25.	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during the construction and operational phases of the project.	An NABL accredited laboratory with expert manpower has assigned the work of monitoring to comply and safeguard under the compliance conditions. The Environmental Monitoring Reports are enclosed herewith as Annexure .
26.	An environmental report indicating the changes, if any, with respect to the baseline environmental quality in the coastal and marine environment shall be	Noted. The Environmental Monitoring Reports are enclosed herewith as Annexure





S. No.	CRZ Conditions	Compliance Status
	submitted every year by the KPT to this Department as well as to the MoEF&CC,GOI.	
27.	The KPT shall have to contribute financially to support the National Green Corps Scheme being implemented in Gujarat by the GEER Foundation, Gandhinagar, in consultation with the Forests and Environment Department	Not applicable
28.	A six-monthly report on compliance with the conditions mentioned in this letter shall have to be furnished by the KPT on a regular basis to this Department/MoEF&CC,GOI	Noted
29.	Any other conditions that may be stipulated by this Department/MoEF&CC,GOI from time to time for environmental protection/management purposes shall also have to be complied with by the KPT.	Noted.





Subject: Point-wise Compliance Status Report for Consent to Establish for Developing integrated facility within the existing Kandla Port at Kandla, Dist: Kutch by M/s. Kandla Port Trust Limited – Reg.

Ref No: - PC/CCA-KUTCH-1231/GPCB ID 44000 dated 22.12.2015 and Amendment of Consent to Establish dated 04.12.2017

Sr. No.	Condition	Compliance Status								
2.	SPECIFIC CONDITIONS:									
	<div>1. Kandla Port Trust shall strictly adhere to all conditions of CRZ Clearance issued by the Forest & Environment Department vide order no. ENV-10-2014-25-E dated 01/07/2015.</div> <div>2. CTE is granted conditionally that Kandla Port Trust shall not install & commission, including the construction activity of seven activities mentioned above, without obtaining Environment Clearance from MoEF&CC, New Delhi.</div> <div>3. Kandla Port Trust shall strictly adhere to all conditions of the Terms of Reference (ToR) (vide letter no. F. No. 11-82/2011-IA.III) by MoEF&CC, New Delhi.</div>	<div>All conditions of CRZ Clearance issued vide order no. ENV-10-2014-25-E dated 01/07/2015 will be strictly adhered to. The current CRZ compliance report up to May 2023 is enclosed herewith.</div> <div>The construction activity was commissioned after due agreement and as per Environment Clearance was issued in the year 2016 by MoEF&CC, New Delhi.</div> <div>Noted</div>								
3.	CONDITION UNDER THE WATER ACT 1974: <div>3.1 There shall be no industrial effluent generation from the loading and unloading activities at the port and other ancillary operations.</div> <div>3.2 The quantity of Domestic wastewater (Sewage) shall not exceed 6.4 KL/Day.</div> <div>3.3 The quality of the sewage shall conform to the following standards:</div> <table><thead><tr><th>PARAMETERS</th><th>GPCB NORMS</th></tr></thead><tbody><tr><td>BOD (5 days at 20 °C)</td><td>20 mg/L</td></tr><tr><td>Suspended solids</td><td>30 mg/L</td></tr><tr><td>Residual Chlorine</td><td>Minimum 0.5 mg/L</td></tr></tbody></table>	PARAMETERS	GPCB NORMS	BOD (5 days at 20 °C)	20 mg/L	Suspended solids	30 mg/L	Residual Chlorine	Minimum 0.5 mg/L	<div>Not applicable</div> <div>The project is under the construction stage</div> <div>The project is under the construction stage</div>
PARAMETERS	GPCB NORMS									
BOD (5 days at 20 °C)	20 mg/L									
Suspended solids	30 mg/L									
Residual Chlorine	Minimum 0.5 mg/L									





	<p>3.4 Sewage shall be disposed of through a septic tank/soak pit system.</p> <p>3.5 The unit shall install meters at utilities for measuring category-wise (Category as given in Schedule II of "Water (Prevention & Control of Pollution) Cess Act-1977") consumption of water.</p>	<p>Noted</p> <p>Noted</p>																
4.	<p>CONDITION UNDER THE AIR ACT 1981:</p> <p>4.1 There shall be no use of fuel hence there shall be no flue and process gas emission from storage handling activity and other ancillary operations.</p> <p>4.2 The applicant shall provide portholes, ladder, platform, etc at chimney(s) for monitoring the air emissions and the same shall be open for inspection. The chimney(s) vents attached to various sources of emission shall be designed by numbers such as S-1, S-2, etc. and these shall be painted/ displayed to facilitate identification.</p> <p>4.3 The concentration of the following parameters in the ambient air within the premises of the industry shall not exceed the limits specified hereunder as per National Ambient Air Quality Standards issued by MoEF&CC dated 16th November-2009.</p> <table><tr><th>Sr. No.</th><th>Pollutant</th><th>Time Weighted Average</th><th>Concentration in Ambient air in µg/m³</th></tr><tr><td>1.</td><td>Sulphur Dioxide (SO₂)</td><td>Annual 24Hours</td><td>50 80</td></tr><tr><td>2.</td><td>Nitrogen Dioxide (NO₂)</td><td>Annual 24Hours</td><td>40 80</td></tr><tr><td>3.</td><td>Particulate Matter (Size less than 10 µm) OR PM10</td><td>Annual 24Hours</td><td>60 100</td></tr></table>	Sr. No.	Pollutant	Time Weighted Average	Concentration in Ambient air in µg/m³	1.	Sulphur Dioxide (SO ₂)	Annual 24Hours	50 80	2.	Nitrogen Dioxide (NO ₂)	Annual 24Hours	40 80	3.	Particulate Matter (Size less than 10 µm) OR PM10	Annual 24Hours	60 100	<p>Not Applicable</p> <p>Not Applicable</p> <p>Routine environment monitoring is being done through NABL accredited laboratory and the data is being submitted to all the concerned authorities along with compliance reports. The latest environmental monitoring reports are enclosed as Annexure.</p>
Sr. No.	Pollutant	Time Weighted Average	Concentration in Ambient air in µg/m³															
1.	Sulphur Dioxide (SO ₂)	Annual 24Hours	50 80															
2.	Nitrogen Dioxide (NO ₂)	Annual 24Hours	40 80															
3.	Particulate Matter (Size less than 10 µm) OR PM10	Annual 24Hours	60 100															





4.	Particulate Matter (Size less than 2.5µm) OR PM 2.5	Annual 24Hours	40 60	
	<p>4.4 The level of Noise in ambient air within the premises of the industrial unit shall not exceed the following levels:</p> <p>Between 6 A.M. to 10 P.M.:75 dB(A)</p> <p>Between 10 P.M. to 6 A.M.:70 dB(A)</p>			The latest environmental monitoring reports are enclosed as Annexure.
5.	<p>CONDITIONS UNDER HAZARDOUS WASTE:</p> <p>5.1 The applicant shall provide temporary storage facilities for each type of Hazardous Waste as per Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008, as amended from time to time.</p> <p>5.2 The applicant shall obtain membership of a common TSDF site for the disposal Hazardous Waste as categorized in Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008, as amended from time to time.</p>			<p>Noted, the Project is under construction stage.</p> <p>Noted, the Project is under construction stage.</p>
6.	<p>GENERAL CONDITIONS</p> <p>6.1 Any change in personnel, equipment, or working conditions as mentioned in the consent form/order should immediately be intimated to this Board.</p> <p>6.2 The waste generator shall be totally responsible for (i.e. Collection, storage, transportation and ultimate disposal) the wastes generated.</p> <p>6.3 Records of waste generation, its management, and annual return shall be submitted to the Gujarat Pollution Control Board in Form- 4 by 31st January of every year.</p> <p>6.4 In case of any accident, details of the same shall be submitted in Form- 5 to the Gujarat Pollution Control Board.</p> <p>6.5 Applicant shall comply with the relevant</p>			<p>Noted</p> <p>Noted</p> <p>Noted</p> <p>Noted</p> <p>Noted</p>





	provision of "Public Liability Insurance Act-91".	
	6.6 Unit shall take all concrete measures to show tangible results in waste generation reduction, avoidance, reuse, and recycling. Action taken in this regard shall be submitted within 03 months and also along with Form 4.	Noted, the project is under the construction stage
	6.7 Industry shall have to display online data outside the main factory gate with regard to the quantity and nature of hazardous chemicals being handled in the plant, including wastewater and air emissions and solid hazardous waste generated within the factory premises.	Noted, the project is under the construction stage
	6.8 Adequate plantation shall be carried out all along the periphery of the industrial premises in such a way that the density of plantation is at least 1000 trees per acre of land and a green belt of 10 meters width is developed.	Noted, the project is under the construction stage
	6.9 The applicant shall have to submit the returns in the prescribed form regarding water consumption and shall have to make payment of water cess to the Board under the Water (Prevention and Control of Pollution) Cess Act 1977.	Noted, the project is under the construction stage



**Monitoring Report (Up to May, 2023)
DATA SHEET**

Sr. No.	Particulars	Reply
1.	Project type: River valley/ Mining/Industry/ thermal/nuclear/Other (specify)	Development of Oil Jetty to handle Liquid Bulk and Ship bunkering Terminal at Old Kandla
2.	Name of the project	Development of Oil Jetty to handle Liquid Bulk and Ship bunkering Terminal at Old Kandla
3.	Clearance Letter (s). OM no and date	MoEFCC File No. F.No.11-82/2011-IA-III Proposal No. IA/GJ/MIS/28772/2011 Dated 16 th May 2016
4.	Location a) District (s) b) State (s)	Location: a) Kutch b) Gujarat
5.	Address for Correspondence a) address of Concerned Project Chief Engineer (with pin code & telephone/telex/fax numbers b) Address of Executive project Engineer/manager/ (with pin code fax numbers)	Regional Head (IMCL) Near IOCL foreshore Terminal Kandla Gandhidham Kutch 370 201 Dy. General Manager Near IOCL foreshore Terminal Kandla Gandhidham Kutch 370 201
6.	Salient features a) Of the Project b) Of the Environmental Management Plan	Jetty: 3.39 MMTPA Tank farm: About 1,36,417 KL & Allied Facilities
7.	Production Details during compliance period and (or) during the previous financial year	Project is under construction stage.
8.	Breakup of the project area a) Submergence area: forest & non- forest	N/A





	b) Others	
9.	<p>Breakup of the project affected population with enumeration of those living houses/dwelling units only agricultural land & landless laborer's/artisen</p> <p>a) SC. ST/Adivasis b) Others (please indicate whether these figures arebased on any scientific and systematic survey carried out of only provisional figures, if a survey is carried out give details and years of survey).</p>	Not Applicable
10.	<p>Financial details</p> <p>a) Project cost as originally planned and subsequent revised estimates and the year of prices reference</p> <p>b) Allocation made for environmental management plans with item wise and year wise break-up</p> <p>c) Benefit cost ratio/Internal rate of Return and the year of assessment Whether (c) includes the cost of environmental management plans so far.</p> <p>d) Actual expenditure incurred on the project</p> <p>e) Actual expenditure incurred on the environmental management plans so far.</p>	<p>Estimated Project cost: Rs. 233.50 Cr</p> <p>Revised project cost: Rs.343 Cr. (Estimated)</p> <p>Rs. 07 Lacs</p> <p>Rs.26.22 Cr.</p> <p>Rs. 5 Lakhs</p>
11.	<p>Forest land requirement</p> <p>a) The status of approval for diversion of forest land for non-forestry use</p> <p>b) The status of clear felling</p> <p>c) The status of compensatory</p>	<p>Nil</p> <p>N/A.</p> <p>N/A</p> <p>N/A</p>





	a forestation, if any d) Comments on the viability & sustainability of compensatory a forestation programmed in the light of actual field experience so far	N/A
12.	The status of clear felling in non-forest areas (such as submergence area of reservoir, approach roads), if any with quantitative information.	N/A
13.	Status of construction a) Date of commencement (Actual and/or planned) b) Date of completion (Actual and/or planned)	Project is under construction stage. Award of concession: December, 2020 Planned date of Completion : 31 st December 2024
14.	Reasons for the delay if the Project is yet to start	Project is under construction stage and delayed because of Pandemic & Local hindrances.
15.	Date of site visited a) The dates on which the project was monitored by the regional office on pervious occasion. if any b) The date site visit for this monitoring report	No
16.	Details of the correspondence with project authorities for obtaining action plans/information on status of compliance to safeguard other than the routine letters for logistic support for site visit. (The first monitoring report may contain the details of all the letters issued so far but the later reports may cover only the letters issued subsequently.)	Noted.





ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA - 370210

Format No. : 7.8 F-01

Date of : 20/12/2022

Report

Report No : A2ZELPL/AN/122022/09

Description of Sample:

Date of Sampling	: 19/12/2022	Type of Sampling	: -----
Date of Sample Received	: 19/12/2022	Sample ID	: AN/122022/09
Sampling Location of Sampling Point	: -----	Sample Particular	: ----
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 9989-1991
Instrument calibration status	: OK	Date of Analysis Start	: 19/12/2022
Metrological conditions during monitoring	: CLEAR SKY	Date of Analysis Completion	: 19/12/2022
Instrument code	: A2ZELPL/SLM/01	Actual Duration of Monitoring (MINUTE)	: 30

Test Results

Sr. No.	LOCATION	Results	CPCB Limit	Unit	Reference Method
1.	NEAR TANK FARM	62	75	dB	IS 9989-1991
2.	NEAR JEETY LANDFALL AREA	60	75	dB	IS 9989-1991
3.	TANK FARM RIGHT SIDE	58	75	dB	IS 9989-1991
4.	TANK FARM LEFT SIDE	54	75	dB	IS 9989-1991

Tested By
(Sr. Analyst/Analyst)

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC
FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 13/01/2023

Report

Report No : A2ZELPL/AN/012023/04

Description of Sample:			
Date of Sampling	: 10/01/2023	Type of Sampling	: -----
Date of Sample Received	: 10/01/2023	Sample ID	: AN/012023/04
Sampling Location of Sampling Point	: -----	Sample Particular	: ----
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 9989-1991
Instrument calibration status	: OK	Date of Analysis Start	: 10/01/2023
Metrological conditions during monitoring	: CLEAR SKY	Date of Analysis Completion	: 10/01/2023
Instrument code	: A2ZELPL/SLM/01	Actual Duration of Monitoring (MINUTE)	: 30

Test Results

Sr. No.	LOCATION	Results	CPCB Limit	Unit	Reference Method
1.	NEAR TANK FARM	68	75	dB	IS 9989-1991
2.	NEAR JEETY LANDFALL AREA	72	75	dB	IS 9989-1991
3.	TANK FARM RIGHT SIDE	54	75	dB	IS 9989-1991
4.	TANK FARM LEFT SIDE	59	75	dB	IS 9989-1991


Tested By
(Sr. Analyst/Analyst)


Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP. SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 16/02/2023

Report

Report No : A2ZELPL/AN/022023/04

Description of Sample:			
Date of Sampling	: 13/02/2023	Type of Sampling	:
Date of Sample Received	: 13/02/2023	Sample ID	: AN/022023/04
Sampling Location of Sampling Point	:	Sample Particular	:
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 9989-1991
Instrument calibration status	: OK	Date of Analysis Start	: 13/02/2023
Metrological conditions during monitoring	: CLEAR SKY	Date of Analysis Completion	: 13/02/2023
Instrument code	: A2ZELPL/SLM/01	Actual Duration of Monitoring (MINUTE)	: 30

Test Results

Sr. No.	LOCATION	Results	CPCB Limit	Unit	Reference Method
1.	NEAR TANK FARM	68	75	dB	IS 9989-1991
2.	NEAR JEETY LANDFALL AREA	72	75	dB	IS 9989-1991
3.	TANK FARM RIGHT SIDE	54	75	dB	IS 9989-1991
4.	TANK FARM LEFT SIDE	59	75	dB	IS 9989-1991

Tested By
(Sr. Analyst/Analyst)

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A2Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 16/03/2023

Report

Report No : A2ZELPL/AN/032023/04

Description of Sample:

Date of Sampling	: 13/03/2023	Type of Sampling	: -----
Date of Sample Received	: 13/03/2023	Sample ID	: AN/032023/04
Sampling Location of Sampling Point	: -----	Sample Particular	: ----
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 9989-1991
Instrument calibration status	: OK	Date of Analysis Start	: 13/03/2023
Metrological conditions during monitoring	: CLEAR SKY	Date of Analysis Completion	: 13/03/2023
Instrument code	: A2ZELPL/SLM/01	Actual Duration of Monitoring (MINUTE)	: 30

Test Results

Sr. No.	LOCATION	Results	CPCB Limit	Unit	Reference Method
1.	NEAR TANK FARM	72	75	dB	IS 9989-1991
2.	NEAR JEETY LANDFALL AREA	74	75	dB	IS 9989-1991
3.	TANK FARM RIGHT SIDE	65	75	dB	IS 9989-1991
4.	TANK FARM LEFT SIDE	68	75	dB	IS 9989-1991

Tested By

(Sr. Analyst/Analyst)

Authorized Signatory

Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 11/04/2023

Report

Report No : A2ZELPL/AN/042023/01

Description of Sample:			
Date of Sampling	: 08/04/2023	Type of Sampling	:
Date of Sample Received	: 08/04/2023	Sample ID	: AN/042023/01
Sampling Location of Sampling Point	:	Sample Particular	:
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 9989-1991
Instrument calibration status	: OK	Date of Analysis Start	: 08/04/2023
Metrological conditions during monitoring	: CLEAR SKY	Date of Analysis Completion	: 08/03/2023
Instrument code	: A2ZELPL/SLM/01	Actual Duration of Monitoring (MINUTE)	: 30

Test Results

Sr. No.	LOCATION	Results	CPCB Limit	Unit	Reference Method
1.	NEAR TANK FARM	74	75	dB	IS 9989-1991
2.	NEAR JEETY LANDFALL AREA	72	75	dB	IS 9989-1991
3.	TANK FARM RIGHT SIDE	68	75	dB	IS 9989-1991
4.	TANK FARM LEFT SIDE	64	75	dB	IS 9989-1991

Tested By
(Sr. Analyst/Analyst)

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 21/05/2023

Report

Report No : A2ZELPL/AN/052023/02

Description of Sample:

Date of Sampling	: 18/05/2023	Type of Sampling	: -----
Date of Sample Received	: 18/05/2023	Sample ID	: AN/052023/02
Sampling Location of Sampling Point	: -----	Sample Particular	: ----
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 9989-1991
Instrument calibration status	: OK	Date of Analysis Start	: 18/05/2023
Metrological conditions during monitoring	: CLEAR SKY	Date of Analysis Completion	: 18/05/2023
Instrument code	: A2ZELPL/SLM/01	Actual Duration of Monitoring (MINUTE)	: 30

Test Results

Sr. No.	LOCATION	Results	CPCB Limit	Unit	Reference Method
1.	NEAR TANK FARM	71	75	dB	IS 9989-1991
2.	NEAR JEETY LANDFALL AREA	70	75	dB	IS 9989-1991
3.	TANK FARM RIGHT SIDE	67	75	dB	IS 9989-1991
4.	TANK FARM LEFT SIDE	63	75	dB	IS 9989-1991

Tested By
(Sr. Analyst/Analyst)

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL
OPP,SHIRVA RAILWAY CROSSING, NEAR LOC
FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01
Date of : 22/12/2022
Report :
Report No : A2ZELPL/DW/12/2022/02

Description of Sample:			
Date of Sampling	: 19/12/2022	Type of Sampling	: Drinking Water
Date of Sample Received	: 19/12/2022	Sample ID	: DW/122022/01
Sampling Location of Sampling Point	: Near office area	Sample Particular	: Drinking Water
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 3025 (Part-1)
Sample Quantity /Total No.	: 2 Litre/1Nos.	Date of Analysis Start	: 20/12/2022
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 22/12/2022
Environment condition during the test	: 25 ± 3 °C		

Test Results

Sr. No.	Parameters	Results	STANDARD Limit	Unit	Reference Method
1.	pH @°C	7.09	6.5-8.5	-	APHA, 23 rd Edition 2017/4500-H ⁺ B
2.	Electrical Conductivity @°C	0.38	..	mS/cm	APHA, 23 rd Edition 2017/2510-B
3.	Temperature	25	..	°C	APHA, 23 rd Edition 2017/2550B
4.	Total dissolved solids	238	500	mg/L	APHA, 23 rd Edition 2017/ 2540-C
5.	Total Suspended solids	64	50-150	mg/L	APHA, 23 rd Edition 2017/ 2540-D
6.	Chloride as Cl	47	250	mg/L	APHA, 23 rd Edition 2017/ 4500 Cl B
7.	Total Hardness as CaCO ₃	58	200	mg/L	APHA, 23 rd Edition 2017/2340-C
8.	Calcium as Ca	15.2	75	mg/L	APHA, 23 rd Edition 2017/3500-Ca-B
9.	Magnesium as Mg,	4.86	30	mg/L	APHA, 23 rd Edition 2017/Calculation Method 3500 -Mg B

Diya
Tested by

(Sr. Analyst/Analyst)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report

Akbarkhan P. Jalori
Authorized Signatory

Akbarkhan P. Jalori
(Quality Manager)



TEST REPORT

Customer's Name and Address:

KOTPL

OPP. SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 13/01/2023

Report

Report No : A2ZELPL/DW/01/2023/03

TC-10331

Description of Sample:

Date of Sampling	: 10/01/2023	Type of Sampling	: Drinking Water
Date of Sample Received	: 10/01/2023	Sample ID	: DW/012023/03
Sampling Location of Sampling Point	: Near office area	Sample Particular	: Drinking Water
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 3025 (Part-1)
Sample Quantity /Total No.	: 2 Litre/1Nos.	Date of Analysis Start	: 11/01/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 13/01/2023
Environment condition during the test	: 25 ± 3 °C		

Test Results

Sr. No.	Parameters	Results	STANDARD Limit	Unit	Reference Method
1.	pH @°C	7.14	6.5-8.5	-	APHA, 23 rd Edition 2017/4500-H ⁺ B
2.	Electrical Conductivity @°C	0.40	..	mS/cm	APHA, 23 rd Edition 2017/2510-B
3.	Temperature	25	..	°C	APHA, 23 rd Edition 2017/2550B
4.	Total dissolved solids	254	500	mg/L	APHA, 23 rd Edition 2017/ 2540-C
5.	Total Suspended solids	86	50-150	mg/L	APHA, 23 rd Edition 2017/ 2540-D
6.	Chloride as Cl	37.8	250	mg/L	APHA, 23 rd Edition 2017/ 4500 Cl B
7.	Total Hardness as CaCO ₃	60	200	mg/L	APHA, 23 rd Edition 2017/2340-C
8.	Calcium as Ca	16	75	mg/L	APHA, 23 rd Edition 2017/3500-Ca-B
9.	Magnesium as Mg.	4.86	30	mg/L	APHA, 23 rd Edition 2017/Calculation Method 3500 -Mg B

Deiz

Tested By

(Sr. Analyst/Analyst)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)



TC-10331

TEST REPORT**Customer's Name and Address:**

KOTPL
OPP,SHIRVA RAILWAY CROSSING, NEAR LOC
FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01
Date of : 16/02/2023
Report
Report No : A2ZELPL/DW/02/2023/03

Description of Sample:			
Date of Sampling	: 13/02/2023	Type of Sampling	: Drinking Water
Date of Sample Received	: 13/02/2023	Sample ID	: DW/022023/03
Sampling Location of Sampling Point	: Near office area	Sample Particular	: Drinking Water
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 3025 (Part-1)
Sample Quantity /Total No.	: 2 Litre/1Nos.	Date of Analysis Start	: 14/02/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 16/02/2023
Environment condition during the test	: 25 ± 3 °C		

Test Results

Sr. No.	Parameters	Results	STANDARD Limit	Unit	Reference Method
1.	pH @°C	7.22	6.5-8.5	-	APHA, 23 rd Edition 2017/4500-II* B
2.	Electrical Conductivity @°C	0.37	--	mS/cm	APHA, 23 rd Edition 2017/2510-B
3.	Temperature	25	--	°C	APHA, 23 rd Edition 2017/2550B
4.	Total dissolved solids	241	500	mg/L	APHA, 23 rd Edition 2017/ 2540-C
5.	Total Suspended solids	52	50-150	mg/L	APHA, 23 rd Edition 2017/ 2540-D
6.	Chloride as Cl	33.5	250	mg/L	APHA, 23 rd Edition 2017/ 4500 Cl B
7.	Total Hardness as CaCO ₃	58	200	mg/L	APHA, 23 rd Edition 2017/2340-C
8.	Calcium as Ca	15.2	75	mg/L	APHA, 23 rd Edition 2017/3500-Ca-B
9.	Magnesium as Mg.	4.86	30	mg/L	APHA, 23 rd Edition 2017/Calculation Method 3500 -Mg B

Tested by
(Sr. Analyst/Analyst)

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)**This Report is issued under the following terms & Condition:**

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL
OPP. SHIRVA RAILWAY CROSSING, NEAR LOC
FORESHORE TERMINALS NEW KANDLA - 370210

Format No. : 7.8 F-01
Date of : 28/03/2023
Report :
Report No : A2ZELPL/DW/03/2023/05

Description of Sample:			
Date of Sampling	: 25/03/2023	Type of Sampling	: Drinking Water
Date of Sample Received	: 25/03/2023	Sample ID	: DW/032023/05
Sampling Location of Sampling Point	: Near office area	Sample Particular	: Drinking Water
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 3025 (Part-1)
Sample Quantity / Total No.	: 2 Litre / 1 Nos.	Date of Analysis Start	: 26/03/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 28/03/2023
Environment condition during the test	: 25 ± 3 °C		

Test Results

Sr. No.	Parameters	Results	STANDARD Limit	Unit	Reference Method
1.	pH @°C	7.04	6.5-8.5	-	APHA, 23 rd Edition 2017/4500-H* B
2.	Electrical Conductivity @°C	0.41	--	mS/cm	APHA, 23 rd Edition 2017/2510-B
3.	Temperature	25	--	°C	APHA, 23 rd Edition 2017/2550B
4.	Total dissolved solids	235	500	mg/L	APHA, 23 rd Edition 2017/ 2540-C
5.	Total Suspended solids	62	50-150	mg/L	APHA, 23 rd Edition 2017/ 2540-D
6.	Chloride as Cl	31.5	250	mg/L	APHA, 23 rd Edition 2017/ 4500 Cl B
7.	Total Hardness as CaCO ₃	62	200	mg/L	APHA, 23 rd Edition 2017/2340-C
8.	Calcium as Ca	16.8	75	mg/L	APHA, 23 rd Edition 2017/3500-Ca-B
9.	Magnesium as Mg,	4.86	30	mg/L	APHA, 23 rd Edition 2017/Calculation Method 3500 -Mg B

Diya
Tested By

(Sr. Analyst/Analyst)

Akbarkhan P. Jalori
Authorized Signatory

Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

----- End of Report -----



TEST REPORT

TC-10331

Customer's Name and Address:

KOTPL
OPP. SHIRVA RAILWAY CROSSING, NEAR LOC
FORESHORE TERMINALS NEW KANDLA - 370210

Format No. : 7.11 P-01
Date of : 11/04/2023
Report :
Report No : A2ZELPL/DW/04/2023/03

Description of Sample:			
Date of Sampling	: 08/04/2023	Type of Sampling	: Drinking Water
Date of Sample Received	: 08/04/2023	Sample ID	: DW/042023/03
Sampling Location of Sampling Point	: Near office area	Sample Particular	: Drinking Water
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: IS 3025 (Part-1)
Sample Quantity / Total No.	: 2 Litre / 1 Nos.	Date of Analysis Start	: 09/04/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 11/04/2023
Environment condition during the test	: 25 ± 3 °C		

Test Results

Sr. No.	Parameters	Results	STANDARD Limit	Unit	Reference Method
1.	pH @°C	7.11	6.5-8.5	-	APIHA, 23 rd Edition 2017/4500-H-B
2.	Electrical Conductivity @°C	0.36	--	mS/cm	APIHA, 23 rd Edition 2017/2510-B
3.	Temperature	25	--	°C	APIHA, 23 rd Edition 2017/2550B
4.	Total dissolved solids	306	500	mg/L	APIHA, 23 rd Edition 2017/2540-C
5.	Total Suspended solids	75	50-150	mg/L	APIHA, 23 rd Edition 2017/2540-D
6.	Chloride as Cl	37.2	250	mg/L	APIHA, 23 rd Edition 2017/4500 Cl-B
7.	Total Hardness as CaCO ₃	72	200	mg/L	APIHA, 23 rd Edition 2017/2340-C
8.	Calcium as Ca	19.2	75	mg/L	APIHA, 23 rd Edition 2017/3500-Ca-B
9.	Magnesium as Mg	5.83	30	mg/L	APIHA, 23 rd Edition 2017/Calculation Method 3500-Mg B

(Sr. Analyst/Analyst)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)



ENVIROTECH LAB PVT. LTD.



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL

OPP. SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 P-01

Date of : 21/05/2023

Report

Report No : AZZELPL/DW/05/2023/04

Description of Sample:			
Date of Sampling	: 18/05/2023	Type of Sampling	: Drinking Water
Date of Sample Received	: 18/05/2023	Sample ID	: DW/052023/04
Sampling Location of Sampling Point	: Near office area	Sample Particular	: Drinking Water
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	: IS 3025 (Part-1)
Sample Quantity /Total No.	: 2 Litre/1 Nos.	Date of Analysis Start	: 19/05/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 21/05/2023
Environment condition during the test	: 25 ± 3 °C		

Test Results

Sr. No.	Parameters	Results	STANDARD Limit	Unit	Reference Method
1.	pH @°C	7.16	6.5-8.5	-	APHA, 23 rd Edition 2017/4500-H ⁺ B
2.	Electrical Conductivity @°C	0.43	--	mS/cm	APHA, 23 rd Edition 2017/2510-B
3.	Temperature	25	--	°C	APHA, 23 rd Edition 2017/2550B
4.	Total dissolved solids	312	500	mg/L	APHA, 23 rd Edition 2017/ 2540-C
5.	Total Suspended solids	58	50-150	mg/L	APHA, 23 rd Edition 2017/ 2540-D
6.	Chloride as Cl	41	250	mg/L	APHA, 23 rd Edition 2017/ 4500 Cl B
7.	Total Hardness as CaCO ₃	76	200	mg/L	APHA, 23 rd Edition 2017/2340-C
8.	Calcium as Ca	20	75	mg/L	APHA, 23 rd Edition 2017/3500-Ca-B
9.	Magnesium as Mg	6.32	30	mg/L	APHA, 23 rd Edition 2017/Calculation Method 3500 -Mg B

Diya

(Sr. Analyst/Analyst)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

Akbar Khan

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

End of Report



ENVIROTECH LAB PVT. LTD.



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL

OPP,SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 22/12/2022

Report

Report No : AZZELPL/AA/12/2022/17

Description of Sample:

Date of Sampling	: 19/12/2022	Type of Sampling	:
Date of Sample Received	: 20/12/2022	Sample ID	: AA/122022/17
Sampling Location of Sampling Point	: NEAR JETTY AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper ISO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 21/12/2022
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 21/12/2022
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: AZZELPL/RDS/01 AZZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	77.53	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	24.96	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	12.49	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	15.01	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By

(Sr. Analyst/Analyst)

Akbar Khan P. Jalori

Authorized Signatory

Akbar Khan P. Jalori

(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP,SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 22/12/2022

Report

Report No : A2ZELPL/AA/12/2022/16

Description of Sample:			
Date of Sampling	: 19/12/2022	Type of Sampling	:
Date of Sample Received	: 20/12/2022	Sample ID	: AA/122022/16
Sampling Location of Sampling Point	: NEAR TANK FARM AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 21/12/2022
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 21/12/2022
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: A2ZELPL/RDS/01 A2ZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	77.02	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	29.99	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	13.36	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	14.96	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL

OPP,SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 13/01/2023

Report

Report No : A2ZELPL/AA/01/2023/03

Description of Sample:			
Date of Sampling	: 10/01/2023	Type of Sampling	:
Date of Sample Received	: 11/01/2023	Sample ID	: AA/012023/03
Sampling Location of Sampling Point	: NEAR TANK FARM AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 12/01/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 12/01/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: A2ZELPL/RDS/01 A2ZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	94.92	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	34.99	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	13.36	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	16.66	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Tested By
(Sr. Analyst/Analyst)Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:
KOTPL
OPP, SHIRVA RAILWAY CROSSING, NEAR LOC
FORESHORE TERMINALS NEW KANDLA - 370210

Format No. : 7.8 F-01
Date of : 12/01/2023
Report
Report No : A2ZELPL/AA/01/2023/04

Description of Sample:			
Date of Sampling	: 10/01/2023	Type of Sampling	:
Date of Sample Received	: 11/01/2023	Sample ID	: AA/012023/04
Sampling Location of Sampling Point	: NEAR JETTY AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: ----
Sample Quantity / Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 12/01/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 12/01/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: A2ZELPL/RDS/01 A2ZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	77.02	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	32.49	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	12.53	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	16.57	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report

A2Z Envirotech Lab Pvt. Ltd.
Plot No. 340, Sector 1A, 2nd Floor,
Shiv House, Near Oslo Circle,
Gandhidham - Kachchh, Gujarat - 370201

Branch:
147, Time Square Empire
Mirjapur Road, Bhuj - Kachchh
Gujarat - 370001

NABL / TC-10331
GST : 24AAUCA0391F120
info@a2zenvirotechlab.com
www.a2zenvirotechlab.com

Akbarkhan Jalori
+ 91 98987 11906



ENVIROTECH LAB PVT. LTD.



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL

OPP,SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 16/02/2023

Report

Report No : AZZELPL/AA/02/2023/03

Description of Sample:

Date of Sampling	: 13/02/2023	Type of Sampling	:
Date of Sample Received	: 14/02/2023	Sample ID	: AA/022023/03
Sampling Location of Sampling Point	: NEAR TANK FARM AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 15/02/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 15/02/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: AZZELPL/RDS/01 AZZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	98.38	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	34.71	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	6.80	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	10.89	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajet

Tested By
(Sr. Analyst/Analyst)

Jalori

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP. SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA - 370210

Format No. : 7.B F-01

Date of : 16/02/2023

Report

Report No. : A2ZELPL/AA/02/2023/04

Description of Sample:

Date of Sampling	: 13/02/2023	Type of Sampling	:
Date of Sample Received	: 14/02/2023	Sample ID	: AA/022023/04
Sampling Location of Sampling Point	: NEAR JETTY AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity / Total No.	: 2 Filter paper ISO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 15/02/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 15/02/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: A2ZELPL/RDS/01 A2ZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	70.04	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	27.06	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	6.72	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	9.95	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 16/03/2023

Report

Report No : AZZELPL/AA/03/2023/03

Description of Sample:

Date of Sampling	: 13/03/2023	Type of Sampling	:
Date of Sample Received	: 14/03/2023	Sample ID	: AA/032023/03
Sampling Location of Sampling Point	: NEAR TANK FARM AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 15/03/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 15/03/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: AZZELPL/RDS/01 AZZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	89.96	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	34.95	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	4.39	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	13.32	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rayat

Tested By
(Sr. Analyst/Analyst)

Akbar Khan P. Jalori

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A Z Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 16/03/2023

Report

Report No : AZZELPL/AA/03/2023/04

Description of Sample:

Date of Sampling	: 13/03/2023	Type of Sampling	:	
Date of Sample Received	: 14/03/2023	Sample ID	:	AA/032023/04
Sampling Location of Sampling Point	: NEAR JETTY AREA	Sample Particular	:	AMBIENT AIR
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	:	-----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	:	15/03/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	:	15/03/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	:	Clear Sky
Instrument code	: AZZELPL/RDS/01 AZZELPL/FDS/01	Actual Duration of Monitoring (Hours)	:	24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	80.54	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	29.96	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	4.27	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	12.16	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat
Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori
Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 11/04/2023

Report

Report No : AZZELPL/AA/04/2023/01

Description of Sample:			
Date of Sampling	: 08/04/2023	Type of Sampling	:
Date of Sample Received	: 09/04/2023	Sample ID	: AA/042023/01
Sampling Location of Sampling Point	: NEAR TANK FARM AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 10/04/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 10/04/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: AZZELPL/RDS/01 AZZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	82.33	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	32.49	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	6.69	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	11.23	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

- The results relate only to the items tested and for applicable parameter
- This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
- Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP. SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 11/04/2023

Report

Report No : A2ZELPL/AA/04/2023/02

Description of Sample:

Date of Sampling	: 08/04/2023	Type of Sampling	:
Date of Sample Received	: 09/04/2023	Sample ID	: AA/042023/02
Sampling Location of Sampling Point	: NEAR JETTY AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 10/04/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 10/04/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: A2ZELPL/RDS/01 A2ZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	81.71	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	33.74	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	7.01	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	11.90	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By
(Sr. Analyst/Analyst)

Akbar Khan P. Jalori

Authorized Signatory
Akbar Khan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.

TEST REPORT



TC-10331

Customer's Name and Address:

KOTPL

OPP, SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA - 370210

Format No. : 7.B P-01

Date of : 21/05/2023

Report

Report No : AZZELPL/AA/05/2023/03

Description of Sample:

Date of Sampling	: 18/05/2023	Type of Sampling	:	
Date of Sample Received	: 19/05/2023	Sample ID	:	AA/052023/03
Sampling Location of Sampling Point	: NEAR TANK FARM AREA	Sample Particular	:	AMBIENT AIR
Sample Collected / Submitted by	: AZZELPL Team Member	Reference Method for Sampling	:	-----
Sample Quantity /Total No.	: 2 Filter paper ISO ₂ × 35 ml, INO ₂ × 35 ml.	Date of Analysis Start	:	20/05/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	:	20/05/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	:	Clear Sky
Instrument code	: AZZELPL/RDS/01 AZZELPL/FDS/01	Actual Duration of Monitoring (Hours)	:	24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	77.62	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	32.29	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	12.52	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	15.03	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rejet

Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A Z Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report



ENVIROTECH LAB PVT. LTD.



TC-10331

TEST REPORT

Customer's Name and Address:

KOTPL

OPP. SHIRVA RAILWAY CROSSING, NEAR LOC

FORESHORE TERMINALS NEW KANDLA -370210

Format No. : 7.8 F-01

Date of : 21/05/2023

Report

Report No : A2ZELPL/AA/05/2023/04

Description of Sample:			
Date of Sampling	: 18/05/2023	Type of Sampling	:
Date of Sample Received	: 19/05/2023	Sample ID	: AA/052023/04
Sampling Location of Sampling Point	: NEAR JETTY AREA	Sample Particular	: AMBIENT AIR
Sample Collected / Submitted by	: A2ZELPL Team Member	Reference Method for Sampling	: -----
Sample Quantity /Total No.	: 2 Filter paper 1SO ₂ × 35 ml, 1NO ₂ × 35 ml.	Date of Analysis Start	: 20/05/2023
Details of Packing/Label/Seal	: Satisfactory	Date of Analysis Completion	: 20/05/2023
Environment condition during the test	: 25 ± 3 °C	Metrological conditions during monitoring	: Clear Sky
Instrument code	: A2ZELPL/RDS/01 A2ZELPL/FDS/01	Actual Duration of Monitoring (Hours)	: 24

Test Results

Sr. No.	Parameters	Results	Unit	NAAQS LIMITS	Reference Method
1.	Particulate Matter PM ₁₀	78.18	µg/m ³	100 µg/m ³	IS 5182 (Part 23)2006/ Reaffirmed 2017
2.	Particulate Matter PM _{2.5}	31.95	µg/m ³	60 µg/m ³	IS 5182 (Part 24)2019
3.	Sulfur Dioxide SO ₂	12.33	µg/m ³	80 µg/m ³	IS 5182 (Part 2)2001/ Reaffirmed 2017
4.	Nitrogen Dioxide NO ₂	16.01	µg/m ³	80 µg/m ³	IS 5182 (Part 6)2006/ Reaffirmed 2017

Rajat

Tested By
(Sr. Analyst/Analyst)

Akbarkhan P. Jalori

Authorized Signatory
Akbarkhan P. Jalori
(Quality Manager)

This Report is issued under the following terms & Condition:

1. The results relate only to the items tested and for applicable parameter
2. This Test report shall not to be reproduced in full or part for any promotional or publicity and can't be used as evidence in court of law without the written consent of A 2 Z Envirotech Lab Private Limited
3. Reanalysis of the sample will be done if requested Within 15 days from the date of reporting of sample if the samples are not consumed during analysis.

End of Report

Site Photographs



Annexure -B

Annexure 1

CURRENT STATUS OF WORK (up to May, 2023)

Subject: Development of 7 integrated facilities (Stage I) within existing Deendayal Authority at Kandla.

Name of Project	Status
1. Development of oil jetty to handle liquid cargo and ship bunkering terminal at old Kandla under PP mode (jetty: 300m x 15m, approach 450 m X 10 m, back up area 5.5 HA, capacity – 3.39 MMTPA, capital dredging 1,73,660 m ³ maintenance dredging 1,56,294 m ³ (Estimated cost: 276.53 Cr.)	The Concession Agreement was executed between DPA and M/s KOTPL on 16/11/2013 to implement the project on Built, Transfer & Operate (BOT-PPP) Basis by M/s KOTPL. The award of concession was issued on 11/12/2020 to M/s KOTPL by DPA. The Project is under construction phase.
2. Multipurpose Cargo Terminal at Tekra off Tuna on BOT basis (T shape jetty 600m X 80 m Capacity 18 MMTPA, back up area 101 Ha capital dredging 1,26,57,175 m ³ maintenance dredging 18,98,576. 25 m ³ Estimated cost: 1686.66 Cr.	The Board of DPA approved the Feasibility Report in its meeting on 19.02.2021. The MoPSW,GoI vide communication dated 21/10/2022 has conveyed approval granted by the Cabinet Committee on Economic Affairs to the project. The project is under bidding stage. <u>No construction activity has started yet.</u>
3. Up gradation of Barge handling capacity at Bundar basis at Kandla capacity 3.33 MMTA back-up area 5 Ha, Estimated cost: 109.59 Cr.	The up-gradation work was completed.
4. Construction of Rail over Bridge at NH 8 A near Nakti Bridge (crossing of NH 8 A Estimated cost: 32.17 Cr.	Construction activity has not yet started.
5. Mechanization of Dry Cargo handling capacity at Kandla Port (Berth 7 and 8 capacity 7.35 MMTPA estimated cost 80.61 Cr.	Mechanization work already completed.
6. Strengthening of Oil jetty 1 (Estimated cost: 7.5 Cr.	The strengthening work completed.
7. Modification and strengthening of Cargo berth No. 6 at Kandla Port Estimated cost: 11.5 Cr.	The modification & strengthening work completed.

