Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/AP/MIS/566/2009
Compliance ID	1229243036
Compliance Number(For Tracking)	EC/M/COMPLIANCE/1229243036/2026
Reporting Year	2026
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	29-05-2026
RO/SRO Name	V Geroge Jenner
RO/SRO Email	tr025@ifs.nic.in
State	ANDHRA PRADESH
RO/SRO Office Address	Integrated Regional Offices, Vijayawada
Note:- SMS and E-Mail has been sent to V Geroge Jenner, ANDHRA PRADESH with Notification to Project Proponent.	

Half Yearly Compliance Report
2026
01 Jun(01 Oct - 31 Mar)

Acknowledgement

Proposal Name	Expansion of Krishnapatnam Port (Phase III)
Name of Entity / Corporate Office	Adani Krishnapatnam Port
Village(s)	N/A
District	SPSR NELLORE

Proposal No.	IA/AP/MIS/566/2009
Plot / Survey / Khasra No.	N/A
State	ANDHRA PRADESH
MoEF File No.	10-18/2016-IA.III

Category	INFRA-1
Sub-District	N/A
Entity's PAN	*****8657J
Entity name as per PAN	ADANI KRISHNAPATNAM PORT LIMITED

Compliance Reporting Details

Reporting Year	2026
Remarks (if any)	We are submitting the 3rd party NABL certified Half yearly compliance EC and CRZ compliance for the period from October 2025 to March 2026 along with EC and CRZ CTE CTO Compliance.
Reporting Period	01 Jun(01 Oct - 31 Mar)

Details of Production and Project Area

Name of Entity / Corporate Office Adani Krishnapatnam Port

	Project Area as per EC Granted	Actual Project Area in Possession
Private	2334	2334
Revenue Land	0	0
Forest	0	0
Others	N/A	N/A
Total	2334	2334

Others Area

Sr. no	Other Name	Area Granted	Area Actual

Production Capacity

Sr. no	Product Name	units	Valid Upto	Capacity	Production last year	Capacity as per CTO
1	Coal	Million Tons per Annum (MTPA)	31/08/2027	139	42.64	46
2	Iron Ore	Million Tons per Annum (MTPA)	31/08/2027	8	5.61	8
3	General Cargo	Million Tons per Annum (MTPA)	31/08/2027	19.5	9.82	14
4	Liquid Cargo	Million Tons per Annum (MTPA)	31/08/2027	51.7	1.14	10
5	Container Cargo	Others:MTEUAs	31/08/2027	3.1	0	2

Conditions

Specific Conditions

Sr.No.	Condition Type	Condition Details
1	Statutory compliance	The Environmental and CRZ Clearance to the project is primarily under provisions of EIA Notification, 2006 and CRZ Notification, 2011. It does not amount to approvals/consent/ permissions etc., required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals / clearances under any other Acts/ Regulations or Statutes as applicable to the project.

PPs Submission: Being Complied Noted the condition and duly complied with during the implementation of the project.	Date: 26/05/2026

2	Statutory compliance	The project proponent shall abide by all the commitments and recommendations made in the Form-II, EIA and EMP report, submissions made during Public Hearing and also that have been made during their presentation to EAC.

PPs Submission: Being Complied Being complied AKPL strictly abides with all the commitments and recommendations made during public hearing.	Date: 26/05/2026

3	Statutory compliance	Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction works other than those permitted i n Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.

PPs Submission: Being Complied Noted AKPL is ensuring that all proposed constructions conform to the norms prescribed in the CRZ Notification issued by the Ministry of Environment and Forests, Government of India. At present, AKPL has constructed one Liquid berth (Nort Side) out of 16 berths approved under phase III EC and CRZ expansion.	Date: 26/05/2026

4	Statutory compliance	All the recommendations and conditions specified by the Andhra Pradesh Coastal Zone Management Authority (APCZMA) vide letter 202/CRZ/IND/201930 dated 21.05.2020 shall be complied with

PPs Submission: Being Complied Noted and being complied.	Date:

		26/05/2026
5	Statutory compliance	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. Creek water monitoring program shall be implemented during the construction phase
PPs Submission: Being Complied Being complied. No creeks or rivers are blocked in the port premises and ensuring free flow of water. AKPL appointed NABL accredited Laboratory of SV Enviro for environmental monitoring and reports are being submitted to statutory bodies.		Date: 26/05/2026
6	Statutory compliance	Development of green belt by native species with consultation with state forest department shall be ensured.
PPs Submission: Being Complied Being Complied. AKPL has developed greenbelt with a native tree species. As on April 2026, AKPL has successfully developed 231.23 Ha (April 26) of green belt along port boundary, around coal yards, avenue and median plantations. Latest Green Belt Drawing is attached as Annexure 1		Date: 29/05/2026
7	Statutory compliance	The proposed expansion entails 60 million cum of dredging in soft soil. As proposed, the PP shall utilize 26 million cu m of dredged sand for reclamation of low lying areas of port, stock pile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT and disposal of balance 32 million cu m of dredged spoil in the identified dredge disposal area of 56 Km2 beyond (-) 20 m contour. The impact of dredging on the marine environment should be monitored and necessary measures shall be taken on priority basis if any adverse impact is observed. NIOT will oversee the work as scientific body and continue to monitor its impact/benefits for at least 5 years post project completion. Necessary financial assistance to be provided by project proponent to NIOT. The report of the same to be submitted to regional office of MoEFCC by project proponent.
PPs Submission: Being Complied Noted, AKPL will monitor marine environment if impact is observed. AKPL has obtained Consent to Establishment (CTE) from APPCB vide Order No. 633/ APPCB/ CFE/RO-NLR/HO/2010 dated 25.02.2021.		Date: 26/05/2026
8	Statutory compliance	Marine ecological monitoring and its mitigation measures for protection of phytoplankton, zooplanktons, macrobenthos, estuaries, sea-grass, algae, sea weeds, Crustaceans, Fishes, coral reefs and mangroves etc. as given in the EIA-EMP Report shall be complied with in letter and spirit with the help of reputed organization or individuals of national repute having knowledge in the said subject. Necessary financial assistance to be provided by project proponent.
PPs Submission: Complied Complied. As given in the EIA-EMP Report, AKPL appointed an NABL Accredited Laboratory to conduct Environmental Monitoring i.e., Terrestrial Marine ecological monitoring. The reports are being submitted to APPCB on monthly basis and MoEFCC on half-yearly basis AKPL appointed M/s. Suganthi Devadason Marine Research Institute (SDMRI) for conducting a Comprehensive Marine Biodiversity Assessment, Impact Assessment and Management Plan. And same submitted to AP State Biodiversity Board, Guntur and Member secretary, APCZMA and APPCB, RO, Nellore on 09.01.2025. Acknowledgement copy is attached as Annexure - 2		Date: 26/05/2026
9	Statutory compliance	Continuous online monitoring of air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance reports to the