Out of a total of 7 project activities, construction activities of 4 projects (i.e. Sr. No. 3, 5, 6 & 7 mentioned in the EC & CRZ Clearance) have already been completed. Whereas construction activity of the project at Sr. No. 2 & 4 have not yet started.

For the current compliance period up to May, 2023, construction activity related to project No. 1 is ongoing. The compliance report submitted by the Concessionaire M/s KOTPL is attached herewith as Annexure A.

COMPLIANCE REPORT (for the period up to May 2023)

Subject: Status of Compliance with the conditions stipulated By Gujarat State Coastal Zone Management Authority, Gandhinagar, in CRZ Recommendation Letter granted for “**Development of 7 integrated facilities (Stage I) within existing Deendayal Authority at Kandla**”.

CRZ Recommendations: Letter No. ENV-I0-2014-25-E dated July 1, 2015, of Director (Environment) & Member Secretary, GCZMA, Forest & Environment Department, GoG.

**Note: Based on the recommendation of the GCZMA, MoEF&CC, GoI had accorded Environmental & CRZ Clearance vide letter dated 19/12/2016*

Sr. No.	Conditions in CRZ Recommendation Letter	Compliance
	Specific Conditions	
1	The provisions of the CRZ notification of 2011 and subsequent amendments issued from time to time shall be strictly adhered to by the KPT. No activity in contradiction to the Provisions of the CRZ Notification shall be carried out by the KPT.	a) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A . b) Further, w.r.t. project at Sr. No. 2 & 4 (construction not yet started), it is assured that no activity in contradiction to the Provisions of the CRZ Notification shall be carried out by DPA.
2	The KPT shall have to ensure that there shall not be any damage to the existing mangrove area.	a) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A . b) Further, w.r.t. project at sr.no. 2 & 4 (construction not yet started), it is assured that due care shall be taken to protect the existing mangrove area.
3	The KPT shall prepare an emergency plan to protect existing mangroves in case of any eventuality/accident.	The final report submitted by M/s GUIDE, Bhuj (vide letter dated 21/5/2018) had already been communicated to the MoEF&CC, GoI, Bhopal & copy to the MoEF&CC, GoI, New Delhi, along with six monthly compliance report submitted vide letter dated 21/06/2018.
4	The KPT shall have to make a provision that mangrove areas get proper flushing water and free flow of water shall not be obstructed.	a) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A . b) Further, w.r.t. project at sr.no. 2 & 4 (construction not yet started), it is assured that provisions shall be made that mangrove areas get proper flushing water and free flow of water shall not be obstructed.

5	The KPT shall have to abide by whatever decision is taken by the GCZMA for violations of CRZ Notification, 2011.	<p>a) Point noted. DPA will abide by whatever decision is taken by the GCZMA for violations of CRZ Notification, 2011.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
6	There shall not be violations of the order dated 9/12/2013 passed by the National Green Tribunal; and accordingly, there shall be no mangrove destruction taking place in the KPT area.	<p>a) Point Noted. It is hereby assured that due care shall be taken to protect the existing mangrove area.</p> <p>b) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
7	No dredging, reclamation or any other project-related activities shall be carried out in the CRZ area categorised as CRZ I (i), and it shall have to be ensured that the mangrove habitats and other ecologically important and significant areas, if any, in the region are not affected due to any of the project activity.	<p>a) It is hereby assured that DPA will undertake only such project activities (7 project activities) recommended by the GCZMA vide letter dated 1/7/2015 and EC & CRZ Clearance accorded by the MoEF&CC, GoI vide letter dated 19/12/2016.</p> <p>DPA issued a work order to M/s GUIDE vide its letter no. EG/WK/ 4751 /Part (Marine Ecology Monitoring) /11 dated 03/05/2021 for Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs for the period 2021-24. The second season report for the year 2022-2023 submitted is attached herewith as Annexure B.</p> <p>b) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
8	The KPT shall participate financially in installing and operating the Vessel Traffic Management System in the Gulf of Kachchh and shall also take the lead in preparing and operational sing and updating regularly after getting it vetted by the Indian Coast Guard.	Deendayal Port Authority had already contributed Rs. 41.25 crores, i.e. 25% of the total project cost of 165 crores for installing and operating the VTMS in the Gulf of Kachchh.
9	The KPT shall strictly ensure that no creeks or rivers are blocked due to any activity at Kandla.	<p>a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p> <p>b) Further, w.r.t. project at sr.no. 2 & 4 (construction not yet started), it is assured that</p>

		no creeks or rivers shall be blocked due to any activity at Kandla.
10	Mangrove plantation in an area of 100 ha. Shall be carried out by the KPT within 2 years in time bound manner on Gujarat coastline either within or outside the Kandla port Trust area, and a six-monthly compliance report along with the satellite images shall be submitted to the Ministry of Environment and Forest as well as to this Department without fail.	<p>DPA has undertaken Mangrove Plantation in an area of 1600 Hectares since the year 2005 including the additional mangrove plantation of 100 ha. carried out through Gujarat Ecology Commission vide Work Order No. DD/WK/3050/Pt-I/GIM/PC-44 dated 02/06/2022. The copy of the details has already been communicated with the earlier compliance reports submitted.</p> <p>In addition to the above, DPA appointed M/s GUIDE, Bhuj, for "Regular Monitoring of Mangrove Plantation carried out by DPA" (period 15/9/2017 to 14/9/2018 vide work order dated 1/9/2017 and 24/5/2021 to 23/5/2022 vide work order dated 3/5/2021). The final report submitted by M/s GUIDE, Bhuj, for the years 2017 to 2018 as well as for the year 2021 to 2022 has been submitted in the earlier compliance report submitted.</p>
11	No activities other than those permitted by the competent authority under the CRZ Notification shall be carried out in the CRZ area.	<p>a) Point Noted. It is assured that only activities permitted by the competent authority under the CRZ Notification shall be carried out in the CRZ area.</p> <p>b) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p>
12	No groundwater shall be tapped for any purpose during the proposed expansion modernization activities.	<p>a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p> <p>b) Further, w.r.t. Project at Sr. no.2 & 4 (construction not yet started), Water requirement will be met through procurement from GWSSB or private tankers. No ground water shall be tapped.</p>
13	All necessary permissions from different Government Departments/agencies shall be obtained by the KPT before commencing the expansion activities.	DPA had already obtained the necessary Environmental & CRZ Clearance for 7 project activities (dated 19.12.2016). Further, Consent to Establish from GPCB had already been obtained from GPCB for 7 project activities. Moreover, DPA had obtained CTE validity extension (CTE-125870) from GPCB vide Order dated 27/04/2023 with validity up to 15/11/2025 (Copy enclosed as Annexure C).
14	No effluent or sewage shall be discharged	a) For completed projects (modification/

	<p>into sea/creek or in the CRZ area and it shall be treated to conform to the norms prescribed by the GPCB and would be reused /recycled within the plant premises.</p>	<p>strengthening/ up-gradation of existing facilities), Sewage is being treated in the STP of Kandla (1.5 MLD). The treated sewages from STP of DPA are utilized for plantation / Gardening.</p> <p>For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure D.</p> <p>b) Further, w.r.t. Project at Sr.No.1, kindly refer to the Monitoring reports submitted by M/s KOTPL along with compliance report placed at Annexure A.</p>
15	<p>All the recommendations and suggestion given by the MANTEC Consultants Pvt. Ltd. in their Comprehensive Environment Impact Assessment report for conservation / protection and betterment of environment shall be implemented strictly by the KPT.</p>	<p>DPA has installed Mist Canon at the Port area to minimize the dust.</p> <p>Further, DPA has already installed continuous sprinkling system in coal stack yard in DPA (40 ha. area) for to prevent dust pollution. Further, to control dust pollution in other area, regular sprinkling through tankers on roads and other staking yards is being done. Regular sweeping of spilled cargo from roads is done by parties on regular basis.</p> <p>For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure D.</p> <p>For ship waste management, DPA issued Grant of License/Permission to carry out the work of collection and disposal of "Hazardous Waste/Sludge/ Waste Oil" and "Dry Solid Waste (Non- Hazardous)" from Vessels calling at Deendayal Port" through DPA contractors. Further, it is to state that, all ships are required</p>

to follow DG Shipping circulars regarding the reception facilities at Swachh Sagar portal.

Further, DPA has appointed GEMI, Gandhinagar for the work of "Preparation of Plan for Management of Plastic Wastes, Solid Waste, including C&D waste, E-waste, Hazardous waste, including Biomedical and Non-Hazardous Waste in the Deendayal Port Authority" vide Work Order dated 24/01/2023. The work is in progress.

DPA assigned work to M/s GUIDE, Bhuj, for regular monitoring of Marine Ecology since the year 2017 (From 2017 - 2021), and final reports of the same submitted by GUIDE, Bhuj has already been communicated to the Regional Office, MoEF&CC, GoI, Gandhinagar as well as to the MoEF&CC, GoI, New Delhi along with compliance reports submitted.

Further, it is to submit that DPA issued a work order to M/s GUIDE vide its letter no. EG/WK/4751 /Part (Marine Ecology Monitoring) /11 dated 03/05/2021 for Regular monitoring of Marine Ecology in and around Deendayal Port Authority (Erstwhile Deendayal Port Trust) and continuous Monitoring Program covering all seasons on various aspects of the Coastal Environs for the period 2021-24. The second season report for the year 2022-2023 submitted is attached herewith as **Annexure B**.

As already informed, DPA entrusted work of green belt development in and around the Port area to the Forest Department, Gujarat at Rs. 352 lakhs (Area 32 hectares). The work is completed.

Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site' (Phase-I)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The final report submitted by GUIDE, Bhuj is attached herewith as **Annexure E**.

For dredged material management, DPA assigned work to M/s GUIDE, Bhuj for analysis of dredged material since the year 2017 and the reports are being submitted from time to

		<p>time along with compliance reports submitted. The final Report submitted by M/s GUIDE, Bhuj for the period 2021-2022 is attached herewith as Annexure F.</p> <p>Further, Dredged Material will be disposed of at designated location as identified by the CWPRS, Pune.</p> <p>For energy conservation measures, DPA is already generating 20 MW of Wind energy. In addition to it, DPA has commissioned a 45 kWp Solar Plant at Gandhidham. Further, it is relevant to mention that, two out of four Nos. of Harbour Mobile Crane (HMC) made electric operated. Balance 02 Nos. shall be made electric operated by 2023-2024. Four Nos. of Diesel operated RTGs converted to e-RTGs. Retrofitting of hydrogen fuel cell in Tug Kalinga and Pilot Boat Niharika to be done as a pilot project under the guidance of MoPSW. Also, 14 Nos. of EV cars to be hired in this year and 03 Nos. EV Bus to be procured by the year 2023-24.</p> <p>Further, for Oil Spill Management, DPA is already having Oil Spill Contingency Plan in place and Oil Response System as per the NOS-DCP guidelines.</p>
16	The construction and operational activities shall be carried out in such a way that there is no negative impact on mangroves and other coastal /marine habitats. The construction activities and dredging shall be carried out only under the constant supervision and guidelines of the Institute of National repute like NIOT.	<p>a) For Project at Sr. No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p> <p>b) For the remaining projects Sr. No 2 & 4 (construction not yet started), it is assured that construction activities and dredging shall be carried out only under the constant supervision and guidelines of the Institute of National repute like NIOT.</p>
17	The KPT shall contribute financially for any common study or project that may be proposed by this Department for environmental management / conservation / improvement for the Gulf of Kutch.	Point noted.
18	The construction debris and / or any other of waste shall not be disposed of into the sea, creek or the CRZ areas. The debris shall be removed from the construction site immediately after the construction is over.	<p>a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p> <p>b) Further, w.r.t. project at sr.no. 2 & 4 (construction not yet started), it is assured that</p>

		construction debris and/ or any other of waste shall not be disposed of into the sea, creek or the CRZ areas, and the debris shall be removed from the construction site immediately after the construction is over.
19	The construction camps shall be located outside the CRZ area and the construction labour shall be provided with the necessary amenities, including sanitation, water supply and fuel and it shall be ensured that the environmental conditions are not deteriorated by the construction labours.	<p>a) No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p> <p>b) Further, w.r.t. project at sr.no. 2 & 4 (construction not yet started), it is assured that, the construction camps shall be located outside the CRZ area, provision of the necessary amenities, including sanitation, water supply and fuel to the construction labour shall be made, and that the environmental conditions are not deteriorated by the construction labours.</p>
20	The KPT shall regularly updates its Local Oil Spill Contingency and Disaster management Plan in accordance with the National Oil Spill and Disaster Contingency Plan and shall submit the same to the MoEF, GoI and this department after having it vetted through the Indian Coast Guard.	<ul style="list-style-type: none"> ▪ Deendayal Port already has an updated Disaster Management Plan. ▪ Further, the Local Oil Spill Contingency Plan is already available with Deendayal Port Trust. ▪ DPT has also executed MOU with Oil Companies, i.e. IOCL, HPCL, BPCL etc., for combating the Oil Spill at Kandla
21	The KPT shall bear the cost of the external agency that may be appointed by this Department for supervision/monitoring of proposed activities and the environmental impacts of the proposed activities.	Point noted.
22	The KPT shall take up massive greenbelt development activities in and around Kandla and also within the KPT limits.	<p>DPA has planted about one lakhs trees in roadside dividers, colony areas at Kandla and Gopalpuri, in the green belt area of Gandhidham & Adipur Township, Sewage Treatment Plants at Gopalpuri & Kandla and some green belt development plans initiated at different locations in Township areas.</p> <p>DPA entrusted work of green belt development in and around the Port area to the Forest Department, Gujarat, at the cost of Rs. 352 lakhs (Area 32 hectares). The plantation is completed.</p> <p>Further, DPA has appointed the Gujarat Institute of Desert Ecology (GUIDE) for "Green belt development in Deendayal Port Authority and its Surrounding Areas, Charcoal site'</p>

		(Phase-I)" vide Work Order No.EG/WK/4757/Part [Greenbelt GUIDE, dated 31st May 2022. The final report submitted by GUIDE, Bhuj is attached herewith as Annexure E .
23	The KPT shall have to contribute financially for taking up the socio-economic upliftment activities in this region in construction with the Forest and Environment Department and the District Collector/District Development Officer.	The details of the fund earmarked under CSR activities and CSR activities undertaken by DPA to date & proposed activities are placed at Annexure G .
24	A separate budget shall be earmarked for environmental management and socioeconomic activities and details thereof shall be furnished to this Department as well as the MoEF, GOI. The details with respect to the expenditure from this budget head shall also be furnished.	<p>a) The allocation made under the "Environmental Services & Clearance of other related Expenditure" during BE 2023-24 is Rs. 274 Lakhs.</p> <p>b) The funds earmarked for EMP by the Concessionaire M/s KOTPL w.r.t. project at Sr.No. 1 are delineated in the compliance report submitted (Annexure A).</p>
25	A separate environmental management cell with qualified personnel shall be created for environmental monitoring and management during the construction and operational phases of the project.	<p>a) For Project at Sr.No. 1 which is under construction, kindly refer compliance submitted by M/s KOTPL (concessionaire of the project) placed at Annexure A.</p> <p>b) DPA is already having Environment Management cell. Further, DPA has also appointed expert agency for providing Environmental Experts from time to time. Recently, DPA appointed M/s Precitech Laboratories, Vapi for providing Environmental Experts vide work order dated 5/2/2021. In addition, it is relevant to submit here that, DPA has appointed Manager (Environment) on contractual basis for the period of 3 years and further extendable to 2 years (Copy of the details has already been communicated with the last compliance report submitted).</p> <p>For monitoring of environmental parameters, DPA has been appointing NABL Accredited laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure D.</p>
26	An Environmental report indicating the changes, if any, with respect to the	For monitoring of environmental parameters, DPA has been appointing NABL Accredited

	baseline environmental quality in the coastal and marine environment shall be submitted every year by the KPT to this Department as well as to the MoEF&CC, GOI.	laboratory and reports are being submitted from time to time to the GPCB, IRO, MoEF&CC, GoI, Gandhinagar. Recently, DPA appointed GEMI, Gandhinagar for regular monitoring of environmental parameters vide Work Order dated 15/02/2023. The work is in progress and the latest environmental monitoring report submitted by GEMI, Gandhinagar is attached herewith as Annexure D .
27	The KPT shall have to contribute financially to support the National Green Corps Scheme being implemented in Gujarat by the GEER Foundation, Gandhinagar, in construction with Forests and Environment Department.	Point Noted.
28	A six-monthly report on compliance of the conditions mentioned in this letter shall have to be furnished by the KPT on regular basis to this department/MoEF, GOI.	DPA has been submitting the six-monthly compliance report of the conditions stipulated in CRZ recommendation to GCZMA and IRO, MoEF&CC, GoI, Gandhinagar.
29	Any other condition that may be stipulated by this department from time to time for environmental protection/management purpose shall also have to be complied with by the KPT.	Point noted.

Annexure -C

Environmental Monitoring Report (EMR) prepared under “Preparing and monitoring of environmental monitoring and management plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years”

Monitoring period (17th April-16th May, 2023)

Document Ref No.: GEMI/DPA/782(2)/2023-24/18



Submitted to:

Deendayal Port Authority (DPA), Kandla



Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

GEMI Bhavan, 246-247, GIDC Electronic Estate, Sector-25, Gandhinagar-382025

“AN ISO 9001:2015, ISO 14001:2015 AND ISO 45001:2018 Certified Institute”



© Gujarat Environment Management Institute (GEMI)

All rights reserved. This "Environment Monitoring Report (17th April-16th May, 2023)" is prepared as a part of the project "Preparing and monitoring of Environmental monitoring and Management plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years". No part of this report may be reproduced, distributed or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of Director, Gujarat Environment Management Institute (GEMI).

Disclaimer:

Gujarat Environment Management Institute (GEMI) has taken all reasonable precautions in the preparation of this report. The data presented in this report have been collected as per the relevant Standard Operating Procedures, Protocols and Guidelines. GEMI believes that the information and facts presented in the report are accurate as on the date it was written. However, it is impossible to dismiss absolutely, the possibility of errors or omissions. GEMI therefore specifically disclaims any liability resulting from the use or application of the information contained in this report. The information is not intended to serve as legal advice related to the individual situation.

About this Document

Gujarat Environment Management Institute (GEMI) has been assigned with the work of “Preparing and monitoring of Environmental monitoring and Management plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years” by Deendayal Port Authority, Kandla. Under the said project the report titled “*Environment Monitoring Report (17April-16May 2023)*” is prepared.

- **Name of the Report:** *Environment Monitoring Report (April-May 2023)*
- **Date of Issue:** 21/08/2023
- **Version:** 2.0
- **Report Ref.:** GEMI/DPA/782(2)/2023-24/18

Table of Contents

CHAPTER 1: INTRODUCTION	1
1.1 Introduction	2
1.2 Green Ports Initiative	2
1.3 Importance of EMP	3
1.4 Objectives and scope of the Study	4
CHAPTER 2: METHODOLOGY	7
2.1 Study Area:	8
a. Kandla:	8
b. Vadinar:	8
2.2 Methodology adopted for the study	13
2.3 Environmental Monitoring at Kandla and Vadinar	14
CHAPTER 3: METEOROLOGY MONITORING	15
3.1 Meteorology Monitoring	16
3.2 Methodology	16
3.3 Results:	17
CHAPTER 4: AMBIENT AIR QUALITY MONITORING	21
4.1 Ambient Air Quality	22
4.2 Methodology adopted for the Study	22
4.3 Result and Discussion:	26
4.4 Conclusion:	34
4.5 Suggestive Measures to control the air pollution:	34
CHAPTER 5: NOISE MONITORING	37
5.1 Noise Monitoring	38
5.2 Method of sampling and analysis:	41
5.3 Result and Discussion	42
5.4 Data Interpretation:	43
5.5 Conclusion	43
5.6 Measures against adverse effects	44
CHAPTER 6: DRINKING WATER MONITORING	45
6.1 Drinking Water Monitoring	46
6.2 Methodology of Monitoring:	49

6.3	Conclusion Result and discussion:	51
6.4	Data Interpretation:.....	54
6.5	Conclusion	55
CHAPTER 7: DG STACK MONITORING		57
7.1	DG Stack Monitoring.....	58
7.2	Method of sampling and analysis:.....	61
CHAPTER 8: SOIL QUALITY MONITORING		63
8.1	Soil Quality Monitoring:	64
8.2	Methodology of Monitoring:.....	67
8.3	Result and Discussion	69
8.4	Data Interpretation:.....	70
8.5	Conclusion:	72
8.6	Measures against adverse effects	72
CHAPTER 9: SEWAGE TREATMENT PLANT MONITORING		73
9.1	Sewage Treatment Plant (STP) Monitoring:.....	74
9.2	Methodology of Monitoring:.....	80
9.3	Result and Discussion	80
9.4	Data Interpretation:.....	82
9.5	Conclusions:.....	83
9.6	Remedial Measures:.....	83
CHAPTER 10: MARINE WATER QUALITY MONITORING		85
10.1	Marine Water:.....	86
10.2	Methodology.....	89
10.3	Result and Discussion	90
10.4	Data Interpretation:.....	92
10.5	Conclusion	93
10.6	Measures against adverse effects	94
CHAPTER 11: MARINE SEDIMENT QUALITY MONITORING		95
11.1	Marine Sediment Monitoring:.....	96
11.2	Result and Discussion	99
11.3	Data Interpretation.....	100
11.4	Conclusion:	102

CHAPTER 12: MARINE ECOLOGY MONITORING	103
2.4 Marine Ecological Monitoring.....	104
2.5 Sampling Methodology	107
2.6 Result and Discussion and Conclusion.....	111
Annexure 1: Photographs of the Environmental Monitoring conducted at Kandla and Vadinar for April-May 2023	118

List of Tables

Table 1: Details of Automatic Weather Station.....	16
Table 2: Automatic Weather Monitoring Station details	16
Table 3: Meteorological data for Kandla and Vadinar.....	17
Table 4: Details of Ambient Air monitoring locations	22
Table 5: Parameters for Ambient Air Quality Monitoring.....	26
Table 6: Summarized results of PM ₁₀ for Ambient Air quality monitoring	26
Table 7: Summarized results of PM _{2.5} for Ambient Air quality monitoring.....	28
Table 8: Summarized results of SO _x for Ambient Air quality	29
Table 9: Summarized results of NO _x for Ambient Air quality monitoring.....	30
Table 10: Summarized results of Carbon Monoxide for Ambient Air quality monitoring	31
Table 11: Summarized results of Total VOC for Ambient Air quality monitoring	32
Table 12: Summarized results of Benzene for Ambient Air quality monitoring	33
Table 13: Summarized results of Polycyclic Aromatic Hydrocarbon.....	33
Table 14: Summarized results of Non-methane VOCs (µg/m ³).....	34
Table 15: Details of noise monitoring locations	38
Table 16: Details of the Noise Monitoring that carried out at Kandla and Vadinar.....	41
Table 17: Ambient Air Quality norms in respect of Noise	41
Table 18: The results of Ambient Noise Quality	42
Table 19: Details of Drinking Water Sampling Locations	46
Table 20: List of parameters for Drinking Water Quality monitoring.....	49
Table 21: Summarized Result of Drinking Water quality	51
Table 22: Details of DG Set monitoring locations.....	58
Table 23: Parameters to be monitored under the study.....	61
Table 24: Standards for stack emission	61

Table 25: Details of the Soil quality monitoring locations.....	64
Table 26: List of parameters to be monitored for Soil Quality.....	67
Table 27: Results of Soil Quality.....	69
Table 28: Classification of soil parameters as mentioned in Hand Book of Agriculture	70
Table 29: Details of the monitoring locations of Sewage Water Treatment Plants	74
Table 30: Norms of treated effluent as per CC&A for Kandla.....	74
Table 31: Norms of treated effluent as per CC&A for Vadinar	77
Table 32: List of parameters monitored for STP's at Kandla and Vadinar	80
Table 33: Water Quality of inlet and outlet of STPs for Kandla	81
Table 34: Water Quality of inlet and outlet of STP for Vadinar	81
Table 35: Details of the sampling locations for Marine water	86
Table 36: List of parameters monitored for Marine Water.....	89
Table 37: Results of Analysis of Marine Water Sample	91
Table 38: Details of the sampling locations for Marine water	96
Table 39: List of parameters to be monitored for Sediments at Kandla and Vadinar	99
Table 40: Summarized Results of Marine Sediment Quality	100
Table 41: Standard Guidelines applicable for heavy metals in sediments.....	101
Table 42: Comparison of Heavy metals with Standard value in marine sediment	101
Table 43: Details of the sampling locations for Marine Ecological	104
Table 44: List of parameters to be monitored for Marine Ecological Monitoring.....	107
Table 45: Summarized Results of Biomass, Net Primary Productivity (NPP), Gross Primary Productivity (GPP), Pheophytin and Chlorophyll	111
Table 46: Phytoplankton variations in abundance and diversity in sub surface sampling stations.....	112
Table 47: Species richness Index and Diversity Index in Phytoplankton	113
Table 48: Zooplankton variations in abundance and diversity in sub surface sampling stations	114
Table 49: Species richness Index and Diversity Index in Zooplankton.....	115
Table 50: Benthic Fauna variations in abundance and diversity in sub surface sampling stations at Kandla and Vadinar.....	116
Table 51: Species richness Index and Diversity Index in Benthic Organism.....	117

List of Figures

Figure 1: Locations Map of Kandla and Vadinar	10
Figure 2: Map of Kandla Port	11
Figure 3: Map of Vadinar Port.....	12
Figure 4: Location Map for Ambient Air Monitoring at Kandla.....	23
Figure 5: Location Map for Ambient Air Monitoring at Vadinar	24
Figure 6: Location Map for Noise Monitoring at Kandla	39
Figure 7: Location Map for Noise Monitoring at Vadinar	40
Figure 8: Location Map for Drinking Water Monitoring for Kandla.....	47
Figure 9: Location Map for Drinking Water Monitoring at Vadinar	48
Figure 10: Location Map for DG Set monitoring at Kandla	59
Figure 11: Location Map for DG Set monitoring at Vadinar	60
Figure 12: Location Map for Soil Quality Monitoring at Kandla	65
Figure 13: Location Map for Soil Quality Monitoring at Vadinar.....	66
Figure 14: Process flow diagram of Kandla STP.....	75
Figure 15: Process flow diagram of Gopalpuri STP	76
Figure 16: Process flowchart for the Vadinar STP.....	77
Figure 17: Location Map for STP Monitoring at Kandla	78
Figure 18: Location Map for STP Monitoring at Vadinar.....	79
Figure 19: Location Map for Marine Water Monitoring at Kandla.....	87
Figure 20: Location Map for Marine Water Monitoring at Vadinar	88
Figure 21: Location Map of Marine Sediment Monitoring at Kandla	97
Figure 22: Locations Map of Marine Sediment Monitoring at Vadinar	98
Figure 23: Locations Map of Marine Ecological Monitoring at Kandla	105
Figure 24: Locations Map of Marine Ecological Monitoring at Vadinar.....	106

List of Graphs

Graph 1: Spatial trend in PM ₁₀ Concentration at Monitoring locations	27
Graph 2: Spatial trend in PM _{2.5} Concentration at Monitoring locations	28
Graph 3: Spatial trend in SO _x Concentration at Monitoring locations	29
Graph 4: Spatial trend in NO _x Concentration at Monitoring locations	30
Graph 5: Spatial trend in CO Concentration at Monitoring locations.....	31
Graph 6: Spatial trend in Total VOCs Concentration at Monitoring locations	32

List of Abbreviations

A	Acceptable Limits as per IS: 10500:2012
AAQ	Ambient Air Quality
AWS	Automatic Weather monitoring stations
BIS	Bureau of Indian Standards
BOD	Biochemical Oxygen Demand
BQL	Below Quantification Limit
CCA	Consolidated Consent & Authorization
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
DO	Dissolved Oxygen
DPA	Deendayal Port Authority
EC	Electrical Conductivity
EMMP	Environmental monitoring and Management Plan
EMP	Environment Management Plan
FPS	Fine Particulate Sampler
FY	Financial Year
GEMI	Gujarat Environment Management Institute
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IMD	India Meteorological Department
IOCL	Indian Oil Corporation Limited
LNG	Liquefied Natural Gas
MGO	Marine Gas Oil
MMTPA	Million Metric Tonnes Per Annum
MoEF	Ministry of Environment & Forests
MoEF&CC	Ministry of Environment, Forest and Climate Change
NAAQS	National Ambient Air Quality Standards
NO_x	Nitrogen oxides
NTU	Nephelometric Turbidity Unit
OOT	Off Shore Oil Terminal
OSR	Oil Spill Response
P	Permissible Limits as per IS: 10500:2012
PAH	Poly Aromatic Hydrocarbons
PM	Particulate Matter
PTFE	Polytetrafluoroethylene
RCC	Reinforced Concrete Cement
RDS	Respirable Dust Sampler
SAR	Sodium Adsorption Ratio
SBM	Single Bouy Mooring
SO_x	Sulfur oxides
STP	Sewage Treatment Plant
TC	Total Coliforms
TDS	Total Dissolved Solids
TOC	Total organic Carbon
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds

CHAPTER 1: INTRODUCTION

1.1 Introduction

Kandla Port, also known as the Deendayal Port is a seaport in Kachchh District of Gujarat state in the western India, near the city of Gandhidham. Located on the Gulf of Kachchh, it is one of major ports on the western coast. The Port is located on the Gulf of Kachchh on the north-western coast of India, 256 nautical miles southeast of the Port of Karachi in Pakistan and over 430 nautical miles north-northwest of the Port of Mumbai (Bombay). It is the largest port of India by volume of cargo handled. Deendayal Port's journey began in 1931 with the construction of RCC Jetty by Maharao Khengarji. Kandla was constructed in the 1950s as the chief seaport serving western India, after the independence of India. In the year 2007-08 and has retained the top position for the 14th consecutive year since then. On 31st March 2016, Deendayal Port created history by handling 100 MMT cargo in a year and became the first Major Port to achieve this milestone. It is the largest port of India by volume of cargo handled. Deendayal Port Authority, India's busiest major port in recent years, is gearing up to add substantial cargo handling capacity with private sector participation. Deendayal port Authority creates a new record by handling 137 MMTPA (at Kandla and Vadinar) during the financial year 2022-23. The Deendayal Port Authority (DPA) had commissioned the Off-shore Oil Terminal facilities at Vadinar in the year 1978, for which M/s. Indian Oil Corporation Limited (IOCL) provided Single Bouy Mooring (SBM) system, having a capacity of 54 MMTPA, which was first of its kind in India. Further, significant Quantum of infrastructural upgradation has been carried out & excellent maritime infrastructure has been created at Vadinar for the 32MMTPA Essar Oil Refinery in Jamnagar District. DPA, Kandla crossed the landmark 100 MMT in cargo throughput for FY 2022-23 on December 28, 2022, thereby becoming the first Major Port to reach three figures in cargo handling, that too in only 3 quarters of a fiscal year.

1.2 Green Ports Initiative

Deendayal Port Authority is committed to sustainable development and adequate measures are being taken to maintain the Environmental well-being of the Port and its surrounding environs. Weighing in the environmental perspective for sustained growth, the Ministry of Shipping had started, Project Green Ports" which will help in making the Major Ports across India cleaner and greener. "Project Green Ports" will have two verticals - one is "Green Ports Initiatives" related to environmental issues and second is "Swachh Bharat Abhiyaan".

The Green Port Initiatives include twelve initiatives such as preparation and monitoring plan, acquiring equipment required for monitoring environmental pollution, acquiring dust suppression system, setting up of sewage/waste water treatment plants/ garbage disposal plant, setting up Green Cover area, projects for energy generation from renewable energy sources, completion of shortfalls of Oil Spill Response (OSR) facilities (Tier-I), prohibition of disposal of almost all kind of garbage at sea, improving the quality of harbour wastes etc.

Deendayal Port Authority had also appointed Gujarat Environment Management Institute (GEMI) as an Advisor for “Making Deendayal Port a Green Port - Intended Sustainable Development under the Green Port Initiatives.

Deendayal Port Authority has also signed MoU with Gujarat Forest Department in August 2019 for Green Belt Development in an area of 31.942 Ha of land owned by Deendayal Port Authority. The plantation is being carried out by the Social Forestry division of Kachchh.

1.3 Importance of EMP

Port activities can cause deterioration of air and marine water quality in the surrounding areas due to multifarious activities. The pollution problems usually caused by port and harbour activities can be categorized as follows:

1. Air pollutant emissions due to ship emissions, loading and unloading activities, construction emission and emissions due to vehicular movement.
2. Coastal habitats may be destroyed and navigational channels silted due to causeway construction and land reclamation.
3. Deterioration of surface water quality may occur during both the construction and operation phases.
4. Harbour operations may produce sewage, bilge wastes, solid waste and leakage of harmful materials both from shore and ships.
5. Human and fish health may be affected by contamination of coastal water due to urban effluent discharge.
6. Oil pollution is one of the major environmental hazards resulting from port/harbour and shipping operations. This includes bilge oil released from commercial ships handling non-oil cargo as well as the more common threat from oil tankers.
7. Unregulated mariculture activities in the port and harbour areas may threaten navigation safety.

Hence, for the determination of levels of pollution, identification of pollution sources, control and disposal of waste from various point and non-point sources and for prediction of pollution levels for future, regular monitoring and assessment are required during the entire construction and operation phase of a major port. As per the Ministry of Environment, Forest and Climate Change (**MoEF&CC**), The Environmental Management Plan (EMP) is required to ensure sustainable development in the area surrounding the project. Hence, it needs to be an all encompasses plan consist of all mitigation measures for each item wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts resulting from the activities of the project. for formulation, implementation and monitoring of environmental protection measures during and after commissioning of projects. The plan indicates the details of various measures and proposed to be taken for appropriate management of the environment of Deendayal Port Authority.

It identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of operational activities associated

with the port. An EMP is a required part of environmental impact assessment of a new port project but could also be evolved for existing ports. It is useful both during the construction and operational phases of the new port but only for operation of existing ports to ensure the effectiveness of the mitigation measures and to give guidance as to the most appropriate way of dealing with any unforeseen effects.

It is extremely essential that port and harbour projects should have an Environmental monitoring and Management Plan (EMMP), which incorporates monitoring of Ambient Air, Drinking Water, Noise, Soil, Marine (water, sediment, ecology) quality along with the collection of online meteorological data throughout the duration of the project.

To ensure the effective implementation of the EMP and weigh the efficiency of the mitigation measures, it is proposed to undertake environmental monitoring both during construction and operation period. In view of the above, Gujarat Environment Management Institute (GEMI) has been awarded with the work **“Preparing and Monitoring of Environmental Monitoring and Management Plan for Deendayal Port Authority at Kandla and Vadinar for a period of 3 years”** vide letter No. EG/WK/EMC/1023/2011/III/239 dated: 15/02/2023 by DPA.

This document presents the environmental monitoring report (EMR) for Kandla and Vadinar for the month of April -May 2023.

1.4 Objectives and scope of the Study

In line with the work order, the key objective of the study is Environmental Monitoring and preparation the Management Plan at Kandla and Vadinar for a period of 3 years". Environmental monitoring refers to systematic sampling of air, water, soil, noise and ecology in order to monitor the performance/ compliance of a project compliance with Environmental quality standards, and any applicable Statutory Compliance and the effectiveness of mitigation measure in EMP.

The scope of work includes not limited to following:

1. To review the locations of Ambient Air, Ambient Noise, drinking water, and Marine Water, Soil and Sediments monitoring stations within the impacted region in and around DPA establishment, in view of the developmental projects.
2. To assess the Ambient Air quality, quality at 6 stations at Kandla and 2 at Vadinar in terms of gases and particulate matter.
3. To assess the DG stack emissions (gases and particulate matter).
4. To assess Drinking water quality at twenty stations in terms of Physical, Chemical and Biological parameters viz., Color, Odor, turbidity, conductivity, pH, Total Dissolved Solids, chlorides, Hardness, total iron, sulfate, NH₄, PO₄, and bacterial count on a monthly basis.
5. To assess the Marine water quality in terms of aquatic Flora and Fauna and Sediment quality in terms of benthic flora and fauna.
6. To assess Marine Water Quality and sediment in term of physical and chemical parameter.

7. To assess the trends of water quality in terms of Marine ecology by comparing the data collected over a specified time period.
8. Every week a sample (Treated wastewater) of the Sewage Treatment Plant (STP) shall be analyzed to see the water quality being discharged by DPA.
9. Noise monitoring will be carried out twice a day at the representative stations for a period of 24 hours.
10. Meteorological parameters are very important from air pollution point of view and precise and continuous data collection is of utmost importance. The data collected is analyzed as per the standards. Meteorological data on wind speed, wind direction, temperature, relative humidity, solar radiation and rainfall will be collected from one permanent station at DPA and one permanent station at Vadinar.
11. To suggest incorporates, mitigation measures, based on the findings of this study and also check compliance with Environmental quality standards, green port initiatives, MIV 2030, and any applicable Statutory Compliance.
12. To recommend Environment management plans on Monitoring programme based on findings of study.



This page is intentionally left blank

CHAPTER 2: METHODOLOGY

2.1 Study Area:

Under the study, the locations specified by Deendayal Port Authority for the areas of Kandla and Vadinar would be monitored. The details of the study area as follows:

a. Kandla:

Deendayal Port (Erstwhile Kandla Port) is one of the twelve major ports in India and is located on the West Coast of India, in the Gulf of Kutch at 23001'N and 70013'E in the state of Gujarat in India. Deendayal port primarily services the Northern India hinterland, including the land locked states of Jammu & Kashmir, Uttar Pradesh, Madhya Pradesh and Gujarat. Now, the Major Port Authorities Act 2021 is the governing statute for Administration of Major Ports. Now, on 18 February 2021, Major Port Authorities, (MPA) Act 2021 notified in the Gazette of India same has come into force from 3 November 2021. Under, MPA 2021, Deendayal Port Trust (DPT) have become Deendayal Port Authority (DPA). At Kandla, Deendayal Port has sixteen (16) cargo berths for handling various types of Dry Bulk Cargo viz, fertilizer, food grains, Coal, sulphur, timber, salt, ores etc. and Containers. Apart from dry bulk, DPA has seven (7) oil for handling all types of Liquid Cargo viz. POL, Chemicals etc. at Kandla. Deendayal Port Authority has handled total 135 MMTPA cargo (at Kandla & Vadinar) during the financial year 2022-23.

- **Climatic conditions of Kandla**

Kandla has a semi-desert climate. Temperature varies from 25°C to 44°C during summer and from 10°C to 25°C during winter. The average annual temperature is 24.8 °C. The average rainfall is 410 mm, most of which occurs during the monsoon from the months of June to September.

b. Vadinar:

Vadinar is a small coastal town located in Devbhumi Dwarka district of the state of Gujarat, India at coordinates 22° 27' 16.20" N - 069° 40' 30.01". The offshore oil terminal of the Deendayal Port Authority (DPA) is located in Vadinar and contributes in a large way to the total earnings of this major port. Vadinar is now notable due to the presence of two refineries-one promoted by Reliance Industries and the other by Essar Oil Ltd. The Deendayal Port Authority had commissioned the Off Shore Oil Terminal (OOT) facilities at Vadinar in the year 1978, for which M/s. Indian Oil Corporation Limited (IOCL) provided Single Bouy Mooring (SBM) system, which has a capacity of 54 MMTPA.

It also handled 43.30 MMT at Vadinar (which includes transshipment), the containerized cargo crossed 4.50 lakh TEU during this period, grossing a total of 100 MMT overall. Major commodities handled by the Deendayal Port are Crude Oil, Petroleum product, Coal, Salt, Edible Oil, Fertilizer, Sugar, Timber, Soya bean, Wheat, etc.

- **Climatic conditions of Vadinar**

Vadinar has a hot semi-arid climate, there are three defined seasons. The summer season lasts from March to May and is extremely hot, humid, but dry. The climatic conditions in Vadinar are quite similar to that recorded in its district head quarter in Jamnagar. The yearly mean temperature is 26.7 °C. Rainy season with extremely erratic monsoonal rainfall that averages around 630 millimetres. Tropical cyclones sometimes affect the region during this period. The winter season is from October to February remains hot during the day but has negligible rainfall, low humidity and cool nights to be by far the most comfortable time of year.