		regional office of MoEF CC.
PPs Submission: Complied Complied. AKPL has been Operating 5 Nos. of Continuous Ambient Air Quality Monitoring stations and connected to APPCB website. AKPL appointed an NABL Accredited Laboratory to conduct Environmental Monitoring i.e Terrestrial Marine parameters. The reports are being submitted to APPCB on monthly basis and MoEFCC on half-yearly basis. Latest Self certified Half yearly compliance report for the period of Apr25 to Sep25 was submitted on 24.11.2025. Copy of the Acknowledgements are attached as Annexure - 3		Date: 26/05/2026
10	Statutory compliance	The actions shall be in accordance with proposed landscape planning concepts to minimize major landscape changes. The change in land use pattern shall be limited to the proposed port limits and be carried out in such a way as to ensure proper drainage by providing surface drainage systems including storm water network.
PPs Submission: Being Complied Being complied Port related activities and operations are restricted within the Port Boundary. AKPL is strictly ensuring proper surface and storm water drainage system for free flow of water. AKPL is continuously monitoring all the drainage network and Rainwater harvesting structures in Port premises with a fixed schedule, plan and removing silt as and when required.		Date: 26/05/2026
11	Statutory compliance	Suitable preventive measures be taken to trap spillage of fuel / engine oil and lubricants from the construction site. Measures should be taken to contain, control and recover the accidental spills of fuel during cargo handling.
PPs Submission: Being Complied Being complied Port has oil spill response equipment to combat any oil spill and coordinate with Indian Coast Guard to contain, control, and recover the accidental spills of fuel during cargo handling.		Date: 26/05/2026
12	Statutory compliance	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.
PPs Submission: Complied Complied Environmental Monitoring Plan is prepared in matrix format for the Phase III expansion and the same is under implementation. However, it shall be noted that the construction of all berths as planned under Phase III is not yet completed.		Date: 26/05/2026
13	Statutory compliance	The company shall draw up and implement Corporate Social Responsibility Plan as per the Company s Act of 2013.
PPs Submission: Being Complied Being complied AKPL implements CSR activities with the help of adani foundation. For October 2025 to March 2026 AKPL has spent 730.61 Lakhs towards CSR Socio economic development schemes and welfare measures. Education Adani Evening Education Centers (AEEC) ULIC: Supported 1496 students across 32 villages with 32 educators. Focus on slow learners improving weak subjects and after school support. Improvement observed in English communication and academic performance. Anganwadi Support Strengthened early education and celebrated Teachers Day. Vidyarathna Scholarships Financial support to meritorious students from SC ST and weaker sections (MBBS Polytechnic IIIT etc.. Community Health Healthcare through Adani Chikitsalayam and village clinics 10885 beneficiaries (6500 clinic 4385 outreach). Health screenings 3895 individuals. Yoga awareness 2150 participants. Focus on noncommunicable disease treatment with free medicines. Climate Action Sanitation Awareness campaigns on cleanliness, waste segregation, and hygiene. Installed 200 solar lights, benefiting 28,600 families. Village sanitation drives (roads, drains, waste removal) covered 17980 people. Participation in Model Village Development (Muthukur) initiative. Community Development Addressed water scarcity and high TDS: 12 RO		Date: 26/05/2026

plants tanker supply serving 10,600 families daily. Around 25,000 families access safe drinking water. Youth engagement in water system maintenance and village development. Promotion of sports (Kabaddi participation). Sustainable Livelihood Conducted 860 awareness sessions, reaching 3,800 women. Formed and strengthened 16 livelihood groups (from 3 earlier). Key initiatives: Farmer support rice processing unit (KFPCL). Women entrepreneurship (food catering, handmade products). Livestock support: AI services (65 cases) and cattle health camp (54 farmers). Market linkage and exposure visits for farmers and SHGs.		
14	Statutory compliance	As per the Ministry s Office Memorandum F. No. 22-65/2017-IA.III dated 30th September 2020, the project proponent shall abide by all the commitments made by them to address the concerns raised during the public consultation. The project proponent shall initiate the activities proposed by them, based on the commitment made in the public hearing, and incorporate in the Environmental Management Plan and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R and R, wildlife and forest conservation/protection measures including the NPV, Compensatory Afforestation etc., either proposed by the project proponent based on the social impact assessment and R and R action plan carried out during the preparation of EIA report or prescribed by EAC, shall also be implemented and become part of EMP.
PPs Submission: Complied Complied The Public Consultation for Phase-III expansion was exempted as it was developed in the existing land area of 6800 Ac. All the commitments made in the public consultation for Phase-II during 2009 were complied with.		Date: 26/05/2026

General Conditions

Sr.No.	Condition Type	Condition Details
1	Statutory compliance	Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011 and the State Coastal Zone Management Plan as drawn up by the State Government. No construction works other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area. A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained.
PPs Submission: Being Complied Being complied AKPL is ensuring that all proposed constructions conform to the norms prescribed in the CRZ Notification issued by the Ministry of Environment and Forests, Government, all the planned activities as part of Phase III EC CRZ Clearance have not been completed.		Date: 26/05/2026
2	Statutory compliance	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Coast Guard, Civil Aviation Department shall be obtained, as applicable by project proponents from the respective competent authorities.
PPs Submission: Complied Complied. AKPL has obtained a license from Chief Controller of Explosives to store petroleum class A , B as a retail outlet inside the port. Fire NOC has been obtained for Buildings (Admin and ETS). Copy of approvals are attached as Annexure 4		Date: 26/05/2026
3	AIR QUALITY MONITORING AND PRESERVATION	The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO2 and Nox in reference to SO2 and Nox emissions)

		within and outside the project area at least at four locations covering upwind and downwind directions.
PPs Submission: Complied Being complied. The Port has been operating 5 No. of CAAQM stations at the below mentioned locations as suggested by APPCB within the Port premises to monitor the parameters viz., PM10, PM2.5, SO2, NH3, NO2, CO and the data is being uploaded to APPCB website. a. CVR Amenities Complex b. Thamminapatnam Village c. Krishnapatnam Village d. North side of the Port e. South side of the port Environmental Monitoring has been rendered by NABL accredited laboratory along with AAQ monitoring at 7 locations covering upwind and downwind directions. Sample copy of the monitoring report for the month of April26 is attached as Annexure - 5.		Date: 26/05/2026
4	AIR QUALITY MONITORING AND PRESERVATION	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed emission standards.
PPs Submission: Being Complied Being complied. Port has adopted and implemented the following measures for the control of fugitive emissions during handling of bulk non bulk cargo and vehicular movement: i. Established mechanical conveyor system for handling coal Iron ore. ii. Provided closed hoods for the conveyor system. iii. Stacker cum reclaimers is being used for loading and unloading the coal. iv. The railway wagons are being loaded mechanically. v. Installed fully mechanized coal handling systems with gantry grab type ship loaders/unloaders. vi. Provided hooded conveyor belt for cargo transferring directly from ship to the designated stockyard by means of closed hopers and transfer towers. vii. Established closed warehouses for storage of weather sensitive cargoes. viii. The loading and discharge points of the conveyor carrying material are covered with exhaust hoods to prevent the formation of dust clouds. ix. All the conveyor galleries are covered to ensure zero dust emission during cargo transfer. x. Provided water sprinkling system at transfer towers to arrest the dust spreading into the atmosphere. xi. Provided semi mechanized facilities for truck tarpaulin covering stations to ensuring all the outgoing cargos by trucks are covered with tarpaulin. xii. Ensuring all the outgoing Railway Rakes are covered with Tarpaulin. xiii. Mist Canon systems provided for watering avenue plantations and road wetting on haul roads xiv. Operating Mechanical dust suppression system comprising of 272 canons. xv. Installed MDSS system towards south side of the port. xvi. Deploying DSS Tankers of Cannon mounted for sprinkling water on haul roads and yards to arrest the dust causing by the vehicular movement xvii. The Cargo stocks/heaps are covered with tarpaulin. xviii. 3 No of Heavy-Duty Sweeping Machines are being deployed at operational areas and all internal roads. xix. Erected maintaining wind breaking wall of height 14 mtrs to prevent any dust nuisance towards habitation supported with high density greenbelt. xx. Greenbelt in an extent of 231.23 (April26) Ha Developed maintaining green belt along the port covering, yards, roads and all operational areas.		Date: 26/05/2026
5	AIR QUALITY MONITORING AND PRESERVATION	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.
PPs Submission: Being Complied AKPL will provide necessary mitigation measures as per operational requirement.		Date: 26/05/2026
6	AIR QUALITY MONITORING AND PRESERVATION	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.
PPs Submission: Being Complied AKPL will provide necessary mitigation measures as per operational requirement.		Date: 26/05/2026
7	AIR QUALITY	The Vessels shall comply the emission norms prescribed from time

	MONITORING AND PRESERVATION	to time.