The locations of Kandla Port and Vadinar port have been depicted in the **Figure 1** as follows:



Figure 1: Locations Map of Kandla and Vadinar

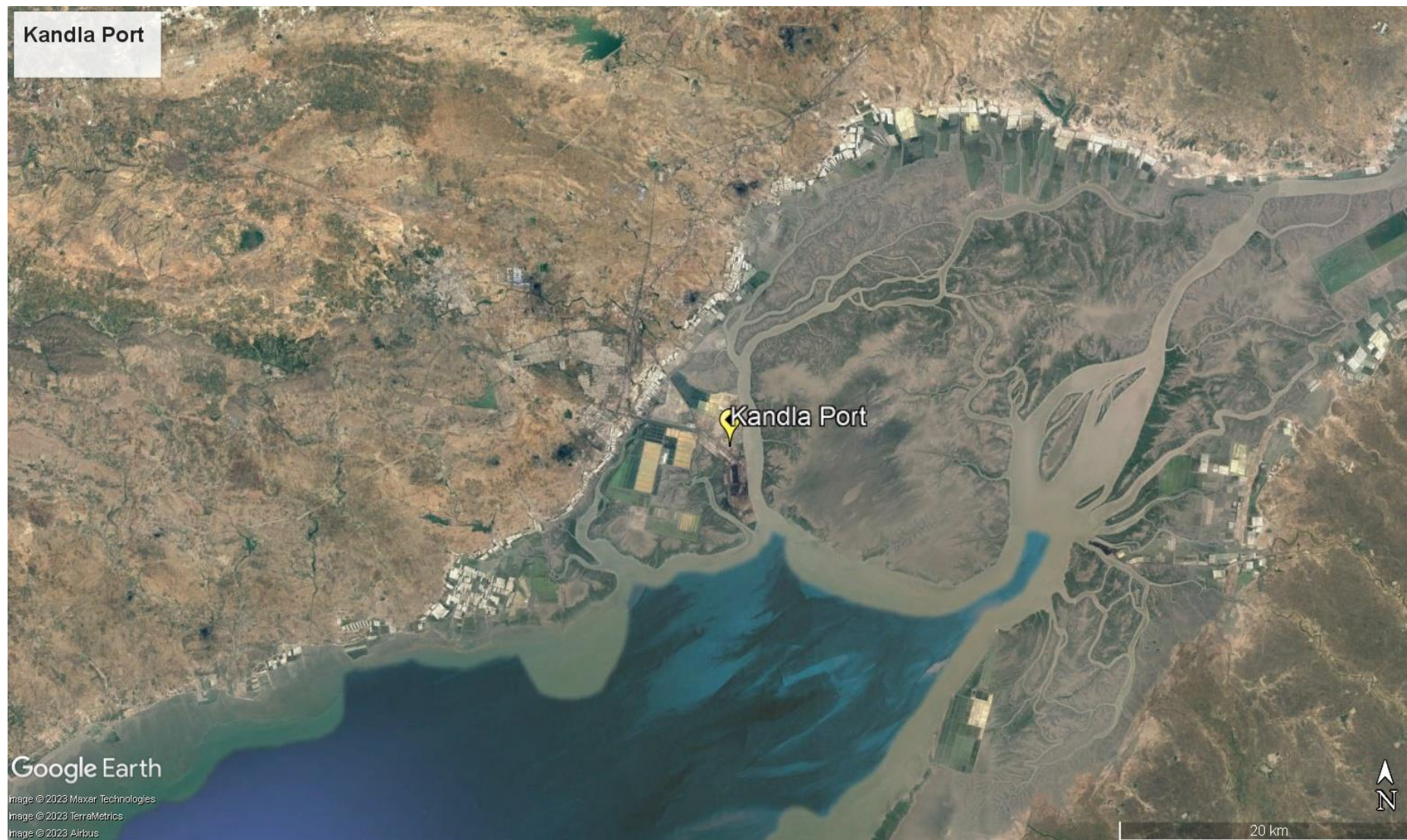


Figure 2: Map of Kandla Port

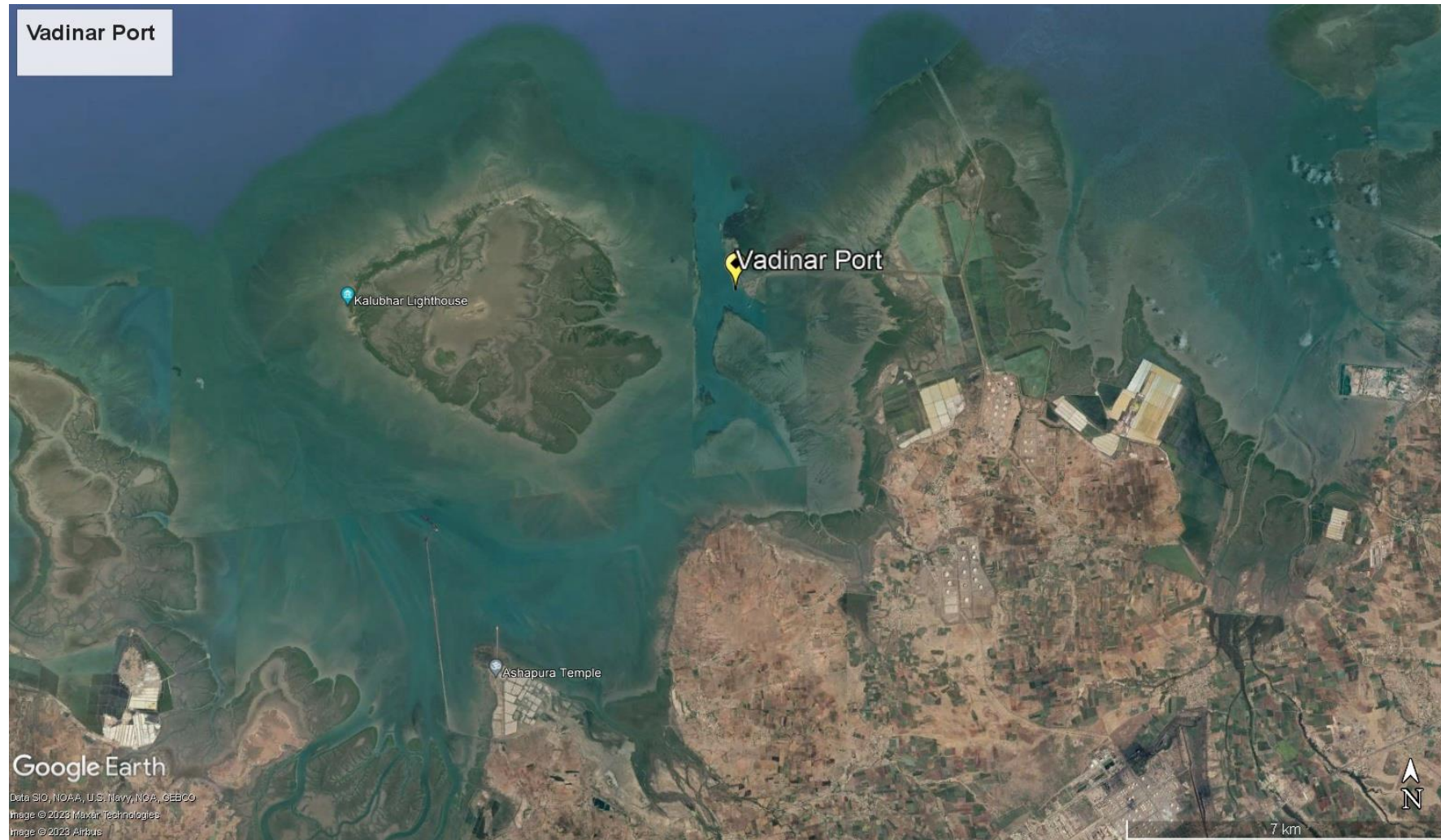
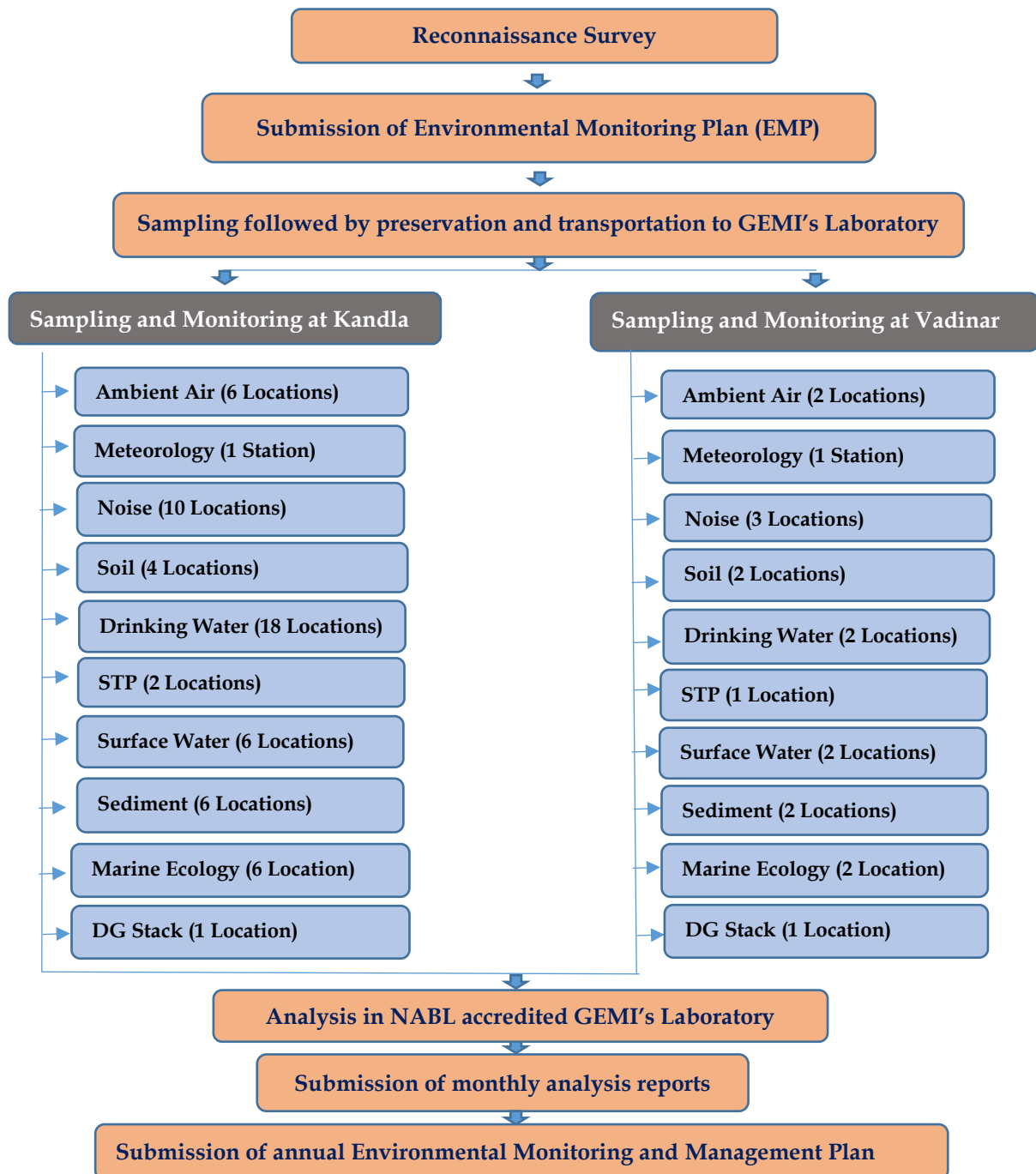


Figure 3: Map of Vadinar Port

2.2 Methodology adopted for the study

Methodology is a strictly defined combination of practices, methods and processes to plan, develop and control a project along the continuous process of its implementation and successful completion. The aim of the project management methodology is to allow the control of the whole process of management through effective decision-making and problem solving. The methodology adopted for the present study is as follows:



2.3 Environmental Monitoring at Kandla and Vadinar

Regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operation. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operation of the project, to enable taking up suitable mitigatory steps in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring.

Environmental Monitoring Plan (EMP) is very important for monitoring the environmental status of the port for sustainable development. The list of main elements for which Environmental monitoring is to be carried out is mentioned below:

- Meteorology
- Ambient Air
- Noise
- Drinking Water
- DG Stack
- Soil
- Sewage
- Marine (Surface) water
- Marine Sediments
- Marine Ecology

Gujarat Environment Management Institute (GEMI) has been entrusted by Deendayal Port Authority to carry out the monitoring of the various aforementioned environmental aspects of the port, so as to verify effectiveness of Environment management plan; confirm statutory and legal compliance; and identify any unexpected changes. Standard methods and procedures have been strictly adhered to in the course of this study. QA/QC procedures were strictly followed which covers all aspects of the study, and includes sample collection, handling, laboratory analyses, data coding, statistical analyses, presentation and communication of results. All analysis was carried out in GEMI's NABL/MoEF accredited/recognized laboratory.

Under the present study, the details of various sectors of Environment monitoring are described in subsequent chapters.

CHAPTER 3: METEOROLOGY MONITORING

3.1 Meteorology Monitoring

Meteorological conditions play a crucial role in dispersion of air pollutants. Meteorological factors play an important role in environmental pollution studies particularly in pollutant transport irrespective of their entry into the environment. The wind speed and direction play a major role in dispersion of environment pollutants. In order to determine the prevailing micro-meteorological conditions at the project site an Automatic Weather Monitoring Stations (AWS) of Envirotech WM280 were installed at both the sites of Kandla and Vadinar at 10 m above the ground. The details of the AWS have been mentioned in **Table 1** as follows:

Table 1: Details of Automatic Weather Station

Sr. No.	Site	Location Code	Location Name	Latitude Longitude
1.	Kandla	AWS-1	Environment Laboratory (DPA)	23.00996N 70.22175E
2.	Vadinar	AWS-2	Canteen Area	22.39994N 69.716608E

3.2 Methodology

During the study, a continuous automatic weather monitoring station was installed at both the sites to record climatological parameters such as Wind speed, Wind Direction, Relative Humidity, Solar Radiation, Rainfall and Temperature to establish general meteorological regime of the study area. The stations (observatory) were installed at Kandla and Vadinar on 19/04/2023. The methodology adopted for monitoring meteorological data shall be as per the standard norms laid down by Bureau of Indian Standards (BIS) and the India Meteorological Department (IMD).

The details of Automatic Weather Monitoring Station have been mentioned in **Table 2**.

Table 2: Automatic Weather Monitoring Station details

Sr. No.	Details of Meteorological Data	Unit of Measurement	Instrument	Frequency
1.	Wind Direction	degree	Automatic Weather Monitoring Station (Envirotech WM280)	Hourly Average
2.	Wind Speed	Km/hr		
3.	Rainfall	mm/hr		
4.	Relative Humidity	% RH		
5.	Temperature	°C		
6.	Solar Radiation	W/m ²		

The Meteorological parameters were recorded at an interval of 1 hour in a day and the average value for all the Meteorological parameters were summarized for the period of April and May 2023 at both the observatory site.

3.3 Results:

The summary of hourly climatological observations recorded at observatory, Kandla during 19th April – 16st May 2023, with respect to significant parameters has been mentioned in **Table 2**. Monthly average of maximum and minimum daily observed values summarized in **Table 3** have been discussed as follows:

Table 3: Meteorological data for Kandla and Vadinar

Details of micro-meteorological data at Kandla Observatory												
Date	Wind Speed (Km/h)			Temperature (°C)			Relative humidity (%)			Solar Radiation (W/m ²)	Wind Direction (°)	Rainfall (mm)
Stat.	Mean	Max.	Min	Mean	Max	Min	Mean	Max	Min			
April-May 23	8.78	27.02	1.54	31.31	32.21	30.40	61.07	64.12	57.76	105.42	South-south East	0.05
Details of micro-meteorological data at Vadinar Observatory												
Date	Wind Speed (Km/h)			Temperature (°C)			Relative humidity (%)			Solar Radiation (W/m ²)	Wind Direction (°)	Rainfall (mm)
Stat.	Mean	Max.	Min	Mean	Max	Min	Mean	Max.	Min			
April-May 23	13.24	26.33	7.78	28.17	28.74	28.04	71.08	73.47	70.00	110.76	west and south	0.02

- **Temperature**

- a. Kandla: The ambient Temperature from April to May varies between the range of 26.75-35.23°C for Kandla, with average temperature of 31.31°C.
- b. Vadinar: The ambient temperature for the month of April varies between the range of 25.04-30.62°C for Vadinar, with average temperature of 28.17°C.

- **Relative Humidity**

- a. Kandla: The Relative Humidity recorded between the range of 43.77-69.65%, with average Humidity of 61.07%.
- b. Vadinar: During the study period, the Relative Humidity varies between 64.53-76.05%, with average Humidity of 71.08%.

- **Rainfall**

- a. Kandla: It is observed that, the average Rainfall in the monitoring period was found to be 0.05 mm
- b. Vadinar: The average Rainfall was recorded as 0.02 mm,

- **Wind Speed**

Wind speed and Direction play a significant role in transporting the pollutants and thus decides the air quality.

- a. Kandla: Wind speed recorded ranges between 3.98-18.42 Km/hr
- b. Vadinar: During the study period, the Wind speed recorded, ranges between 6.23-18.08 Km/hr.

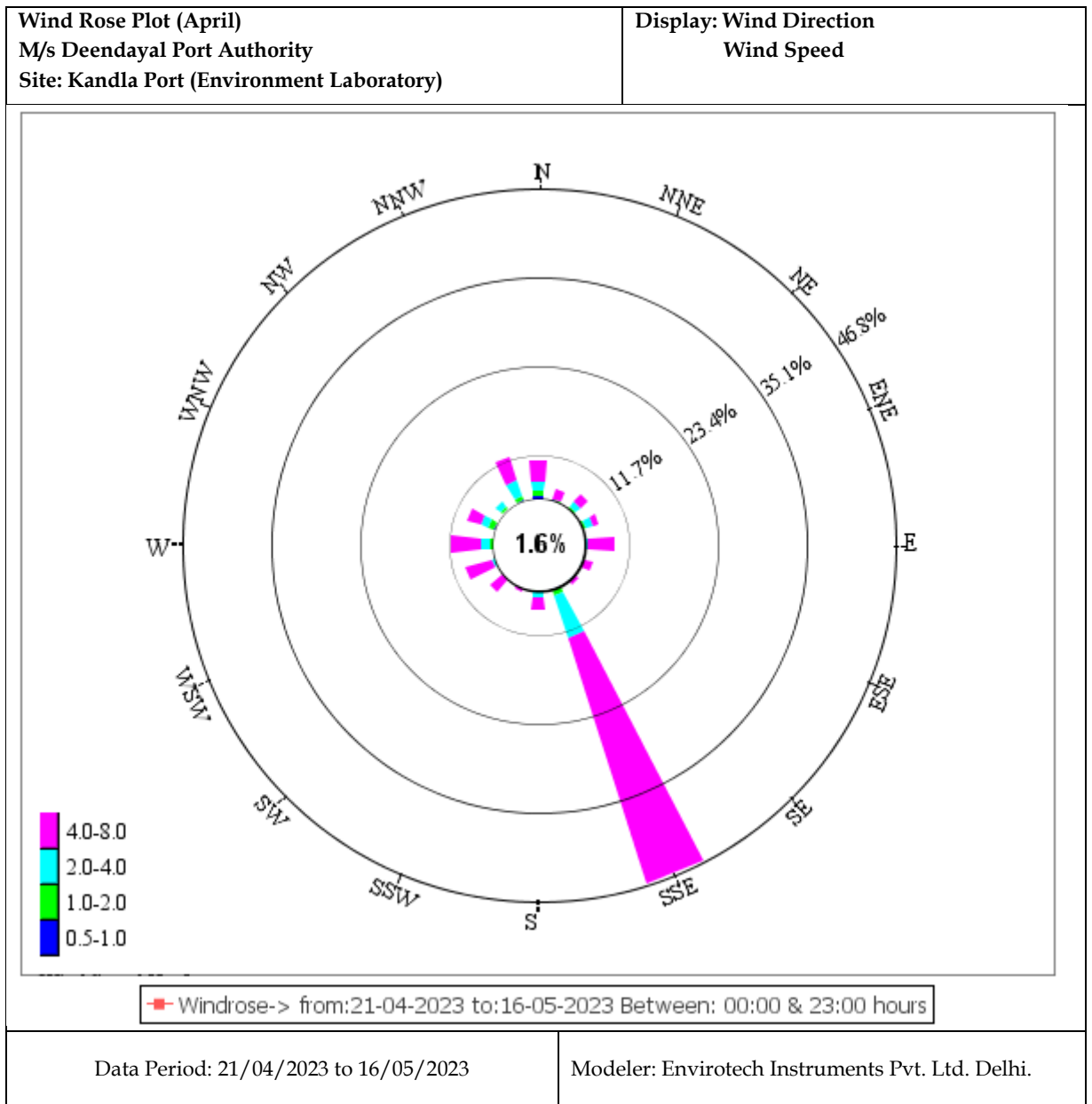
- **Solar Radiation:**

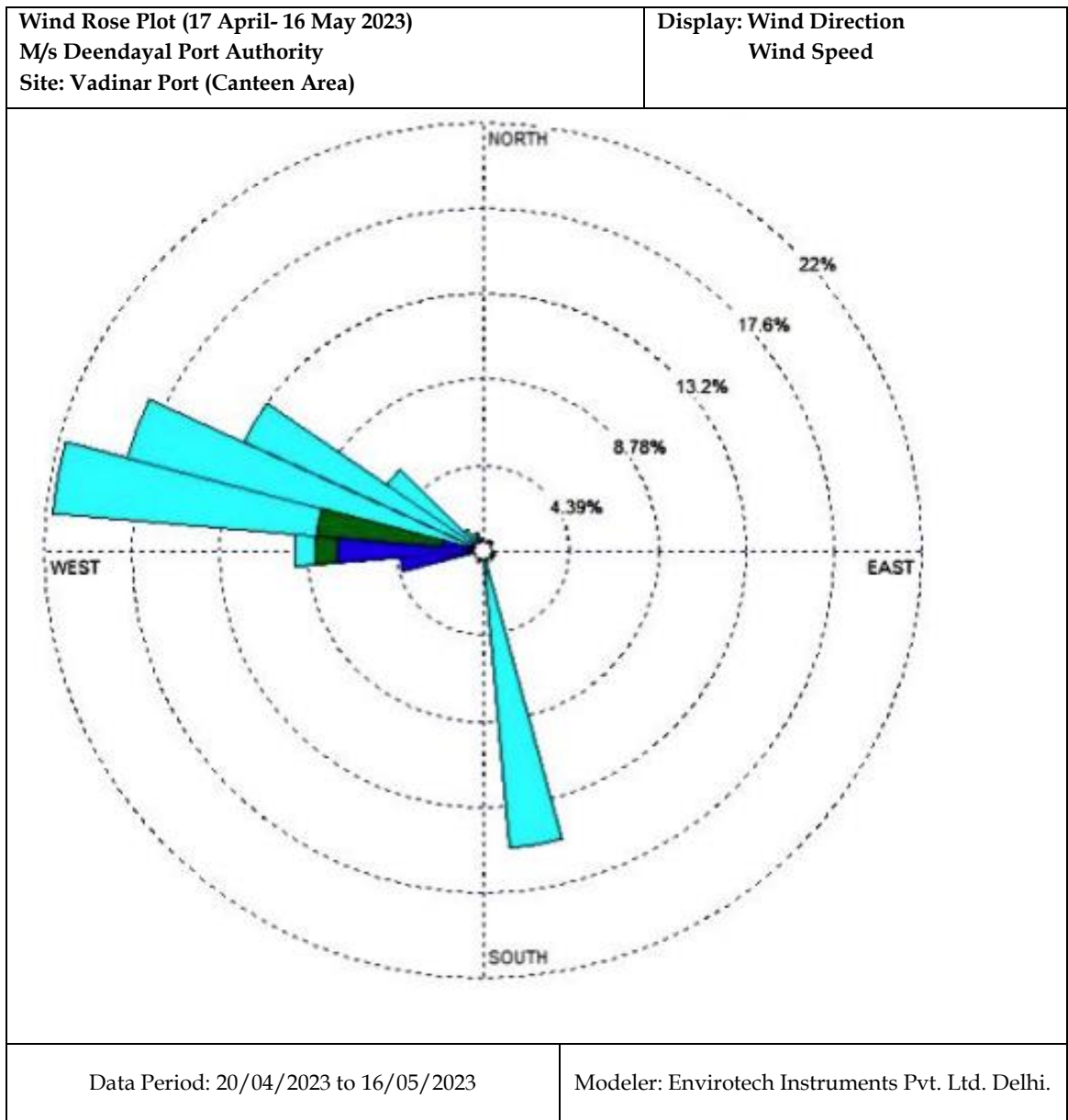
- a. Kandla: The average Solar Radiation for the monitoring period was recorded as 105.42 W/m².
- b. Vadinar: The average Solar Radiation was recorded as 110.76 W/m²

- **Wind rose diagram -**

The wind-rose diagram for the Monitoring period has been drawn on the basis of hourly wind speed and direction data.

This wind rose reveals that the prevailing winds in Kandla during the given period predominantly blow from the northwest direction. The wind rose diagram represents that the wind flow at Kandla for the monitoring month towards South-South east. Whereas the winds at Vadinar were observed to flow from west directions.





CHAPTER 4: AMBIENT AIR QUALITY MONITORING

4.1 Ambient Air Quality

To determine the impact of the shipping activities and port operations on the ambient air quality, it is necessary to monitor the ambient air quality of the study area. The prime objective of ambient air quality monitoring with respect to is to assess the present air quality and its conformity to ambient air quality standards (NAAQS, 2009). Ambient air quality in terms of (parameters) are monitored from 17th April- 15th May 2023 covering 6 weeks.

4.2 Methodology adopted for the Study

The study area represents the area occupied by Deendayal port authority and its associated Port area, facilities, as well as the surrounding area comprising of few villages. The sources of air pollution in the region are mainly vehicular traffic, fuel burning, loading & unloading of dry cargo, fugitive emissions from storage area and dust arising from unpaved village roads, eight locations within the study area were scientifically selected and are based on the following considerations:

- Meteorological conditions;
- Topography of the study area;
- The direction of the wind;
- Representation of the region for establishing current air quality status; and
- Representation with respect to likely impact areas.

The description of various stations monitored at Kandla and Vadinar are given in **Table 4**.

Table 4: Details of Ambient Air monitoring locations

Sr. No.	Location Code	Location Name	Latitude Longitude	Significance
1.	Kandla	A-1	Oil Jetty No. 1	Loading of materials, dry cargo handling, liquid containers, emission from ship
2.		A-2	Oil Jetty No. 7	
3.		A-3	Kandla Port Colony	Vehicular activity, dust emission, Traffic
4.		A-4	Marine Bhavan	Construction activity, road dust emission
5.		A-5	Coal Storage Area	Coal Dust, Vehicular activity
6.		A-6	Gopalpuri Hospital	Residential area, dust emission, vehicular activity
7.	Vadinar	A-7	Admin Building	Vehicular activity
8.		A-8	Vadinar Colony	Residential Area, burning waste, vehicular activity

The monitoring locations at Kandla and Vadinar have been depicted in **Figure 4 and 5** respectively follows:



Figure 4: Location Map for Ambient Air Monitoring at Kandla

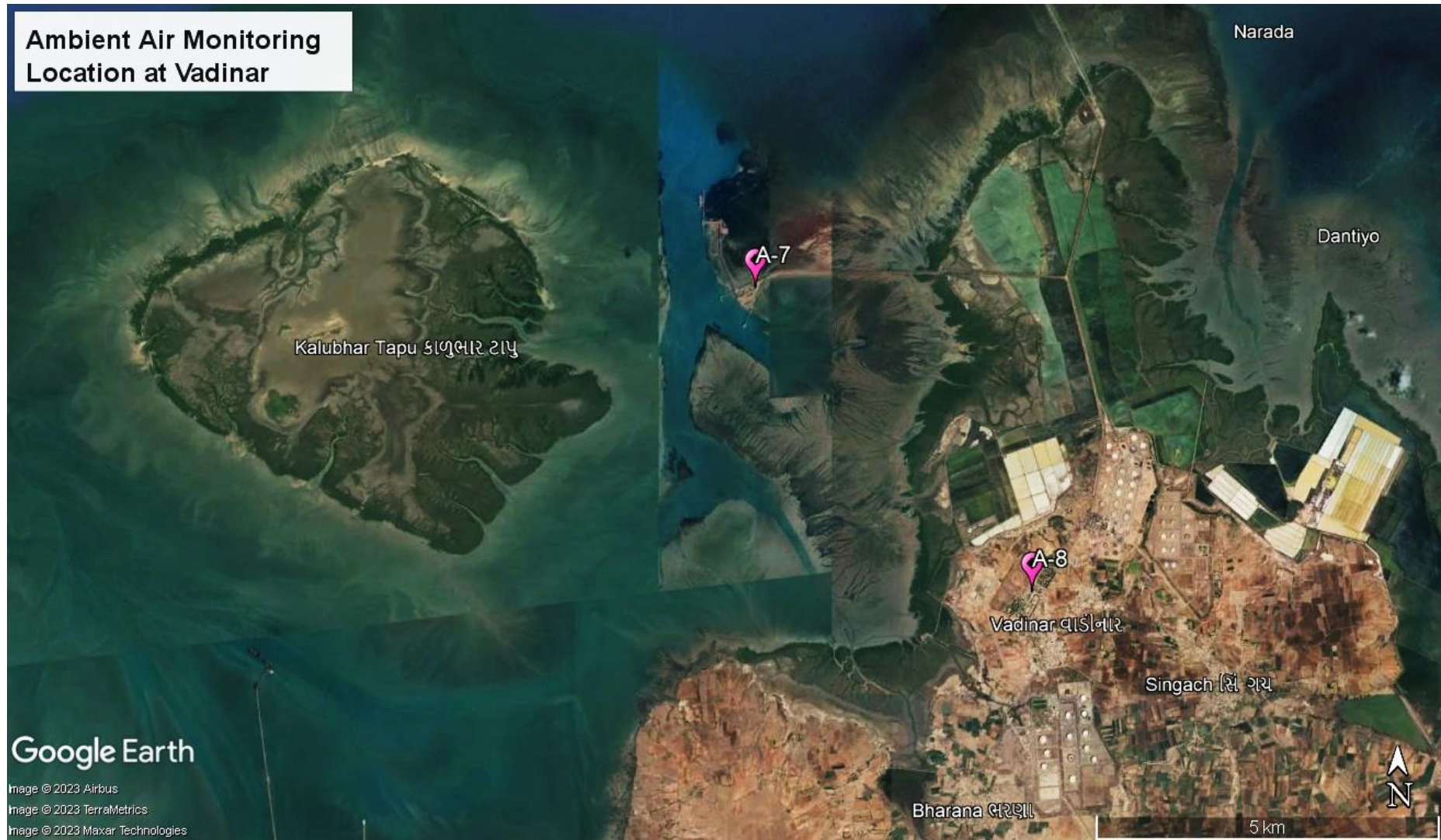


Figure 5: Location Map for Ambient Air Monitoring at Vadinar

Frequency of AAQ Monitoring

The sampling for Particulate matter (PM₁₀, PM_{2.5}) and gaseous like SO_x, NO_x, CO and Total VOCs were monitored twice in a week for a duration of 24 hours a day. Whereas, the samples of PAH, Benzene and non-Methane VOCs were collected on monthly basis.

Method of sampling and analysis:

The Sampling of the Ambient Air Quality parameters and analysis is done as per CPCB guidelines of National Ambient Air Quality monitoring. The sampling was performed at a height of 3.5 m (approximately) from the ground level.

For the sampling of PM₁₀, calibrated 'Respirable Dust Samplers' were used, where Whatman GF/A microfiber filter paper (size: 8" X 10") was used for the collection of PM₁₀. APM- air sampler of the make Envirotech instrument was attached with Respirable Dust Sampler PM_{2.5} sampler for monitoring particulate matter of size <2.5 microns. A known volume of ambient air is passed through the cyclone to the initially pre-processed filter paper. The centrifugal force in cyclone acts on particulate matter to separate them into two parts and collected as following: -

Particles <10 μ size (Respirable): GF/A Filter Paper

Particles <2.5 μ size (Respirable): Polytetrafluoroethylene (PTFE)

Sampling and analysis of ambient SO₂ was performed by adopting the 'Improved West and Gaeke Method'. The ambient air, drawn through the draft created by the RDS, is passed through an impinger, containing a known volume of absorbing solution of sodium tetrachloromercurate, at a pre-determined and measured flow rate of 1 liter/minute (L/min). Similarly, NO_x was performed by adopting the 'Jacob Hochheister Modified' (Na arsenite) method. The impinger contains known volume of absorbing solution of sodium arsenite and sodium hydroxide.

Data has been compiled for PM₁₀, PM_{2.5}, SO_x and NO_x samples of 24-hour duration on two days a week (i.e., 8 samples were collected at each location). In case of CO, one hourly sample were taken on selected monitoring days using the sensor-based CO Meter. For the parameters Benzene, Methane & Non-methane and Volatile Organic Carbons (VOCs) the Low Volume Sampler is used, where the charcoal tubes are used as sampling media. The sampling in the Low Volume Sampler is carried out as per IS 5182 (Part 11): 2006 RA: 2017, where the ambient air flow rate is maintained at 200 cc/min, the volume of air that passes through the low volume sampler during two hours monitoring is approx. 24 L. Whereas the sampling of PAHs is carried out as per IS: 5182 (Part 12): 2004. Where, the EPM 2000 Filter papers are utilized in the Respirable Dust Sampler (RDS). For the parameters, PAH & Non-methane VOC's, monthly monitoring is carried out. The details of the parameters with their frequency monitored are mentioned in **Table 5:**

Table 5: Parameters for Ambient Air Quality Monitoring

Sr. No.	Parameters	Units	Reference method	Instrument	Frequency
1.	PM ₁₀	µg/m ³	IS 5182 (Part 23): 2006	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-23): 2006	Twice in a week
2.	PM _{2.5}	µg/m ³	IS:5182 (Part:24):2019	Fine Particulate Sampler (FPS) conforming to IS:5182 (Part-24): 2019	
3.	Sulphur Dioxide (SO _x)	µg/m ³	IS 5182 (Part:2): 2001	Gaseous Attachment conforming to IS:5182 Part-2	
4.	Oxides of Nitrogen (NO _x)	µg/m ³	IS:5182 (Part-6): 2006	Gaseous Attachment conforming to IS:5182 Part-6	
5.	Carbon Monoxide	mg/m ³	GEMI/SOP/AAQM/1 1; Issue no 01, Issue date 17.01.2019: 2019	Sensor based Instrument (Make: Vaibhav Instruments)	
6.	VOC	µg/m ³	IS 5182 (Part 17): 2004	Low Flow Air Sampler	
7.	Benzene	µg/m ³	IS 5182 (Part 11): 2006 RA: 2017	Low Flow Air Sampler	
8.	PAH	µg/m ³	IS: 5182 (Part 12): 2004	Respirable Dust Sampler (RDS) conforming to IS:5182 (Part-12): 2004	Monthly
9.	Non-methane VOC	µg/m ³	IS 5182 (Part 11): 2006	Low Volume Sampler	

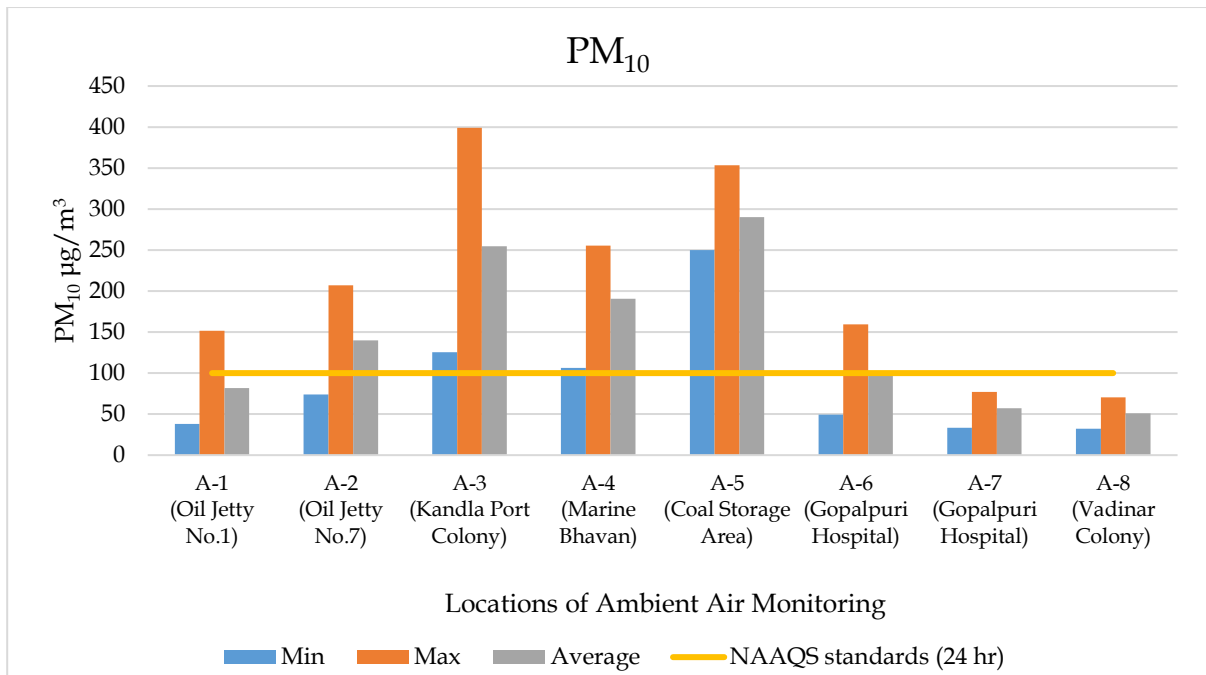
4.3 Result and Discussion:

The summarized results of ambient air quality monitoring for the period from 17th April to 15th May 2023 are presented in **Table-6 to 15** along with the graphical representation depicted in **Graph 1 to Graph 6**. Various parameters monitored during the study have been presented by their maximum, minimum, average and standard deviation.

Table 6: Summarized results of PM₁₀ for Ambient Air quality monitoring

PM ₁₀ (µg/m³)										
Sr No	Location Sampling Date	Kandla						Vadinar		NAAQS standards (24 hr)
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	17-Apr-2023	86.35	144.87	341.95	255.59	211.81	89.13	56.62	42.63	100 µg/m³
2	19-Apr-2023	69.35	135.52	349.89	106.41	305.36	115.90	59.78	56.55	
3	24-Apr-2023	72.27	121.69	399.25	155.37	260.08	159.38	74.25	56.50	
4	26-Apr-2023	151.72	149.37	271.07	185.15	216.88	73.34	76.96	70.37	
5	1-May-2023	81.83	124.52	182.54	156.01	219.18	56.78	33.42	43.40	
6	3-May-2023	58.16	74.14	125.42	252.46	323.61	124.93	33.97	32.10	
7	8-May-2023	72.81	207.10	287.49	207.14	249.87	109.62	56.42	59.48	

PM ₁₀ (µg/m ³)										
Sr No	Location Sampling Date	Kandla						Vadinar		NAAQS standards (24 hr)
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
8	10-May-2023	104.33	154.22	204.48	207.03	267.24	128.82	63.83	49.15	
9	15-May-2023	37.94	149.14	128.12	189.98	353.42	49.35	57.77	46.17	
	Minimum	37.94	74.14	125.42	106.41	249.87	49.35	33.42	32.10	
	Maximum	151.72	207.10	399.25	255.59	353.42	159.38	76.96	70.37	
	Average	81.64	140.06	254.47	190.57	290.18	100.81	57.00	51.02	
	Std Dev	32.07	35.06	99.61	47.63	55.45	36.37	15.16	12.38	



Graph 1: Spatial trend in PM₁₀ Concentration at Monitoring locations

Interpretation:

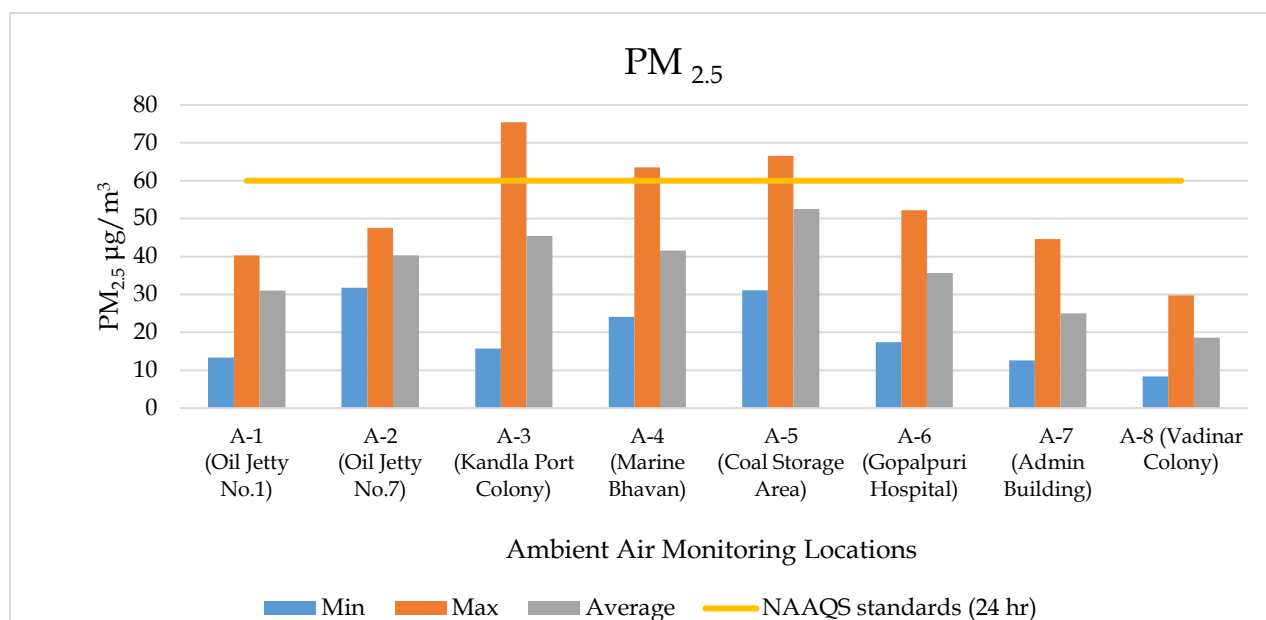
The results were compared with National Ambient Air Quality Standards (NAAQS), 2009 of Central Pollution Control Board (CPCB). Particulate Matter (PM₁₀) exceeded the norms at locations (Oil jetty 1, KPT colony, Marine Bhavan, Coal storage area). The highest concentration of PM₁₀ was observed at location A-3 i.e., Kandla Port Colony (399.25 µg/m³), whereas the lowest was observed at A-1 i.e., Oil Jetty No.1 (37.94 µg/m³). All the monitored values of PM₁₀ at station A-2, A-3, A-4 and A5 are exceeding the specified limit of 100 µg/m³.

The higher reporting of PM₁₀ could be due to heavy vehicular traffic, loading and unloading of cargo, dust from construction activities. Emissions and dispersion from construction equipment, work vessels, trucks and other vehicles used in construction work could be a source of Particulate matter. The unloading of coal directly in the truck, using grabs cause coal to disperse in air as well as coal dust to fall and settle on ground. This settled coal dust again mixes with the air while trucks travel through it. Also, the coal loaded trucks were not always covered with tarpaulin sheets and these results in increased

suspension of coal from trucks/dumpers during its transit from vessel to yard or storage site. This also increases the PM values around marine Bhavan & Coal storage area. Whereas for the Ambient Air locations of Vadinar, the concentration of PM₁₀ falls within the stipulated norm of 100 µg/m³. Kandla Port is a coastal area with extensive salt pans on the western side. Some of these salt pans are temporarily not in use and the hence this barren area is source of fugitive dust. Wind speeds also contribute to increased dispersion of pollutants in the area. Apart from this, dust storms are also common.