PPs Submission: Being Complied AKPL is complying with MARPOL guidelines.	Date: 26/05/2026

8	AIR QUALITY MONITORING AND PRESERVATION	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low Sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board

PPs Submission: Being Complied It is proposed to implement DG sets under phase III. AKPL will comply with the DG sets guidelines.	Date: 26/05/2026

9	AIR QUALITY MONITORING AND PRESERVATION	A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments.

PPs Submission: Complied Complied AKPL appointed M/s. FP Project Management to study and prepare a Traffic Management and Decongestion Plan. Conclusion and recommendations of the study 1. Classified Traffic Volume Count was conducted at 5 locations within 5 Km radius of Krishnapatnam Port to assess current traffic levels on all major roads surrounding the Krishnapatnam port . 2. Daily traffic volume on the major roads varied from 3389 PCU to 15137 PCU. The highest traffic was recorded on Port Access Road since it serves as the main link connecting Port. 3. The traffic observed at CTVC-1 (North Gate) is mainly Two-wheelers and Car traffic. This is because it is majorly used by Port staff. Also 2-Axle trucks are higher as water tanker movement is observed from the North Gate. 4. West gate is the main gate for the Cargo/ truck traffic and the access to the same is provided through Krishnapatnam Port access road which is connected to NH-16. 5. Port traffic especially cargo traffic is not observed on SH-361 and is majorly used by the local traffic as per the survey. A copy of the report submitted to the Nellore urban development authority and R and B dept. on 11.07.2024 with vide letter no. AKPL/EC/EHS/032 dated 03.07.2024 to R and B Dept and NUDA. Copy of the Acknowledgement is attached as Annexure -6.	Date: 26/05/2026

10	WATER QUALITY MONITORING AND PRESERVATION	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.

PPs Submission: Being Complied The Kandaleru and Buckingham canals are not blocked.	Date: 26/05/2026

11	WATER QUALITY MONITORING AND PRESERVATION	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality. Silt curtains shall be used to contain the spreading of suspended sediment during dredging within the dredging area.

PPs Submission: Being Complied Noted and will be complied		Date: 26/05/2026
12	WATER QUALITY MONITORING AND PRESERVATION	No ships docking at the proposed project site will discharge its on-board waste water untreated in to the estuary / channel. All such wastewater load will be diverted to the proposed Effluent Treatment Plant of the project site.
PPs Submission: Being Complied AKPL does not allow any ship to discharge wastewater within the port premises. AKPL complies with MARPOL guidelines.		Date: 26/05/2026
13	WATER QUALITY MONITORING AND PRESERVATION	Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.
PPs Submission: Being Complied Being complied. Port has oil spill response equipment to combat any oil spill supported by Indian Coast Guard to contain, control and recover the oil spill. Latest OPR drill was conducted at the port on 16.02.2026. Copy attached as Annexure-7		Date: 26/05/2026
14	WATER QUALITY MONITORING AND PRESERVATION	The project proponents will draw up and implement a plan for the management of temperature differences between intake waters and discharge waters.
PPs Submission: Being Complied AKPL is not drawing any sea water or discharging any water into the creek or sea.		Date: 26/05/2026
15	WATER QUALITY MONITORING AND PRESERVATION	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.
PPs Submission: Being Complied Noted and will be complied.		Date: 26/05/2026
16	WATER QUALITY MONITORING AND PRESERVATION	Total fresh water use shall not exceed the proposed requirement as provided in the project details. Prior permission from competent authority shall be obtained for use of fresh water.
PPs Submission: Complied Complied. AKPL has obtained permission from Irrigation dept. AP for drawing 1000 KLD of fresh water from Muthukur Reservoir.		Date: 26/05/2026
17	WATER QUALITY MONITORING AND PRESERVATION	Sewage Treatment Plant shall be provided to treat the wastewater generated from the project. Treated water shall be reused for horticulture, flushing, backwash, HVAC purposes and dust suppression.
PPs Submission: Being Complied Treated wastewater from the existing STP is being utilized for the green belt irrigation within port premises. AKPL has been operating 500 KLD STP (1 X 300 KLD 1 X 200 KLD) at CVR Amenities Complex, 40 KLD STP Admin. Building.		Date: 29/05/2026
18	WATER QUALITY MONITORING AND PRESERVATION	A certificate from the competent authority for discharging treated effluent/ untreated effluents into the Public sewer/ disposal/ drainage systems along with the final disposal point should be obtained.

		PPs Submission: Being Complied AKPL is not discharging any treated effluent/ untreated effluent into the public sewer. The treated domestic wastewater is being utilized for greenbelt development and dust suppression. Date: 26/05/2026
19	WATER QUALITY MONITORING AND PRESERVATION	No diversion of the natural course of the river shall be made without prior permission from the Ministry of Water resources.
		PPs Submission: Being Complied The Kandaleru Creek and Buckingham Canal, which is part of Port area, are not diverted. Free flow of water is ensured. Date: 26/05/2026
20	WATER QUALITY MONITORING AND PRESERVATION	All the erosion control measures shall be taken at water front facilities. Earth protection work shall be carried out to avoid erosion of soil from the shoreline/boundary line from the land area into the marine water body.
		PPs Submission: Being Complied AKPL has developed 100m Casuarina boundary plantation at north and south shorelines to avoid the erosion of soil from the shoreline/boundary line from the land area. Date: 26/05/2026
21	Noise Monitoring & Prevention	Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.
		PPs Submission: Being Complied AKPL appointed a NABL Accredited Laboratory to monitor Noise quality at the following locations: AKPL is currently monitoring Noise levels at the following locations and submitting in six-monthly compliance reports. 1. Zero Point 2. Thamminapatnam 3. CVR Building 4. Gopalapuram 5. Chalivendram 6. Krishnapatnam 7. Krishnapatnam Village near Light House The ambient noise levels are within the standards. Date: 26/05/2026
22	Noise Monitoring & Prevention	Noise from vehicles, power machinery and equipment on-site should not exceed the prescribed limit. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.
		PPs Submission: Being Complied Noted and will be complied Date: 26/05/2026
23	Noise Monitoring & Prevention	Acoustic enclosures for DG sets, noise barriers for ground-run bays, ear plugs for operating personnel shall be implemented as mitigation measures for noise impact due to ground sources.
		PPs Submission: Being Complied The DG Sets are being operated as back up for emergency lighting safety during power breakdowns. i. Retrofitting certification was carried-out for the DG Sets. It is proposed to implement DG sets under phase III. AKPL will comply with the DG sets guidelines. Date: 26/05/2026
24	Noise Monitoring & Prevention	The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.
		PPs Submission: Being Complied Being complied. AKPL is currently monitoring Noise levels at the following locations and submitting in six-monthly compliance reports. Zero Point Thamminapatnam CVR Building Gopalapuram Chalivendram Krishnapatnam Krishnapatnam Village near Light House The ambient noise levels are within the standards. Date: 26/05/2026

25	ENERGY PRESERVATION MEASURES	Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights parking around project area and maintain the same regularly

PPs Submission: Being Complied S.No Source Average monthly Power consumption in KWH 1. APSPDCL (Grid power) 29.10 Lakh units 2. Renewable energy from AESL 5.4 Lakh Units 3. Renewable energy from M/s Atria Power 25.50 Lakh Units AKPL is already meeting its 50 parentage of power requirement through above mentioned renewable sources.	Date: 26/05/2026

26	ENERGY PRESERVATION MEASURES	Provide LED lights in their offices and port areas.

PPs Submission: Being Complied All the existing office buildings, street lights and other operation buildings are provided with LED lights. Similar LED lighting will be provided under Phase III implementation.	Date: 26/05/2026

27	WASTE MANAGEMENT	Dredged material shall be disposed safely in the designated areas.

PPs Submission: Being Complied AKPL is disposing of dredged material in designated areas.	Date: 26/05/2026

28	WASTE MANAGEMENT	Shoreline should not be disturbed due to dumping. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring reports.

PPs Submission: Being Complied Noted and will be implemented. AKPL appointed NIOT team for shoreline stability study. The study commenced in March 2023 and covered a 17.3 km stretch of coastline, extending from 14.322 N, 80.156 E (South) to 14.171 N 80.126 E (North). Beach profiling and data collection were carried out five times over 22 months, from March 2023 to January 2025. A copy of the same was submitted on 20.01.2026 to IRO Vijayawada through mail 16.04.2025 to APPCB, RO Nellore. Vide Letter no. AKPL/EC/ENV/007/2025-26 dated 09.04.2025. Acknowledgments of the same attached as Annexure - 8	Date: 26/05/2026

29	WASTE MANAGEMENT	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 or State Pollution Control Board and under the Environment (Protection) Act, 1986.

PPs Submission: Being Complied Treated wastewater from the existing STPs (AKPL has been operating 500 KLD STP (1 X 300 KLD 1 X 200 KLD) at CVR Amenities Complex, 40 KLD STP Admin. Building) is being utilized for the green belt irrigation within port premises	Date: 29/05/2026

30	WASTE MANAGEMENT	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.

PPs Submission: Being Complied Being Complied. AKPL arranged solid waste collection bins across strategic locations within the port area, supported by dedicated operational arrangements for regular waste collection. In strict adherence to statutory requirements, all collected solid waste is systematically segregated and disposed of in compliance with the Solid Waste Management Rules, 2016, along with all applicable amendments.	Date: 29/05/2026

31	WASTE MANAGEMENT	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction

		and Demolition Waste Management Rules, 2016.
PPs Submission: Being Complied AKPL will comply with Construction and Demolition Waste Construction and Demolition Waste Management (Management and Handling) Rules, 2016 during Phase - III implementation.		Date: 26/05/2026
32	WASTE MANAGEMENT	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.
PPs Submission: Being Complied Noted and being complied, the generated MSW is being disposed to APPCB authorized vendor, certificate of the same is being received.		Date: 26/05/2026
33	WASTE MANAGEMENT	Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination.
PPs Submission: Being Complied AKPL is implementing E- waste management for the existing facilities, similar procedure will be followed for proposed phase - III expansion. AKPL is regularly submitting Form - III, E- waste annual returns to APPCB		Date: 26/05/2026
34	WASTE MANAGEMENT	Oil spill contingency plan shall be prepared and part of DMP to tackle emergencies. The equipment and recovery of oil from a spill would be assessed. Guidelines given in MARPOL and Shipping Acts for oil spill management would be followed. Mechanism for integration of terminals oil contingency plan with the overall area contingency plan under the co- ordination of Coast should be covered.
PPs Submission: Being Complied AKPL has developed an Oil Spill Contingency Plan. This plan is being reviewed periodically and will be updated as per the Phase - III expansion facilities.		Date: 26/05/2026
35	GREENBELT	Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCB guidelines.
PPs Submission: Being Complied AKPL is committed to complying with the conditions stipulated in Phase III EC CRZ clearance, wherein 120 ha. of greenbelt will be developed. In which 39.73 Ha (up to April 26). of greenbelt area developed with native species. Latest Green Belt Drawing is attached as Annexure-1		Date: 29/05/2026
36	GREENBELT	Top soil shall be separately stored and used in the development of green belt.
PPs Submission: Being Complied AKPL is using coco peat, red soil and vermi compost for enriching the topsoil.		Date: 26/05/2026
37	Marine/Coastal	The dredging schedule shall be so planned that the turbidity developed is dispersed soon enough to prevent any stress on the fish population.
PPs Submission: Being Complied Being complied During dredging operations, AKPL ensures water quality protection by deploying silt curtains around the dredging area to contain suspended sediments and prevent dispersion beyond the designated zone. Continuous monitoring of turbidity and water quality is carried out by NABL-accredited laboratory of SV Enviro labs to ensure with APPCB and MoEFCC standards. Annamalai		Date: 26/05/2026

University team conducted Marine Environmental Monitoring surveys Pre Dredging, during Dredging and Post Dredging phases for analyzing marine Environmental Status. And report of the same enclosed Annexure - 9		
38	Marine/Coastal	While carrying out dredging, an independent monitoring shall be carried out through a Government Agency/Institute to assess the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.
PPs Submission: Being Complied Being complied AKPL appointed NABL accredited 3rd party M/s Falcon Resilient Infra Consultants and Annamalai university team jointly to study and assess the impact of Pre, during and post dredging activity, Monitoring completed.And report of the same enclosed Annexure -9 In addition to the above, AKPL appointed NABL accredited Laboratory of SV Enviro for environmental monitoring in which they are collecting and analyzing marine water samples monthly, the reports of the same were being submitted to statutory bodies		Date: 26/05/2026
39	Marine/Coastal	A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, sub- tidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography.
PPs Submission: Complied Complied Comprehensive Marine Biodiversity Impact Assessment and management Plan was prepared by Sugandhi Devadason Marine Research Institute (SDMRI) and the same was submitted to AP State Biodiversity Board, Guntur and Member secretary, APCZMA and APPCB, RO, Nellore on 09.01.2025. Copy of acknowledgements attached as Annexure -2		Date: 26/05/2026
40	Marine/Coastal	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components including all micro, macro and mega floral and faunal components of marine biodiversity.
PPs Submission: Being Complied Being complied AKPL Appointed a NABL Accredited Laboratory for Monitoring the Terrestrial Marine parameters viz., Marine water quality, Marine sediment quality, Surface Water Quality and ground water quality at regular intervals with NABL Laboratory. Comprehensive Marine Biodiversity Impact Assessment and management Plan was prepared by Sugandhi Devadason Marine Research Institute (SDMRI) and the same was submitted to AP State Biodiversity Board, Guntur and Member secretary, APCZMA and APPCB, RO, Nellore on 09.01.2025. Copy of acknowledgements attached as Annexure - 2		Date: 26/05/2026
41	Marine/Coastal	The project proponent shall ensure that water traffic does not impact the aquatic wildlife sanctuaries that fall along the stretch of the river.
PPs Submission: Being Complied Being complied. There are no aquatic wildlife sanctuaries in the vicinity of the Port. AKPL has been ensuring that the water traffic does not impact the marine ecosystem for port operations.		Date: 26/05/2026
42	PUBLIC HEARING	The work space shall be maintained as per international standards for occupational health and safety with provision of fresh air respirators, blowers, and fans to prevent any accumulation and inhalation of undesirable levels of pollutants including VOCs.

PPs Submission: Being Complied AKPL is certified in ISO 45001 2018 Occupation Health and safety. AKPL strictly enforcing all the workers, employees, stakeholders to wear PPEs at operational areas.		Date: 26/05/2026
43	PUBLIC HEARING	Workers shall be strictly enforced to wear personal protective equipment's like dust mask, ear muffs or ear plugs, whenever and wherever necessary/ required. Special visco-elastic gloves will be used by labour exposed to hazards from vibration.
PPs Submission: Being Complied Being complied. AKPL strictly enforcing all the workers, employees, stakeholders to wear PPEs at operational areas.		Date: 26/05/2026
44	PUBLIC HEARING	Safety training shall be given to all workers specific to their work area and every worker and employee will be engaged in fire hazard awareness training and mock drills which will be conducted regularly. All standard safety and occupational hazard measures shall be implemented and monitored by the concerned officials to prevent the occurrence of untoward incidents/ accidents.
PPs Submission: Being Complied AKPL provides the following as part of safety trainings All the employees, workers contractors are given daily toolbox talks, monthly review meetings, Job specific trainings with employees engaged in various activities of the Port. Port is implementing mock drill to ensure compliance of safety measures. AKPL is certified in ISO 45001 2018 occupational health and safety management systems		Date: 26/05/2026
45	PUBLIC HEARING	Emergency preparedness plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.
PPs Submission: Being Complied Port has developed Emergency Preparedness Plan based on the HIRA and Disaster Management Plan. This plan is being reviewed periodically and updated as per the Phase - III expansion facilities.		Date: 26/05/2026
46	PUBLIC HEARING	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.
PPs Submission: Being Complied AKPL will provide the following facilities during Phase - III construction. Drinking water Mobile Toilets Mobile STP Power facility OHC facility		Date: 26/05/2026
47	PUBLIC HEARING	Occupational health surveillance of the workers shall be done on a regular basis.
PPs Submission: Being Complied AKPL has been conducting annual Occupational health checkups/training to the workers.		Date: 26/05/2026
48	Corporate Environmental Responsibility	The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental / forest /wildlife norms/ conditions. The company shall have defined system of reporting infringements / deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders / stake

		holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.
PPs Submission: Complied Complied. Environmental Policy Summary Exceed Regulations: Build and run all facilities to meet or surpass all environmental laws. Assess Mitigate Risks: Evaluate climate impacts across all activities, including logistics, and create fix plans. Assign Responsibilities: Clearly define staff roles for executing the environmental policy. Train Employees: Educate staff on how business operations affect nature. Drive Continuous Improvement: Set targets to cut waste, lower emissions, reduce noise, and save resources. Protect Local Habitats: Work with stakeholders to conserve nature around operational sites. Conduct Due Diligence: Run environmental checks for new projects, expansions, and mergers. Engage Stakeholders: Build awareness with suppliers, customers, contractors, and local communities. Audit Report: Measure performance regularly, run audits, and share results with stakeholders. Copy of Environmental Policy is attached as Annexure -10		Date: 26/05/2026
49	Corporate Environmental Responsibility	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.
PPs Submission: Being Complied Being complied, the organogram is attached, this organogram will be upgraded during Phase - III expansion. Organogram attached as Annexure -11		Date: 26/05/2026
50	Corporate Environmental Responsibility	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.
PPs Submission: Being Complied AKPL is maintaining and implementing EMP matrix during Operational Phase as per the recommendations made in the EIA/EMP report. The Funds Expenditure earmarked for environment protection measures are being reported in Form V Environmental Statement for the period 2024-25 and was submitted on 16-07-2025 to APPCB MoEF CC. Copy Attached as Annexure-12.		Date: 26/05/2026
51	Corporate Environmental Responsibility	Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.
PPs Submission: Being Complied Noted and being complied.		Date: 26/05/2026
52	MISCELLANEOUS	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent’s website permanently.
PPs Submission: Complied Complied. Advertisement was published in District Newspapers namely Vartha in local language The New Indian Express in English language dated 23.01.2021. Copy attached as Annexure -13		Date: 26/05/2026
53	MISCELLANEOUS	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the

		Government who in tum has to display the same for 30 days from the date of receipt.
PPs Submission: Complied Complied. A copy of the Environmental clearance is submitted to the District Collector vide our letter dated 03.02.2021 and local Panchayats vide letter dated 01.02.2021. Copy attached as Annexure-14		Date: 26/05/2026
54	MISCELLANEOUS	The criteria pollutant levels namely; PM2.5, PM10, SO2, NOx (ambient levels) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.
PPs Submission: Complied Complied. The Port has been operating 5 No. of CAAQM stations at the below mentioned locations as suggested by APPCB within the Port premises to monitor the parameters viz., PM10, PM2.5, SO2, NH3, NO2, CO and the data is being uploaded to APPCB website. a. CVR Amenities Complex b. Thamminapatnam Village c. Krishnapatnam Village d. North side of the Port e. South side of the port AKPL has installed digital display board at publicly visible place at the zero point gate		Date: 26/05/2026
55	MISCELLANEOUS	The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.
PPs Submission: Being Complied AKPL obtained CTE of APPCB for Order No. 633/APPCB/CFE/RO- NLR/HO/2010 dated 25.02.2021 and CTO Order No: APPCB/VJA/NLR/11344/CFO/HO/2019 11/11/2022, and expansion order vide order no.289514/APPCB/TPT/NLR/CTO/HO/2026 dated 20.05.2026. AKPL will intimate once the financial closure for implementing Phase III expansion is completed		Date: 26/05/2026
56	MISCELLANEOUS	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.
PPs Submission: Being Complied AKPL will comply with the conditions stipulated by the State Pollution Control Board and the State Government		Date: 26/05/2026
57	MISCELLANEOUS	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.
PPs Submission: Being Complied Noted and will be complied.		Date: 26/05/2026
58	MISCELLANEOUS	No further expansion or modifications in the port area shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).
PPs Submission: Being Complied Noted. AKPL will not carryout any modifications or expansion without obtaining the necessary approvals from the MoEFCC.		Date: 26/05/2026
59	MISCELLANEOUS	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.

PPs Submission: Being Complied Noted and will be complied.		Date: 26/05/2026
60	MISCELLANEOUS	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.
PPs Submission: Being Complied Noted. AKPL as a responsible corporate citizen will abide with all the conditions stipulated in environmental clearance.		Date: 26/05/2026
61	MISCELLANEOUS	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.
PPs Submission: Being Complied Noted		Date: 26/05/2026
62	MISCELLANEOUS	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/ monitoring reports.
PPs Submission: Being Complied Noted.		Date: 26/05/2026
63	MISCELLANEOUS	The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.
PPs Submission: Being Complied Noted and being complied by AKPL.		Date: 26/05/2026
64	MISCELLANEOUS	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.
PPs Submission: Being Complied Noted and being complied. Latest Self certified Half yearly compliance report for the period of Apr25 to Sep25 submitted on 24.11.2025. Submitting the 6 Monthly Self Certified and NABL Accredited 3rd Party Compliance Reports for the period from April to September and October to March respectively along with Terrestrial and Marine Monitoring reports submitted on 30.05.25 to MoEFCC and APPCB. Copies of the acknowledgment is attached as Annexure- 3		Date: 26/05/2026
65	MISCELLANEOUS	The project proponent shall submit six- monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.
PPs Submission: Being Complied Noted and being Complied. Latest Self certified Half yearly compliance report for the period of		Date:

Apr25 to Sep25 submitted on 24.11.2025. Submitted the 6 Monthly NABL Accredited 3rd Party Compliance Reports for the period from October 24 to March 25 respectively along with Terrestrial Marine Monitoring reports submitted on 30.05.25 to MoEFCC and APPCB. Copies of the acknowledgments are attached as Annexure-3		26/05/2026
66	MISCELLANEOUS	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.
PPs Submission: Complied Noted and complied Form V Environmental Statement for the existing facilities is submitted to APPCB and MoEFCC. Latest report submitted on 16.07.2025 for the period 2024-2025. Copy of the Acknowledgment is Attached as Annexure-15.		Date: 26/05/2026
67	Statutory compliance	A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained.
PPs Submission: Complied Complied. AKPL is meeting the power demand as follows Source Average Power consumption per month in (KWH) APSPDCL (Grid power) 29.10 Lakh units Renewable energy from AESL 5.4 Lakh Units Renewable energy from M/s Atria Power 25.50 Lakh Units		Date: 26/05/2026
68	MISCELLANEOUS	Any appeal against this EC 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.
PPs Submission: Being Complied Noted.		Date: 26/05/2026

Visit Remarks

Last Site Visit Report Date:	N/A
Additional Remarks:	We are submitting the 3rd party NABL certified Half yearly compliance EC and CRZ compliance for the period from October 2025 to March 2026 along with EC and CRZ CTE CTO Compliance.

Note: This acknowledgement is as per the details submitted by project proponent. In no way is this document to be considered as conclusion on any action on the compliance of the project. This is strictly for the project proponent's reference purpose.

Date: 27.05.2026

To,
M/s. Adani Krishnapatnam Ports Ltd.
Krishnapatnam (V), Muthukur (M),
SPSR Nellore District, Andhra Pradesh

Subject: Third Party Review and Certification of environmental approvals and related documents

This is to state that **B S Envitech Pvt. Ltd. (BSET)** was engaged by **M/s Adani Krishnapatnam Ports Ltd.** vide Purchase Order No. 5702034515 dated 27.04.2026 to review the compliance of environmental approvals, consents, permissions, and related compliance documents made available by the client for the above project.

Based on the documents submitted for review, the following records were considered, to the extent made available and as applicable:

- Environmental Clearance (EC) issued for all the Phases
- Consent to Establish (CTE) issued for Phase - III
- Consent to Operate (CTO) / Consent for Operation issued for Phase - III
- CRZ Clearance,
- Related amendments, renewals, authorisations, returns, submissions, and correspondence provided by the client

Statement

Based solely on the documents submitted by **M/s Adani Krishnapatnam Ports Ltd** and reviewed by BSET, it is understood that the project has been issued the environmental approvals / consents / clearances placed before us, including EC, CTE, CTO, CRZ clearance, and related permissions, wherever applicable.

Further, based on the documents reviewed, the records appear to indicate compliance status against the relevant conditions, **subject to the assumptions, exclusions, limitations, and observations stated below**.