Table 7: Summarized results of PM_{2.5} for Ambient Air quality monitoring

PM _{2.5} (µg/m³)										
Sr. No	Location	Kandla						Vadinar		NAAQS standards (24 hr)
	Sampling date	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	17-Apr-2023	40.32	31.73	60.77	49.96	68.52	35.99	40.63	35.08	60 µg/m³
2	19-Apr-2023	28.39	38.62	41.03	45.23	88.51	35.27	42.74	30.15	
3	24-Apr-2023	31.31	47.55	67.13	47.27	56.75	35.27	44.65	28.31	
4	26-Apr-2023	39.87	42.70	32.14	31.82	71.62	36.21	32.58	29.76	
5	1-May-2023	22.23	34.23	28.33	24.06	38.84	34.46	12.61	11.05	
6	3-May-2023	38.73	47.58	38.22	36.51	89.04	25.32	14.52	8.35	
7	8-May-2023	26.60	42.51	75.44	39.65	66.58	48.62	26.09	19.25	
8	10-May-2023	38.44	37.28	50.47	63.55	60.03	52.18	25.99	22.94	
9	15-May-2023	13.32	40.22	15.73	35.86	31.09	17.39	18.87	10.49	
	Minimum	13.32	31.73	15.73	24.06	31.09	17.39	12.61	8.35	
	Maximum	40.32	47.58	75.44	63.55	66.58	52.18	44.65	29.76	
	Average	31.02	40.27	45.47	41.55	52.57	35.63	25.04	18.59	
	Std Dev	9.33	5.46	19.54	11.53	18.89	10.51	11.16	8.81	



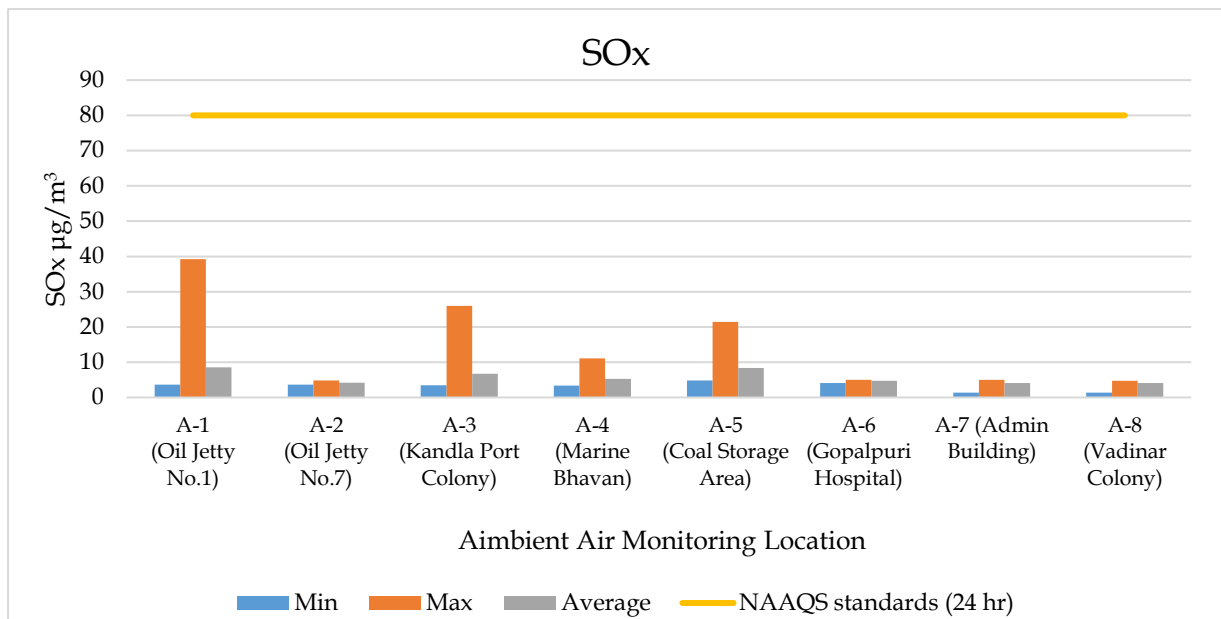
Graph 2: Spatial trend in PM_{2.5} Concentration at Monitoring locations

The highest PM_{2.5} concentration (75.44 µg/m³) was recorded at station A-3, Kandla Port Colony which is above the limit prescribed by NAAQS. Whereas majority of the monitored values of PM_{2.5} at Kandla were reported well below the specified limit of 60 µg/m³. While for Vadinar monitoring station the maximum value for PM_{2.5} observed is,

44.65 $\mu\text{g}/\text{m}^3$ at Admin Building (A-7). Similar to values detected for the Respirable Dust i.e., PM_{10} , higher concentration of $\text{PM}_{2.5}$ was also observed at the Locations A-3 to A-5. This may be attributed to emissions from combustion of gasoline, oil, diesel fuel or wood produce.

Table 8: Summarized results of SO_x for Ambient Air quality

SO_x ($\mu\text{g}/\text{m}^3$)										
Sr. No	Location Sampling date	Kandla						Vadinar		NAAQS standards (24 hr)
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	17-Apr-2023	5.98	4.8	4.1	3.6	5.33	4.9	4.6	4.6	80 $\mu\text{g}/\text{m}^3$
2	19-Apr-2023	4.3	4.2	4.9	3.8	7.53	4.6	4.3	4.2	
3	24-Apr-2023	3.9	4.5	4.6	3.7	9.21	4.1	4.51	4.58	
4	26-Apr-2023	7.44	3.6	3.6	3.4	4.8	4.9	1.39	4.69	
5	1-May-2023	39.19	3.8	5.16	3.9	8.65	4.98	3.12	1.4	
6	3-May-2023	4.2	3.9	3.5	8.27	5.15	4.85	4.99	4.67	
7	8-May-2023	3.6	4.6	26.01	11.13	21.47	4.67	4.6	4.25	
8	10-May-2023	4.1	4.0	4.6	4.9	7.97	4.58	4.2	4.36	
9	15-May-2023	3.6	3.6	3.5	3.4	4.8	4.1	1.39	1.4	
	Minimum	3.6	3.6	3.5	3.4	4.8	4.1	1.39	1.4	
	Maximum	39.19	4.8	26.01	11.13	21.47	4.98	4.99	4.69	
	Average	8.57	4.18	6.74	5.28	8.34	4.72	4.06	4.11	
	Std Dev	11.55	0.40	7.25	2.66	5.21	0.27	1.13	1.04	



Graph 3: Spatial trend in SO_x Concentration at Monitoring locations

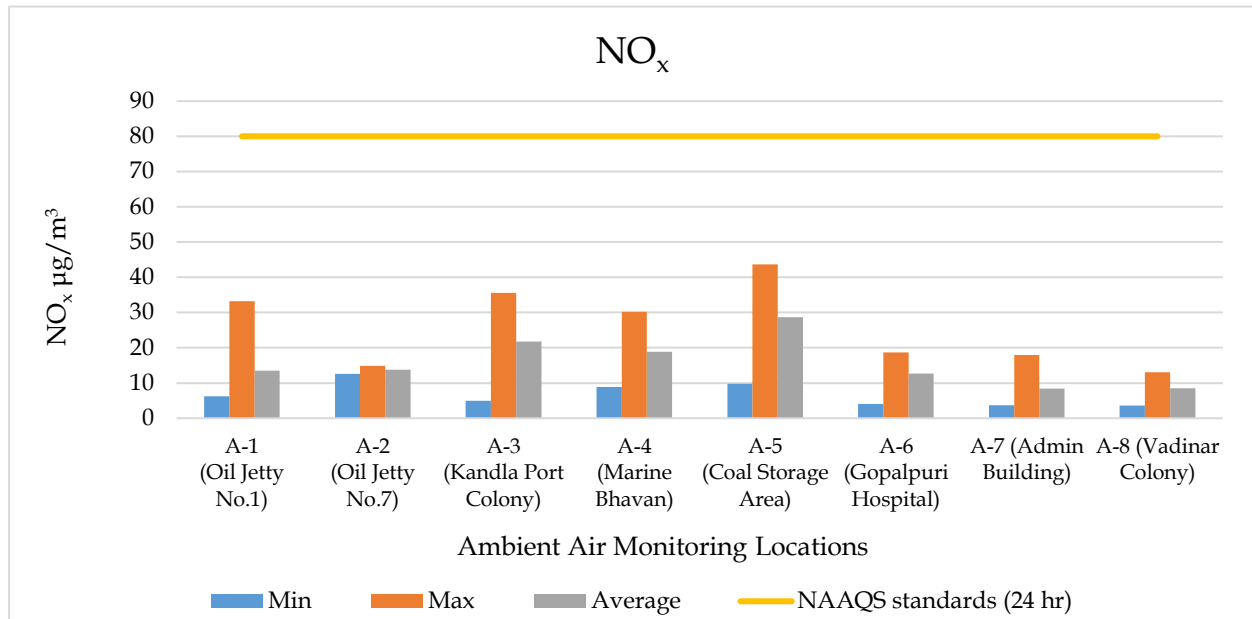
The highest SO_x concentration (39.19 $\mu\text{g}/\text{m}^3$) was recorded at station A-1, Oil Jetty No.1 area while the lowest SO_x concentration was found to be 3.4 $\mu\text{g}/\text{m}^3$ at A-4, Marine Bhavan. From the observed value it is seen that the concentration of SO_x falls within the limit prescribed by NAAQS.

Whereas for Vadinar monitoring station the maximum and minimum value for SO_x observed is, 4.99 $\mu\text{g}/\text{m}^3$ and 1.39 $\mu\text{g}/\text{m}^3$ at Admin Building (A-7) at different month. The

majority of the monitored values of SO_x at Vadinar were reported well below the specified limit of 80 µg/m³.

Table 9: Summarized results of NO_x for Ambient Air quality monitoring

NO _x (µg/m ³)										
Sr No	Location Sampling date	Kandla						Vadinar		NAAQS standards (24 hr)
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	17-Apr-2023	9.20	12.85	21.94	19.41	27.76	8.70	8.14	9.72	80 µg/m ³
2	19-Apr-2023	10.02	12.55	19.88	8.90	31.22	10.24	7.64	11.25	
3	24-Apr-2023	6.20	14.87	35.54	18.80	32.57	17.38	17.94	12.81	
4	26-Apr-2023	33.24	13.40	30.12	25.04	20.64	13.24	10.00	10.58	
5	1-May-2023	18.72	14.89	21.27	19.81	21.84	18.68	7.47	13.06	
6	3-May-2023	7.52	14.33	5.00	13.18	25.84	4.08	6.43	6.48	
7	8-May-2023	12.28	13.37	23.49	21.98	32.60	14.12	7.85	7.77	
8	10-May-2023	13.99	13.55	27.64	30.18	43.64	12.00	5.45	5.12	
9	15-May-2023	10.65	14.36	11.05	12.57	9.78	15.61	3.66	3.61	
	Minimum	6.20	12.55	5.00	8.90	9.78	4.08	3.66	3.61	
	Maximum	33.24	14.89	35.54	30.18	43.64	18.68	17.94	13.06	
	Average	13.54	13.80	21.77	18.87	28.67	12.67	8.40	8.49	
	Std Dev	8.26	0.85	9.33	6.60	17.27	4.55	4.65	3.73	

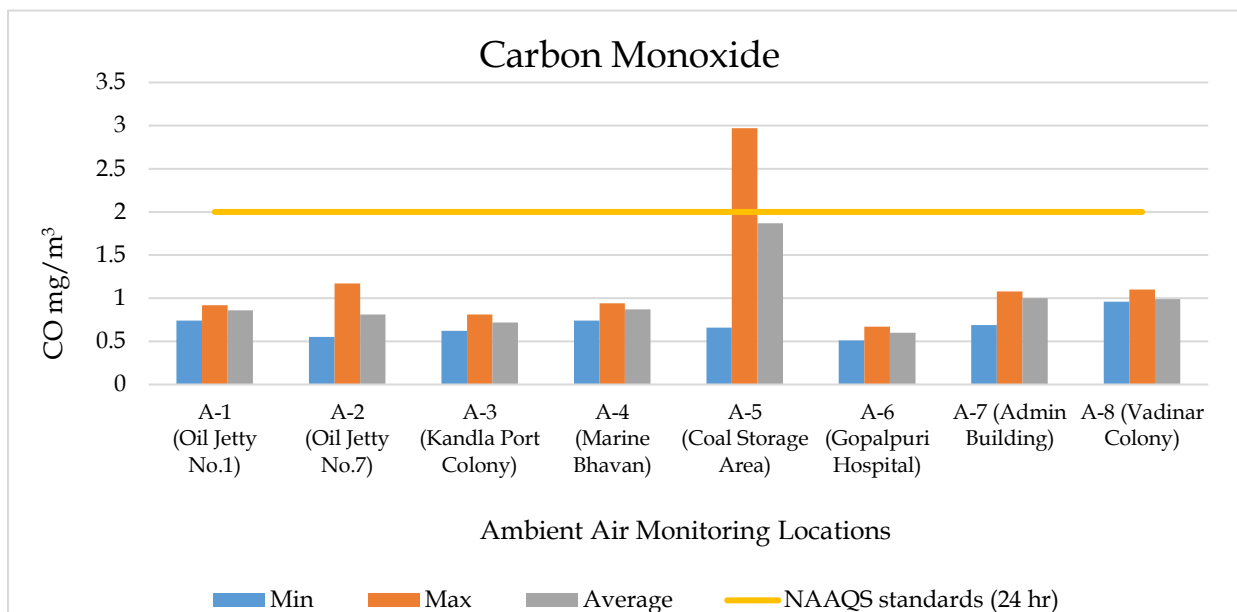


Graph 4: Spatial trend in NO_x Concentration at Monitoring locations

The highest NO_x concentration 43.64 µg/m³ was recorded at station A-5, Coal Storage Area. All the monitored values of NO_x are found well below the specified limit of 80 µg/m³. At Vadinar, the concentration of NO_x was found to be below the NAAQS limit for both the monitoring stations.

Table 10: Summarized results of Carbon Monoxide for Ambient Air quality monitoring

Carbon Monoxide (mg/m ³)										
Sr No	Location Sampling date	Kandla						Vadinar		NAAQS standards (8 hr)
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	17-Apr-2023	0.90	0.76	0.62	0.89	1.13	0.66	0.88	0.97	2 mg/m ³
2	19-Apr-2023	0.86	1.06	0.65	0.86	1.16	0.64	0.94	0.89	
3	24-Apr-2023	0.89	1.17	0.63	0.87	1.98	0.65	1.08	1.10	
4	26-Apr-2023	0.91	0.55	0.71	0.92	2.01	0.67	0.69	0.99	
5	1-May-2023	0.91	0.77	0.67	0.91	0.54	0.66	1.01	0.96	
6	3-May-2023	0.74	0.71	0.79	0.94	1.68	0.52	1.03	0.98	
7	8-May-2023	0.92	0.76	0.80	0.83	1.97	0.51	1.04	0.99	
8	10-May-2023	0.75	0.56	0.79	0.87	2.97	0.58	1.08	0.97	
9	15-May-2023	0.84	0.92	0.81	0.74	0.66	0.54	1.04	0.96	
	Minimum	0.74	0.55	0.62	0.74	0.66	0.51	0.69	0.96	
	Maximum	0.92	1.17	0.81	0.94	2.97	0.67	1.08	1.10	
	Average	0.86	0.81	0.72	0.87	1.87	0.60	1.00	0.99	
	Std Dev	0.07	0.21	0.08	0.06	1.16	0.07	0.14	0.05	



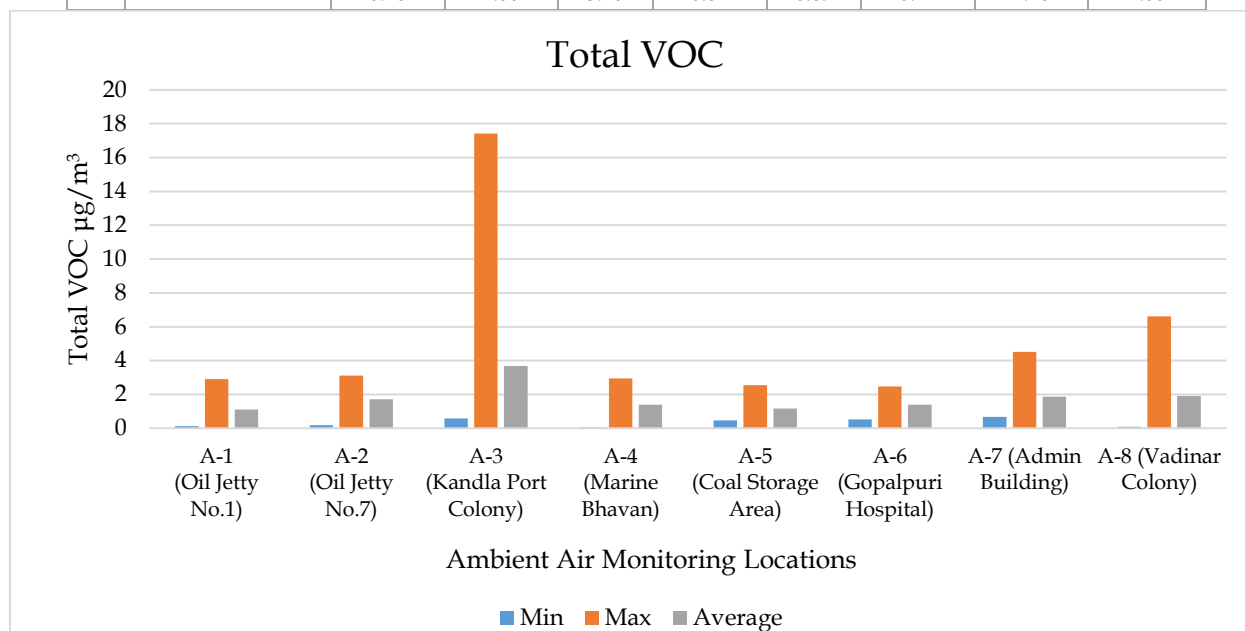
Graph 5: Spatial trend in CO Concentration at Monitoring locations

During the monitoring period, the highest CO concentration i.e., 2.97 mg/m³ was recorded at A-5, Coal Storage Area with mean value 1.87 mg/m³. Whereas other monitoring station were recorded the CO concentration well below the specified limit of 2 mg/m³.

The levels of CO at monitoring station of Vadinar were found well within the permissible limit. The mean concentration of CO was found 1.00 and 0.99 mg/m³, in A-7 (Admin building) and A-8 (Vadinar Colony) respectively. In the coal storage area, as the moisture in the coal is liberated and the coal oxidizes, both heat and carbon monoxide are created. This might be attributed to the higher concentration of Carbon Monoxide in the Coal Storage Area as compared to the other monitored locations.

Table 11: Summarized results of Total VOC for Ambient Air quality monitoring

Total VOCs ($\mu\text{g}/\text{m}^3$)									
Sr. No	Locations Sampling date	Kandla						Vadinar	
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8
1	17-Apr-2023	0.13	2.54	17.43	2.36	2.54	2.48	4.52	6.62
2	19-Apr-2023	1.32	0.67	2.21	0.04	1.14	2.06	2.6	2.4
3	24-Apr-2023	0.69	2.45	1.97	0.94	0.47	1.84	2.76	2.98
4	26-Apr-2023	2.91	1.99	2.85	1.58	1.85	0.81	0.87	2.45
5	1-May-2023	1.08	2.07	1.83	2.95	0.49	0.52	1.28	0.25
6	3-May-2023	0.97	3.11	2.92	1.74	1.52	2.10	2.09	1.08
7	8-May-2023	1.04	0.19	1.91	0.99	0.58	1.00	1.06	0.08
8	10-May-2023	1.05	2.11	1.47	0.85	0.96	0.85	0.95	0.27
9	15-May-2023	0.65	0.28	0.57	1.09	1.02	0.87	0.68	1.09
	Minimum	0.13	0.19	0.57	0.04	0.47	0.52	0.68	0.08
	Maximum	2.91	3.11	17.43	2.95	2.54	2.48	4.52	6.62
	Average	1.10	1.71	3.68	1.39	1.17	1.39	1.87	1.91
	Std Dev	0.76	1.06	5.20	0.87	0.69	0.72	1.26	2.06



Graph 6: Spatial trend in Total VOCs Concentration at Monitoring locations

During the monitoring period, the highest total VOC concentration was observed ($17.43 \mu\text{g}/\text{m}^3$) at A-3, Kandla Port Colony. While at Vadinar monitoring station the highest total VOC concentration was observed $6.62 \mu\text{g}/\text{m}^3$ at A-8 with mean value $1.91 \mu\text{g}/\text{m}^3$. VOCs emitted from an urban source to the atmosphere may cause pollution on a local scale. VOCs are present mainly due to motor vehicles emissions. Gasoline and natural gas are a major source of VOCs that impact outdoor air quality. Vehicle exhaust and burning fossil fuels, wood, and garbage all release VOCs into the atmosphere.

Table 12: Summarized results of Benzene for Ambient Air quality monitoring

Benzene ($\mu\text{g}/\text{m}^3$)										
Sr. No	Location Sampling date	Kandla						Vadinar		NAAQS standards (24 hr)
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	
1	17-Apr-2023	3.5	1.01	1.43	0.04	1.08	1.08	0.48	0.37	5 $\mu\text{g}/\text{m}^3$

The Ambient air Monitoring location of Kandla recorded the highest Benzene concentration i.e., 1.43 $\mu\text{g}/\text{m}^3$ at A-3, Kandla Port Colony. While at Vadinar monitoring station the highest Benzene concentration was found to be 0.77 $\mu\text{g}/\text{m}^3$ at A-7, Admin Building. Thus, all monitoring station at Kandla and Vadinar recorded the Benzene concentration well below the specified limit of 5 $\mu\text{g}/\text{m}^3$.

Table 13: Summarized results of Polycyclic Aromatic Hydrocarbon

Sr No	Location Components	Kandla						Vadinar	
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8
		26-Apr-2023		24-Apr-2023				24-Apr-2023	
1	Napthalene	0.41	17.31	0.49	0.32	1.92	39.82	0.39	0.32
2	Acenaphthylene	0.03	0.48	0.34	0.53	0.03	0.05	0.005	0.005
3	Acenaphthene	0.01	0.45	15.10	119.08	0.02	11.80	0.14	0.12
4	Fluorene	0.04	0.33	22.99	178.72	0.07	27.22	0.05	0.03
5	Anthracene	0.23	0.47	0.88	5.05	0.35	3.78	0.32	0.27
6	Phenanthrene	0.34	0.13	0.08	0.55	0.51	0.78	0.29	0.22
7	Fluoranthene	0.34	0.26	1.43	15.67	0.26	20.36	0.36	0.30
8	Pyrene	0.40	0.26	2.40	42.23	0.33	51.22	0.21	0.01
9	Chrycene	0.39	0.15	0.58	6.27	0.36	5.82	0.22	0.25
10	Banz(a)anthracene	1.17	0.38	1.64	15.42	0.92	16.73	0.32	0.21
11	Benzo[k]fluoranthene	0.98	0.38	0.71	0.64	0.64	4.25	0.31	0.03
12	Benzo[b]fluoranthene	0.89	0.35	0.47	3.97	0.61	6.52	0.25	0.07
13	Benzopyrene	0.75	0.29	0.52	2.85	0.70	3.40	0.32	0.03
14	Indeno[1,2,3-cd]fluoranthene	2.39	0.69	0.80	2.46	1.68	4.61	0.35	0.1
15	Dibenz(ah)anthracene	1.00	0.19	0.21	1.04	0.31	0.46	0.29	0.05
16	Benzo[ghi]perylene	2.34	0.47	0.97	6.07	1.90	6.38	0.27	0.21

Higher concentration of the PAH was observed the period of 17th April to 16th May 2023. Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous pollutants in urban atmospheres. Anthropogenic sources of total PAHs in ambient air emissions are greater than those that come from natural events. Polycyclic aromatic hydrocarbons (PAHs) are a class of chemicals that occur naturally in coal, crude oil, and gasoline. They result from burning coal, oil, gas, etc. Six sources can be identified such as road dust, oil, coal, vehicles, incineration, and road salt. The road dust and emissions from traffic are the main outdoor source for the PAH concentration. Other outdoor sources of PAHs are industrial plants in and around the DPA premises.

Table 14: Summarized results of Non-methane VOCs ($\mu\text{g}/\text{m}^3$)

Sr No	Location Sampling date	Kandla						Vadinar	
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8
1	17-Apr-2023	0.12	0.15	0.16	0.17	0.13	0.19	0.15	0.15

The Ambient air Monitoring location of Kandla recorded the highest Non-methane VOC concentration i.e., $0.19 \mu\text{g}/\text{m}^3$ at A-6, Gopalpuri Hospital while the lowest Non-methane VOC concentration was found $0.12 \mu\text{g}/\text{m}^3$ at A-1, Oil Jetty No.1. While at Vadinar monitoring station, the lowest Non-methane VOC concentration was observed $0.09 \mu\text{g}/\text{m}^3$ at A-7, Admin Building. Thus, all monitoring station at Kandla and Vadinar recorded the Benzene concentration well below the specified limit of $5 \mu\text{g}/\text{m}^3$.

4.4 Conclusion:

From the ambient monitoring study conducted for a period (17th April-15th May 2023), it may be concluded that the particulate matter (PM_{10}), were reported in higher concentrated and apparently were exceeding the NAAQS particularly at 4 locations in Kandla (Oil Jetty No 7, Coal storage area, Kandla port colony and Marine bhavan) while gaseous pollutants (NO_x , SO_x , CO, VOCs etc.) falls within the permissible limit. The probable reason contributing to these emissions of pollutants into the atmosphere in and around the port area are summarized as follows-

- Ship Emissions:** Ships primarily emit air pollutants through their exhaust stacks. These emissions include sulfur oxides (SO_x), nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), volatile organic compounds (VOCs), and greenhouse gases (GHGs) such as carbon dioxide (CO_2). The type of fuel used by ships greatly influences the amount and type of emissions produced.
- Port Machinery:** Port activities involve the use of various machinery and equipment, including cranes, forklifts, tugboats, and cargo handling equipment. These machines often rely on diesel engines, which can emit pollutants such as NO_x , PM, and CO. Older or poorly maintained equipment tends to generate higher emissions.
- Port Vehicles:** Trucks and other vehicles operating within port and port area contributes to air pollution. Similar to port machinery, diesel-powered vehicles can emit NO_x , PM, CO, and other pollutants such as (PAH), VOCs etc. Vehicle traffic and congestion in and around port areas can exacerbate the air quality issues.
- While docked or at anchor, ships may use auxiliary engines to power onboard systems such as lighting, heating, and refrigeration. These engines can emit pollutants and contribute to air pollution, particularly in port areas with significant vessel traffic.

4.5 Suggestive Measures to control the air pollution:

Efficient mitigation strategies need to be implementation for substantial environmental and health co-benefits. To improve air quality the port has adopted a number of precautionary measures, such as maintained a wide expanse of Green zone, initiated Inter-Terminal Transfer (ITT) of tractor-trailers, Centralized Parking Plaza, providing shore power supply to tugs and port crafts, the use of LED lights at DPA area helps in

lower energy consumption and decreases the carbon foot prints in the environment, time to time cleaning of paved and un paved roads, use of tarpaulin sheets to cover dumpers at project sites etc. are helping to achieve the cleaner and green future at port. To address air pollution from port shipping activities, various measures can be implemented including:

- Practice should be initiated for using mask as preventative measure, to avoid Inhalation of dust particle-Mask advised in sensitive areas.
- Covering vehicles with tarpaulin during transportation of construction material to site.
- Ensuring that contractors are maintaining engines and that machinery deployed during construction are complying with emission standards.
- Ensuring frequent water sprinkling on roads to reduce dust vehicular movement on land. The water sprinkling should be use at each and every stage of transporting coal up the loading of truck to avoid generation of coal dust.
- Use of proper transport methods, such as a conveyor belt, for excavated material and screens around the construction site.
- Temporary pavement of roads in a construction site could considerably reduce dust emission.
- Prohibition of the use of heavy diesel oil as fuel could be a possible means to reduce pollutants Use of Cleaner Fuels: Encouraging or mandating the use of low-sulfur fuels, such as marine gas oil (MGO) or liquefied natural gas (LNG), can significantly reduce sulfur and particulate matter emissions from ships.
- Retrofitting and Engine Upgrades: Retrofitting ships with exhaust gas cleaning systems, also known as scrubbers, can help reduce sulfur emissions. Engine upgrades, such as optimizing fuel combustion and improving engine efficiency, can reduce overall emissions.
- Shore Power Infrastructure: Investing in infrastructure for cold ironing allows ships to connect to the electrical grid while docked, reducing the need for auxiliary engines and associated emissions.
- Improved Port Operations: Implementing efficient cargo-handling processes, optimizing logistics to reduce congestion and idling times, and encouraging use of cleaner port machinery and vehicles can all contribute to reducing air pollution in port areas.
- Inspection of condition of contractor's barges and equipment before start of work and ensuring a maintenance schedule is followed for the equipment used.
- Minimization of movement of project vehicles at night and especially during peak hour traffic (9-11am, 2-3 pm and 5-6pm).
- Regular maintenance of diesel generators engines However, continued efforts are needed to improve air quality and mitigate the impact of port shipping activities on the environment and public health.



This page is intentionally left blank

CHAPTER 5: NOISE MONITORING

5.1 Noise Monitoring

Noise can be defined as an unwanted sound. It is, therefore, necessary to measure both the quality as well as the quantity of environmental noise in and around the study area. Noise produced during operation stage and thereafter activities may affect surrounding environment impacting the fauna and also the human population working and residing not only at site but also in the nearby areas. Under the scope, the noise monitoring is required to be carried out at 10 locations in Kandla and 3 locations in Vadinar. The sampling locations for noise are confined to commercial areas of DPA. The details of the noise monitoring stations are mentioned in **Table 15** and locations have been depicted in the **Figure 6 and 7** as follow:

Table 15: Details of noise monitoring locations

Sr. No.	Location Code	Location Name	Latitude/ Longitude
1.	Kandla	N-1	Oil Jetty 7
2.		N-2	West Gate No.1
3.		N-3	Canteen Area
4.		N-4	Main Gate
5.		N-5	Main Road
6.		N-6	Marin Bhavan
7.		N-7	Port & Custom Building
8.		N-8	Nirman Building
9.		N-9	ATM Building
10.		N-10	Wharf Area/ Jetty
11.	Vadinar	N-11	Near Main Gate
12.		N-12	Near Vadinar Jetty
13.		N-13	Port Colony Vadinar



Figure 6: Location Map for Noise Monitoring at Kandla



Figure 7: Location Map for Noise Monitoring at Vadinar

Frequency of Noise Monitoring

Monitoring was carried out at each noise monitoring station for Leq. noise level (Day and Night), which was recorded for 24 hours continuously for once in a month with the help of Class-1 Sound/Noise Level Meter.

5.2 Method of sampling and analysis:

The intensity of sound energy in the environment is measured in a logarithmic scale and is expressed in a decibel (dB(A)) scale. Ordinary sound level meter measures the sound energy that reaches the microphone by converting it into electrical energy and then measures the magnitude in dB(A). In a sophisticated type of sound level meter, an additional circuit (filters) is provided, which modifies the received signal in such a way that it replicates the sound signal as received by the human ear and the magnitude of sound level in this scale is denoted as dB(A). The sound levels are expressed in dB(A) scale for the purpose of comparison of noise levels, which is universally accepted by the international community.

Noise levels were measured using an integrated sound level meter of the make Casella Sound Level Meter (Class-I). It has an indicating mode of Lp and Leq. Keeping the mode in Lp for few minutes and setting the corresponding range and the weighting network in "A" weighting set the sound level meter was run for one-hour time and Leq was measured at all locations.

The day noise levels have been monitored during 6.00am to 10.00pm and night noise levels, during 10.00pm to 6.00am at all the thirteen locations monthly.

Table 16: Details of the Noise Monitoring that carried out at Kandla and Vadinar

Sr. No.	Parameters	Units	Reference Method	Instrument
1.	Leq (Day)	dB(A)	IS 9989: 2014	Noise Level Meter (Class-I)
2.	Leq (Night)	dB(A)		

Standard for Noise

Ministry of Environment & Forests (MoEF) has notified the noise standards vide gazette notification dated February 14, 2000 for different zones under the Environment Protection Act (1986). The specified standards are as mentioned in **Table 17** as follows:

Table 17: Ambient Air Quality norms in respect of Noise

Area Code	Category of Area	Noise dB(A) Leq	
		Daytime	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note:

- 1 Day time shall mean from 6.00 am to 10.00 pm.
- 2 Night time shall mean from 10.00 pm to 6.00 am.
- 3 Silence zone is defined as area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area, which is declared as such by the competent authority.

5.3 Result and Discussion

The details of the Noise monitoring conducted for the months of April-May 2023 have been summarized in the **Table 18**. The day noise levels have been monitored during 6.00am to 10.00pm and night noise levels, during 10.00pm to 6.00am at all the thirteen locations monthly.

Table 18: The results of Ambient Noise Quality

Sr. No.	Station Code	Station Name	Category of Area	Standard	Day Time			Standard	Night Time		
					Max.	Min.	Leq dB(A) Total		Max	Min	Leq dB(A) Total
1	N-1	Oil Jetty 7	A	75	64.5	38.4	53.7	70	56.3	36.9	48.4
2	N-2	West Gate No.1	A	75	66.3	46.1	57.2	70	51.3	39.6	46.6
3	N-3	Canteen Area	B	65	66.2	38.0	54.8	55	51.2	38.6	46.4
4	N-4	Main Gate	A	75	60.8	37.1	52.2	70	50.8	38.6	46.3
5	N-5	Main Road	A	75	64.9	41.4	54.9	70	51.0	33.6	43.5
6	N-6	Marin Bhavan	B	65	60.7	39.0	52.1	55	52.3	44.3	48.5
7	N-7	Port & Custom Building	B	65	66.3	37.6	54.5	55	53.2	37.9	45.7
8	N-8	Nirman Building	B	65	58.7	42.1	51.3	55	58.9	38.5	50.8
9	N-9	ATM Building	B	65	64.5	35.1	54.2	55	53.4	37.3	49.0
10	N-10	Wharf Area/ Jetty	A	75	74.5	42.1	63.1	70	52.7	38.7	48.9
11	N-11	Near Main Gate	A	75	67.7	35.7	56.7	70	54.3	34.3	46.8
12	N-12	Near Vadinar Jetty	A	75	65.3	39.2	54.5	70	54.1	34.7	46.2
13	N-13	Port Colony Vadinar	C	55	58.7	41.8	50.7	45	55.7	36.3	47.8

5.4 Data Interpretation:

With reference to the Table 18, during the monitoring period at Kandla highest day time noise was observed at N-10 i.e., Wharf Area/Jetty (74.5 dB(A)). The day time noise levels were observed to be within the prescribed limit of 75 dB(A).

While considering the Night time, highest noise was observed at N-8 i.e., Nirman Building (58.9 dB(A)), whereas lowest noise was observed at N-5 i.e., Main Road area (33.6 dB(A)). The night time noise levels were observed to be within the prescribed limit of 70 dB(A).

For the locations of Vadinar highest and lowest day time noise was observed at N-11 i.e., Near Main Gate as 67.7 dB(A) and 35.7 dB(A) respectively. The day time noise levels were observed to be within the prescribed limit of 75 dB(A).

While considering the Night time, highest noise was observed at N-13 i.e., Port Colony Vadinar (55.7 dB(A)), whereas lowest noise was observed at N-11 i.e., Near Main Gate (34.3 dB(A)). The night time noise levels were observed to be within the prescribed limit of 70dB(A).

5.5 Conclusion

Transportation systems are the main source of noise pollution in urban areas. Construction of buildings, highways, and roads cause a lot of noise, due to the usage of air compressors, bulldozers, loaders, dump trucks, and pavement breakers. Noise sources in port operations include cargo handling, vehicular traffic, and loading / unloading containers and ships. Noise sources in port operations include cargo handling, vehicular traffic, and loading / unloading containers and ships. The Day Time Noise Level in all 10 locations at Deendayal Port Authority ranged from 51.3 dB(A) to 63.1 dB(A) while at Vadinar port 3 location ranged from 50.7 dB(A) to 56.7 dB(A) and for The Night Time Average Noise Level in all locations of Deendayal Port Authority ranged from 43.5 dB(A) to 50.8 dB(A) while at Vadinar port ranged from 46.2 dB(A) to 47.8 dB(A) which falls within the permissible limits set for the industrial, commercial and residential area for the daytime.

Transportation systems are the main source of noise pollution in project areas. Noise sources in port operations include cargo handling, vehicular traffic, and loading / unloading containers and ships. Construction activities may create a problem of noise generated by construction equipment, truck traffic, work vessels and other similar sources. Sources of noise can be individuated in port areas in the following three main areas:

- Passenger car and heavy vehicle (trucks) road traffic (the most important one);
- Goods movement (from machinery such as quay-crane, pumps, etc.);
- Rail traffic noise: rail movement in port and in surrounding areas are prevalent to low speed and of consequence the noise level is not so high, however in highly trafficked areas the problem can be relevant.

5.6 Measures against adverse effects

Transmission of noise may reduce with the distance from their sources. Noise could be considerably reduced by adoption of low noise equipment or installation of sound insulation fences. Green belt of plants can be a good barrier. Limitation of working hours may be a possible means to mitigate the nuisances of construction activities.

CHAPTER 6: DRINKING WATER MONITORING

6.1 Drinking Water Monitoring

It is necessary to check with the drinking water sources regularly so as to know whether water quality meets the prescribed standards for drinking. Monitoring the drinking water quality is essential to protect human health and the environment. A total of 20 locations (18 at Kandla and 2 at Vadinar) were monitored for Drinking Water. The location map has been depicted in the **Figure 8 and 9** and the details of the drinking water monitoring locations within the premises of DPA have been mentioned in **Table 19**.

Table 19: Details of Drinking Water Sampling Locations

Sr. No.	Location Code		Location Name	Latitude/ Longitude
1.	Kandla	DW-1	Oil Jetty 7	23.043527N 70.218456E
2.		DW-2	Port & Custom Building	23.009033N 70.222047E
3.		DW-3	North Gate	23.007938N 70.222411E
4.		DW-4	Workshop	23.009372N 70.222236E
5.		DW-5	Canteen Area	23.003707N 70.221331E
6.		DW-6	West Gate 1	23.006771N 70.217340E
7.		DW-7	Sewa Sadan -3	23.009779N 70.221838E
8.		DW-8	Nirman Building	23.009642N 70.220623E
9.		DW-9	Custom Building	23.018930N 70.214478E
10.		DW-10	Port Colony Kandla	23.019392N 70.212619E
11.		DW-11	Wharf Area/ Jetty	22.997833N 70.223042E
12.		DW-12	Hospital Kandla	23.018061N 70.212328E
13.		DW-13	A.O. Building	23.061914N 70.144861E
14.		DW-14	School Gopalpuri	23.083619N 70.132061E
15.		DW-15	Guest House	23.078830N 70.131008E
16.		DW-16	E- Type Quarter	23.083306N 70.132422E
17.		DW-17	F- Type Quarter	23.077347N 70.135731E
18.		DW-18	Hospital Gopalpuri	23.081850N 70.135347E
19.	Vadinar	DW-19	Near Vadinar Jetty	22.440759N 69.675210E
20.		DW-20	Near Port Colony	22.401619N 69.716822E



Figure 8: Location Map for Drinking Water Monitoring for Kandla



Figure 9: Location Map for Drinking Water Monitoring at Vadinar

6.2 Methodology of Monitoring:

The water samples were collected from the finalized sampling locations and analyzed for physico-chemical and microbiological parameter. The analysis of these samples collected was carried out as per APHA, 23rd Edition and Indian Standard method in GEMI's NABL Accredited Laboratory, Gandhinagar. GEMI has followed the CPCB guideline as well as framed its own guidelines for the collection of water/wastewater samples, under the provision of Water (Preservation and Control of Pollution) Act 1974, titled as '**Sampling Protocol for Water & Wastewater**'; approved by the Government of Gujarat vide letter no. ENV-102013-299-E dated 24-04-2014. The samples under the study were collected and preserved as per the said Protocol. The samples were analyzed for selected parameters to establish the existing water quality of the study area. The parameters finalized to assess the drinking water quality have been mentioned in **Table 20** as follows:

Table 20: List of parameters for Drinking Water Quality monitoring

Sr. No.	Parameters	Units	Reference method	Instrument
1.	pH	-	APHA, 23 rd Edition (Section-4500-H ⁺ B):2017	pH Meter
2.	EC	μS/cm	APHA, 23 rd Edition (Section-2510 B):2017	Conductivity Meter
3.	Turbidity	NTU	APHA, 23 rd Edition (Section -2130 B):2017	Nephlo Turbidity Meter
4.	TDS	mg/L	APHA, 23 rd Edition (Section-2540 C):2017	Vaccum Pump with filtration assembly and Oven
5.	TSS	mg/L	APHA, 23 rd Edition, 2540 D: 2017	
6.	Chloride	mg/L	APHA, 23 rd Edition (Section-4500-Cl-B):2017	Titration Apparatus
7.	Total Hardness	mg/L	APHA, 23 rd Edition (Section-2340 C):2017	
8.	Ca Hardness	mg/L	APHA, 23 rd Edition (Section-3500-Ca B):2017	
9.	Mg Hardness	mg/L	APHA, 23 rd Edition (Section-3500-Mg B):2017	
10.	Free Residual Chlorine	mg/L	APHA 23 rd Edition, 4500	
11.	Fluoride	mg/L	APHA, 23 rd Edition (Section-4500-F-D):2017	UV- Visible Spectrophotometer
12.	Sulphate	mg/L	APHA, 23 rd Edition (Section 4500-SO ₄ -2-E):2017	
13.	Sodium	mg/L	APHA, 23 rd Edition (Section-3500-Na-B):2017	Flame Photometer
14.	Potassium	mg/L	APHA, 23 rd Edition, 3500 K-B: 2017	
15.	Salinity	mg/L	APHA, 23 rd Edition (section 2520 B, E.C. Method)	Salinity /TDS Meter

Sr. No.	Parameters	Units	Reference method	Instrument
16.	Nitrate	mg/L	APHA, 23 rd Edition, 4500 NO ₃ - B: 2017	UV- Visible Spectrophotometer
17.	Nitrite	mg/L	APHA, 23 rd Edition, 4500 NO ₂ -B: 2017	
18.	Hexavalent Chromium	mg/L	APHA, 23 rd Edition, 3500 Cr B: 2017	
19.	Manganese	mg/L	APHA, 23 rd Edition, ICP Method 3120 B: 2017	ICP-OES
20.	Mercury	mg/L	EPA 200.7	
21.	Lead	mg/L	APHA ICP 23 rd Edition (Section- 3120 B):2017	
22.	Cadmium	mg/L	APHA ICP 23 rd Edition (Section- 3120 B):2017	
23.	Iron	mg/L	APHA ICP 23 rd Edition (Section- 3120 B):2017	
24.	Total Chromium	mg/L	APHA ICP 23 rd Edition (Section- 3120 B):2017	
25.	Copper	mg/L	APHA, 23 rd Edition, ICP Method 3120 B: 2017	ICP-OES
26.	Zinc	mg/L	APHA ICP 23 rd Edition (Section- 3120 B):2017	
27.	Arsenic	mg/L	APHA ICP 23 rd Edition (Section- 3120 B):2017	
28.	Colour	mg/L	APHA, 23 rd Edition, 2120 B:2017	Color Comparator
29.	Total Coliforms	MPN/ 100ml	IS 15185: 2016	LAF/ Incubator

6.3 Conclusion Result and discussion:

The drinking water quality of the locations at Kandla and Vadinar and its comparison with the to the standard (Drinking Water Specifications i.e., IS: 10500:2012) have been summarized in **Table 21**.

Table 21: Summarized Result of Drinking Water quality

Sr. No.	Parameters	Units	Standard values as per IS		Kandla																		Vadinar	
			A	P	DW-1	DW-2	DW-3	DW-4	DW-5	DW-6	DW-7	DW-8	DW-9	DW-10	DW-11	DW-12	DW-13	DW-14	DW-15	DW-16	DW-17	DW-18	DW-19	DW-20
1.	pH	-	6.5-8.5	-	7.35	7.15	7.36	7.26	7.27	7.31	7.45	7.42	7.24	7.23	7.33	7.19	7.62	7.65	7.55	7.53	7.6	7.28	7.46	7.45
2.	Colour	Hazen	5	15	1	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	1	1	5	20
3.	EC	μS/cm	-	-	198	38	138	36	42	48	36	40	315	138	55	62	24	551	58	146	150	38	115	683
4.	Salinity	mg/L	-	-	0.10	0.02	0.07	0.02	0.02	0.02	0.02	0.02	0.15	0.07	0.02	0.03	0.02	0.27	0.03	0.07	0.07	0.02	0.06	0.33
5.	Turbidity	NTU	1	5	BQL	BQL	0.7	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	5.3
6.	Chloride	mg/L	250	1000	46.9	7.50	30.99	8.5	10.32	12.59	7.5	10.50	72.48	25.99	13.54	12.50	7.50	80.97	12.50	25.99	26.49	11.5	19.99	90.47
7.	Total Hardness	mg/L	200	600	15	10	10	15	10	15	10	15	15	10	15	15	10.0	160	15	20	20	10	20	160
8.	Ca Hardness	mg/L	-	-	5	5	5	5	5	5	5	5	5	5	5	5	5.0	90	5	10	10	5	5	80
9.	Mg Hardness	mg/L	-	-	10	5	5	10	5	10	5	10	10	5	10	10	5.0	70	10	10	10	5	15	80
10.	Free Residual Chlorine	mg/L	0.2	1	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
11.	TDS	mg/L	500	2000	100	20	72	20	22	25	20	22	158	70	29	30	28	278	32	76	78	20	62	346
12.	TSS	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	12
13.	Fluoride	mg/L	1.0	1.5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
14.	Sulphate	mg/L	200	400	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	25.84	BQL	BQL	BQL	BQL	BQL	40.57



Sr. No.	Parameters	Units	Standard values as per IS		Kandla																		Vadinar	
			A	P	DW-1	DW-2	DW-3	DW-4	DW-5	DW-6	DW-7	DW-8	DW-9	DW-10	DW-11	DW-12	DW-13	DW-14	DW-15	DW-16	DW-17	DW-18	DW-19	DW-20
15.	Nitrate	mg/L	45	-	9.59	1.09	3.27	BQL	BQL	BQL	BQL	BQL	3.615	7.458	BQL	BQL	BQL	3.564	1.223	1.097	1.191	BQL	15.79	18.54
16.	Nitrite	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
17.	Sodium	mg/L	-	-	24.1	BQL	13.00	BQL	12	13.6	BQL	BQL	41.55	13	12.8	BQL	BQL	50.93	BQL	16.83	17.51	BQL	7.55	54.55
18.	Potassium	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
19.	Hexavalent Chromium	mg/L	-	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	0.041	0.015
20.	Odour	TON	Agreeable		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21.	Arsenic	mg/L	0.01	0.05	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
22.	Cadmium	mg/L	0.003	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
23.	Copper	mg/L	0.05	1.5	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	16.25	BQL
24.	Iron	mg/L	0.3	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	1.478	BQL
25.	Lead	mg/L	0.01	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	10.53	BQL
26.	Manganese	mg/L	0.1	0.3	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	139.03	93.717
27.	Mercury	mg/L	0.001	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

Sr. No.	Parameters	Units	Standard values as per IS		Kandla																		Vadinar	
			A	P	DW-1	DW-2	DW-3	DW-4	DW-5	DW-6	DW-7	DW-8	DW-9	DW-10	DW-11	DW-12	DW-13	DW-14	DW-15	DW-16	DW-17	DW-18	DW-19	DW-20
28.	Total Chromium	mg/L	0.05	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
29.	Zinc	mg/L	5	15	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
30.	Total Coliform*	CFU/100ml	Shall not be detected		5	390	BQL	25	5	5	BQL	BQL	BQL	BQL	5	5	BQL	135	BQL	7650	2350	5	2850	130000

A: Acceptable, P:Permissible, BQL: Below Quantification limit Turbidity (QL=0.5), Free Residual Chlorine (QL=2), Total Suspended Solids (QL=2), Fluoride (QL=0.3), Sulphate (QL=10), Nitrate as NO₃ (QL=1), Nitrite as NO₂ (QL=0.1), Sodium as Na (QL=5), Potassium as K (QL=5), Hexavalent Chromium (QL=0.01), Arsenic (QL=5), Cadmium (QL=2), Copper (QL=5), Iron (QL=0.1), Lead (QL=2), Manganese (QL=40), Mercury (QL=0.5), Total Chromium (QL=5), Zinc (QL=0.5)

***Note:** For Total Coliform, one MPN is equivalent to one CFU. The use of either methods; MPN or CFU for the detection of bacteria are considered valid measurements for bacteria limits.

6.4 Data Interpretation:

- **pH:** The pH is measure of the intensity of acidity or alkalinity and the concentration of hydrogen ion in water. At Kandla, the pH values for drinking water samples ranged from 7.15-7.65 and mean value was 7.37 while at Vadinar pH ranged from 7.45-7.46 and mean value was 7.45.
- **Turbidity:** Turbidity measurements are used to determine how clear and clean a water sample is. Small particles like clay, silt, algae, and microorganisms can be suspended in water and cause light scattering, giving water a milky or cloudy appearance. At the drinking water locations of Kandla, the turbidity was observed to be "Below the detection Limit" for majority of the locations, except location DW-3 (0.7 NTU). Whereas, for Vadinar the turbidity was observed to be "Below the detection Limit" for DW-19 and 5.3 NTU for DW-20.
- **Total Dissolved Solids (TDS):** Water has the ability to dissolve a wide range of inorganic and some organic minerals or salts such as potassium, calcium, sodium, bicarbonates, chlorides, magnesium, sulfates etc. During the study period, TDS values at Kandla varied between 20 to 278 mg/L. The average TDS value was found 114.8 mg/L. The minimum value for TDS was 20 mg/L at DW-2, DW-4, DW-7 and DW-18 and maximum was 278 mg/L at DW-14. The average TDS was 61.11 mg/L. Whereas, at Vadinar TDS ranged from 62-346 mg/L and mean was 204 mg/L.
- **Electrical Conductivity** is the ability of a solution to transfer (conduct) electric current. Conductivity is used to measure the concentration of dissolved solids which have been ionized in a polar solution such as water. The conductivity in the samples collected ranged from 24-551 $\mu\text{S}/\text{cm}$ with the average value as 117.38 $\mu\text{S}/\text{cm}$. While at Vadinar, the value of EC ranged from 115-683 $\mu\text{S}/\text{cm}$ with the average value as 399 $\mu\text{S}/\text{cm}$.
- **Chlorides:** Excessive chloride concentration increase rates of corrosion of metals in the distribution system. The Chloride concentration varied from 7.5-80.97 mg/L, with the average value as 23.57 mg/L. The lowest concentration was observed at DW-2, DW-7 and DW-13, while the highest was observed at DW-14. While at Vadinar, the concentration varied from 19.99-90.47 mg/L. With the average chloride concentration as 55.23 mg/L. The lowest concentration was observed at DW-19, while the highest was observed at DW-20.
- **Total Hardness:** Hardness is caused by compounds of calcium and magnesium, and by a variety of other metals. The Total Hardness concentration varied from 10-160 mg/L, with the average value as 21.66 mg/L. The highest was observed at DW-14. While at Vadinar, the concentration varied from 20-160 mg/L. With the average Total Hardness concentration as 90 mg/L. Hardness at all the locations was observed to have concentrations within the norms specified. The hardness of water is according to the IS standards and it is not harmful for local inhabitants.
- The parameters Free Residual Chlorine, Total Suspended Solids, Fluoride, Sulphate, Nitrate, Nitrite, Sodium, Hexavalent Chromium, Potassium, and the metals Arsenic, Cadmium, Copper, Iron, Lead, Manganese, Mercury, Total Chromium and Zinc were all observed to have concentrations "Below the Quantification Limit (BQL)" at majority of the locations for both the monitoring period.

- Bacteriological Analysis of the drinking water at Kandla and Vadinar reveals that the Total Coliforms were detected at majority of the locations of Kandla and Vadinar. This shows that drinking water samples is unfit for human consumption. Reporting such high concentration of Coliforms indicates certain external influx may contaminate the source. Hence, it should be checked at every distribution point.

6.5 Conclusion

- These results were compared with permissible limits as prescribed in IS 10500:2012 – Drinking Water Specification. It may be concluded from the analysis data that amongst the drinking water parameters so monitored, the parameters such as TDS, Total hardness, chloride, fluoride were observed to be well below the acceptable limit of IS standard at all the 20 monitoring locations. Whereas Total Coliforms were found to be present in all the drinking water samples collected from both the locations.
- Low TDS water shall contain lower mineral content, Normal drinking water provides about 20% of your dietary intake of dissolved minerals. So, which means by consuming such water may result in mineral deficiency. Further, it may increase the metal leaching.
- Bacteriological Analysis of the drinking water at Kandla and Vadinar reveals that the drinking water samples is unfit for human consumption.
- Appropriate water treatment processes should be implemented to remove or inactivate coliform bacteria that include disinfection with chlorine, ultraviolet (UV) light, or ozone etc. Filtration systems can also help remove bacteria, sediment, and other impurities.
- Further, a regular monitoring program to test the quality of drinking water at various stages, including the source, purification plants, distribution network, and consumer endpoints would help in early detection of coliform bacteria or other microbial contaminants.



This page is intentionally left blank

CHAPTER 7: DG STACK MONITORING

7.1 DG Stack Monitoring

A diesel generator is a mechanical-electrical machine that produces electrical energy (electricity) from diesel fuel. They are used by the residential, commercial, charitable and governmental sectors to provide power in the event of interruption to the main power, or as the main power source. Diesel generating (DG) sets are generally used in places without connection to a power grid, or as an emergency power supply if the grid fails. These DG sets utilize diesel as fuel and generate and emit the air pollutants such as Suspended Particulate Matter, SO_x, NO_x, CO, etc. from the stack during its functioning. The purpose of stack sampling is to determine emission levels from plant processes to ensure they are in compliance with any emission limits set by regulatory authorities to prevent macro environmental pollution. The stack is nothing but chimney which is used to disperse the hot air at a great height, emissions & particulate matters that are emitted. Hence, monitoring of these stacks attached to DG Sets is necessary in order to quantify the emissions generated from it.

As defined in scope by Deendayal Port Authority (DPA), the monitoring of DG Stack shall be carried out at two locations, one at Kandla and one at Vadinar. The details of the DG Sets at Kandla and Vadinar have been mentioned in **Table 22** as follows:

Table 22: Details of DG Set monitoring locations

Sr. No.	Location Code	Location Name	Latitude/ Longitude
1.	DG-1	Kandla	22.98916N 70.22083E
2.	DG-2	Vadinar	22.44155N 69.67419E

The map depicting the locations of DG Stack Monitoring to be monitored in Kandla and Vadinar have been mentioned in **Map 10 and 11** as follows:



Figure 10: Location Map for DG Set monitoring at Kandla



Figure 11: Location Map for DG Set monitoring at Vadinar

Frequency of DG Monitoring

Monitoring is required to be carried out once a month for both the locations of Kandla and Vadinar.

7.2 Method of sampling and analysis:

Under the study, the list of parameters to be monitored under the projects for the Soil Quality Monitoring been mentioned in **Table 23** as follows:

Table 23: Parameters to be monitored under the study

Sr. No.	Parameter	Unit	Instrument
1.	Suspended Particulate Matter	mg/Nm ³	Stack Monitoring Kit
2.	Sulphur Dioxide (SO ₂)	mg/Nm ³	Sensor based Flue Gas Analyzer (Make: TESTO, Model 350)
3.	Oxides of Nitrogen (NO _x)	mg/Nm ³	
4.	Carbon Monoxide	mg/Nm ³	
5.	Carbon Dioxide	mg/Nm ³	

The methodology for monitoring of DG Set has been mentioned as follows:

The monitoring of DG Stack is carried out as per the IS:11255 and USEPA Method. The Stack monitoring kit is used for collecting representative samples from the stack to determine the total amount of pollutants emitted into the atmosphere in a given time. Source sampling is carried out from ventilation stack to determine the emission rates/or characteristics of pollutants. Sample collected must be such that it truly represents the conditions prevailing inside the stack. Whereas the parameters Sulphur Dioxide, Oxides of Nitrogen (NO_x), Carbon Monoxide and Carbon Dioxide, the monitoring is carried out by using the sensor-based Flue Gas Analyzer.

As per CPCB or Indian standards for Industrial Stack Monitoring the flue gas emission from DG set emissions should not exceed the limit as mentioned in **Table 24**.

Table 24: Standards for stack emission

Sr. No.	Stack Monitoring Parameters for DG Sets	Stack Monitoring Limits / Standards As per CPCB (mg/Nm ³)
1.	Particulate Matter	150
2.	Sulphur Dioxide (SO ₂)	40
3.	Oxides of Nitrogen (NO _x)	25
4.	Carbon Monoxide	1%

During the monitoring period, the DG sets were not utilized, and hence monitoring was not conducted.



This page is intentionally left blank

CHAPTER 8: SOIL QUALITY MONITORING

8.1 Soil Quality Monitoring:

The purpose of soil quality monitoring is to track changes in the features and characteristics of the soil, especially the chemical properties of soil occurring at specific time intervals under the influence of human activity. Soil quality assessment helps to determine the status of soil functions and environmental risks associated with various practices prevalent at the location.

As defined in scope by Deendayal Port Authority (DPA), Soil Quality Monitoring shall be carried out at Six locations, four at Kandla and two at Vadinar. The details of the soil monitoring locations within the Port area of DPA are mentioned in **Table 25**:

Table 25: Details of the Soil quality monitoring locations

Sr. No.	Location Name		Location Code	Latitude Longitude
1.	Kandla	Oil Jetty 7	S-1	23.043527N 70.218456E
2.		IFFCO Plant	S-2	23.040962N 70.216570E
3.		Khori Creek	S-3	22.970382N 70.223057E
4.		Nakti Creek	S-4	23.033476N 70.158461E
5.	Vadinar	Near SPM	S-5	22.400026N 69.714308E
6.		Near Vadinar Jetty	S-6	22.440759N 69.675210E

The map depicting the locations of Soil Quality Monitoring to be monitored in Kandla and Vadinar have been mentioned in **Map 12 and 13** as follows:



Figure 12: Location Map for Soil Quality Monitoring at Kandla



Figure 13: Location Map for Soil Quality Monitoring at Vadinar

8.2 Methodology of Monitoring:

As per the defined scope by Deendayal Port Authority (DPA), the sampling and analysis of Soil quality has been carried out on monthly basis.

The samples of soil collected from the locations of Kandla and Vadinar and analyzed for the various physico-chemical parameter. Collection and analysis of these samples was carried out as per established standard methods and procedures. The samples were analyzed for selected parameters to get the present soil quality status and its and environmental risks associated with various practices prevalent at the location. GEMI has framed its own guidelines for collection of soil samples titled as '*Soil Sampling Manual*'. Soil samples were collected from up to 30 cm depth below the surface using scrapper, filled in polythene bags, labelled on-site with specific location code and name and sent to GEMI's laboratory for further detailed analysis. The samples collected from all locations are homogeneous representative of each location. The list of parameters to be monitored under the projects for the Soil Quality Monitoring been mentioned in **Table 26** as follows:

Table 26: List of parameters to be monitored for Soil Quality

Sr. No.	Parameters	Units	Reference method	Instruments
1.	TOC	%	Methods Manual Soil Testing in India January, 2011, 09. Volumetric method (Walkley and Black, 1934)	Titration Apparatus
2.	Organic Carbon	%		
3.	Inorganic Phosphate	mg/Kg	Practical Manual Chemical Analysis of Soil and Plant Samples, ICAR-Indian Institute of Pulses Research 2017 Determination of Available Phosphorus in Soil	UV-Visible Spectrophotometer
4.	Texture	-	Methods Manual Soil Testing in India January 2011,01	Hydrometer
5.	pH	-	IS 2720 (Part 26): 1987	pH Meter
6.	Conductivity	μS/cm	IS 14767: 2000	Conductivity Meter
7.	Particle size distribution & Silt content	-	Methods Manual Soil Testing in India January 2011	Sieves Apparatus
8.	SAR	meq/L	Procedures for Soil Analysis, International Soil Reference and Information Centre, 6 th Edition 2002 13-5.5.3 Sodium Absorption Ratio (SAR), Soluble cations	Flame Photometer

Sr. No.	Parameters	Units	Reference method	Instruments
9	Water Holding Capacity	%	NCERT, Chapter 9, 2022-23 and Water Resources Department Laboratory Testing Procedure for Soil & Water Sample Analysis	Muffle Furnace
10	Aluminium	mg/Kg	EPA Method 3051A	ICP-OES
11	Chromium	mg/Kg		
12	Nickel	mg/Kg		
13	Copper	mg/Kg	Methods Manual Soil Testing in India January, 2011, 17a	
14	Zinc	mg/Kg	Methods Manual Soil Testing in India January, 2011, 17a	
15	Cadmium	mg/Kg	EPA Method 3051A	
16	Lead	mg/Kg		
17	Arsenic	mg/Kg		
18	Mercury	mg/Kg		

8.3 Result and Discussion

The analysis results of physical analysis of the soil samples collected during environmental monitoring mentioned in **Table 27** are shown below:

Table 27: Results of Soil Quality

Sr. No	Location Parameters	Unit	Kandla				Vadinar	
			S-1 (Oil Jetty 7)	S-2 (IFFCO Plant)	S-3 (Khor Creek)	S-4 (Nakti Creek)	S-5 (Near SPM)	S-6 (Near Vadinar Jetty)
1	pH	-	7.69	8.27	7.27	8.04	7.92	8.5
2	Conductivity	µS/cm	8840	6040	39600	11700	111	625
3	Inorganic Phosphate	mg/Kg	11.01	27.6	20.31	11.46	5.64	5.1
4	Organic Carbon	%	0.03	0.38	1.88	0.46	0.85	0.3
5	Organic Matter	%	0.06	0.66	3.23	0.79	1.47	0.52
6	SAR	meq/L	1.05	0.67	1.10	1.65	0.10	0.25
7	Aluminium	mg/Kg	1392.53	1368.22	1569.23	1388.41	1480.53	1425.50
8	Chromium	mg/Kg	69.98	69.92	79.56	70.18	106.00	91.88
9	Nickel	mg/Kg	33.32	27.54	27.16	31.51	40.89	42.68
10	Copper	mg/Kg	25.33	51.65	148.05	50.49	123.18	98.20
11	Zinc	mg/Kg	52.29	155.24	100.20	61.30	83.05	52.89
12	Cadmium	mg/Kg	BQL	1.07	BQL	BQL	BQL	BQL
13	Lead	mg/Kg	9.30	17.33	3.45	7.24	BQL	0.91
14	Arsenic	mg/Kg	4.87	8.4	BQL	4.03	BQL	BQL
15	Mercury	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL
16	Water Holding Capacity	%	45.54	45.29	25.98	45.84	39.85	54.23
17	Sand	%	70.7	72.28	60.08	76.33	51.84	53.62
18	Silt	%	9.77	13.86	29.74	11.84	12.24	36.08
19	Clay	%	19.53	13.86	10.18	11.84	35.92	10.3
20	Texture		Sandy loam	Loamy Sand	Sandy loam	Sandy loam	Sandy loam	Sandy loam

Under the project, in order to classify the soil quality of Kandla and Vadinar, the “Standard Soil Classification” has been adopted from Hand Book of Agriculture, ICAR, New Delhi. The classification is mentioned in the **Table 28** as follows for the parameters pH, Electrical Conductivity and Organic Carbon.

Table 28: Classification of soil parameters as mentioned in Hand Book of Agriculture

Sr. No.	Soil Parameters	Classification
1.	pH	<4.5 Extremely acidic 4.51-5.50 Very strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline >9.00 very strongly alkaline
2.	EC (ppm) (1ppm = 640 μ mhos)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3.	Organic Carbon	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient

8.4 Data Interpretation:

- pH**

For the month of April 2023, the value of pH ranges from 7.27-8.27, highest at location S-2 IFFCO Plant; while the average value was 7.81. Whereas, at Vadinar highest pH was observed at S-6 i.e., near Jetty Area (8.5) with the average soil pH as 8.21. As per the classification mentioned in the Handbook of Agriculture, the pH in Kandla varies from the Neutral to moderately alkaline. Whereas, pH of Soil at Vadinar was found to be moderately alkaline.

- Electrical Conductivity (EC)**

During the study period, at Kandla the value of EC ranges from 6040-39600 μ S/cm, highest at location S-3 Khorī creek (11700 μ S/cm) and lowest at S-2 IFFCO Plant (6040 μ S/cm); while the average value was 16545 μ S/cm. Whereas, at Vadinar highest EC was observed at S-6 i.e., near Jetty Area (6.25 μ S/cm) and lowest was observed at S-5 i.e., Near SPM (111 μ S/cm), while the average value was 368 μ S/cm.

As per the classification mentioned in the Handbook of Agriculture, the Electrical Conductivity at Kandla the status of soil quality was found to be harmful to crops. Whereas, at Vadinar EC was observed to be below the average value of 640 μ S/cm.

- Inorganic Phosphate**

During the monitoring period at Kandla the value of Inorganic Phosphate ranges from 11.01-27.6 mg/Kg, highest at location S-2 IFFCO Plant (27.6 mg/Kg) and lowest at S-1 Oil Jetty-7 (11.01 mg/Kg); while the average value was 17.595 mg/Kg. Whereas, at

Vadinar highest Inorganic Phosphate was observed at S-6 i.e., near Jetty Area (5.1 mg/Kg) and lowest was observed at S-5 i.e., Near SPM (5.64 mg/Kg), while the average value was 5.37 mg/Kg.

- **Total organic Carbon (TOC)**

At Kandla the value of TOC ranges from 0.03 to 1.88 % highest at location S-3 Khoricreek (1.18%) and lowest at S-1 Oil Jetty-7 (0.03%); while the average value was 0.68%. Whereas, at Vadinar highest TOC was observed at S-5 i.e., Near SPM (0.85%) and lowest was observed at S-6 i.e., near Jetty Area (0.3%). As per the classification mentioned in the Handbook of Agriculture, the Organic Carbon at Kandla and Vadinar was on an average in sufficient concentration.

- **Heavy Metals**

For the sampling period, the concentration of **Aluminium** in the soil samples at varies from 1368.22 to 1569.23 mg/kg at Kandla and 1425.5 to 1480.53 mg/kg at Vadinar with mean value reported as 1429.59 and 1453.01 mg/kg at Kandla and Vadinar monitoring station respectively

The concentration of **Chromium** in the soil samples varies from 69.92 to 79.5623 mg/kg at Kandla and 91.88 to 106mg/kg at Vadinar with mean value 72.41 and 98.94 mg/kg at Kandla and Vadinar monitoring station respectively.

The concentration of **Nickel** in the soil samples of DPA Kandla varies from 27.16 to 33.32 mg/kg at Kandla and 40.89 to 42.68 mg/kg at Vadinar with mean value 29.88 and 41.78 mg/kg at Kandla and Vadinar monitoring station respectively.

The concentration of **Copper** in the soil samples of DPA Kandla varies from 25.33 to 148.05 mg/kg and 98.2 to 123.18 mg/kg at Vadinar with mean value 68.88 and 110.69 mg/kg at Kandla and Vadinar monitoring station respectively.

The concentration of **Zinc** in the soil samples of DPA Kandla varies from 52.29 to 155.24 mg/kg and 52.89 to 83.05mg/kg at Vadinar with mean value 92.25 and 67.97 mg/kg at Kandla and Vadinar monitoring station, respectively.

The concentration of **Lead** in the soil samples of DPA Kandla varies from 3.45 to 17.33 mg/kg and BQL to 0.91 mg/kg at Vadinar with mean value 9.33 and 0.91 mg/kg at Kandla and Vadinar monitoring station, respectively.

The concentration of **Arsenic** in the soil samples of DPA Kandla varies from BQL to 8.4 mg/kg with mean value 5.76 mg/Kg and observed below the detection Limit for Vadinar.

The concentration of **Water Holding Capacity** in the soil samples of DPA Kandla varies from 25.98 to 45.84% and 39.85 to 54.23% at Vadinar and mean value 40.66% and 47.04 % for Kandla and Vadinar respectively.

Heavy Metals like **Mercury and Cadmium** in the Soil was found to “Below the detection limit” for majority the soil samples collected at Kandla and Vadinar.

The soil texture observed at all the locations of Kandla and Vadinar for the sampling period was “Sandy Loam”.

8.5 Conclusion:

The soil quality of Kandla and Vadinar was assessed based on the Handbook of Agriculture. As per the said comparison, the pH in Kandla varies from the Slightly acidic to moderately alkaline. Whereas, pH of Soil at Vadinar was found to be moderately alkaline, the Organic Carbon at Kandla and Vadinar was on an average in sufficient concentration, whereas, the Electrical Conductivity at Kandla for both the months of April and May was found to be harmful to crops. There are several reasons that can contribute to soil quality degradation at port areas, such as:

- **Contamination:** Port areas are prone to various types of contamination due to the handling, storage, and transportation of goods and materials. Spills of hazardous substances, leakage from storage tanks, and improper disposal of waste can result in soil contamination. Chemicals such as heavy metals, petroleum products, and industrial pollutants can accumulate in the soil, making it less suitable for plant growth and potentially harmful to human health.
- **Erosion:** Ports are often located near coastlines or rivers, where erosion can be a significant issue. The construction of port infrastructure, such as breakwaters, jetties, and embankments, can alter natural sediment flow and wave patterns, leading to increased erosion of nearby soils. Erosion can cause loss of topsoil, which is rich in organic matter and essential nutrients for plant growth.
- **Increased salinity:** Ports situated in coastal areas may experience saltwater intrusion into the soil. Dredging activities, land reclamation, and alteration of natural water flow can disrupt the balance between freshwater and saltwater, resulting in increased salinity in the soil. High salt concentrations can hinder plant growth, reduce crop productivity, and adversely affect soil structure.
- **Compaction:** Heavy machinery, trucks, and containers moving in port areas can exert significant pressure on the soil, leading to compaction. Compacted soils have reduced pore spaces, limiting air and water movement and impeding root penetration. This can result in poor drainage, decreased nutrient availability, and restricted plant growth.
- **Loss of organic matter:** Port areas often undergo significant land transformation, including the removal of vegetation and topsoil during construction. The removal of organic matter-rich topsoil reduces the soil's fertility and capacity to retain moisture, making it less suitable for supporting plant life.

8.6 Measures against adverse effects

Addressing soil quality degradation at port areas requires implementing measures such as proper soil management practices, regular monitoring and testing for contaminants, erosion control measures, and the use of sustainable construction techniques. Additionally, promoting the restoration of vegetation and implementing strategies to minimize the introduction and spread of invasive species can help mitigate soil degradation in port areas.

CHAPTER 9: SEWAGE TREATMENT PLANT MONITORING

9.1 Sewage Treatment Plant (STP) Monitoring:

The principal objective of Sewage Treatment Plant is to remove contaminants from sewage to produce an effluent that is suitable to discharge to the surrounding environment or an intended reuse application, thereby preventing water pollution from raw sewage discharges. As defined in the scope by Deendayal Port Authority (DPA), Kandla, the Sewage Water Treatment Plant Monitoring as to be carried out at three locations, one at Kandla, one at Gopalpuri and one STP at Vadinar. The samples each from the treated wastewater of the STP have to be collected weekly. The details of the locations of Sewage Treatment Plants to be monitored for Kandla and Vadinar are as mentioned in **Table 29** as follows:

Table 29: Details of the monitoring locations of Sewage Water Treatment Plants

Sr. No..	Location Code		Location Name	Latitude Longitude
1.	Kandla	STP-1	STP Kandla	23.021017N 70.215594E
2.		STP-2	STP Gopalpuri	23.077783N 70.136759E
3.	Vadinar	STP-3	STP at Vadinar	22.406289N 69.714689E

The Consolidated Consent and Authorization (CC&A) issued by the Gujarat Pollution Control Board (GPCB) were referred for the details of the Sewage Treatment Plant (STP) for Kandla and Gopalpuri. The said CC&A of Kandla and Gopalpuri suggests that the domestic effluent generated shall be treated as per the norms specified in **Table 30**. The treated effluent conforming to the norms shall be discharged on the land within the premises strictly for the gardening and plantation purpose. Whereas, no sewage shall be disposed outside the premises in any manner.

Table 30: Norms of treated effluent as per CC&A for Kandla

Sr. No.	Parameters	Prescribed limits
1.	pH	6.5-8.5
2.	BOD (3 days at 27°C)	30 mg/L
3.	Suspended Solids	100 mg/L
4.	Fecal Coliform	< 1000 MPN/100 ml

The detailed process flow diagram of the Kandla and Gopalpuri STP have been mentioned in **Figure 14 and 15** as follows:

Process Flow Diagram of Kandla Sewage Treatment Plant (STP)

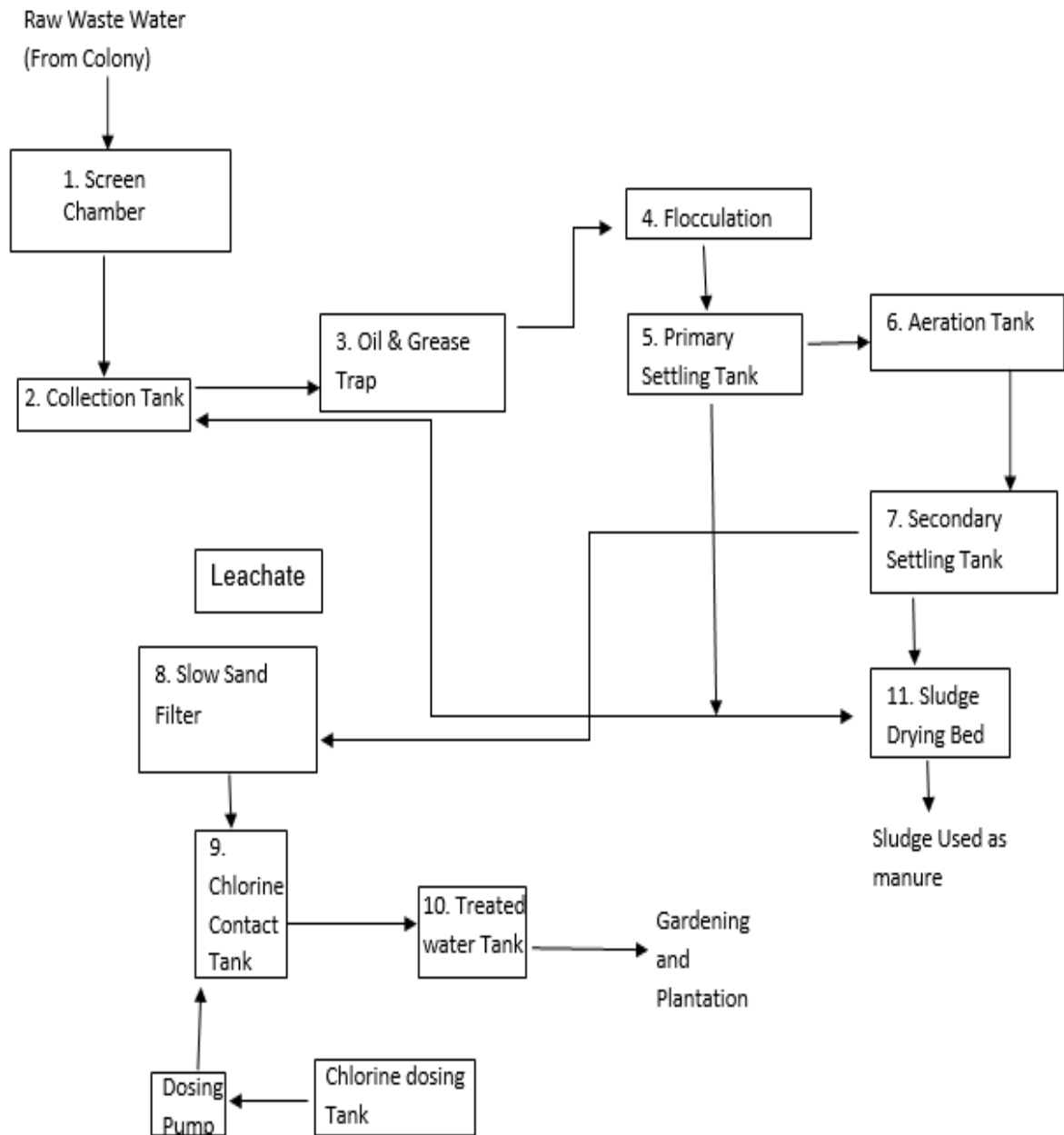


Figure 14: Process flow diagram of Kandla STP

Process Flow Diagram of Gopalpuri Sewage Treatment Plant (STP)

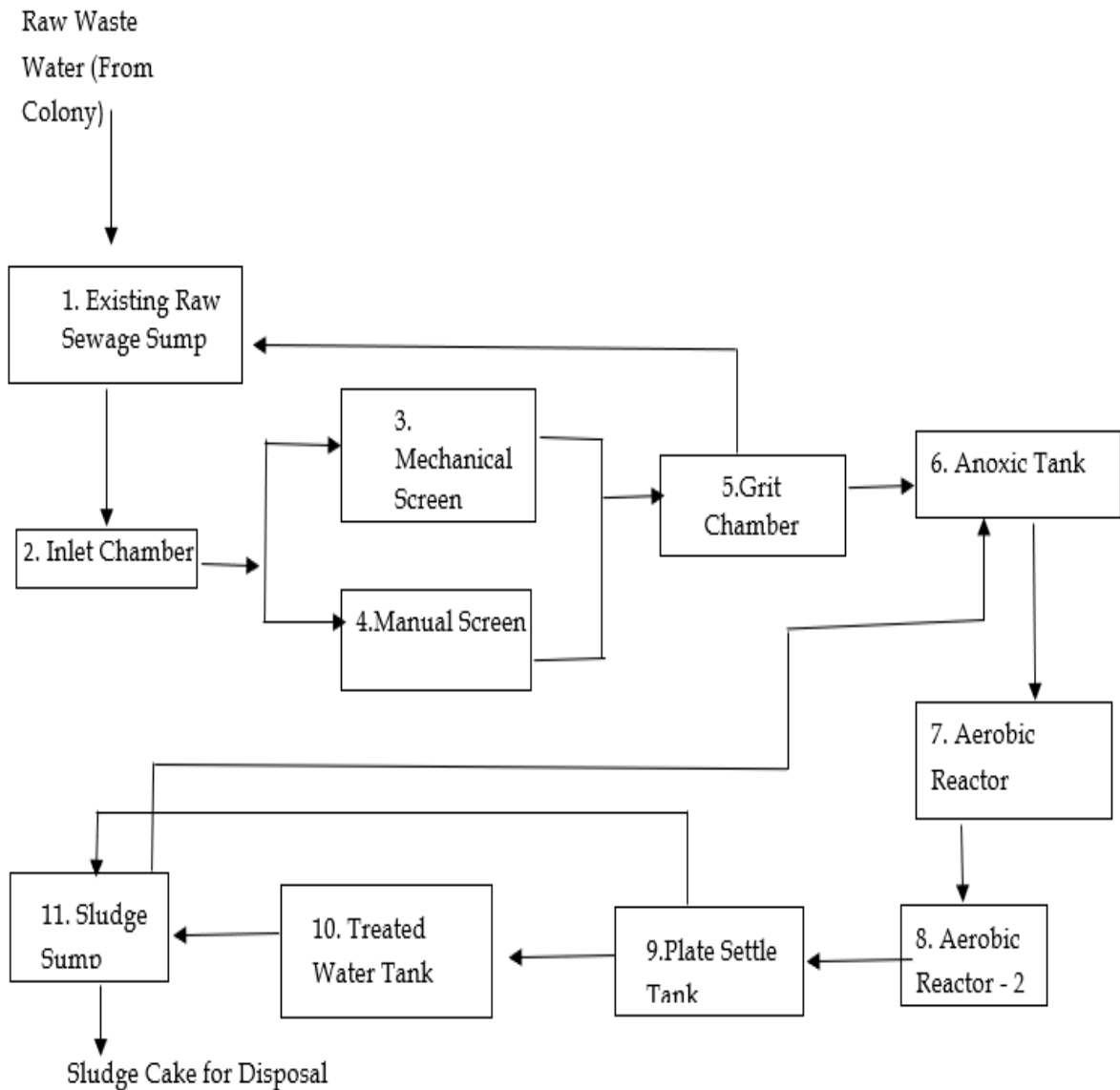


Figure 15: Process flow diagram of Gopalpuri STP

The STP at Vadinar has been built with a treatment capacity of 450 KLD/day. The Consolidated Consent and Authorization (CC&A) issued by the Gujarat Pollution Control Board (GPCB) were referred for the details of the Sewage Treatment Plant (STP) for Kandla and Gopalpuri. The said CC&A of the Vadinar STP suggests that the domestic effluent generated shall be treated as per the norms specified in **Table 31**. The treated effluent conforming to the norms shall be discharged on the land within the premises strictly for the gardening and plantation purpose. Whereas, no sewage shall be disposed outside the premises in any manner.

Table 31: Norms of treated effluent as per CC&A for Vadinar

Sr. No.	Parameters	Prescribed limits
1.	pH	5.5-9
2.	BOD (3 days at 27°C)	10 mg/L
3.	Suspended Solids	20 mg/L
4.	Fecal Coliform	Desirable 100 MPN/100 ml Permissible 230 MPN/100 ml
5.	COD	50 mg/L

The detailed process flow diagram of the Vadinar STP have been mentioned in **Figure 16** as follows:

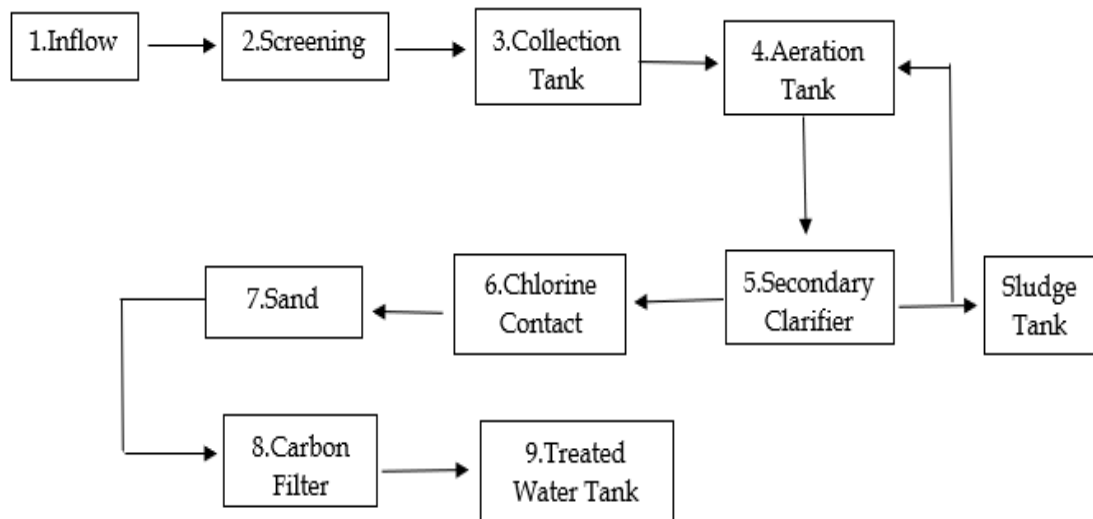


Figure 16: Process flowchart for the Vadinar STP

The map depicting the locations of Sewage Water Treatment Plant Monitoring to be monitored in Kandla and Vadinar have been shown in **Figure 17 and 18** as follows:

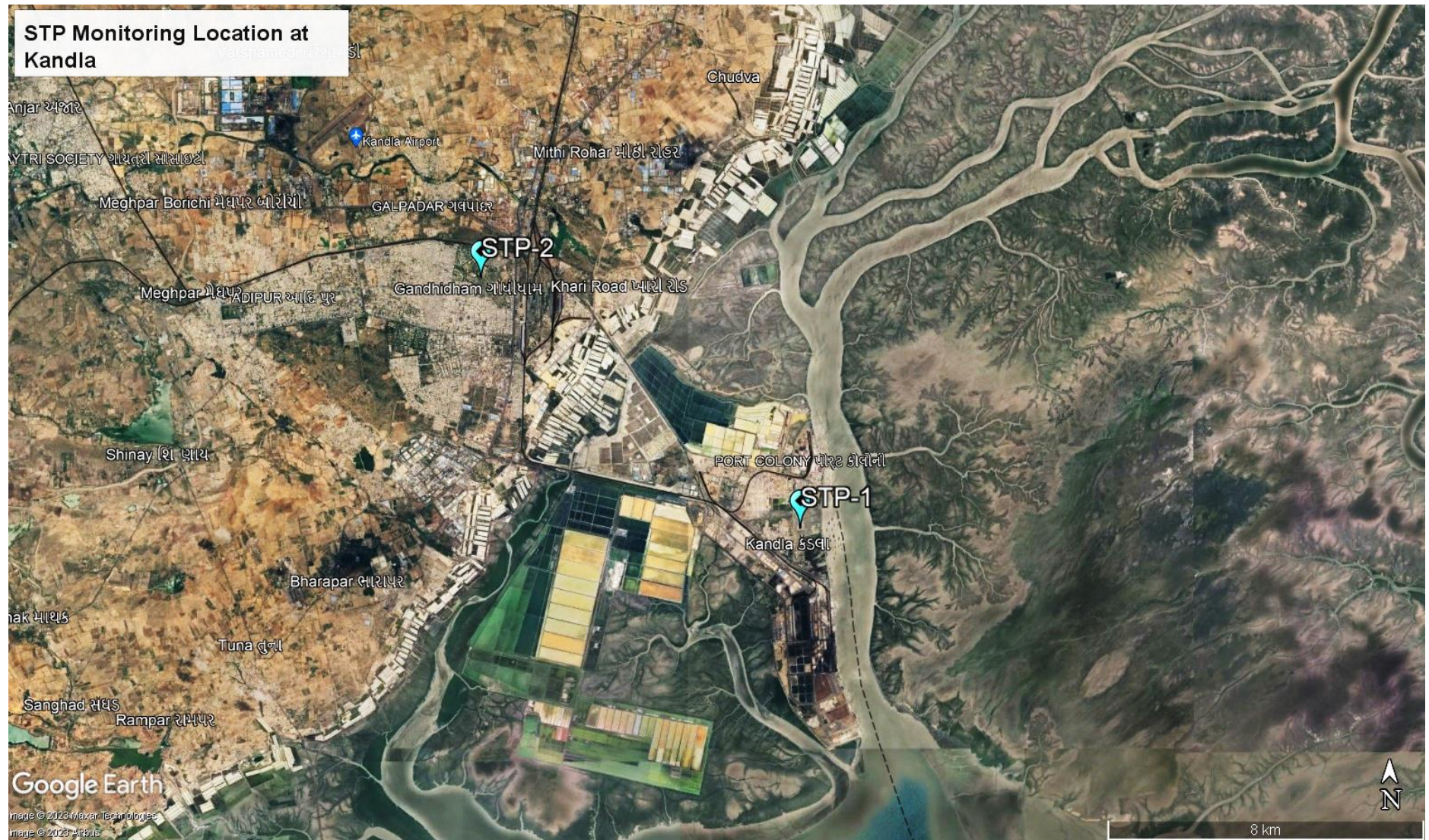


Figure 17: Location Map for STP Monitoring at Kandla



Figure 18: Location Map for STP Monitoring at Vadinar

9.2 Methodology of Monitoring:

As per the defined scope by Deendayal Port Authority (DPA), the sampling and analysis of water samples from the inlet and outlet of the STP of Kandla and Vadinar are carried out once a week, i.e., four times a month.