Important limitations

This document is issued subject to the following:

- This review is based only on copies of documents and information submitted by the client.
- BSET has not issued any statutory approval and does not act in place of any government authority, Pollution Control Board, CZMA, MoEF&CC, or other competent authority.
- This document should not be construed as a legal opinion, statutory compliance guarantee, or conclusive certification of compliance.
- Validity, renewal status, amendments, project changes, expansions, modifications, and any facts not disclosed to BSET are outside the scope of this document.
- Any non-compliance, omission, or variation not evident from the documents provided to BSET is not covered by this review.
- Where required, the client should obtain confirmation directly from the concerned regulatory / statutory authority.

Limited use

This document is issued at the request of **M/s. Adani Krishnapatnam Ports Ltd** for its internal record purposes only and should not be used as a substitute for a statutory certificate, legal opinion, or formal confirmation from the competent authority.

For B S Envitech Pvt. Ltd.

(Y B S MOORTHY)
Managing Director

B S ENVI-TECH PVT. LTD. SEC BAD-17

HALF YEARLY COMPLIANCE REPORT

on the Conditions Stipulated in
Environmental & CRZ clearance, Consent to Establishment and Operation

adani
Ports and Logistics

ADANI KRISHNAPATNAM PORT LIMITED

Muthukur (M), SPSR Nellore Dist., Andhra Pradesh

- 1. EC-vide Order No.10-08/2016-IA-III dated 11.01.2021 (Phase III)
- 2. Consent to Operate vide Order No: APPCB/VJA/NLR/11344/CFO/HO/2019 Dt. 11.11.2022 (Phase III)
- 3. EC-vide Order No.10-22/2005-IA-III dated 26.07.2006. (Phase I)
- 4. EC & CRZ Clearance F. No. 11 – 62 / 2009 – IA.III dated 13.11.2009 (Phase II)
- 5. Consent Establishment Order No: 633/APPCB/CFE/RO-NLR/HO/2010 Dt. 25.02.2021 and amended vide order dated 06.04.2021 and 16.07.2021 (Phase III)

Project Proponent	Environmental Consultant
M/s. Adani Krishnapatnam Port limited Muthukur (M), SPSR Nellore Dist, Andhra Pradesh – 524344 Phone: +91-891-2377999 Fax: +91-891-237 7046	**B.S. Envi – Tech Pvt. Ltd.,** #12-13-1270/71/73, Amity Ville, 4thFloor, Beside Spencer Super Market, St. Ann's Road, Tarnaka, Secunderabad-500017 **Accreditation No**: NABET/EIA/2326/RA 0302 (Rev .01) NABL Certificate No: TC-5233 & MoEFCC Recognised Laboratory

INTRODUCTION

The Krishnapatnam Port has its historical background. When Sri Krishnadeva Raya, the Vijayanagar Emperor, used to operate the port, thus the name was given to it as Krishnapatnam Port & now the name has been changed to Adani Krishnapatnam Port Limited (AKPL). AKPL, a private port operator located on the East Coast of India, an all-weather worldclass deep-water port of international standards and capable of handling Cape Size vessels round the clock throughout the year.

The port caters to land locked hinterland of South India with multimodal connectivity. Seamless connectivity by road and rail with very close proximity to National Highway 16 and National Rail Network (Chennai – Kolkata Main Line).

AKPL has got State of Art Infrastructure, Mechanized Handling Systems and dedicated storage yards which provides clean and contamination free handling facilities for bulk and break-bulk cargo.

AKPL is AEO Certified Port and has Customs EDI Connectivity with Customs Office headed by Joint Commissioner which is located within the port for faster custom clearance and quick assessment of cargo and containers.

AKPL is an ISMS Certified Port in relation to Core Port Operations – Information Technology, HR & Admin., Finance & Account, Safety & Environment, Security, Engineering Services, Dry Cargo Operations, Dredging, Commercial & Stores, Container Operations, Marine Services, and Railway Operations.

AKPL is an ISO 28000: 2022, ISO 9001:2015, ISO 14001 2015, ISO 45001:2018, and ISO 50001:2018, Certified Port for providing Port facilities for berthing, double banking, handling of ships, bulk, breakbulk, liquid and containerized cargos, its storage and transportation by road, rail, pipeline and conveyor.

As per the Environment Impact Assessment (EIA) Notification dated 14th September 2006 and the amendments thereof, Krishnapatnam port is classified under 'Category A' as schedule under activity 7(e).

LOCATION OF THE PROJECT

Adane Krishnapatnam Port is located at 14°15'10" N Latitude and 80°08'05" E Longitude in the SPSR Nellore District, Muthukur Mandal, Andhra Pradesh, along east coast of India about 180 km to north of Chennai Port. **Fig - 1** shows the approved layout.

AKPL has easy access to the hinterlands in proximity covering Andhra Pradesh, Karnataka and North Tamil Nadu by road, rail and air. It has become the largest automated port in South Asia.

FIG – 1 APPROVED LAYOUT

STATUTORY APPROVALS

ENVIRONMENT & CRZ CLEARANCES FROM MOEFCC

- For Phase – I -received vide Order No. 10-22/2005-IA-III dated 26th July 2006
- For Phase II – received vide F. No. 11 – 62 / 2009 – IA.III dated 13th November 2009 and extended vide Order even No. dated 18.08.2015 & 16.04.2018 and amended vide order dated 16.3.2016.
- Phase III – received vide File No: 1018/2016-IA.III dated 11.01.2021.

Approval of Name Change from Krishnapatnam Port Company Limited to Adani Krishnapatnam Port Limited

Date of MoEFCC Approval	Environment Clearance dated	Project	From	To
10.03.2021	11.01.2021	Expansion of Krishnapatnam Port (Phase - III)	Krishnapatnam Port Company Limited	Adani Krishnapatnam Port Limited
08.02.2022	13.11.2009	Expansion of Krishnapatnam Port (Phase - II)	Krishnapatnam Port Company Limited	Adani Krishnapatnam Port Limited
08.02.2022	26.07.2006	Expansion of Krishnapatnam Port (Phase - I)	Krishnapatnam Port Company Limited	Adani Krishnapatnam Port Limited

CONSENT TO ESTABLISHMENT (CTE) from A.P. Pollution Control Board

- Order No. APPCB/VJA/NLR/633/HO/2004/9 - 467 dt. 25.05.2004. **The Phase - I facility was commissioned during the year 2009.**
- Order No. 633/PCB/CFE/RO-NLR/HO/2010-390 dated 08.05.2010. Extended vide Order dated 02.07.2015 and amended vide Orders dated 14.03.2014, 02.07.2015, 10.02.2016, 04.01.2017 & 22.02.2018.
- Order No: 633/APPCB/CFE/RO-NLR/HO/2010 Dt. 25.02.2021 and amended vide order dated 06.04.2021 and 16.07.2021.

CONSENT TO OPERATE (CTO) from A.P. Pollution Control Board

- Order No. APPCB/VSP/VJA/NLR/633/CFO/HO/2009-582, dated 08.06.2009
- Order No. APPCB/VJA/NLR/11344/CFO/HO/2018 dated 29.07.2018 & 30.08.2018 which is valid till 31st October 2023.
- Order No: APPCB/VJA/NLR/11344/CFO/HO/2019 dated 11.11.2022 valid till 31.08.2027. This CFO has superseded all CFO, and its amendments issued by APPCB earlier.

Presently, AKPL is operating 13 berths, with an approved cargo handling capacity of 78 MTPA of non-container cargo and 2.0 MTEUs PA of container cargo.

OPERATIONS

The Cargo comprises mainly of Coal, Gypsum and Granite. The bulk Liquids are handled through the ship's pumps. Pipelines have been provided for transportation of liquid cargo from berths to tank farms of users.

- AKPL is currently operating 13 No. of Berths.
- Out of which Berth No. N1 and N2 are Container berths, Berth No. N4, N6, N7, N8, NW1, NW2 & NW3 are fully mechanized berths.
- Berths N3, N5 & S4 are semi-mechanized berths. Berth no L4 is Liquid Jetty dedicated for POL products.