The water samples were collected from inlet and the outlet of the STP's and analyzed for physico-chemical and microbiological parameter. Collection and analysis of these samples was carried out as per established standard methods and procedures for the examination of water. The samples were analyzed for selected parameters to establish the existing water quality of the inlet and outlet points of the STP. GEMI has framed its own guidelines for collection of water/wastewater samples titled as 'Sampling Protocol for Water & Wastewater'; which has been approved by the Government of Gujarat vide letter no. ENV-102013-299-E dated 24-04-2014 under the provision of Water (Preservation and Control of Pollution) Act 1974. The sample collection and preservation are done as per the said Protocol.

Under the project, the list of parameters to be monitored for the STP have been mentioned in **Table 32** as follows:

Table 32: List of parameters monitored for STP's at Kandla and Vadinar

Sr. No.	Parameters	Units	Reference method	Instruments
1.	pH	-	APHA, 23 rd edition, 4500- H ⁺ B, 2017	pH Meter
2.	TDS	mg/L	APHA, 23 rd Edition, 2540 C: 2017	Vacuum Pump with filtration assembly and Oven
3.	TSS	mg/L		
4.	DO	mg/L	APHA, 23 rd Edition, 4500 C: 2017	Titration Apparatus
5.	COD	mg/L	APHA, 23 rd Edition, 5220 B: 2017	Titration Apparatus plus Digester
6.	BOD	mg/L	IS-3025, Part 44, 1993	BOD Incubator plus Titration Apparatus
7.	SAR	meq/L	IS 11624: 2019	Flame Photometer
8.	Total Coliforms	MPN/100ml	IS 1622: 2019	LAF/ Incubator

9.3 Result and Discussion

The quality of the water samples collected from the inlet and the outlet of the STP's of Kandla and Vadinar has been summarized in **Table 33 and 34** for the monitoring period. The said water quality has been represented in comparison with the standard values specified in the Consolidated Consent and Authorization (CC&A) of the STPs.



Environmental Monitoring Report of Deendayal Port Authority, April-May 2023

Table 33: Water Quality of inlet and outlet of STPs for Kandla

Sr No.	Parameter	Units	GPCB Norms (Kandla)	Kandla															
				Week 3 (April)				Week 4 (April)				Week 1 (May)				Week 2 (May)			
				STP-1 (I)	STP-1 (O)	STP-2 (I)	STP-2 (O)	STP-1 (I)	STP-1 (O)	STP-2 (I)	STP-2 (O)	STP-1 (I)	STP-1 (O)	STP-2 (I)	STP-2 (O)	STP-1 (I)	STP-1 (O)	STP-2 (I)	STP-2 (O)
1.	pH	-	6.5-8.5	7.04	7.15	6.97	8.88	7.22	7.4	7.14	7.18	6.96	7.1	7.06	7.09	7.13	7.21	6.85	7.37
2.	TDS	mg/L	-	2522	3586	484	820	2688	4616	512	546	2564	3776	588	556	2280	3612	528	512
3.	TSS	mg/L	100	148	66	146	10	918	88	52	6	1648	32	138	12	102	28	150	4
4.	DO	mg/L	-	BQL	2	6.6	BQL	BQL	3.21	BQL	6.6	BQL	1	BQL	7.6	BQL	3.4	BQL	4.8
5.	COD	mg/L	-	255.06	117.41	275.3	76.92	307.5	202.2	200.8	60.24	135.46	277.09	388.65	67.73	156.63	96.39	333.33	68.27
6.	BOD	mg/L	30	65.77	25.1	56	18.45	80.78	27.89	40.16	11.12	32	52.4	76.1	13	36.45	22	71	15.1
7.	SAR	meq/L	-	11.36	12.58	2.71	2.89	12.65	14.98	2.67	2.85	9.69	12	3.63	3.31	12.81	16.02	3.48	3.22
8.	Total Coliforms	MPN/100ml	<1000	1600	1600	1600	BQL	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600

Table 34: Water Quality of inlet and outlet of STP for Vadinar

Sr No.	Parameter	Units	GPCB Norms (Vadinar)	Vadinar (April)				Vadinar (May)			
				Week 3		Week 4		Week 1		Week 2	
				STP-3 (Inlet)	STP-3 (Outlet)	STP-3 (Inlet)	STP-3 (Outlet)	STP-3 (Inlet)	STP-3 (Outlet)	STP-3 (Inlet)	STP-3 (Outlet)
1.	pH	-	5.5-9	7.1	7.08	7.32	7.38	7.1	7.18	7.15	7.42
2.	TDS	mg/L	-	496	468	515	446	538	458	536	450
3.	TSS	mg/L	20	64	36	61	21	40	10	26	12
4.	DO	mg/L	-	BQL	4.6	BQL	4.24	BQL	1.7	0.5	7.4
5.	COD	mg/L	50	197.58	52.42	184.54	54.5	149.19	40.32	165.99	48.58
6.	BOD	mg/L	10	45	11	36.24	10.88	31	8	37.1	10
7.	SAR	meq/L	-	2.96	3.06	3.44	3.20	3.13	3.03	3.3	2.98
8.	Total Coliforms	MPN/100ml	100-230	1600	1600	1600	1600	1600	1600	1600	1600

BQL: Below Quantification limit; Total Suspended Solids (QL=2), Dissolved Oxygen (QL=0.5)

9.4 Data Interpretation:

- **pH:** As per the norms, pH of the treated domestic effluent should conform to the standard of 6.5-8.5. the pH for the STP-1 and STP-2 of Kandla. Whereas for STP-3 at Vadinar falls within the 5.5-9 and hence conforms to the stipulated norms.
- **Total Suspended Solids:** The TSS for the STP-1 and STP-2 of Kandla and STP-3 of Vadinar falls within the stipulated norms of 100 mg/L and hence conforms to the norms specified.
- As per the norms, the **Chemical Oxygen Demand (COD)** for the outlet for Vadinar STP shall be 50 mg/L. COD exceeds slightly for month of April 2023 for Vadinar STP. Whereas, the COD was observed to comply with the stipulated norms for the month of May 2023.
- The main focus of wastewater treatment plants is supposed to reduce the **BOD** in the effluent discharged to natural waters. Wastewater treatment plants are designed to function as bacteria farms, where bacteria are fed oxygen and organic waste. The final treated outlet was observed to have BOD values within the stipulated norms at STP-1, STP-2 and STP-3 for the sampling conducted during the month of April and May 2023. Exceeding value of BOD were observed at STP-1, during the sampling conducted in the first week of May 2023.
- The **Total Coliforms** were observed to exceed the norms at all the locations of the STP outlets of Kandla and Vadinar. This indicates that the method of disinfection applied is not adequate.

9.5 Conclusions:

During the monitoring period, only Total Coliforms and COD at STP Kandla, are found exceeding the limit while rest of the sewage parameters for STP outlet were within norms of CCA at both the monitoring sites. The treated sewage water of Kandla STP, Deendayal Port Colony (Gopalpuri) STP and Vadinar STP were in line with the standards set by the Central Pollution Control Board. Regular monitoring of the STP performance should be conducted on regular basis to ensure adequate treatment as per the norms.

9.6 Remedial Measures:

- The quantum of raw sewage (influent) entering the STP should be monitored flow meter. If the quantity of the sewage exceeds the treatment capacity of the treatment plant, then provision of additional capacity of collection sump should be provided.
- The adequacy and efficacy of the stages of Sewage treatment units shall be conducted.
- The treatment parameters such as retention time, Mixed Liquor Suspended Solids (MLSS), Mixed liquor volatile suspended solids (MLVSS), Recirculation rate, sludge generation, etc should be monitored timely.
- During the treatment, the required retention time and rate of aeration should be maintained, so that the efficiency of the treatment plant is maintained.
- The dosage of chemicals administered during the treatment should be reviewed and alterations in the dosage should be done.
- The results show the presence of total coliforms; hence the method of disinfection (Chlorination) sodium or calcium Hypochlorite can be used.
- Effectiveness of any technology depends on factors such as the specific pollutants in the wastewater, plant size, local regulations, and available resources. There are several processes that may be implemented such as - Advanced oxidation process involve using strong oxidants to break down complex organic compounds. Methods like Fenton's reagent (hydrogen peroxide and iron catalyst) and UV/H₂O₂ treatment can help in reducing COD through oxidation.
- Electrochemical processes like Electrocoagulation (EC) and Electrooxidation (EO) that involve the application of an electric current to facilitate the removal of pollutants through coagulation, flocculation, and oxidation. These methods can be useful for treating sewage containing various pollutants.
- Enhanced biological treatment processes, such as Moving Bed Biofilm Reactors (MBBR), Integrated Fixed-film Activated Sludge (IFAS) systems, and Membrane Bio-Reactors (MBRs) are utilised to improve the efficiency of organic matter and nutrient removal from wastewater.



This page is intentionally left blank

CHAPTER 10: MARINE WATER QUALITY MONITORING

10.1 Marine Water:

Deendayal Port is one of the largest ports of the country and thus, is engaged in wide variety of activities such as movement of large vessels, oil tankers and its allied small and medium vessels and handling of dry cargo several such activities whose waste if spills in water, can cause harmful effects to marine water quality.

Major water quality concerns at ports include wastewater and leakage of toxic substances from ships, stormwater runoff, etc. This discharge of wastewater, combined with other ship wastes which includes sewage and wastewater from other on-board uses, is a serious threat to the water quality as well as to the marine life. As defined in the scope by Deendayal Port Authority (DPA), the Marine Water sampling and analysis has to be carried out at a total of eight locations, six at Kandla and two at Vadinar. The marine water sampling was be carried out with the help of Niskin Sampler with a capacity of 5L. The Niskin Sampler is a device used to take water samples at a desired depth without the danger of mixing with water from other depths. The details of the locations to be monitored is as mentioned in **Table 35**:

Table 35: Details of the sampling locations for Marine water

Sr. No.	Location Code	Location Name	Latitude Longitude
1.	MW-1	Near Passenger Jetty One	23.017729N 70.224306E
2.	MW-2	Kandla Creek (nr KPT Colony)	23.001313N 70.226263E
3.	MW-3	Near Coal Berth	22.987752N 70.227923E
4.	MW-4	Khori Creek	22.977544N 70.207831E
5.	MW-5	Nakti Creek (nr Tuna Port)	22.962588N 70.116863E
6.	MW-6	Nakti Creek (nr NH-8A)	23.033113N 70.158528E
7.	MW-7	Near SPM	22.500391N 69.688089E
8.	MW-8	Near Vadinar Jetty	22.440538N 69.667941E

The map depicting the locations of Marine Water to be sampled and analysed in Kandla and Vadinar have been mentioned in **Map 19 and 20** as follows:



Figure 19: Location Map for Marine Water Monitoring at Kandla

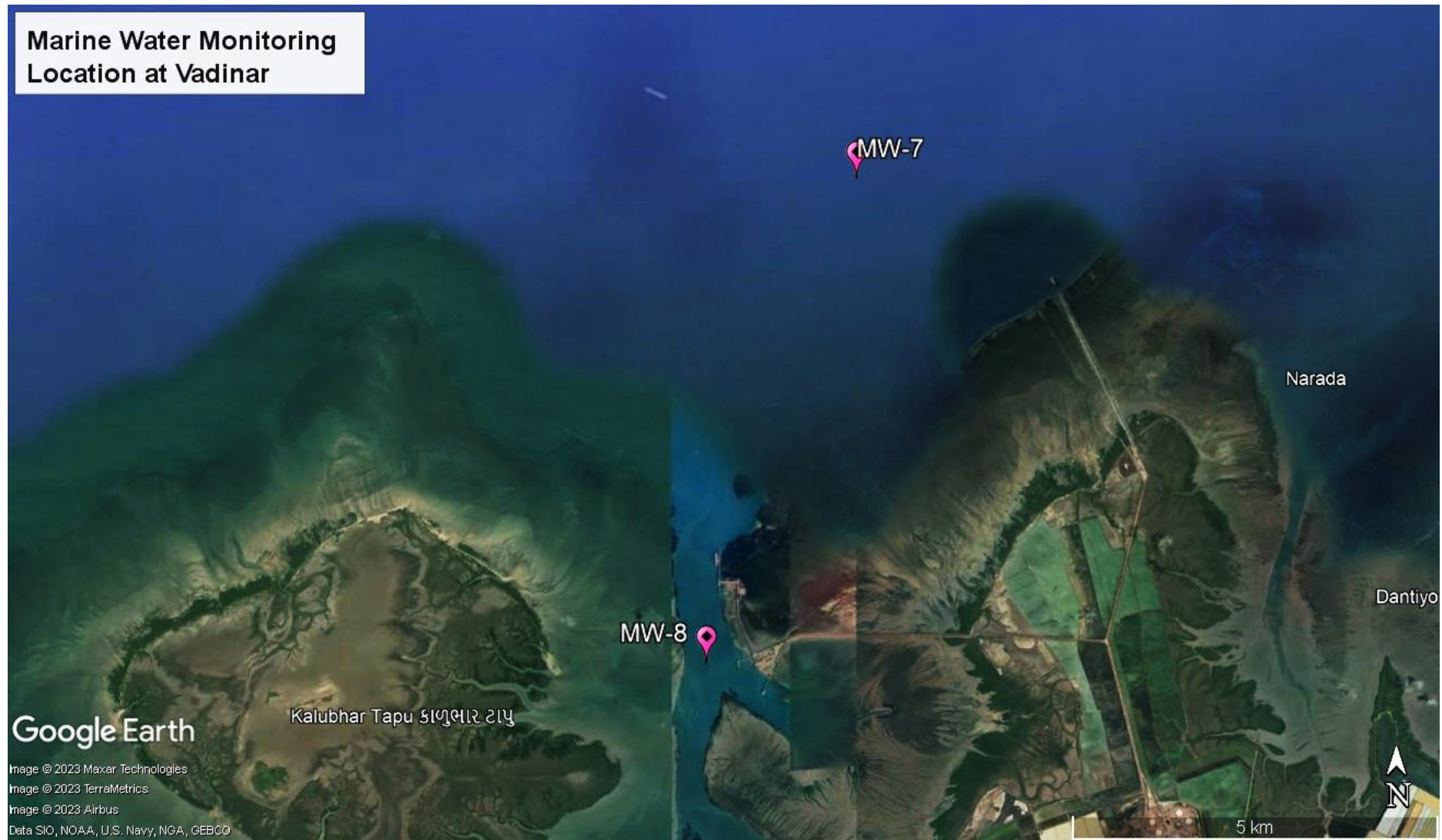


Figure 20: Location Map for Marine Water Monitoring at Vadinar

Frequency

As defined in the scope by Deendayal Port Authority (DPA), the sampling and analysis of Marine Water has to be carried out once a month at the eight locations (i.e., six at Kandla and two at Vadinar).

10.2 Methodology

Similar to the methodology adopted for the sampling and monitoring of Drinking water under the study, the sampling of Marine Water was carried out as per the '**Sampling Protocol for Water & Wastewater**' developed by GEMI as well as the CPCB guidelines. The water samples collected through the Niskin Sampler are collected in a clean bucket to reduce the heterogeneity. From the collected water sample 1 liter of water sample is separated in an opaque plastic bottle for the estimation of chlorophyll. The list of parameters to be monitored under the project for the Marine Water quality have been mentioned in **Table 36** along with the analysis method and instrument.

Table 36: List of parameters monitored for Marine Water

Sr. No	Parameters	Units	Reference method	Instrument
1.	Electrical Conductivity	μS/cm	APHA, 23 rd Edition (Section-2510 B):2017	Conductivity Meter
2.	Dissolved Oxygen (DO)	mg/L	APHA, 23 rd Edition, 4500 O C, 2017	Titration Apparatus
3.	pH		APHA, 23 rd Edition (Section-4500-H+B):2017	pH meter
4.	Color	Hazen	APHA, 23 rd Edition, 2120 B: 2017	Color comparator
5.	Odour		IS 3025 Part 5: 2018	Heating mantle & odour bottle
6.	Turbidity	NTU	IS 3025 Part 10: 1984	Nephlo Turbidity Meter
7.	Total Dissolved Solids (TDS)	mg/L	APHA, 23 rd Edition (Section-2540 C):2017	Vaccum Pump with Filtration Assembly and Oven
8.	Total Suspended Solids (TSS)	mg/L	APHA, 23 rd Edition, 2540 D: 2017	
9.	Particulate Organic Carbon	mg/L	APHA, 23 rd Edition, 2540 D and E	TOC analyser
10.	Chemical Oxygen Demand (COD)	mg/L	IS-3025, Part- 58: 2006	Titration Apparatus plus Digester
11.	Biochemical Oxygen Demand (BOD)	mg/L	IS-3025, Part 44,1993,	BOD Incubator plus Titration apparatus
12.	Silica	mg/L	APHA, 23 rd Edition, 4500 C, 2017	UV- Visible Spectrophotometer
13.	Phosphate	mg/L	APHA,23 rd Edition, 4500 P-D: 2017	

Sr. No	Parameters	Units	Reference method	Instrument
14.	Sulphate	mg/L	APHA, 23rd Edition, 4500 SO4-2 E: 2017	
15.	Nitrate	mg/L	APHA, 23rd Edition, 4500 NO3-B: 2017	
16.	Nitrite	mg/L	APHA, 23 rd Edition, 4500 NO2- B: 2017	
17.	Sodium	mg/L	APHA,23 rd Edition, 3500 Na-B: 2017	Flame photometer
18.	Potassium	mg/L	APHA,23 rd Edition, 3500 K-B: 2017	
19.	Manganese	mg/L	APHA,23 rd Edition, ICP Method 3120 B: 2017	ICP-OES
20.	Iron	mg/L	APHA,23 rd Edition, ICP Method 3120 B: 2017	
21.	Total Chromium	mg/L	APHA, 23 rd Edition, 3500 Cr B: 2017	
22.	Hexavalent Chromium	mg/L		UV- Visible Spectrophotometer
23.	Copper	mg/L	APHA, 23 rd Edition, ICP Method 3120 B: 2017	ICP-OES
24.	Cadmium	mg/L		
25.	Arsenic	mg/L		
26.	Lead	mg/L		
27.	Zinc	mg/L		
28.	Mercury	mg/L	EPA 200.7	
29.	Floating Material (Oil grease scum, petroleum products)	mg/L	APHA, 23 rd Edition, 5520 C: 2017	Soxhlet Assembly
30.	Total Coliforms (MPN)	MPN/ 100ml	IS 1622: 2019	LAF/ Incubator

10.3 Result and Discussion

The quality of the Marine water samples collected from the locations of Kandla and Vadinar during the monitoring period has been summarized in the **Table 37**. The said water quality has been represented in comparison with the standard values as stipulated by CPCB.

Table 37: Results of Analysis of Marine Water Sample

Sr. No.	Parameters	Unit	Primary Water Quality Criteria for Class SW-IV Waters	Kandla						Vadinar	
				MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
1.	Density	kg/m ³	-	1.021	1.021	1.022	1.021	1.022	1.022	1.022	1.022
2.	pH	-	6.5-9.0	7.76	7.74	7.83	7.81	7.84	8.04	8.07	8.11
3.	Color	Hazen	No Noticeable	9	12	15	10	9	11.6	4	5
4.	EC	μS/cm	-	60,391	58,491	57,913	54,179	55,587	61,528	55,871	52,119
5.	Turbidity	NTU	-	>50	>50	>50	>50	>50	>50	3.2	4.5
6.	TDS	mg/L	-	41,930	39,386	38,688	38,072	39,434	38,587	34,950	34,892
7.	TSS	mg/L	-	184	334	124	740	642	852	220	151
8.	COD	mg/L	-	72	76	81	81	71	78	75	75
9.	DO	mg/L	3.0 mg/L	5.6	5.5	5.4	5.6	5.7	5.7	7.3	7.4
10.	BOD	mg/L	5.0 mg/L	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
11.	Oil & Grease	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
12.	Sulphate	mg/L	-	2747.55	2665.78	2433.35	2684.05	2771.15	3156.54	2212.35	2441.56
13.	Nitrate	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
14.	Nitrite	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
15.	Phosphate	mg/L	-	0.46	0.09	1.46	0.75	0.57	0.54	0.64	1.43
16.	Silica	mg/L	-	0.32	1.51	0.65	2.79	1.74	0.33	BQL	BQL
17.	Sodium	mg/L	-	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000	>10,000
18.	Potassium	mg/L	-	385.03	397.63	347.34	424.53	423.34	442.63	321.10	351.13
19.	Hexavalent Chromium	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
20.	Odour	-	-	1	1	1	1	1	1	1	1
21.	Arsenic	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
22.	Cadmium	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
23.	Copper	mg/L	-	5.10	6.07	BQL	12.01	7.60	10.2	BQL	BQL
24.	Iron	mg/L	-	1.03	1.05	2.2	5.4	3.9	5.3	BQL	BQL
25.	Lead	mg/L	-	BQL	1.7	1.32	6.2	2.21	3.41	BQL	BQL
26.	Manganese	mg/L	-	73.11	75.21	85.71	121.79	86.75	86.24	BQL	BQL
27.	Total Chromium	mg/L	-	BQL	5.62	BQL	15.71	8.25	BQL	BQL	BQL
28.	Zinc	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
29.	Mercury	mg/L	-	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
30.	Total Coliform	MPN /100 ml	500/100 ml	900	35	10	55	30	44	BQL	BQL
31.	Particulate Organic Carbon	mg/L	-	0.32	0.16	0.56	0.25	0.35	0.29	0.36	0.39

Sr. No.	Parameters	Unit	Primary Water Quality Criteria for Class SW-IV Waters	Kandla						Vadinar	
				MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
32.	Floating Material (Oil grease scum, petroleum products)	mg/L	10 mg/L	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

BQL- Below Quantification Limit; Turbidity (DL=50), Biochemical Oxygen Demand (QL=3), Oil & Grease (QL=1), Nitrate as NO₃ (QL=1), Nitrite as No₂ (QL=0.1), Phosphorous (QL=0.5), Silica (QL=0.05), Sodium as Na (QL=10,000), Hexavalent Chromium (QL=0.01), Arsenic (QL=5), Cadmium (QL=2), Copper (QL=5), Iron (QL=0.1), Lead (QL=2), Manganese (QL=40), Total Chromium (QL=5), Zinc (QL=0.5), Mercury (QL=0.5)

10.4 Data Interpretation:

The Marine water quality of Deendayal Port Harbor waters at Kandla and Vadinar has been monitored for various physico-chemical and biological parameters during the high tide at sampling time.

- The parameter **pH** was observed in the range of 7.74-8.04, with the average pH as 7.83 for the locations of Kandla, whereas for the locations of Vadinar, pH was observed in the range of 8.07-8.11, with the average pH as 8.09.
- The **Color** was observed in the range of 9-15 Hazen, with the average color as 11.1 Hazen for the locations of Kandla, whereas for the locations of Vadinar, color was observed in the range of 4-5 Hazen, with the average color as 4.5 Hazen.
- The **Density** of marine water for the locations of Kandla and Vadinar was observed to vary from 1.021-1.022 Kg/m³.
- Turbidity** for all locations of Kandla was observed >50 NTU for all the locations. Whereas for the locations of Vadinar, lower values of turbidity were observed. Turbidity is the amount of particulate matter that is suspended in water. Turbidity measures the scattering effect that suspended solids have on light: the higher the intensity of scattered light, the higher the turbidity. Materials that cause water to be turbid include clay, silt, finely divided organic and inorganic matter, soluble color organic compounds, plankton and microscopic organisms. Turbidity affects the amount of light penetrating to the plants for photosynthesis.
- The parameter **Electrical conductivity (EC)** was observed in the range of 54179-61528 µS/cm, with the average EC as 58014.83 µS/cm for the locations of Kandla, whereas for the locations of Vadinar, EC was observed in the range of 52119-55871 µS/cm, with the average EC as 53995 µS/cm.

- **Total Dissolved Solids (TDS)** values in the studied area during high Tide varied between 38072-41930 mg/L at DPA Kandla and 34892-34950 mg/L at Vadinar with the average value as 39349.5 mg/L and 34921 mg/L respectively for Kandla and Vadinar.
- **Total Suspended Solids (TSS)** values in the studied area during high Tide varied between 124-852 mg/L at DPA Kandla and 151-220 mg/L at Vadinar, with the average value as 479.33 mg/L and 185.5 mg/L respectively for Kandla and Vadinar.
- **Chemical Oxygen Demand (COD)** values in the studied area varied between 71-81 mg/L at DPA Kandla and 74-75 mg/L at Vadinar, with the average value as 76.5 mg/L and 74.5 mg/L respectively for Kandla and Vadinar.
- **Dissolved Oxygen (DO)** level in the studied area during high Tide varied between 5.4-5.7 mg/L at DPA Kandla and 7.3-7.4 mg/L at Vadinar. The value of DO was found to exceed the minimum concentration of 3.0 mg/L for majority of the locations, which represents that the marine water quality is good and hence suitable for the aquatic species.
- The parameters BOD, Oil & Grease, Nitrate, Nitrite, Hexavalent Chromium, Arsenic, Cadmium, Zinc and Mercury were observed to have concentrations “Below the Quantification Limits (BQL)” for all the locations of Kandla and Vadinar.
- **Sulphate** concentration in the studied area during high Tide varied between 2433.35-3415.54 mg/L at DPA Kandla and 2212.35-2441.56 mg/L at Vadinar.
- The concentration of **Phosphate** in the studied area during high Tide varied between 0.09-1.46 mg/L at DPA Kandla, while at Vadinar, the concentration of Phosphate was observed to range from 0.64-1.43 mg/L at Vadinar.
- The concentration of **Potassium** in the studied area during high Tide varied between 347.34-442.63 mg/L at DPA Kandla and 321.10-351.13 mg/L at Vadinar, with the average value as 403.41 mg/L and 336.11 mg/L respectively for Kandla and Vadinar.
- The concentration of **Sodium** was detected to be >10,000 mg/L for the locations of Kandla and Vadinar.
- Under the study, the parameters BOD, Oil and Grease, Hexavalent and Total Chromium, Nitrate, Nitrite, Arsenic, Lead, Manganese, Cadmium, Zinc and Mercury were found to have concentrations “Below the detection limit” for both the locations of Kandla and Vadinar.
- **Total Coliforms (TC)** at Kandla were observed to be within the range of 10-900 MPN/100 ml. On the contrary, the TC were observed “Below the detection limit” for the months at Vadinar.
- **Floating Material (Oil grease scum, petroleum products)** was observed to be “Below the quantification limit” all the locations of Kandla and Vadinar.

10.5 Conclusion

During the Monitoring period, marine water samples were analysed and found in line with Primary Water Quality criteria for class-IV Waters (For Harbour Waters).

10.6 Measures against adverse effects

Appropriate regulations on ship discharges and provision of reception facilities are indispensable for proper control of emissions and effluent from ships. Detection of spills is also important for regulating ship discharges. Since accidental spills are unavoidable, recovery vessels, oil fences, and treatment chemicals should be prepared with a view to minimizing dispersal. Proper contingency plans and a prompt reporting system are keys to prevention of oil dispersal. Periodical clean-up of floating wastes is also necessary for preservation of port water quality.

CHAPTER 11: MARINE SEDIMENT QUALITY MONITORING

11.1 Marine Sediment Monitoring:

Marine sediment, or ocean sediment, or seafloor sediment, are deposits of insoluble particles that have accumulated on the seafloor. These particles have their origins in soil and rocks and have been transported from the land to the sea, mainly by rivers but also by dust carried by wind. The unconsolidated materials derived from pre-existing rocks or similar other sources by the process of denudation are deposited in water medium is known as sediment. For a system, like a port, where large varieties of raw materials and finished products are handled, expected sediment contamination is obvious.

The materials or part of materials spilled over the water during loading and unloading operations lead to the deposition in the harbour water along with sediment and thus collected as harbour sediment sample. These materials, serve as receptor of many trace elements, which are prone to environment impact. In this connection it is pertinent to study the concentration and distribution of environmentally sensitive elements in the harbour sediment. However, human activities result in accumulation of toxic substances such as heavy metals in marine sediments. Heavy metals are well-known environmental pollutants due to their toxicity, persistence in the environment, and bioaccumulation. Metals affect the ecosystem because they are not removed from water by self-purification, but accumulate in sediments and enter the food chain.

As defined in the scope by Deendayal Port Authority (DPA), the Marine Sediment sampling is required to be carried out once in a month at total eight locations, i.e., six at Kandla and two at Vadinar. The sampling of the Marine Sediment is carried out using the Van Veen Grab Sampler of the make Holy Scientific Instruments Pvt. Ltd. The Van Veen Grab sampler is an instrument to sample (disturbed) sediment up to a depth of 20-30 cm into the sea bed. While letting the instrument down on the seafloor, sediment can be extracted. The details of the locations of Marine Sediment to be monitored under the study are mentioned in **Table 38** as follows:

Table 38: Details of the sampling locations for Marine water

Sr. No	Location Code	Location Name	Latitude Longitude
1.	Kandla	MS-1	Near Passenger Jetty One
2.		MS-2	Kandla Creek
3.		MS-3	Near Coal Berth
4.		MS-4	Khori Creek
5.		MS-5	Nakti Creek (near Tuna Port)
6.		MS-6	Nakti Creek (near NH-8A)
7.	Vadinar	MS-7	Near SPM
8.		MS-8	Near Vadinar Jetty

The map depicting the locations of Marine Sediment sampling in Kandla and Vadinar have been mentioned in **Map 21 and 22** as follows:



Figure 21: Location Map of Marine Sediment Monitoring at Kandla

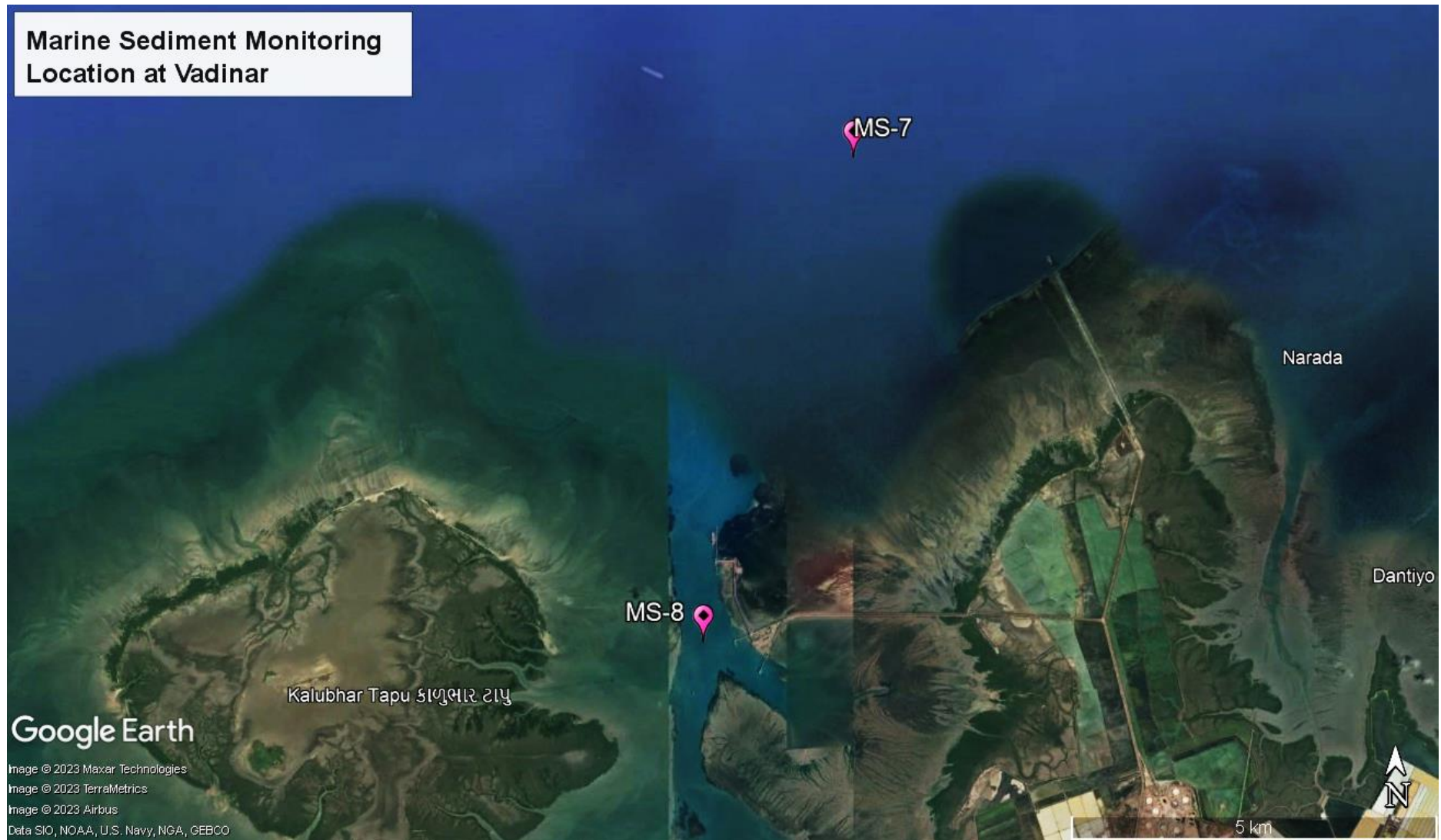


Figure 22: Locations Map of Marine Sediment Monitoring at Vadinar

The list of parameters to be monitored under the projects for the Marine Sediment sampling been mentioned in **Table 39** as follows:

Table 39: List of parameters to be monitored for Sediments at Kandla and Vadinar

Sr. No.	Parameters	Units	Reference method	Instruments
1.	Texture		Methods Manual Soil Testing in India January 2011,01	Hydrometer
2.	Organic Matter	%	Methods Manual Soil Testing in India January, 2011, 09. Volumetric method (Walkley and Black, 1934)	Titration apparatus
3.	Inorganic Phosphates	mg/Kg	Practical Manual Chemical Analysis of Soil and Plant Samples, ICAR-Indian Institute of Pulses Research 2017	UV- Visible Spectrophotometer
4.	Silica	mg/Kg	EPA METHOD 6010 C & IS: 3025 (Part 35) – 1888, part B	
5.	Phosphate	mg/Kg	EPA Method 365.1	
6.	Sulphate as SO ₄ - (Available)	mg/Kg	IS: 2720 (Part 27) - 1977	
7.	Nitrite	mg/Kg	ISO 14256:2005	
8.	Nitrate	mg/Kg	Methods Manual Soil Testing in India January, 2011, 12	
9.	Calcium as Ca	mg/Kg	Methods Manual Soil Testing in India January 2011, 16.	Titration Apparatus
10.	Magnesium as Mg	mg/Kg	Method Manual Soil Testing in India January 2011	
11.	Sodium	mg/Kg	EPA Method 3051A	Flame Photometer
12.	Potassium	mg/Kg	Methods Manual Soil Testing in India January, 2011	
13.	Aluminium	mg/Kg	EPA Method 3051A	ICP-OES
14.	Chromium	mg/Kg		
15.	Nickel	mg/Kg		
16.	Zinc	mg/Kg		
17.	Cadmium	mg/Kg		
18.	Lead	mg/Kg		
19.	Arsenic	mg/Kg		
20.	Mercury	mg/Kg		

11.2 Result and Discussion

The quality of Marine Sediment samples collected from the locations of Kandla and Vadinar has been summarized in the **Table 40**.

Table 40: Summarized Results of Marine Sediment Quality

Sr. No.	Parameters	Unit	Kandla						Vadinar	
			MS-1	MS-2	MS-3	MS-4	MS-5	MS-6	MS-7	MS-8
1.	Inorganic Phosphate	kg/Hectare	16.85	14.37	11.55	18.94	14.25	17.34	14.55	18.51
2.	Phosphate	mg/Kg	3247.85	1497.25	2571.43	2671.98	3741.91	3541.28	2357.68	3217.54
3.	Organic Matter	mg/Kg	0.32	1.60	0.50	1.21	0.94	1.14	0.26	0.38
4.	Sulphate as SO ⁴⁻	mg/Kg	759	849	555	496	768	732	296	179.43
5.	Calcium as Ca	mg/Kg	2657	1259	962	1102	1089	1162	2585	2463
6.	Magnesium as Mg	mg/Kg	1259	924	764	987	1032	953	1348	1167
7.	Silica	g/Kg	498.5	465.12	571.51	549.6	531.88	487.2	379.45	492.5
8.	Nitrite	mg/Kg	0.75	0.18	0.15	0.19	0.16	0.13	0.11	0.12
9.	Nitrate	mg/Kg	19.75	20.98	10.22	21.64	9.67	15.34	25.33	24.82
10.	Sodium	mg/Kg	3410	3670	4432	3940	3725	2394	9082	8854
11.	Potassium	mg/Kg	241	276	264	294	322	394	1082	1028
12.	Aluminium	mg/Kg	3517.25	4834.50	4317.46	4552.39	3751.85	4579.21	4138.27	4528.35
13.	Chromium	mg/Kg	56.17	32.74	42.38	53.30	51.33	36.71	45.20	41.85
14.	Nickel	mg/Kg	16.80	11.54	18.94	25.60	24.00	12.80	14.70	20.50
15.	Zinc	mg/Kg	38.22	32.11	48.20	34.98	19.54	32.00	42.80	40.30
16.	Cadmium	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
17.	Lead	mg/Kg	6.1	5.84	4.25	5.85	5.71	4.24	6.88	7.41
18.	Arsenic	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL	2.74	5.17
19.	Mercury	mg/Kg	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL
20.	Texture		Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam	Sandy loam

11.3 Data Interpretation

- **Inorganic Phosphate** was observed in the range of 11.55 to 18.94 Kg/Ha for Kandla and 11.85 to 15.84 Kg/Ha for Vadinar.
- **Phosphate** was observed in the range of 1497.25 to 3741.91 mg/Kg for Kandla and 2357.68 to 3217.54 mg/Kg for Vadinar.
- **Organic Matter** was observed in the range of 0.32 to 1.6 % for Kandla and 0.26 to 0.38 % for Vadinar.
- **Sulphate** was observed in the range of 496 to 849 mg/Kg for Kandla and 179.43 to 296 mg/Kg for Vadinar.
- **Calcium** was observed in the range of 962 to 2657 mg/Kg for Kandla and 2463 to 2585 mg/Kg for Vadinar.
- **Magnesium** was observed in the range of 764 to 1259 mg/Kg for Kandla and 1167 to 1348 mg/Kg for Vadinar.
- **Nitrate** was observed in the range of 9.67 to 21.64 mg/Kg for Kandla and 24.82 to 25.33 mg/Kg for Vadinar.
- **Nitrite** was observed in the range of 0.13 to 0.75 mg/Kg for Kandla and 0.11 to 0.12 for Vadinar.

- **Sodium** was observed in the range of 2394 to 4432 for Kandla and 8854 to 9082 mg/Kg for Vadinar.
- **Silica** was observed in the range of 465.12 to 571.51 mg/Kg for Kandla and 379.45 to 492.5 mg/Kg.
- **Potassium** was observed in the range of 241 to 394 mg/Kg for Kandla and 1028 to 1082 mg/Kg for Vadinar.
- **Aluminium** was observed in the range of 3517.25 to 4834.5 mg/Kg for Kandla and 4138.27 to 4528.35 mg/Kg for Vadinar.
- **Mercury** was observed below the detection limit was limit for Kandla and Vadinar.
- Texture was observed to be “**Sandy Loamy**” in both Kandla and Vadinar.

Heavy Metals

The sediment quality of Kandla and Vadinar has been compared with respect to the Average Standard guideline applicable for heavy metals in marine sediment specified by EPA have been mentioned in **Table 41**.

Table 41: Standard Guidelines applicable for heavy metals in sediments

Sr. No.	Metals	Sediment quality (mg/kg)			Source
		Not polluted	Moderately polluted	Heavily polluted	
1.	As	<3	3-8	>8	EPA
2.	Cu	<25	25-50	>50	
3.	Cr	<25	25-75	>75	
4.	Ni	<20	20-50	>50	
5.	Pb	<40	40-60	>60	
6.	Zn	<90	90-200	>200	
7.	Cd	-	<6	>6	
ND = Not Detected					

(Source: G Perin et al. 1997)

The details of the said comparison have been mentioned in the **Table 42** as follows:

Table 42: Comparison of Heavy metals with Standard value in marine sediment

Sr. No.	Parameters	Kandla						Vadinar	
		MS-1	MS-2	MS-3	MS-4	MS-5	MS-6	MS-7	MS-8
1.	Arsenic	BQL	BQL	BQL	BQL	BQL	BQL	2.74	5.17
2.	Copper	5.6	11.4	4.2	6.8	12	8.9	5.5	8.2
3.	Chromium	56.17	32.74	42.38	53.30	51.33	36.71	45.20	41.85
4.	Nickel	16.80	11.54	18.94	25.60	24.00	12.80	14.70	20.50
5.	Lead	6.1	5.84	4.25	5.85	5.71	4.24	6.88	7.41
6.	Zinc	38.22	32.11	48.20	34.98	19.54	32.00	42.80	40.30
7.	Cadmium	BQL	BQL	BQL	BQL	BQL	BQL	BQL	BQL

- **Arsenic** was observed below the detection limit for Kandla in both the monitoring period of April and May. While for Vadinar 2.74 to 5.17 mg/Kg range in the month of

April. The Sediment quality in both the monitoring period at Kandla and Vadinar show the concentration of Arsenic in range of 3-8 mg/Kg which indicate the moderately polluted status of Sediment for both the April and May, 2023.

- **Copper** was observed in the range of 4.2 to 12 mg/Kg for Kandla and 5.5 to 8.2 mg/Kg for Vadinar for the month of April. The Sediment quality in both the monitoring period at Kandla and Vadinar show the concentration of Copper <25 mg/Kg which indicate the non-polluted status of Sediment for both the April and May, 2023.
- **Chromium** was observed in range of 32.74 to 56.17 mg/Kg for Kandla and 41.85 to 45.2 mg/Kg for Vadinar for the month of April. The Sediment quality in both the monitoring period at Kandla and Vadinar show the concentration of Chromium in range of 25-75 mg/Kg which indicates that the sediment is moderately polluted for both April and May, 2023.
- **Nickel** was observed in the range of 11.54 to 25.60 mg/Kg for Kandla and 14.17-20.50 mg/Kg for Vadinar for the month of April. The Sediment quality in both the monitoring period at Kandla and Vadinar show the concentration of Nickel in range of 20-50 mg/Kg which indicate the moderately polluted Sediment for both the April and May, 2023.
- **Lead** was observed in the range of 4.24 to 6.10 mg/Kg for Kandla and 6.88 to 7.41 mg/Kg for Vadinar for the month of April. The Sediment quality in both the monitoring period at Kandla and Vadinar show the concentration of Lead <40 mg/Kg which indicate the non-polluted status of Sediment for both the April and May, 2023.
- **Zinc** was observed in the range of 19.54 to 48.20 mg/Kg for Kandla and 40.30 to 42.8 mg/Kg for Vadinar for the month of April. The Sediment quality in both the monitoring period at Kandla and Vadinar show the concentration of Zinc <90 mg/Kg which indicate the non-polluted status of Sediment for both the April and May, 2023.
- **Cadmium** was observed below the detection limit was limit for Kandla and Vadinar in both April and May month, which indicates that the sediment is non polluted.

11.4 Conclusion:

Analysis of the sediments does not indicate any pollution. However, it may be noted that, the sediments are highly dynamic being constantly deposited and carried away by water currents. Hence maintaining the quality of sediments is necessary as it plays a significant role in regulating the quality of the marine water and the marine ecology.

CHAPTER 12: MARINE ECOLOGY MONITORING

2.4 Marine Ecological Monitoring

The monitoring of the biological and ecological parameters is important in order to assess the marine environment. A marine sampling is an estimation of the body of information in the population. The theory of the sampling design is depending upon the underlying frequency distribution of the population of interest. The requirement for useful water sampling is to collect a representative sample of suitable volume from the specified depth and retain it free from contamination during retrieval. Deendayal Port and its surroundings have mangroves, mudflats and creek systems as major ecological entities.

As defined in the scope by Deendayal Port Authority (DPA), the Marine Ecological Monitoring is required to be carried out once a month specifically at eight locations, six at Kandla and two at Vadinar. The sampling of the Benthic Invertebrates has been carried out with the help of D-frame nets, whereas the sampling of zooplankton and phytoplankton has been carried out with the help of Plankton Nets (60 micron and 20 micron). The details of the locations of Marine Ecological Monitoring have been mentioned in **Table 43** as follows:

Table 43: Details of the sampling locations for Marine Ecological

Sr. No.	Location Code		Location Name	Latitude Longitude
1.	Kandla	ME-1	Near Passenger Jetty One	23.017729N 70.224306E
2.		ME-2	Kandla Creek (near KPT Colony)	23.001313N 70.226263E
3.		ME-3	Near Coal Berth	22.987752N 70.227923E
4.		ME-4	Khori Creek	22.977544N 70.207831E
5.		ME-5	Nakti Creek (near Tuna Port)	22.962588N 70.116863E
6.		ME-6	Nakti Creek (near NH - 8A)	23.033113N 70.158528E
7.	Vadinar	ME-7	Near SPM	22.500391N 69.688089E
8.		ME-8	Near Vadinar Jetty	22.440538N 69.667941E

The map depicting the locations of Marine Ecological monitoring in Kandla and Vadinar have been mentioned in **Map 23 and 24** as follows:



Figure 23: Locations Map of Marine Ecological Monitoring at Kandla

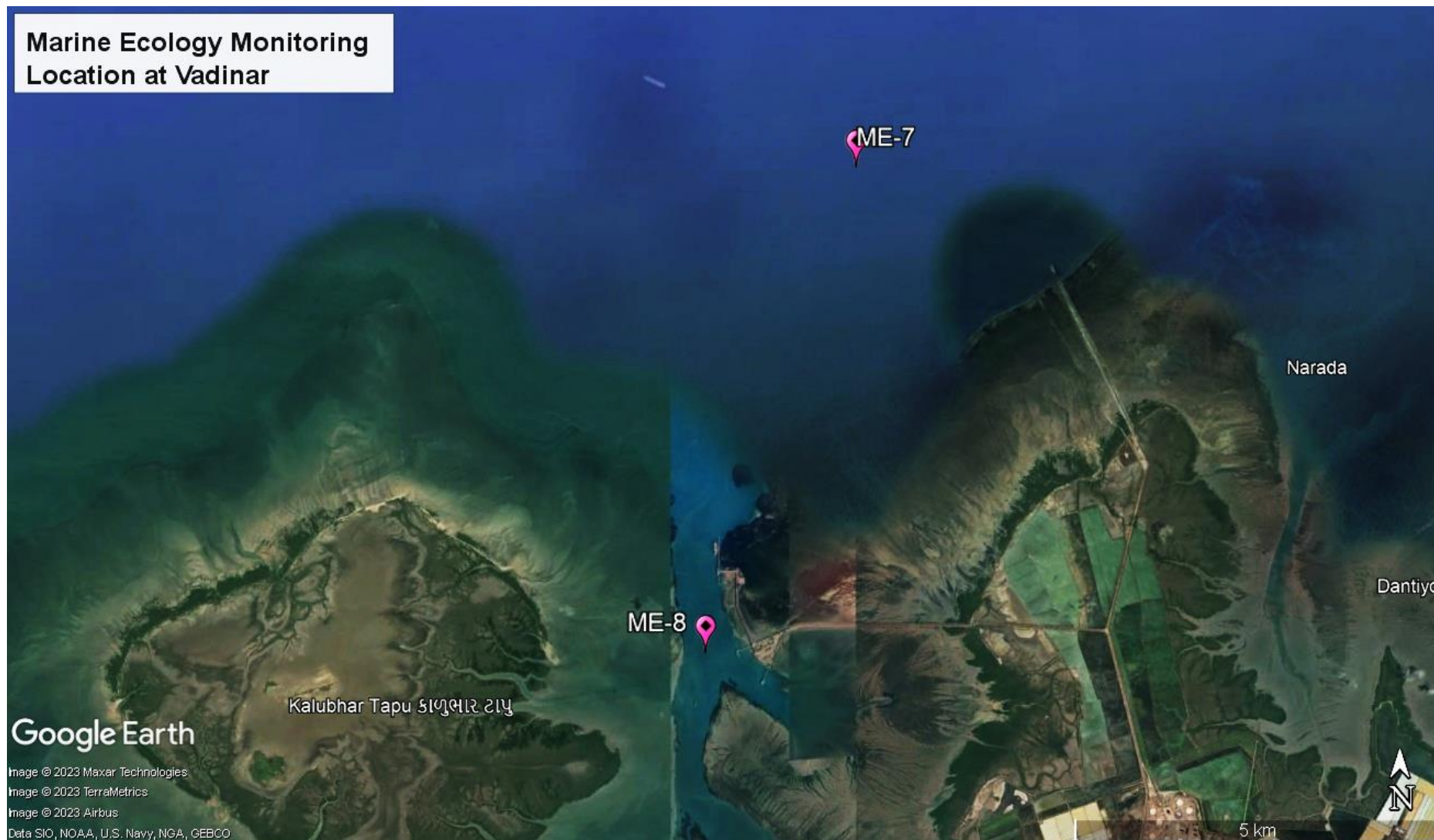


Figure 24: Locations Map of Marine Ecological Monitoring at Vadinar

The various parameters to be monitored under the study for Marine Ecological Monitoring are mentioned in **Table 44** as follows:

Table 44: List of parameters to be monitored for Marine Ecological Monitoring

Sr. No.	Parameters
1.	Productivity (Net and Gross)
2.	Chlorophyll-a
3.	Pheophytin
4.	Biomass
5.	Relative Abundance, species composition and diversity of phytoplankton
6.	Relative Abundance, species composition and diversity of zooplankton
7.	Relative Abundance, species composition and diversity of benthic invertebrates (Meio, Micro and macro benthos)
8.	Particulate Oxidisable Organic Carbon
9.	Secchi Depth

2.5 Sampling Methodology

Processing for chlorophyll estimation:

Samples for chlorophyll estimation were preserved in ice box on board in darkness to avoid degradation in opaque container covered with aluminium foil. Immediately after reaching the shore after sampling, 1 litre of collected water sample was filtered through GF/F filters (pore size 0.45 µm) by using vacuum filtration assembly. After vacuum filtration the glass micro fiber filter paper was grinded in tissue grinder, macerating of glass fiber filter paper along with the filtrate was done in 90% aqueous Acetone in the glass tissue grinder with glass grinding tube. Glass fiber filter paper will assist breaking the cell during grinding and chlorophyll content was extracted with 10 ml of 90% Acetone, under cold dark conditions along with saturated magnesium carbonate solution in glass screw cap tubes. After an extraction period of 24 hours, the samples were transferred to calibrated centrifuge tubes and adjusted the volume to original volume with 90% aqueous acetone solution to make up the evaporation loss. The extract was clarified by using centrifuge in closed tubes. The clarified extracts were then decanted in clean cuvette and optical density was observed at wavelength 664, 665 nm.

Phytoplankton in the marine environment: Phytoplanktons are free floating unicellular, filamentous and colonial eutrophic organisms that grow in aquatic environments whose movement is more or less dependent upon water currents. These micro flora acts as primary producers as well as the basis of food chain, source of protein, bio-purifier and bio-indicators of the aquatic ecosystems of which diverse array of the life depends. They are considered as an important component of aquatic flora, play a key role in maintaining equilibrium between abiotic and biotic components of aquatic ecosystem. The phytoplankton includes a wide range of photosynthetic and phototrophic organisms.

Marine phytoplankton is mostly microscopic and unicellular floating flora, which are the primary producers that support the pelagic food-chain. The two most prominent groups of phytoplankton are Diatoms (*Bacillariophyceae*) and Dinoflagellates (*Dinophyceae*). Phytoplankton also include numerous and diverse collection of extremely small, motile algae which are termed micro flagellates (naked flagellates) as well as Cyanophytes (Bluegreen algae). Algae are an ecologically important group in most aquatic ecosystems and have been an important component of biological monitoring programs. Algae are ideally suited for water quality assessment because they have rapid reproduction rates and very short life cycles, making them valuable indicators of short-term impacts. Aquatic populations are impacted by anthropogenic stress, resulting in a variety of alterations in the biological integrity of aquatic systems. Algae can serve as an indicator of the degree of deterioration of water quality, and many algal indicators have been used to assess environmental status.

Zooplankton includes a taxonomically and morphologically diverse community of heterotrophic organisms that drift in the waters of the world's oceans. Qualitative and quantitative studies on zooplankton community are a prerequisite to delineate the ecological processes active in the marine ecosystem. Zooplankton community plays a pivotal role in the pelagic food web as the primary consumers of phytoplankton and act as the food source for organisms in the higher trophic levels, particularly the economically essential groups such as fish larvae and fishes. They also function in the cycling of elements in the marine ecosystem. The dynamics of the zooplankton community, their reproduction, and growth and survival rate are all significant factors determining the recruitment and abundance of fish stocks as they form an essential food for larval, juvenile and adult fishes. Through grazing in surface waters and following the production of sinking faecal matters and also by the active transportation of dissolved and particulate matter to deeper waters via vertical migration, they help in the transport of organic carbon to deep ocean layers and thus act as key drivers of 'biological pump' in the marine ecosystem. Zooplankton grazing and metabolism also, transform particulate organic matter into dissolved forms, promoting primary producer community, microbial demineralization, and particle export to the ocean's interior. The categorisation of zooplankton into various ecological groups is based on several factors such as duration of planktonic life, size, food preferences and habitat. As they vary significantly in size from microscopic to metazoic forms, the classification of zooplankton based on size has paramount importance in the field of quantitative plankton research.

Diversity Index

A diversity index is a measure of species diversity within a community that consists of co-occurring populations of several (two or more) different species. It includes two components: richness and evenness. Richness is the measure of the number of different species within a sample showing that more the types of species in a community, the higher is the diversity or greater is the richness. Evenness is the measure of relative abundance of the different species with in a community.

- The basic idea of diversity index is to obtain a quantitative estimate of biological variability that can be used to compare biological entities composed of discrete components in space and time. Biodiversity is commonly expressed through indices based on species richness and species abundances. Biodiversity indices are a non-parametric tool used to describe the relationship between species number and abundance. The most widely used bio diversity indices are Shannon Weiner index and Simpson's index.

1. Simpson's index:

A reasonably high level of dominance by one or a small number of species is indicated by the range of **0.89 to 0.91**. The general health and stability of the ecosystem may be impacted by this dominance. Community disturbances or modifications that affect the dominant species may be more likely to have an impact. The dominating species determined by the Simpson's index can have big consequences on how the community is organised and how ecological interactions take place.

The formula for calculating D is presented as:

$$D = 1 - \sum (p_i^2)$$

Where, \sum = Summation symbol, p_i = Relative abundance of the species

2. Shannon-Wiener's index:

An index of diversity commonly used in plankton community analyses is the Shannon-Wiener's index (H), which emphasizes not only the number of species (richness or variety), but also the apportionment of the numbers of individuals among the species. Shannon-Wiener's index (H) reproduces community parameters to a single number by using an equation are as follow:

$$H' = \sum p_i * \ln (p_i)$$

Where, \sum = Summation symbol,

p_i = Relative abundance of the species,

\ln = Natural logarithm

More diverse ecosystems are considered healthier and more resilient. Higher diversity ecosystems typically exhibit better stability and greater tolerance to fluctuations. e.g., The Shannon diversity index values between 2.19 and 2.56 indicate relatively high diversity within the community compared to communities with lower values. It suggests that the community likely consists of a variety of species, and the species are distributed somewhat evenly in terms of their abundance.

3. Margalef's diversity index:

The number of species is significantly related to the port's vegetation cover surface, depth, and photosynthetic zone. The habitat heterogeneity is a result of these three elements. Species richness is related to the number of distinct species present in the analysed area. Margalef's index has a lower correlation with sample size. Small species losses in the community over time are likely to result in inconsistent changes.

Margalef's index D_{Mg} , which is also a measure of species richness and is based on the presumed linear relation between the number of species and the logarithm of the number of individuals. It is given by the formula:

$$D_{Mg} = \frac{S-1}{\ln N}$$

Where N = total number of individuals collected

S = No. of taxa or species or genera

4. Berger-Parker index:

This is a useful tool for tracking the biodiversity of deteriorated ecosystems. Environmental factors have a considerable impact on this index, which accounts for the dominance of the most abundant species over the total abundance of all species in the assemblage. The preservation of their biodiversity and the identification of the fundamental elements influencing community patterns are thus critical for management and conservation. Successful colonising species will dominate the assemblage, causing the Berger-Parker index to rise, corresponding to well-documented successional processes. The environmental and ecological features of the system after disturbance may therefore simply but significantly determine the identity of the opportunistic and colonising species through niche selection processes.

The Berger-Parker index is a biodiversity metric that focuses on the dominance or relative abundance of a single species within a community. It provides a measure of the most abundant species compared to the total abundance of all species present in the community. Mathematically, it can be represented as follows:

$$d = \frac{N_{max}}{N_i}$$

Where,

N_{max} = Max no of individuals of particular genera or species

$\sum N_i$ = Total no of individuals obtained.

The resulting value of the Berger-Parker index ranges between 0 and 1. A higher index value indicates a greater dominance of a single species within the community. Conversely, a lower index value suggests a more even distribution of abundance among different species, indicating higher species diversity. The range of the Berger-Parker index can be interpreted as when the index value is close to 0, it signifies a high diversity with a more even distribution of abundances among different species. In such cases, no single species dominates the community, and there is a balanced representation of various species.

5. **Relative Abundance:** The species abundance distribution (SAD) from disturbed ecosystems follows even/ uneven pattern. E.g., If relative abundance is 0.15, then the found species are neither highly dominant nor rare.

$$RA = \frac{\text{No. of Individuals of Sp.}}{\text{Total no. of Individual}} * 100\%$$

6. Evenness index-

Evenness index determines the homogeneity (and heterogeneity) of the species' abundance. Intermediate values between 0 and 1 represent varying degrees of evenness or unevenness in the distribution of individuals among species. Value of species evenness represents the degree of redundancy and resilience in an ecosystem. High species evenness = All species of a community can perform similar ecological activities or functions= even utilization of available ecological niches = food web more stable = ecosystem is robust (resistant to disturbances or environmental changes). Intermediate values between 0 and 1 represent variable degrees of evenness or unevenness.

$$EI = \frac{H}{\ln(S)}$$

Where,

H= Shannon value

ln(S) = the natural logarithm of the number of different species in the community

2.6 Result and Discussion and Conclusion

The details of Marine Ecological Monitoring conducted for the locations of Kandla and Vadinar during the monitoring period has been summarized in the **Table 45**.

Table 45: Summarized Results of Biomass, Net Primary Productivity (NPP), Gross Primary Productivity (GPP), Pheophytin and Chlorophyll

Sr. No.	Parameters	Units	Kandla						Vadinar	
			ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
1.	Biomass	mg/l	78	81	111	88	85	91	26	32
2.	Net Primary Productivity	mg/L/hr	7.21	8.25	7.33	8.87	8.32	7.12	6.52	7.64
3.	Gross Primary Productivity	mg/L/hr	8.55	7.12	8.32	8.71	6.45	7.13	6.94	5.74
4.	Pheophytin	mg/m ³	NIL	3	NIL	NIL	NIL	6	7.21	6.74
5.	Chlorophyll-a	mg/m ³	3.16	BQL	1.82	BQL	4.23	BQL	1.34	BQL
6.	Particulate Oxidizable Organic Carbon	mg/L	0.32	0.16	0.56	0.25	0.35	0.29	0.36	0.39
7.	Secchi Depth	ft	0.89	0.84	0.76	0.91	0.72	0.81	5.30	4.26

- Biomass:**

The value of **Biomass** reported from location ME-1 to ME-6 in range between 78-111 g/m² where highest biomass present in ME-3 (Near Coal Berth) and lowest biomass present in ME-1 (Near passenger Jetty 1) during sampling period. In Vadinar, the value of biomass was observed 26 g/m² at ME-7 (Near SPM), monitoring station and 32 g/m² in ME-8 (Near Vadinar Jetty).

- Chlorophyll-a**

In the sub surface water, the monitoring station reported the maximum **Chlorophyll-a** value at ME-5 (Nakti creek) i.e., 4.23 mg/m³ and the value observed to be "Below the detection limit" at three locations (ME-2, ME-4 and ME-6) during the sampling. In the Vadinar, the value of chlorophyll-a was observed 1.34 mg/m³ at ME-7 (Near SPM), monitoring station and ME-8 (Near Vadinar Jetty) recorded below the detection limit.

- **Pheophytin**

The level of **Pheophytin** was detected or found nil in majority of the monitoring location in Kandla except for location ME-2 and 6 (Kandla and Nakti Creek) where it was recorded 3 and 6, respectively. While it was observed 7.21 and 6.74 in ME-7 (Near SPM) and ME-8 (Near Vadinar Jetty) respectively, in Vadinar.

- **Secchi Depth**

In monitoring station of Kandla from ME-1 to ME-6 the level of **Secchi Depth** was observed between 0.72 to 0.91 ft whereas the value recorded in Near SPM (ME-7) is 5.30ft and in Near Vadinar Jetty is 4.26 ft.

- **Productivity (Net and Gross)**

Gross primary productivity (GPP) is the rate at which organic matter is synthesised by producers per unit area and time (GPP). The amount of carbon fixed during photosynthesis by all producers in an ecosystem is referred to as gross primary productivity. The monitoring station reported **GPP** value in range between 6.45-8.71 mg/L/hr where the highest value recorded in Khorī creek and lowest recorded at Nakti creek (near Tuna port) during sampling period. In the Vadinar, the value of **GPP** was observed 6.94 mg/L/hr at ME-7 (Near SPM) monitoring station and ME-8 (Near Vadinar Jetty) recorded 5.74 mg/L/hr.

Net primary productivity, is the amount of fixed carbon that is not consumed by plants, and it is this remaining fixed carbon that is made available to various consumers in the ecosystem. The Net primary productivity of the monitoring location at Kandla from (ME-1 to ME-6) has been estimated to be between 7.12 to 8.87 mg/L/hr, while for Vadinar the value of NPP recorded 6.52 mg/L/hr and 7.64 mg/L/hr in ME-7 and ME-8 during the monitoring month.

- **Particulate Oxidisable Organic Carbon**

For the month of April, the concentration of the Particulate oxidisable organic Carbon was observed to fall within the range of 0.16-0.35 mg/L at Kandla and 0.36-0.39 mg/L for Vadinar.

- **Ecological Diversity**

Phytoplankton: For the evaluation of the Phytoplankton population in DPA Kandla and Vadinar within the immediate surroundings of the port, sampling was conducted between **mid-April to May, 2023**. Total 8 sampling locations were studied i.e. sampling locations (6 from Kandla and two from Vadinar). The details of variation in abundance and diversity in phytoplankton communities is mentioned in **Table 46**.

Table 46: Phytoplankton variations in abundance and diversity in sub surface sampling stations

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
<i>Bacillaria sp.</i>	460	700	680	750	660	850	650	700
<i>Biddulphia sp.</i>	650	510	-	650	-	-	755	350
<i>Chaetoceros sp.</i>	350	765	680	530	755	550	800	480
<i>Chlamydomonas sp.</i>	150	560	-	-	380	860	420	545
<i>Cyclotella sp.</i>	-	-	800	540	650	880	-	390
<i>Ditylum sp</i>	900	780	390	685	-	350	450	600

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
<i>Coscinodiscus sp.</i>	-	500	950	320	600	820	785	-
<i>Fragilaria sp.</i>	650	600	580	-	700	-	710	840
<i>Gomphonema sp.</i>	550	840	-	360	-	350	900	-
<i>Gyrosigma sp.</i>	410	500	650	750	-	685	400	655
<i>Pleurosigma sp.</i>	-	385	-	480	-	700	455	350
<i>Navicula sp.</i>	800	750	440	885	670	600	550	400
<i>Nitzschia sp.</i>	785	550	600	500	750	540	800	685
<i>Skeletonema sp.</i>	500	765	480	-	-	740	655	-
<i>Synedra sp.</i>	800	480	-	556	-	700	-	750
<i>Planktothrix sp.</i>	-	780	500	680	730	750	500	-
<i>Oscillatoria sp.</i>	940	-	670	-	845	800	-	785
Density-Units/l	7945	9465	7420	7686	6740	10175	8830	7530
No. of genera	13	15	12	13	10	15	14	13

The phytoplankton community of the sub surface water in the Kandla and Vadinar was represented by, Diatoms, blue green algae and Cynobacteria. Diatoms were represented by 14 genera, Blue green algae were represented by 1 genera and Cynobacteria were represented by 2 genera during the sampling period.

The density of phytoplankton of the sampling stations from ME-1 to ME-6 (Kandla) varying from 6800-7220 units/L, while for Vadinar its density of phytoplankton observed 6535 units/L at ME-7 and 8360 units/L at ME-8. During the sampling, phytoplankton communities were dominated by *Cyclotella sp.* and *Navicula sp.* in Kandla, while *Nitzschia sp.* in Vadinar.

Table 47: Species richness Index and Diversity Index in Phytoplankton

Indices	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Taxa S	12	12	14	13	16	13	12	14
Individuals	7450	8745	9155	9100	10310	7990	8025	9650
Shannon diversity	2.49	2.68	2.46	2.53	2.29	2.68	2.61	2.52
Simpson 1-D	0.91	0.93	0.91	0.92	0.90	0.93	0.92	0.98
Species Evenness	0.97	0.99	0.99	0.99	0.99	0.99	0.99	0.98
Margalef richness	1.34	1.53	1.23	1.34	1.02	1.52	1.43	1.34
Berger-Parker	0.12	0.09	0.13	0.12	0.13	0.09	0.10	0.11
Relative abundance	0.16	0.16	0.16	0.17	0.15	0.15	0.16	0.17

- **Shannon-Wiener's Index (H)** of phytoplankton communities at the sampling stations was in the range of 2.29-2.68 between selected sampling stations from ME-1 to ME-6 with an average value of 2.52 at Kandla creek and nearby creeks which indicate the higher and stable diversity. Shannon-Wiener's Index (H) of phytoplankton communities in the sampling stations was in the range of 2.52-2.61 between selected sampling stations with an average value of 2.56 at Vadinar. The apportionment of the numbers of individuals

among the species observed higher in Nakti Creek in Kandla and Near Vadinar Jetty (Vadinar).

- In the month of **April**, **Margalef's diversity index** (Species Richness) of phytoplankton communities in the Kandla and nearby creeks sampling stations was varying from 1.02-1.53 with an average of 1.33 during the sampling. While for Vadinar Margalef's diversity index (Species Richness) of phytoplankton communities observed 1.43 at ME-7 and 1.34 at ME-8 with an average value of 1.38.
- **Simpson diversity index (1-D)** of phytoplankton communities was ranged between 0.90-0.93 at Kandla creek and nearby creeks, with an average of 0.91 in studied location. Similarly, for Vadinar Simpson diversity index (1-D) of phytoplankton communities was 0.92 at ME-7 and 0.98 at ME-8 with an average of 0.92. Both the Monitoring station of Kandla and Vadinar shows a good diversity of phytoplankton communities.
- **Berger-Parker Index (d)** of phytoplankton communities in the sampling stations was in the range of 0.09-0.13 between selected sampling stations from ME-1 to ME-6 with an average value of 0.11 at Kandla creek and nearby creeks. Berger-Parker Index (d) of phytoplankton communities in the sampling stations of Vadinar, was in the range of 0.10-0.11 with an average value of 0.11 All the monitoring station signifies a low diversity with an even distribution among the different species.
- **Relative Abundance** of phytoplankton communities in the sampling stations was in the range of 0.15-0.17 between selected sampling stations from ME-1 to ME-6 with an average value of 0.15 at Kandla creek and nearby creeks. Relative Abundance of phytoplankton communities in the sampling stations was in the range of 0.16-0.17 with an average value of 0.17 at Vadinar. The average relative abundance is found in range of 0.15, thus the studied species can be stated as neither highly dominant nor rare.
- The **Species Evenness** is observed in the range of 0.99 to 1 for all the eight-monitoring station of Kandla and Vadinar, indicate varying degrees of evenness or unevenness in the distribution of individuals among the studied species. The details of variation in abundance and diversity in zooplankton communities is mentioned in **Table 48**.

Table 48: Zooplankton variations in abundance and diversity in sub surface sampling stations

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
<i>Acartia sp.</i>	-	3	1	4	3	1	2	
<i>Acrocalanus</i>	1	2	7	4	1	1	3	5
<i>Amoeba</i>	6	1		3	6	2	4	1
<i>Brachionus sp.</i>	2	4	2	1		8	5	-
<i>Calanus sp.</i>	1	1	-	3	-	2	2	2
<i>Cladocera sp.</i>	1	-	-	2	1	1	2	3
<i>Copepod larvae</i>	3	8	5	6	5	3	10	3
<i>Cyclopoida</i>	2	4	1	3	2	-	1	1
<i>Diaptomus sp.</i>	4	1	3	1	10	1	1	3
<i>Eucalanus sp.</i>	5	-	1	4	4	8	7	9
<i>Mysis sp.</i>	-	11	8	4	-	2	7	-
<i>Oithona sp.</i>	1	2	5	2	1	2	3	9

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
<i>Paracalanus sp.</i>	12	10	13	18	15	15	20	17
Density Unit/L	38	47	46	55	48	46	66	53
No. of genera	11	11	10	13	10	12	12	10

A total of 13 groups/taxa of zooplankton were recorded in Kandla and Vadinar during the study period which mainly constituted by copepods, branchiopoda, monogononata, fish and shrimp larval forms. Copepods had the largest representation at all stations from (ME-1 to ME-8). The density of Zooplankton of the sampling stations from ME-1 to ME-6 (Kandla) varying from 67-187 units/L, while for Vadinar its density of phytoplankton observed 198 units/L at ME-7 and 133 units/L at ME-8. During the sampling, zooplankton communities were dominated by *Mysis sp.* in Kandla, while *Paracalanus sp.* in both the monitoring location of Kandla and Vadinar.

Table 49: Species richness Index and Diversity Index in Zooplankton

Indices	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Taxa S	11	11	10	13	10	12	12	10
Individuals	38	47	46	55	48	46	66	53
Shannon diversity	2.05	2.08	1.99	2.23	1.94	2.03	2.15	1.95
Simpson (1-D)	0.85	0.87	0.85	0.86	0.84	0.84	0.86	0.83
Species Evenness	0.85	0.87	0.86	0.87	0.84	0.82	0.87	0.85
Margalef	2.75	2.6	2.35	2.99	2.32	2.87	2.63	2.27
Berger-Parker	0.32	0.23	0.28	0.33	0.31	0.33	0.3	0.32
Relative abundance	28.95	23.4	21.74	23.64	20.83	26.09	18.18	18.87

- **Shannon-Wiener's Index (H)** of Zooplankton communities, at sampling stations was in the range of 1.94-2.23 between selected sampling stations from ME-1 to ME-6 with an average value of 2.05 at Kandla creek and nearby creeks. Shannon-Wiener's Index (H) of zooplankton communities in the sampling stations was in the range of 1.95-2.15 between selected sampling stations with an average value of 2.05 at Vadinar. The diversity of zooplankton species was observed to be less in both the monitoring location of Kandla and Vadinar.
- **Margalef's diversity index** (Species Richness) of zooplankton communities in the Kandla and nearby creeks sampling stations was varying from 2.32-2.99 with an average of 2.64 during the sampling. While for Vadinar Margalef's diversity index (Species Richness) S of zooplankton communities observed 2.63 at ME-7 and 2.27 at ME-8 with an average of 2.45. The higher value was observed in Khori creek (ME-4), Kandla and in ME-7 (near SPM), Vadinar.
- **Simpson diversity index (1-D)** of zooplankton communities was ranged between 0.84-0.87 at all sampling stations in Kandla creek and nearby creeks, with an average of 0.85. While for Vadinar, Simpson diversity index (1-D) of zooplankton communities was 0.86 at ME-7 and 0.83 at ME-8 with an average of 0.84.

- **Berger-Parker Index (d)** of zooplankton communities in the sampling stations was in the range of 0.23-0.33 between selected sampling stations from ME-1 to ME-6 with an average value of 0.3 at Kandla creek and nearby creeks. Berger-Parker Index (d) of zooplankton communities in Vadinar sampling stations was found in range of 0.3–0.32 with an average value of 0.31. All the monitoring station signifies a low diversity with an even distribution among the different species.
- **Relative Abundance** of zooplankton communities at sampling stations was in the range of 20.83-28.95 between selected sampling stations from ME-1 to ME-6 with an average value of 24.10 at Kandla creek and nearby creeks. Relative Abundance of zooplankton communities in the sampling stations was in the range of 18.18–18.87 with an average value of 18.52 at Vadinar.
- The **Species Evenness** is observed in the range of 0.82 to 0.87 for all the eight-monitoring station of Kandla and Vadinar, the highest value recorded in ME-2,4&7 (Kandla & Khorri Creek, near SPM), Kandla & Vadinar and the lowest value found in ME-6 (Nakti Creek).

Table 50: Benthic Fauna variations in abundance and diversity in sub surface sampling stations at Kandla and Vadinar

Genera	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
<i>Diapatra sp.</i>	1	2	1	6	2	4	1	3
<i>Mollusca sp.</i>	3	1	4	3	1	-	1	-
<i>Odonata sp.</i>	4	1	1	-	1	3	4	5
<i>Coleoptera sp.</i>	1	2	2	3	-	1	3	1
<i>Crustacea sp.</i>	-	1	3	5	1	3	1	-
<i>Hemiptera sp.</i>	3	6	-	2	2	1	-	1
<i>Tricoptera sp.</i>	3	6	4	-	2	5	2	1
Density-Units/l	15	19	15	19	9	17	12	11
No of genera	6	7	6	5	6	6	6	5

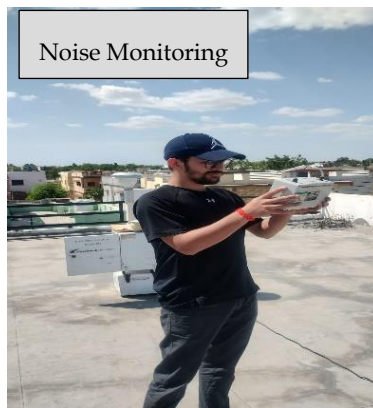
Few Benthic organisms were observed in the collected sample by using the Van-Veen grabs during the sampling conducted in the month of April and May from DPA Kandla and Vadinar. Majority of the species were found under the Macro-benthic organisms during the sampling period were represented by *Diapatra sp.*, *Mollusca sp.*, *Odonata sp.*, *Crustacea sp.* Etc. The density of benthic fauna was varying from 10-14- Unit/L. The dominating benthic communities at Kandla Creek and nearby creek (Nakti and Khorri creek) were represented *Diapatra sp.* While lowest number of benthic species was represented by *Hemiptera sp.* Their population was found as 16 Unit /L at Near SPM and 5 Unit/L near Vadinar Jetty area during both the sampling period.

Table 51: Species richness Index and Diversity Index in Benthic Organism

Indices	ME-1	ME-2	ME-3	ME-4	ME-5	ME-6	ME-7	ME-8
Taxa S	6	7	6	5	6	6	6	5
Individuals	15	19	15	19	9	17	12	11
Shannon diversity	1.68	1.67	1.66	1.54	1.74	1.65	1.63	1.37
Simpson 1-D	0.86	0.81	0.85	0.81	0.92	0.84	0.85	0.76
Species Evenness	0.94	0.86	0.93	0.96	0.97	0.92	0.91	0.85
Margalef	1.85	2.04	1.85	1.36	2.28	1.76	2.01	1.67
Berger-Parker	0.27	0.32	0.27	0.32	0.22	0.29	0.33	0.45
Relative abundance	40	36.84	40	26.32	66.67	35.29	50	45.45

- **Shannon-Wiener's Index (H)** of Benthic organisms at sampling stations was in the range of 1.54-1.74 between selected sampling stations from ME-1 to ME-6 with an average value of 1.65 at Kandla creek and nearby creeks. Shannon-Wiener's Index (H) of Benthic organisms in the sampling stations was in the range of 1.37-1.63 between selected sampling stations with an average value of 1.5 at Vadinar. Diversity of zooplankton species was observed to be less in both the monitoring location of Kandla and Vadinar.
- **Margalef's diversity index** (Species Richness) of Benthic organisms in the Kandla and nearby creeks sampling stations was varying from 1.36-2.28 with an average of 1.85 during the sampling period. While for Vadinar Margalef's diversity index (Species Richness) of Benthic organisms observed 2.01 at ME-7 and 1.67 at ME-8 with an average of 1.84.
- **Simpson diversity index (1-D)** of Benthic organisms was ranged between 0.81-0.92 at all sampling stations in the Kandla creek and nearby creeks, with an average of 0.84. The highest value was observed at ME-5. While for Vadinar Simpson diversity index (1-D) of benthic organism was 0.85 at ME-7 and 0.76 at ME-8 with an average of 0.80 during the sampling period.
- **Berger-Parker Index (d)** of Benthic organisms in the sampling stations was in the range of 0.22-0.32 between selected sampling stations from ME-1 to ME-6 with an average value of 0.28 at Kandla creek and nearby creeks. Berger-Parker Index (d) of Benthic organisms in Vadinar sampling stations was found in range of 0.33-0.45 with an average value of 0.39. Thus, all the eight-monitoring station of Kandla and Vadinar signifies a moderate diversity with an even distribution among the different species.
- **Relative Abundance** of benthic organism at sampling stations was in the range of 26.32-66.67 between selected sampling stations from ME-1 to ME-6 with an average value of 40.85 at Kandla creek and nearby creeks. Relative Abundance of phytoplankton communities in the sampling stations was in the range of 45.45-50 with an average value of 47.73 at Vadinar. The average relative abundance is found in range of 0.15, thus the studied species can be stated as neither highly dominant nor rare.
- The **Species Evenness** is observed in the range of 0.85 to 0.97 for all the eight-monitoring station, with an average value of 0.91 at Kandla and Vadinar indicate varying degrees of evenness or unevenness in the distribution of individuals among the studied species.

Annexure 1: Photographs of the Environmental Monitoring conducted at Kandla for April-May 2023



Annexure 1: Photographs of the Environmental Monitoring conducted at Vadinar for April-May 2023

Ambient Air Monitoring



Meteorological Monitoring



Noise Monitoring



Soil Monitoring



Drinking water Monitoring



Preservation at site



STP Monitoring



Marine (water, sediment & ecology) Monitoring



Source: GEMI



Gujarat Environment Management Institute (GEMI)

(An Autonomous Institute of Government of Gujarat)

'An ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 Certified Institute'

Head Office

Plot No. B 246 & 247, G.I.D.C. Electronic Estate,
Sector-25, Gandhinagar-382024

Laboratory

Plot No. B-64, G.I.D.C. Electronic Estate,
Opp. I.P.R., Sector-25, Gandhinagar-382025

Tel: (+91) 79-23240964 (O), T: (+91) 79-23287758 (Lab), F: (+91) 79-23240965

E-mail: info-gemi@gujarat.gov.in | Website: www.gemi.gujarat.gov.in

"We Provide Environmental Solutions"

Annexure -D



DEENDAYAL PORT AUTHORITY (Erstwhile: DEENDAYAL PORT TRUST)

Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038

www.deendayalport.gov.in

Date: 19/06/2023

EG/WK/EMC/CCA/ Part(III)/ 325

To,
The Member Secretary
Gujarat Pollution Control Board
Paryavaran Bhavan,
Sector 10A, Gandhinagar - 382010

Sub: Submission of Annual Return of Hazardous waste in format form IV for the financial year 2022-23 reg.

- Ref.:** 1) KPT letter no. EG/WK/4660(EC)/549 dated 20/6/2012
2) KPT letter no. MR/GN/1527(Part I)/2012 dated 20/5/2013
3) KPT letter no. MR/GN/1527(Part I)/336 dated 17/05/2014
4) KPT letter no. MR/GN/1527/ (Part I)/dated 27/04/2015
5) KPT letter no. EG/WK/EMC/CCA (Part II)/217 dated 27/6/2016
6) KPT letter no. EG/WK/EMC/CCA (Part II)/213 dated 19/6/2017
7) DPT letter no. EG/WK/EMC/CCA (Part II)/294 dated 13/6/2018
8) DPT letter no. EG/WK/EMC/CCA (Part II) dated 27/5/2019
9) DPT letter no. EG/WK/4751 (CCA Renewal) dated 22/5/2020
10) DPT letter no. EG/WK/4751 (CCA Renewal)/13 dated 30(4)/4(5)/2021
11) DPT letter no. EG/WK/4751 (CCA Renewal)/131 dated 06/07/2022

Sir,

It is requested to kindly refer above cited references for the said subject.

In this connection, it is to state that, the Deendayal Port Authority has obtained renewal of consent order from the GPCB Vide order no. AWH - 110594 dated 22/01/2021 valid up to 21/07/2025 for Deendayal Port Authority area.

In this regard, as per statutory requirement, the DPA has regularly submitted Annual Returns (as mentioned in reference above) in format Form IV to the GPCB.

Now please find the enclosed herewith Annual Return of Hazardous Waste in Form IV for the year 2022-23

This is for kind information and record please.