APPROVED CARGO PROFILE AS PER EC & CRZ CLEARANCE OF MOEF & CC

Cargo	Capacity approved till Phase II	Phase III Proposed expansion	Total after implementation of Phase III
Coal	51 MMTPA	88 MMTPA	139 MMTPA
Iron Ore	8 MMTPA	-	8 MMTPA
General Cargo	9 MMTPA	10.5 MMTPA	19.5 MMTPA
Liquid Cargo	-	51.7 MMTPA	51.7 MMTPA
Container	2 MTEUsPA	1.1 MTEUsPA	3,1 MMTPA
No. of Berths	12 Berths	Approved 16 (Incl. 3 Liquid Berths & and 3 SBMs Constructed 1 Liquid jetty	28 berths
Total Capacity	68 MMTPA (Non- Container) + 2 MTEUs PA (Container)	150.2 MMTPA (Non- Container) + 1.1 MTEUs PA (Container)	218.2 MMTPA (Non-Container) + 3.1 MTEUs PA (Container)

AKPL is presently operating 13 No. of Berths.

S. No	Name of the Berths	Type of Cargo handled	Type of Loading/ Unloading System
1.	N1	Container berth	Mechanized
2.	N2	Container berth	Mechanized
3.	N3	General Cargo berth	Semi-Mechanized
4.	N4	General Cargo berth	Fully Mechanized
5.	N5	Coal cargo berth	Semi-Mechanized

S. No	Name of the Berths	Type of Cargo handled	Type of Loading/ Unloading System
6.	N6	Coal cargo berth	Fully Mechanized
7.	N7	Coal cargo berth	Fully Mechanized
8.	N8	Coal cargo berth	Fully Mechanized
9.	NW1	Multipurpose	Fully Mechanized
10.	NW2	Iron Ore	Fully Mechanized
11.	NW3	General Cargo	Fully Mechanized
12.	S4	Coal cargo berth	Semi-Mechanized
13.	L4	Liquid jetty for POL products	Pipelines

SCOPE OF THE AUDIT

The core objectives of this audit included:

- Performing a third-party environmental audit of the port facility.
- Reviewing and certifying compliance with the conditions specified in the Environmental Clearance accorded by the Ministry of Environment, Forests and Climate Change (MoEFCC).
- Assessing adherence to the Consent to Establish (CTE) and Consent to Operate (CTO), both issued by the Andhra Pradesh Pollution Control Board (APPCB).

METHODOLOGY OF THE AUDIT

Our audit process followed a structured methodology to ensure comprehensive evaluation:

- **Initial Document Review (Desk Study):** We began by meticulously reviewing all documents furnished by the client.
- **Questionnaire Development:** A specific questionnaire was then developed to facilitate productive discussions with the client's personnel.
- **On-site Assessment:** A visit to the AKPL project site was conducted to gather first hand observations and data.
- **Stakeholder Consultations:** Discussions were held with AKPL's EHS team to understand their practices and address queries.
- **Supplementary Information Review:** Any additional inputs provided by the client after initial discussions were thoroughly reviewed.
- **Compliance Report Compilation:** Comprehensive compliance reports were prepared for the Environmental Clearance (EC), Consent to Establish (CTE), and Consent to Operate (CTO), including all necessary supporting annexures.
- **Client Endorsement:** The draft compliance reports were submitted to the client for their review and approval.
- **Official Submission Documents:** Certified compliance documents were then issued, ready for submission to the respective regulatory authorities.

- **Final Report:** Issue of Third-Party Audit & Half Yearly Compliance Report to the Client

AUDIT TEAM

The BSET audit team, comprising **Mr. Y. B. S. Moorthy, Managing Director (BSET)**, and **Mr. N. Sumanth, Environment Engineer**, conducted the site visit at AKPL on **May 15th, 2026**. The agenda for their visit and subsequent meetings was shared with the AKPL team in advance.

OPENING MEETING

On May 15th, 2026, the BSET team commenced the audit with an opening meeting held at the Administrative Block of AKPL. During this session, the BSET representatives introduced themselves and articulated the primary objective of the audit to the AKPL team. The meeting was attended by the following AKPL officials:

- Mr. Kaushal Singh - HOD (EHS)
- Mr. B. Srinu - HOS (EHS)
- Mr. G. Mahesh – Environmental Engineer
- Mr. G. Vinay Sai – Deputy Manager

Compliance on the conditions stipulated in EC & CRZ Clearance (For Phase – 3)

Compliance on the conditions stipulated in EC & CRZ Clearance (For Phase – 3) Vide Order No.10-08/2016-IA-III dated 11.01.2021.

S.No	Conditions	Compliance
	Special Conditions	
i.	The Environmental and CRZ Clearance to the project is primarily under provisions of EIA Notification, 2006 and CRZ Notification, 2011. It does not amount to approvals/consent/ permissions etc., required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals / clearances under any other Acts/ Regulations or Statutes as applicable to the project.	Noted the condition and duly complied with during the implementation of the project.
ii.	The project proponent shall abide by all the commitments and recommendations made in the Form-II, EIA and EMP report, submissions made during Public Hearing and also that have been made during their presentation to EAC.	Being complied AKPL strictly abides with all the commitments and recommendations made during public hearing.
iii.	Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction works other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	Noted AKPL is ensuring that all proposed constructions conform to the norms prescribed in the CRZ Notification issued by the Ministry of Environment and Forests, Government of India. At present, AKPL has constructed one Liquid berth (Nort Side) out of 16 berths approved under phase III EC&CRZ expansion.
iv.	All the recommendations and conditions specified by the Andhra Pradesh Coastal Zone Management Authority (APCZMA) vide letter 202/CRZ/IND/201930 dated 21.05.2020 shall be complied with.	Noted & being complied.
v.	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. Creek water monitoring program shall be implemented during the construction phase	Being complied. ➢ No creeks or rivers are blocked in the port premises and ensuring free flow of water. AKPL appointed NABL accredited Laboratory of SV Enviro for environmental monitoring and reports are being submitted to statutory bodies.

vi.	Development of green belt by native species with consultation with state forest department shall be ensured.	Being Complied. • AKPL has developed greenbelt with a native tree species. • As on April 2026, AKPL has successfully developed 231.23 Ha (April'26) of green belt along port boundary, around coal yards, avenue& median plantations. • Latest Green Belt Drawing is attached as **Annexure 1**
vii.	The proposed expansion entails 60 million cum of dredging in soft soil. As proposed, the PP shall utilize 26 million cu m of dredged sand for reclamation of low lying areas of port, stock pile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT and disposal of balance 32 million cu m of dredged spoil in the identified dredge disposal area of 56 Km2 beyond (-) 20 m contour. The impact of dredging on the marine environment should be monitored and necessary measures shall be taken on priority basis if any adverse impact is observed. NIOT will oversee the work as scientific body and continue to monitor its impact/benefits for at least 5 years post project completion. Necessary financial assistance to be provided by project proponent to NIOT. The report of the same to be submitted to regional office of MoEFCC by project proponent.	Noted, AKPL will monitor marine environment if impact is observed. • AKPL has obtained Consent to Establishment (CTE) from APPCB vide Order No. 633/ APPCB/ CFE/RO-NLR/HO/2010 dated 25.02.2021.
viii.	Marine ecological monitoring and its mitigation measures for protection of phytoplankton, zooplanktons, macrobenthos, estuaries, sea-grass, algae, sea weeds, Crustaceans, Fishes, coral reefs and mangroves etc. as given in the EIA-EMP Report shall be complied with in letter and spirit with the help of reputed organization or individuals of national repute having knowledge in the said subject. Necessary financial assistance to be provided by project proponent.	Complied. As given in the EIA-EMP Report, AKPL appointed an NABL Accredited Laboratory to conduct Environmental Monitoring i.e., Terrestrial & Marine ecological monitoring. The reports are being submitted to APPCB on monthly basis and MoEF&CC on half-yearly basis AKPL appointed M/s. Suganthi Devadason Marine Research Institute (SDMRI) for conducting a Comprehensive Marine Biodiversity Assessment, Impact Assessment and Management Plan. And same submitted to AP State Biodiversity Board, Guntur and Member secretary, APCZMA and APPCB, RO, Nellore on 09.01.2025.