Encl: As above

Yours faithfully

Manager (Environment)
Deendayal Port Authority

Enclosure – A

Annual Return of Hazardous waste Return (Form IV)
For Deendayal Port Authority, Kandla
For the FY @ 2022-2023

"FORM-IV"

[(See rule 6(%), 13(8), 16(6) and 20(21)]

(To be submitted to State Pollution Control Board by 30th day of June of every year for the preceding period April 22 to March 23)

Sr. No.	Particulars	Details
1.	Name and Address of the Facility	Deendayal Port Authority Administrative Office Building Post Box No. 50 Gandhidham Dist.: Kutch- 370201 Gujarat State Tel. No.: 02836-233192 Fax No.: 02836-220050
2.	Authorization No. and Date of issue	Consent order no. AWH – 110594 granted by the GPCB dated 22/01/2021 and correction to consent order done dated 09/04/2021
3.	Name of Authorized Person and full address with telephone, Fax number and E-Mail	Mr. Raveendra Reddy Chief Engineer Deendayal Port Authority Administrative Office Building Post Box No. 50 Gandhidham Dist.: Kutch- 370201 Gujarat State Tel. No.: 02836-233192 Fax No.: 02836-220050
4.	Production during the year (product wise) wherever applicable	NA Deendayal Port Authority has only loading & unloading activities for dry cargo and liquid cargo. During FY 2022-23 Total Cargo Handled is 137.5 MMTPA

PART A. To be filled by Hazardous Waste Generator

1.	Total quantity of waste generated category wise	Used oil/Waste residue containing oil 1. Used Spent Oil: 4758.79 MT 2. Waste residue containing oil: 9157.58 MT
2.	Quantity Dispatched a. To disposal Facility b. To recycler or co-processor or pre-processor c. Others	Used Oil/Waste residue containing oil has been disposed of through CPCB/GPCB authorized vendor (Annexure-1)
3.	Quantity utilized inhouse -if any	NA
4.	Quantity in storage at the end of the year	NA

PART B To be filled Treatment, Storage and Disposal Facility Operator

1.	Total Quantity Received 1. Direct Landfill 2. Incineration 3. Land fill after treatment	NA
2.	Quantity at stock at the beginning of the year 1. Direct Landfill 2. Incineration 3. Land fill after treatment	
3.	Quantity treated (Landfill) Land fill after Treatment	
4.	Quantity disposed in landfill as such and after treatment 1. Direct Landfill 2. Land fill after treatment 3. Incineration Ash 4. Salts from Spray Dryer 5. Total	
5.	Quantity incinerated (if applicable)	
6.	Quantity processed other than specified above	
7.	Quantity in storage at the end of the year 1. Incineration 2. Landfill after treatment	

PART C To be filled by recyclers or co-processor or other users

1.	Quantity of the waste received during the year 1. Domestic sources 2. Imported (if applicable)	NA
2.	Quantity in stock at the beginning of the year	
3.	Quantity recycled or co processed or used	
4.	Quantity of products dispatched (wherever applicable)	
5.	Quantity of waste generated	
6.	Quantity of waste disposed	
7.	Quantity re-exported (wherever Applicable)	
8.	Quantity in storage at the end of the year	

Manager (Environment)

Deendhal Port Authority

Date: 13/06/23

Place : Gondal

DEENDAYAL PORT AUTHORITY - MARINE DEPARTMENT				
Statement of Hazardous & Non Hazardous Waste disposal from the vessels at Kandla & Vadinar Port Year 2022-23				
Sr.No.	MONTH	HAZARDOUS WASTE DATA for FY 2022-23		
		Total	Used spent Oil	Waste residue containing oil
		Quantity Disposed (MT)		
1	Apr-22	1237.33	412.44	824.89
2	May-22	1285.56	428.52	857.04
4	Jun-22	1568.41	522.80	1045.61
5	Jul-22	1238.46	412.82	825.64
3	Aug-22	1414.94	471.65	943.29
4	Sep-22	872.60	290.87	581.73
5	Oct-22	1210.04	403.35	806.69
3	Nov-22	938.71	312.90	625.81
4	Dec-22	1286.64	428.88	857.76
5	Jan-23	1284.40	428.13	856.27
3	Feb-23	762.19	254.06	508.13
4	Mar-23	637.09	212.36	424.73
Total	--		4578.79	9157.58
Total Hazardous waste Genreted for FY 2022-23				13736.37


 उप संरक्षक
 दीनदयाल पतन प्राधिकरण
 Deputy Conservator
 Deendayal Port Authority

Marine Department

Statement showing the Collection and disposal of Hazardous and Non-Hazardous Wastes carried out by various parties from April - 2022 to Mar - 2023

No.	Name of Party	Type of Licence	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Total
1	Alicid Organic Industries Ltd	Hazardous	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Amar Hydrocarbon Pvt. Ltd	Hazardous	-	-	-	-	-	-	-	-	-	19.00	-	-	19.00
3	Atlas Organics Pvt. Ltd	Hazardous	21.39	35.28	-	-	34.06	-	-	18.80	10.98	-	17.06	-	137.57
4	Aviation Corporation	Hazardous	35.12	50.34	-	-	-	-	-	-	-	-	-	-	85.46
5	Fine Refiners Pvt. Ltd	Hazardous	-	14.50	53.77	21.08	-	20.11	16.32	-	43.56	-	39.65	-	208.99
6	Mahalanxi Asphalt Pvt Ltd	Hazardous	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Priyansu Corporation	Hazardous	52.91	22.44	11.38	30.33	-	30.65	-	-	17.56	-	49.18	36.05	250.50
8	Revolution Petrochem LLP	Hazardous	874.00	965.00	964.00	710.12	1,058.06	463.81	713.57	524.23	787.61	888.73	339.75	257.12	8,546.00
9	Shano Oil Process	Hazardous	-	-	-	-	-	-	-	-	-	-	-	-	-
10	United Shipping Company	Hazardous	253.91	198.00	539.26	476.93	322.82	358.03	480.15	395.68	426.93	376.67	316.55	343.92	4,488.85
11	Chitrukut Trading & Industries	Non-Hazardous	-	0.16	0.19	0.19	0.17	0.35	6.36	-	31.38	12.42	3.94	16.54	71.70
12	Golden Shipping Services	Non-Hazardous	77.42	38.26	19.63	1.14	30.28	8.36	21.82	26.57	15.06	22.82	18.42	46.48	326.26
13	Green Earth Marine Solution	Non-Hazardous	-	39.72	3.46	2.88	3.24	2.30	-	3.60	-	1.30	2.88	-	59.38
14	Harish A. Pandya	Non-Hazardous	3.58	0.06	3.20	-	-	4.47	1.13	-	0.22	-	5.70	4.89	23.25
15	K M Enterprise	Non-Hazardous	30.15	47.56	57.24	101.56	64.00	35.28	46.08	63.36	72.93	65.02	91.77	41.82	716.77
16	Naaz Shipping Services Ent	Non-Hazardous	-	-	-	-	-	-	-	-	-	10.80	-	-	10.80
17	New India Marine Work	Non-Hazardous	1.44	2.16	-	-	-	-	-	-	-	-	2.16	1.08	6.84
18	Omega Marine Services	Non-Hazardous	350.63	73.10	42.15	-	104.40	25.46	23.69	45.97	53.31	19.80	43.32	23.29	805.12
19	V K Enterpris	Non-Hazardous	23.76	28.08	12.96	10.80	15.12	17.28	10.80	12.96	15.12	10.80	12.96	10.80	181.44
20	Vishwa Trade-link Inc	Non-Hazardous	21.92	11.74	20.65	30.10	29.38	29.88	31.48	35.44	14.59	15.91	10.52	20.02	271.63
Hazardous Total			1,237.33	1,285.56	1,568.41	1,238.46	1,414.94	872.60	1,210.04	938.71	1,286.64	1,284.40	762.19	637.09	13,736.37
Non-Hazardous Total			508.90	240.84	159.48	146.67	246.59	123.38	141.36	187.90	202.61	158.87	191.67	164.92	2,473.19

उप संरक्षक
दीनदयाल पतन प्राधिकरण
Deendayal Port Authority

Annexure -E

Final Report

On

Greenbelt Development for the Deendayal Port Authority at Kandla Port



Submitted to



Deendayal Port Authority

Administrative Office Building
Post Box No.50, Gandhidham (Kachchh)
Gujarat-370201

Prepared by



Gujarat Institute of Desert Ecology

Mundra Road, Bhuj-370 001, Kachchh, Gujarat

E-mail: desert_ecology@yahoo.com

www.gujaratdesertecology.com

Final Report
on
**Greenbelt Development for the Deendayal Port Authority at Kandla
Port, Kandla**

Co-ordinator

Dr. V. Vijay Kumar, Director

Principal Investigator

Dr. Jayesh B. Bhatt, Scientist

Co-Principal Investigator

Mr. Bhagirath Paradva, Project Fellow

Mr. Rakesh Popatani, Project Fellow

Technical Support

Mr. Prakash Patel, Executive Engineer

Mr. Ajay K. Gohel, Project Fellow



Gujarat Institute of Desert Ecology Opp.

Changleshwer Temple, Mundra Road Bhuj-370

001, Kachchh, Gujarat

www.gujaratdesertecology.com

Content

Sr. No	Title	Page No
1	Introduction	1
2	Rationale	3
3	Project Site	5
4	Scope of Work	5
5	Approach and Methodology for Greenbelt Development	5
6	Plantation techniques	7
7	Selection of plant species for plantation	8
8	Number of sapling	8
9	Management and Monitoring of Greenbelt	8

List of Table

Sr. No	Title	Page No
1	Time Schedule for Watering	9
2	List of Plants for Plantation at Site for Greenbelt Development	9

List of Figure

Sr. No	Title	Page No
1	Before Plantation	10
2	Map of Plantation Area	11
3	Digging Out Trench for Plantation	11
4	Transportation of Plants to Site	12
5	Fertile Soil for Better Survival of Plants	12

6	Plantation Pits of Soil Filling	12
7	Organic Manure for Better Growth and Survival	13
8	Regular Watering of the plants by tanker	13
9	Plantation in October 2022	14
10	Plantation in December 2022	15
11	Plantation in February 2023	16
12	Plantation in May 2023	17

Introduction

Green vegetation cover surrounding human environment is a vital entity for supply of oxygen, food, fodder and medicine for the survival of all living being, and also it has played an important role in maintaining ecological balance, climate regulation, biodiversity conservation, retention of soil moisture, control of soil erosion, increasing soil fertility, maintaining pleasant micro climate of the region, etc. In addition, vegetation cover also absorbs various pollutants from the environment and thus helps in effective pollution control. However, due to the various types and extent of economic development like industrialization, mining, infrastructural development, etc. has reducing and fragmenting natural vegetation cover day-by day all over the world. The infrastructural and industrial development leads to influence the life of all the living organisms in two directions: either upwards or downwards. In the upward mode, human being gets opportunities for luxuriant life with easy accessibility to the resources while in downward, the quality of ecosystem services gets affected. Most of the industrial and infra-structural developmental activities generate pollution of one or other types with varying magnitudes, which makes susceptible to all the organisms, nevertheless, the power of resistance of each organism helps themselves to overcome the hazards caused by such pollutants.

Therefore, development of green belts alongside of industries, mines, thermal power station, roadsides, and other development unit is an effective mechanism to rejuvenate vital vegetation cover for safeguarding health of human and other living being. Green belts in and around urban and industrial areas are important to the ecological health of any given region. Greenbelt is the row of trees planted along the industrial units, mines, roadside for reducing the pollution originating from these operations (Flemming, 1967; Hanson and Throne, 1970; Warren, 1973; Ganguly, 1976). Greenbelt has developed considering following factors; (i) physical characteristics of the green belt eg. Distance from the source, width, and height and leaf surface area density (ii) aerodynamic properties eg. Wind speed through greenbelt and effective height of the incident air stream (iii) deposition velocity of the pollutant and (iv) atmospheric stability conditions (CPCB, 2000).

As per the National Forest Policy (NFP-1988), it is necessary to encourage the planting of trees alongside of roads, railway lines, rivers and streams and canals, and on other

unutilized lands under state/corporate, institutional or private ownership. NFP give emphasis on the green belt developments. It says – Green belts should be raised in urban/industrial areas as well as in arid tracts. Such a programme will help to check erosion and desertification as well as improve the microclimate.

Green infrastructure serves to provide on ecological framework for social, economic and environmental health of the surroundings. The main components of this approach include storm water management, climate adaptation, less heat stress, more biodiversity, food production, better air quality, sustainable energy production, clean water and healthy soils, as well as the more anthropocentric functions such as increased quality of life through recreation and providing shade and shelter in and around infrastructure and industrial areas. Green infrastructure is thought to be effective in such scenarios, where green plants from a surface capable of absorbing air pollutants and act as a sink for pollutants. Leaves with their vast leaf area in the tree canopy, absorbs pollutants on their surface. Thus, effectively reduce their concentrations in the ambient air. Often the absorbed pollutants are incorporated in metallic streams and thus the air is purified. Plants grown in such a way as to function as pollutant sinks are collectively referred to as green infrastructure or green belts. Apart from functioning as a pollutant sink, green belts would also provide other benefits like aesthetic improvement and providing possible habitats for birds and animals along with maintain the soil moisture regime with the soil microorganisms and improve the Soil quality and ground water recharge. The greenbelts has helps in improving the ecology, maintenance of biodiversity, mitigation of dust pollution and fugitive emission, control of noise pollution, provide fresh air, mitigates soil erosion, increasing aesthetic values of an area and overall improvement of the landscape.



Rationale

Deendayal Port in Kachchh District of Gujarat State (formerly Kandla Port Trust), operated by Deendayal Port Authority (DPA), is a gateway Port to the hinterland in the western and northern states of India. It is one of the 11 major Ports of India situated at 22°59'39.77" N latitude and; 70°13'20.14" E longitude on Kandla creek at Gulf of Kachchh. The inclusion of Karachi Port in Pakistan after India's partition and heavy traffic congestion at the then Bombay Port gave impetus for promoting Deendayal Port during the year 1950s. In 1955, Deendayal Port acquired the status of a major Port in India. Because of its proximity to the Gulf countries, large quantities of crude petroleum and other assorted cargo are imported through Deendayal Port. The Port presently has 14 jetties, six oil terminals, and several allied facilities for handling dry and liquid cargo. Regular expansion/developmental activities such as the addition of jetties, allied Special Economic Zones (SEZ hereafter), industrial parks and ship bunkering facilities are underway to cope with the increasing cargo handling demands. Shri Mansukh Mandaviya, Minister of State for Ports, Shipping and Waterways (I/C) appreciated the efforts taken by Deendayal Port and added that it is indeed the major achievements in the challenging (COVID) times and it is significant indication that economy is bouncing back to achieve pre-COVID times.

Major commodities handled by the Deendayal Port are Crude Oil, Petroleum product, Coal, Salt, Edible Oil, Fertilizer, Sugar, Timber, Soya bean, Wheat. This major achievement can be attributed to the user-friendly approach of port with the Shipping fraternity / stakeholders and constant consultations with them to improve ease of doing business. An assortment of liquid and dry cargo is being handled at Deendayal Port. The dry cargo includes fertilizers, iron scrap, steel, food grain, metal products, ores, cement, coal, machinery, sugar, wooden logs, salt extractions, etc. The liquid cargo includes edible oil, crude oil and other petroleum products. DPA created a new record by handling 127.10 million metric tonnes of cargo during FY 2021-22 compared to 117.566 MMT in FY 2020-21, with a growth of 8.11%. Incidentally, DPA is the only major Indian Port to handle more than 127 MMT cargo throughput, and it has also registered as the highest cargo throughput in its history. The Port has handled 3151 vessels during FY 2021-22 compared to 3095 vessels in FY 2019-20. While the Port has flagged off several projects related to infrastructure creation, DPA has successfully awarded the work of

augmentation of Liquid cargo handling capacity by revamping the existing pipeline network at the oil jetty area in September 2021. Deendayal Port is a natural harbour located on the eastern bank of North-South trending Kandla creek at an aerial distance of 145 km from the Gulf's mouth.

Being located at the inner end of the Gulf of Kachchh (GoK), Deendayal Port has a fragile marine ecosystem with a vast expanse of mangroves, mudflats, creek systems and allied biota. The Port location is marked by a network of major and minor mangrove-lined creek systems with a vast extent of mudflats. The coastal belt in and around the Port has an irregular and dissected configuration.

There are no perennial or seasonal rivers in Gandhidham taluka where the port is located. Total rainy days during the monsoon season is limited to only 15-20 days and used to be erratic. Freshwater input into the near coastal waters is relatively meagre and appears to have less influence on the ambient coastal water quality except during monsoon months, during which freshwater through flash floods get discharged in the near coastal waters. The annual average humidity is 60%, which increases to 80% during the southwest monsoon (June to September) and decreases to 50% during the months of November and December. The drought phenomenon is common with two drought years in a cycle of 5 years.

The coastal belt in and around the Kandla region is characterized by a network of creek systems and mudflats covered by sparse halophytic vegetation, creek water and salt-encrusted land mass, which forms the major land forms. The surrounding environment in a radius of 10 km from the Port is mostly built-up areas consisting of salt works, human habitations and Port related structures on the west and north, creek system, mangrove formations and mudflats on the east and south. The Deendayal Port and its surroundings have mangroves, mudflats and creek systems as major ecological entities.

DPA is committed towards environment protection since its establishment and has taken many initiatives towards increasing green cover and greenbelt development in various areas under DPA through intensive plantation activities and developing greenbelt around its established port and jetty areas and human habitations.

In order to enhance and strengthen Greenbelt Development, the DPA has approached GUIDE to develop the greenbelt area within the port area in phase wise manner. It was finalised to raise 5000 plants at a suitable site during the first phase.

Project Site

Based on observation made by the GUIDE Team and Officials from Deendayal Port Authority, a site at adjacent to Berth 11-12 (Wood log site) have been selected on the peripheral boundary of two sides.

The area proposed for green development of Deendayal Port is barren land without any vegetation. The soil of the area is black muddy highly saline soil and with saline ground water. The area is very dry and hot during the summer. The highest temperature used to be recorded in this area.

Scope of Works

The overall objective is to Development Greenbelt at Deendayal Port. The following activities of the Greenbelt development have been carried out:

1. To make an inventory of suitable sites for greenbelt development in and around the Deendayal Port at Kandla.
2. To carryout Soil and Moisture Conservation (SMC) of the selected sites.
3. Identification of suitable native species of plants for the greenbelt plantation.
4. Adopting plantation technique of plant saplings.
5. Regular monitoring (survival and growth) of the plantation.
6. Suggest measures for management and improvement of the greenbelt.

Approach and Methodology for Greenbelt Development

Following steps have been adopted for greenbelt development:

- Removal of exotic/unwanted plants plant species from the entire area demarcated for green belt development: The entire selected site have been cleared by removing

unwanted weeds and material such as stones, plastics etc. by JCB and also with labours.

- Landscaping of the area and land preparation Trench line of 2.5x 2.5 ft. have been dig out through JCB along the boundary adjacent to birth 11 & 12 wood log area up to approximately 5000 ft.
- Soil and moisture conservation work since the port area is highly saline, SMC work was very much essential for better survival of the plants. Eight dumper of fertile soil from the field have been added.
- Identification of native species of plants for plantation in greenbelt as per the site suitability the site was very challenging for greenbelt development since the water and soil is highly saline with the extreme climatic condition, the selection of plant species for plantation has been made very carefully. 40 % of plants have been selected as native species for plantation where as 60% species of *Conocarpus*.
- Procurement of sapling of identified species or Nursery management or seeding of tree/shrub species all the saplings were procured where of 3-4 ft. in height from reliable nursery. All saplings were of tree species.
- Installation of irrigation facilities was not feasible therefore activity was planned preferably through tankers. The watering of the plantation have been schedule as per the seasons which is given in table. Regular watering as per the scheduled have been provided by the water tanker under the supervision of team expert
- Use of Manure, preferably organic fertilizer for enhancing soil fertility best quality organic manure of 12,500 kg have been provided to the saplings for better growth and survival. Weed management and trench repairing have been carried out periodically also as and when it required.
- Regular monitoring and management of the saplings by a qualified team from GUIDE the selected site is wood log site hence, the wood log used to roll down on a path for water tanker while uploading and downloading the wood log. The regular visit to the site has been made for monitoring and clearing the road for water tanker for irrigation. Gap filling were also made during the period.

Plantation Techniques:

- Site development for a plantation includes clearance for weeds and it involves, bush cutting, soil and moisture conservation works in 'nalas', construction of bunds or check dams, marking of pits for planting of saplings etc.
- After clearing the land sites for digging of pits, plantation have been marked on ground using a measuring tape to ensure the desired spacing.
- Pits of the size 45 cm x 45 cm and 45 cm depth have been dug for tree plantation. Pits have been deep enough to ensure that the roots of the plants do not curl up once the planting material is placed in it.
- Since the soil is highly saline, a fertile soil around 6 dumper have been added for better survival of plants
- Organic manure around 12,500 kg. Have been given for better growth and survival.
- The pit have been filled a little above the ground level so that after the earth settles the upper surface of the pit is level to the ground thus avoiding any water logging.
- The plantation has been out in two phase since the some areas were blocked by wood logs.
- Around 4100 saplings have been planted during the month of September 2022 at available plantation area.
- The remaining and gap filling of 1500 saplings have been planted after the clearance of the area during the month of Feb.2023. A total number of 5000 plantations, were completed in the area.

Selection of Plant Species for Plantation:

Various indigenous tree species suitable for the area have been identified and selected for plantation in suitable areas based on the assessment of soil quality, available water facility, and other environmental parameters.

Number of Sapling:

Approximate numbers of saplings to be required for the greenbelt are as follows:

- Peripheral plantation adjacent to birth 11-12 (along the boundary of the wood log area both sides): 5000 saplings

Management and Monitoring of Greenbelt:

The plantation within the identified site have been managed and monitored for a period of one year from June 2022 to June 2023. The management of plantation includes appropriate irrigation of the plantation in regular intervals, during summer and winter periods and if required even during monsoon with dry spells.

Watering have been made through tanker service at given schedule during the different seasons. (Table 1)

The all plants are growing very well and reached more 4-6 ft. height. The survival of plants have been noted very high as 98% during June 2023.



Table: 1 Time Schedule for Watering

Sr. No.	Month & Year	Number of Time
1	September 2022	4 times/month
2	October 2022	5 times/ month
3	November 2022	8 times/ month
4	December 2022	8 times/ month
5	January 2023	8 times/ month
6	February 2023	8 times/ month
7	March 2023	12 times/ month
8	April 2023	12 times/ month
9	May 2023	12 times/ month
10	June 2023	2 times/ month (end of the project 4 th June 2023)

Table: 2 List of Plants for Plantation at Site for Greenbelt Development

SI. No.	Scientific Name	Local Name	No. of Plant
1	<i>Conocarpus lancifolius</i>	Conocarpus	3500
2	<i>Ficus religiosa</i>	Piplo	100
3	<i>Azadirachta indica</i>	Limblo	200
4	<i>Peltophorum pterocarpum</i>	Pletoforam	300
5	<i>Millettia pinnata</i>	Karanj	300
6	<i>Cassia fistula</i>	Garmalo	100
7	<i>Delonix regia</i>	Gulmahor	300
8	<i>Mimusops elengi</i>	Borssalii	200



Fig. 1 Before Plantation



Fig. 2 Map of Plantation Area



Fig. 3 Digging Out Trench for Plantation



Fig. 4 Transportation of Plants to Site



Fig. 5 Fertile Soil for Better Survival of Plants



Fig. 6 Plantation Pits of Soil Filling



Fig. 7 Organic Manure for Better Growth and Survival



Fig. 8 Regular Watering of the plants by tanker

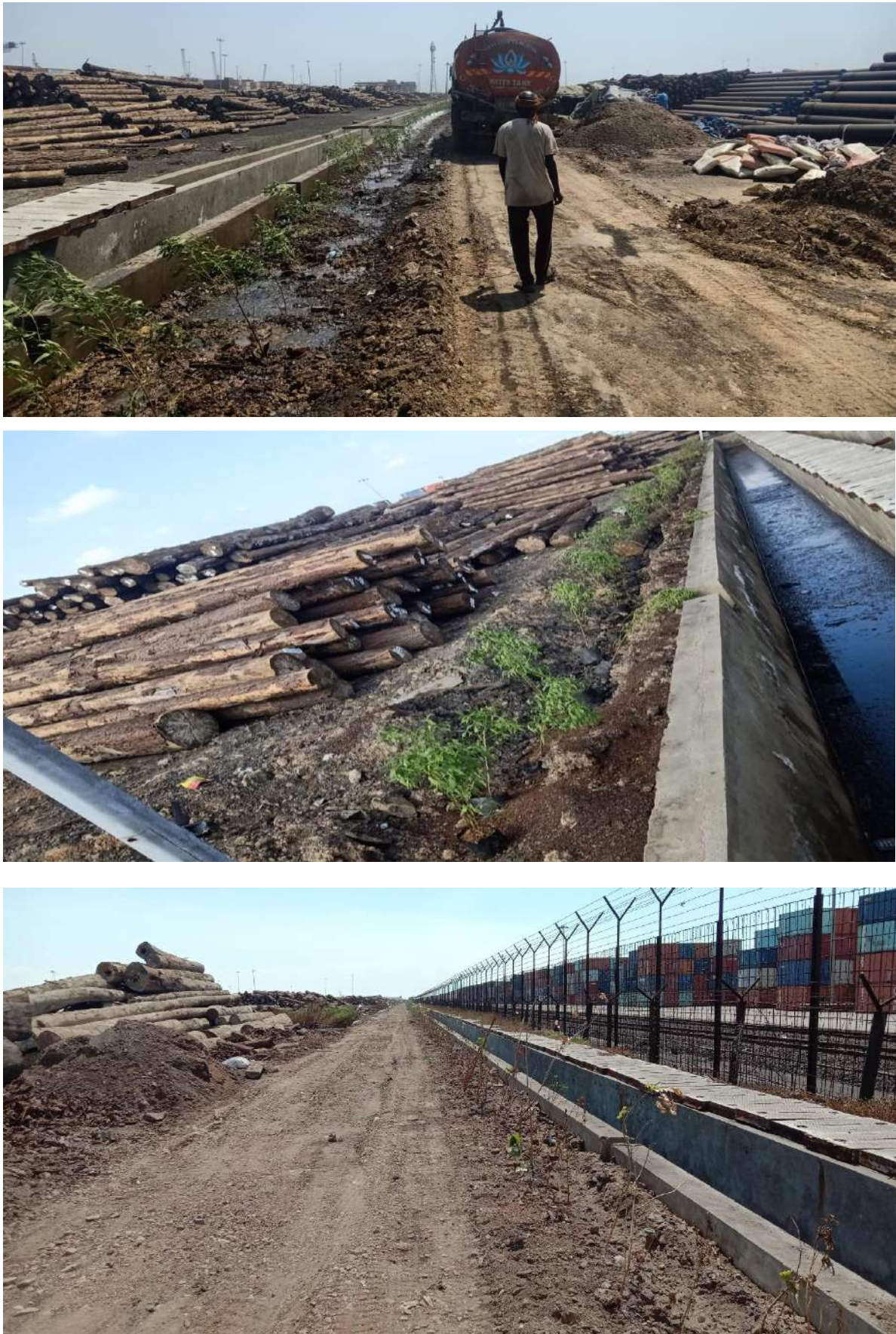


Fig. 9 Plantation in October 2022



Fig. 10 Plantation in December 2022



Fig. 11 Plantation in February 2023

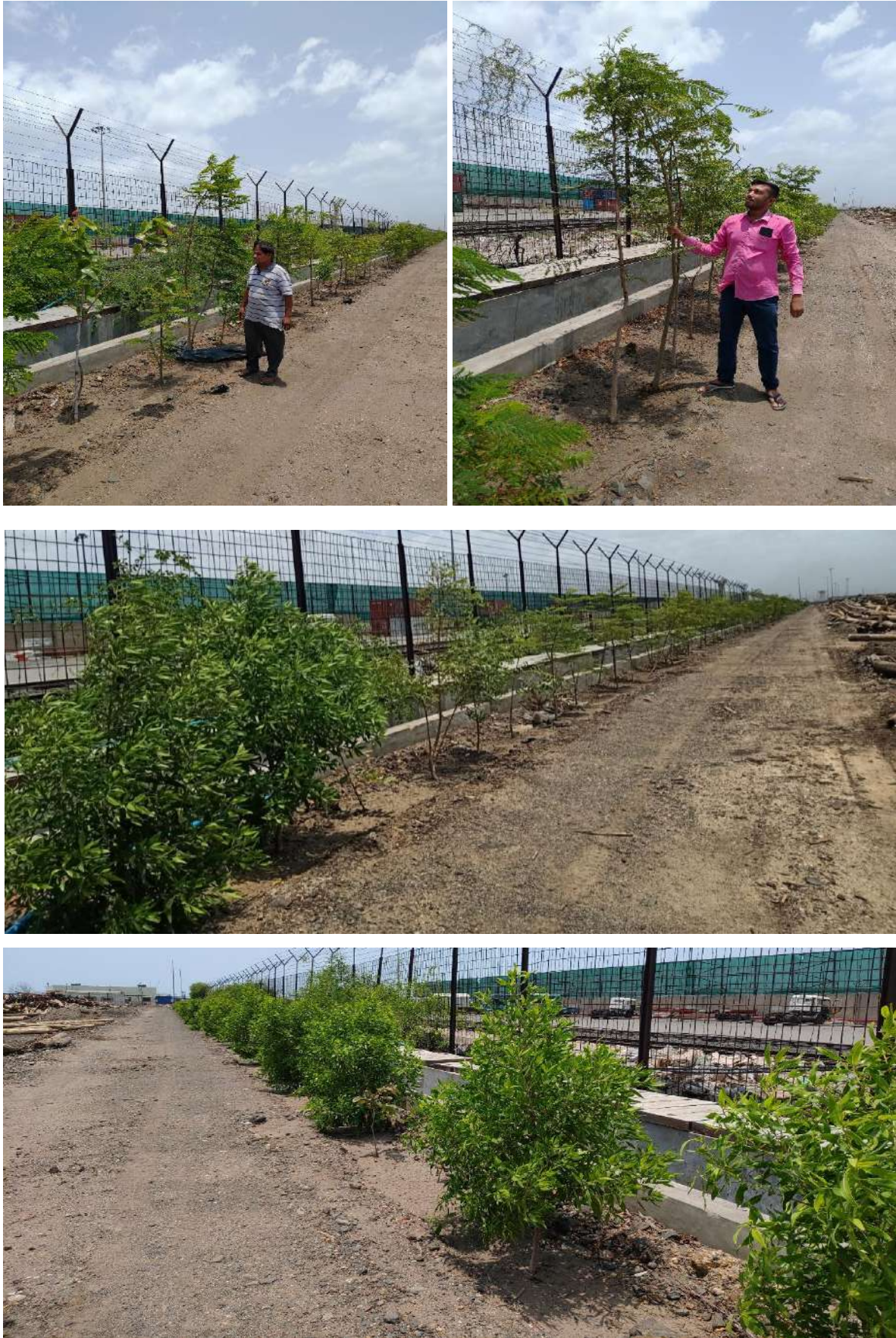


Fig. 12 Plantation in May 2023

Annexure -F



DEENDAYAL PORT AUTHORITY (Erstwhile: DEENDAYAL PORT TRUST)

Administrative Office Building
Post Box NO. 50
GANDHIDHAM (Kutch).
Gujarat: 370 201.
Fax: (02836) 220050
Ph.: (02836) 220038

www.deendayalport.gov.in

Date: 19/06/2023

EG/WK/4751 (CCA Renewal)/ 326

To,
The Member Secretary
Gujarat Pollution Control Board
Paryavaran Bhavan,
Sector 10A, Gandhinagar - 382010

Sub: Submission of Environmental statement in format form V for the financial year 2022-23 reg.

- Ref.:** 1) KPT letter no. MR/GN/1527(Part I)/535 dated 16/6/2012
2) KPT letter no. MR/GN/1527(Part I)/2011 dated 20/5/2013
3) KPT letter no. MR/GN/1527(Part I)/337 dated 17/05/2014
4) KPT letter no. MR/GN/1527/ (Part I)/dated 27/04/2015
5) KPT letter no. EG/WK/EMC/CCA (Part II)/218 dated 27/6/2016
6) KPT letter no. EG/WK/EMC/CCA (Part II)/214 dated 19/6/2017
7) DPT letter no. EG/WK/EMC/CCA (Part II)/294 dated 13/6/2018
8) DPT letter no. EG/WK/EMC/CCA (Part II) dated 27/5/2019
9) DPT letter no. EG/WK/4751 (CCA Renewal) dated 22/5/2020
10) DPT letter no. EG/WK/4751 (CCA Renewal)/14 dated (30)04/(4)5/2021
11) DPA letter no. EG/WK/4751 (CCA Renewal)/132 dated 06/07/2022

Sir,

It is requested to kindly refer above cited references for the said subject.

In this connection, it is to state that, the GPCB has renewed the consolidated consent & Authorization granted to Deendayal Port Authority (Erstwhile Deendayal Port Trust) and issued CCA order no. AWH-110594 vide PC/CA-KUTCH-812 (5)/GPCB ID 28494/581914 dated 21/01/2021 valid upto 21/07/2025

In this regard, as per statutory requirement, the DPA has regularly submitted Annual Returns (as mentioned in reference above) in format Form V to the GPCB.

Now please find the enclosed herewith Environmental Statement in Form V for the year 2022-23

This is for kind information and record please.

Encl : As above

Yours faithfully

Manager (Environment)
Deendayal Port Authority

Enclosure – A

Environmental Statement (Form V)
For Deendayal Port Authority, Kandla
For the FY @ 2022-2023

"FORM-V"
(See rule -14)

From:

Deendayal Port Authority,
Administrative Office Building,
Post Box No.: 50, Gandhidham,
Dist.: Kutch – 370 207. Gujarat State.
Tel No.: O: 02836-220038
Fax No.: 02836-220050

To,

The Member Secretary,
Gujarat Pollution Control Board,
Paryavaran Bhavan, Sector - 10A,
Gandhinagar – 382043

Environmental statement for the financial year ending the 31st March, 2023

"PART-A"

1) Name and Address of the owner/occupier of the industry or process		
➤ NAME	:	Mr. Raveendra Reddy Chief Engineer
➤ ADDRESS	:	Deendayal Port Authority Administrative Office Building, Post Box No.: 50, Gandhidham, Dist.: Kutch – 370 207. Gujarat State. Tel No.: O: 02836-220038 Fax No.: 02836-220050
➤ Industry Category Primary – (STC code) Secondary – (STC code)	:	Major port Authority under the administrative control of Ministry of Ministry of Ports, Shipping and waterways, GOI
➤ Year of Establishment	:	8th April 1955
➤ Date of the last Environment audit report submitted	:	27 th June, 2016

"PART-B"

WATER AND RAW MATERIAL CONSUMPTION

Sr.No.	WATER CONSUMPTION	(M ³ /Day)
1.	Process	652676.55
2.	Cooling	
3.	Domestic Purpose	
Total water consumption for the period from April 2022 to March 2023 was KL hence, average water consumption for per day – 1788 M ³ /day		

I. Water Consumption

Sr. No.	Name of Products	Process Water Consumption per unit of products output	
		During the current financial year 2021-22	During the current financial year 2022-23
01.	Dry Cargo Handling	127.10 MT	137.5 MT
02.	Liquid Cargo Handling		
Deendayal Port Authority has only loading & unloading activities for dry cargo and liquid cargo. Hence consumption of process water consumption per unit of output with respective to production is not applicable.			
During FY 2022-23 Total Cargo Handled is 137.5 MMTPA			
However, Details of the Domestic water consumption for the financial year 2022-23 please refer Annexure-1			

II. Raw material Consumption

Sr.No.	Name of Raw Material	Name of Products	Consumption of Raw material per unit of output	
			During the current financial year 2021-22	During the current financial year 2022-23
1.	Deendayal Port Authority has only loading & unloading activities for dry cargo and liquid cargo. Hence consumption of raw material per unit of output with respective to production is not applicable			

"PART-C"

**POLLUTION DISCHARGED TO ENVIRONMENT/UNIT OF OUTPUT
(PARAMETERS AS SPECIFIED IN THE CONSENT)**

Pollutant	Quantity of Pollutant Discharged (mass/day)	Concentration of Pollution in Discharge (mass/volume)	% of Variation from prescribed standard with reasons
<p>Please Refer Annexure -II for Environmental Monitoring Reports of</p> <ul style="list-style-type: none">• Ambient Air Quality Monitoring• Drinking Water Quality Monitoring• Marine Water Monitoring• Noise Level Monitoring			

"PART-D"

**HAZARDOUS WASTE
[AS SPECIFIED UNDER HAZARDOUS WASTE (MANAGEMENT AND HANDLING) RULES -1989 & AMENDMENT RULES -2008]**

Sr.No.	Hazardous Waste	Total Quantity in MT/Year	
		During the current financial year 2021-22	During the current financial year 2022-23
1.	5.1- Used Spent Oil	3195.28	4578.79
2.	5.2- Waste Residue Containing Oil	6390.57	9157.58
<ul style="list-style-type: none">• Details of Hazardous Waste generated during the financial year 2022-23 please refer Annexure-III			
<p>a. From Process: NA</p> <p>b. From Pollution Control facility: NA</p>			

"PART-E"
SOLID WASTE

Sr.No.	Solid Waste	Total Quantity in MT/year	
		During the current financial year 2021-22	During the current financial year 2022-23
1.	From Process	Nil	Nil
2.	From pollution Control Facility	Nil	Nil
a.	Quantity Recycled or Reutilized within the unit	Nil	Nil
b.	Sold	Nil	Nil
c.	Disposed Off	1724.08 MT	2473.19 MT
Details of Solid Waste (Non-Hazardous Waste) generated during the financial year 2022-23 please refer Annexure-IV			

"PART-F"

PLEASE SPECIFY THE CHARACTERISTICS (IN TERMS OF CONCENTRATION AND QUANTUM) OF HAZARDOUS AS WELL AS SOLID WASTES AND INDICATE DISPOSAL PRACTICE ADOPTED FOR BOTH THESE CATEGORIES OF WASTES.

Hazardous Waste:

Companies authorized by Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) have been awarded the work of collection, transporting and disposal of hazardous Waste by the Deendayal Port Authority. The same will be hand over to authorize parties for further Treatment & disposal.

Solid Waste:

Garbage facility is provided as per MARPOL Act 73/78 to the vessel berthed at Deendayal Port Authority. Companies authorized by Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB) have been awarded the work of collection, transporting and disposal of solid waste by the Deendayal Port Authority. The same will be hand over to authorize parties for further treatment and disposal.

"PART-G"

IMPACT OF THE POLLUTION ABATEMENT MEASURES TAKEN ON CONSERVATION OF NATURAL RESOURCES AND ON THE COST OF PRODUCTION.

DPA has awarded the work of "Preparing and Monitoring of Environmental monitoring and management plan for Deendayal Port Authority Kandla and Vadar to Gujarat Environment Management Institute (GEMI), Gandhinagar (An autonomous Institute of Government of Gujarat).

Further for Pollution Abatement measures taken for Conservation of Natural Resources DPA appointed renowned agency i.e M/s. GUIDE, Bhuj for the following work.

1. Regular Monitoring of Mangrove Plantation.
2. Preparation of detailed marine Biodiversity management plan for the impact of the project activities as per the requirement of EC & CRZ Clearance accorded by the MoEF&CC, GOI for the project "Creation of water front facilities (Oil jetties 8,9,10,11) and development of land of area 554 acres for associated facilities for storage at old Kandla, Gandhidham, kutch, Gujarat by M/s Deendayal Port Authority"
3. Regular monitoring of marine ecology in and around the Deendayal Port Authority area and continuous monitoring programme covering all season on various aspects of the coastal environ covering physico-chemical parameters of marine sediments samples coupled with biological indices, as per the requirement of EC & CRZ clearance accorded by the MoEF&CC,GOI to the various projects of the Deendayal port Authority.
4. Study on dredged material for presence of contaminant as per EC and CRZ clearance accorded by the MoEF&CC, GOI dated 19/12/2016 – specific condition vii

"PART-H"

ADDITIONAL MEASURES / INVESTMENT PROPOSAL FOR ENVIRONMENTAL PROTECTION INCLUDING ABATEMENT OF POLLUTION, PREVENTION OF POLLUTION

The allocation made under the scheme of "Environmental Services & Clearance there of other related Expenditure" during BE 2023-2024 is Rs. 274 Lakhs

"PART-I"

ANY OTHER PARTICULAR FOR IMPROVING THE QUALITY OF THE ENVIRONMENT

1. DPA is ISO 14001:2015 certified port for "Providing port facility and related maritime services for vessel and Cargo handling including storage
2. DPA has appointed M/s GEMI, Gandhinagar for the work "Making Deendayal Port a Green Port- Intended Sustainable Development under the Green Port Initiatives". M/s GEMI, Gandhinagar had submitted the Final Report on 10/03/2021
3. DPA has accorded the work of Afforestation project in Deendayal Port Area to Forest Department, GoG which includes plantation and maintenance work of 1100 plants per ha.
4. DPA has accorded the work of green belt development in Deendayal port Authority and its Surrounding areas charcoal site to GUIDE for the plantation of 5000 saplings of suitable species.
5. DPA has planted 7500 trees in Deendayal port trust area during the year 2014-15 6000 trees during financial year 2016-17 and the same has been regularly maintained.
6. DPA has planted 4000 trees at A.O building, Gopalpuri residential colony and along the road side at Kandla. Further, approximately 885 no. of trees have been planted since September 2015 onwards.
7. Continuous water sprinkling has been carried out on the top of the heap of coal, at regular intervals to prevent dusting, fire and smoke. DPA already installed sprinkling system inside Cargo Jetty area for coal dust suppression in coal yard (40 Ha. Area) at the cost of Rs. 14.44 crores.
8. DPA has installed Mist Canon at the Port area to minimize the coal dust.
9. Deendayal port Authority (traffic department) issued a Circular (SOP) to the trade with regard to control of dust pollution arising out of coal handling and ensuring safety in coal handling. In case of any violations of SOP, provision of impose of penalty of Rs. 10000/- has been made and if violation is repeated thrice, the same will lead to ban of concerned party into port area. The DPA is taking all the measures to reduce coal dust by implementing the coal handling guidelines through port users.

10. All trucks before leaving the storage yard have been covered with tarpaulin and also trucks are also not over loaded as well as there is no spillage during transportation and there is adequate space for movement of vehicles at the surrounding area.
11. DPA has constantly improving the house keeping in the dry cargo storage yard and nearby approved areas leading to roads. Adequate steps under the provisions of air prevention and control of pollution Act 1981, Environmental Protection Act 1986 are taken.
12. DPA commissioned STP of capacity 1.5 MLD for treatment of domestic waste water for entire DPA area. (Details of domestic waste water generation is attached herewith as **Annexure V**)
13. Deendayal Port Authority had carried out mangrove plantation in an area of 1500 ha. through various government agencies like Gujarat Ecology Commission, State Forest Department.
14. It is also relevant to mention here that, DPA entrusted work to Forest Department, GoG (Social Forestry Division, Bhuj) during August, 2019 for green belt development in and around port area 31.942 hectares (approx. 35200 plants at various locations) at a cost of Rs. 352.32 lakhs.
15. DPA is involved in various CER activities like providing the proper sanitation and development of better roads for connectivity
16. DPA is managing its plastic waste as per Plastic Waste Management Rules – 2016 and amendments made therein. In order to strictly implement the said rules, DPT had issued a circular regarding plastic waste minimization, source segregation, recycling etc. vide its Circular no. EG/WK/4751/Part 243(A) dated 03/09/2021
17. DPA has entrusted the work to GEMI, Gandhinagar for "Preparation of Plan for Management of Plastic Waste, Solid Waste, C&D Waste, E-waste, Hazardous Waste including Bio-medical Waste and Non-hazardous waste in the Deendayal Port Authority Area
18. DPA has assigned the work to TERI, New Delhi for "Transition of Business Operations to Water Neutrality – Water Neutrality of Deendayal Port, Kandla (Phase I- Study and assessment)
19. Recently, DPA has entrusted the work to GEMI, Gandhinagar for "Study of CO₂ Emission Estimation and Reduction Strategy under Maritime India Vision 2030.
20. Initiative for Installation of Continuous Ambient Air Quality Monitoring System (CAAQMS) for monitoring of Air quality is under process.