		• Acknowledgement copy is attached as **Annexure - 2**
ix.	Continuous online monitoring of air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance reports to the regional office of MoEF&CC.	Complied. AKPL has been Operating 5 Nos. of Continuous Ambient Air Quality Monitoring stations and connected to APPCB website. AKPL appointed an NABL Accredited Laboratory to conduct Environmental Monitoring i.e., Terrestrial & Marine parameters. The reports are being submitted to APPCB on monthly basis and MoEF&CC on half-yearly basis. Latest Self certified Half yearly compliance report for the period of Apr'25 to Sep'25 was submitted on 24.11.2025. Copy of the Acknowledgements are attached as **Annexure - 3**
x.	The actions shall be in accordance with proposed landscape planning concepts to minimize major landscape changes. The change in land use pattern shall be limited to the proposed port limits and be carried out in such a way as to ensure proper drainage by providing surface drainage systems including storm water network.	Being complied Port related activities and operations are restricted within the Port Boundary. AKPL is strictly ensuring proper surface and storm water drainage system for free flow of water. AKPL is continuously monitoring all the drainage network and Rainwater harvesting structures in Port premises with a fixed schedule, plan and removing silt as and when required.
xi.	Suitable preventive measures be taken to trap spillage of fuel / engine oil and lubricants from the construction site. Measures should be taken to contain, control and recover the accidental spills of fuel during cargo handling.	Being complied Port has oil spill response equipment to combat any oil spill and coordinate with Indian Coast Guard to contain, control, and recover the accidental spills of fuel during cargo handling.
xii.	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.	Complied Environmental Monitoring Plan is prepared in matrix format for the Phase-III expansion and the same is under implementation. However, it shall be noted that the construction of all berths as planned under Phase III is not yet completed.
xiii.	The company shall draw up and implement Corporate Social Responsibility Plan as per the Company's Act of 2013.	Being complied AKPL implements CSR activities with the help of adani foundation. For October 2025 to March 2026 AKPL has spent 730.61 Lakhs towards CSR Socio economic development schemes and welfare measures.

		Education Adani Evening Education Centers (AEEC) & ULIC: Supported 1,496 students across 32 villages with 32 educators. Focus on slow learners, improving weak subjects, and after-school support (4:00–6:30 PM). Improvement observed in English communication and academic performance. Anganwadi Support: Strengthened early education and celebrated Teachers' Day. **Vidyarathna Scholarships:** Financial support to meritorious students from SC/ST and weaker sections (MBBS, Polytechnic, IIIT, etc.). **Community Health** Healthcare through Adani Chikitsalayam and village clinics: 10,885 beneficiaries (6,500 clinic + 4,385 outreach). Health screenings: 3,895 individuals. Yoga awareness: 2,150 participants. Focus on non-communicable disease treatment with free medicines. **Climate Action & Sanitation** Awareness campaigns on cleanliness, waste segregation, and hygiene. Installed 200 solar lights, benefiting 28,600 families. Village sanitation drives (roads, drains, waste removal) covered 17,980 people. Participation in Model Village Development (Muthukur) initiative. **Community Development** Addressed water scarcity and high TDS: 12 RO plants + tanker supply serving 10,600 families daily. Around 25,000 families access safe drinking water.

		Youth engagement in water system maintenance and village development. Promotion of sports (Kabaddi participation). Sustainable Livelihood Conducted 860 awareness sessions, reaching 3,800 women. Formed and strengthened 16 livelihood groups (from 3 earlier). **Key initiatives:** Farmer support & rice processing unit (KFPCL). Women entrepreneurship (food catering, handmade products). **Livestock support**: AI services (65 cases) and cattle health camp (54 farmers). Market linkage and exposure visits for farmers and SHGs.
xiv.	As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30th September, 2020, the project proponent shall abide by all the commitments made by them to address the concerns raised during the public consultation. The project proponent shall initiate the activities proposed by them, based on the commitment made in the public hearing, and incorporate in the Environmental Management Plan and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R&R, wildlife and forest conservation/protection measures including the NPV, Compensatory Afforestation etc., either proposed by the project proponent based on the social impact assessment and R&R action plan carried out during the preparation of EIA report or prescribed by EAC, shall also be implemented and become part of EMP.	Complied • The Public Consultation for Phase-III expansion was exempted as it was developed in the existing land area of 6800 Ac. • All the commitments made in the public consultation for Phase-II during 2009 were complied with.
	STANDARD CONDITIONS	
	Statutory Compliance:	
i.	Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011 and the State Coastal Zone Management Plan as drawn up by	Being complied AKPL is ensuring that all proposed constructions conform to the norms prescribed in the CRZ

<table>
<tr><td></td><td>the State Government. No construction works other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.</td><td>Notification issued by the Ministry of Environment and Forests, Government, all the planned activities as part of Phase III EC&CRZ Clearance have not been completed.</td></tr>
<tr><td>ii.</td><td>A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained.</td><td>Complied.

AKPL is meeting the power demand as follows
<table><tr><th>S.No</th><th>Source</th><th>Average Powe consumption pe month in (KWH)</th></tr><tr><td>1.</td><td>APSPDCL (Grid power)</td><td>29.10 Lakh units</td></tr><tr><td>2.</td><td>Renewable energy from AESL</td><td>5.4 Lakh Units</td></tr><tr><td>3.</td><td>Renewable energy from M/s Atria Power</td><td>25.50 Lakh Units</td></tr></table></td></tr>
<tr><td>iii.</td><td>All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Coast Guard, Civil Aviation Department shall be obtained, as applicable by project proponents from the respective competent authorities.</td><td>Complied.
AKPL has obtained a license from Chief Controller of Explosives to store petroleum class A & B as a retail outlet inside the port.
Fire NOC has been obtained for Buildings (Admin and ETS).

Copy of approvals are attached as Annexure -4</td></tr>
<tr><td colspan="3">II. Air Quality Monitoring and Preservation</td></tr>
<tr><td>i.</td><td>The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO2 and Nox in reference to SO2 and Nox emissions) within and outside the project area at least at four locations covering upwind and downwind directions.</td><td>Being complied.
• The Port has been operating 5 No. of CAAQM stations at the below mentioned locations as suggested by APPCB within the Port premises to monitor the parameters viz., PM_{10}, $PM_{2.5}$, SO_2, NH3, NO_2, CO and the data is being uploaded to APPCB website.
a. CVR Amenities Complex
b. Thamminapatnam Village
c. Krishnapatnam Village
d. North side of the Port
e. South side of the port
• Environmental Monitoring has been rendered by NABL accredited laboratory along with AAQ monitoring at 7 locations covering upwind and downwind directions.
Sample copy of the monitoring report for the month of April26 is attached as Annexure - 5.</td></tr>
</table>

ii.	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed emission standards.	Being complied. Port has adopted and implemented the following measures for the control of fugitive emissions during handling of bulk & non-bulk cargo and vehicular movement: i. Established mechanical conveyor system for handling coal & Iron ore. ii. Provided closed hoods for the conveyor system. iii. Stacker cum re-claimers is being used for loading and unloading the coal. iv. The railway wagons are being loaded mechanically. v. Installed fully mechanized coal handling systems with gantry grab type ship loaders/unloaders. vi. Provided hooded conveyor belt for cargo transferring directly from ship to the designated stockyard by means of closed hopers and transfer towers. vii. Established closed warehouses for storage of weather sensitive cargoes. viii. The loading and discharge points of the conveyor carrying material are covered with exhaust hoods to prevent the formation of dust clouds. ix. All the conveyor galleries are covered to ensure zero dust emission during cargo transfer. x. Provided water sprinkling system at transfer towers to arrest the dust spreading into the atmosphere. xi. Provided semi mechanized facilities for truck tarpaulin covering stations to ensuring all the outgoing cargos by trucks are covered with tarpaulin. xii. Ensuring all the outgoing Railway Rakes are covered with Tarpaulin. xiii. Mist Canon systems provided for watering avenue plantations and road wetting on haul roads xiv. Operating Mechanical dust suppression system comprising of 272 canons. xv. Installed MDSS system towards south side of the port.

		xvi. Deploying DSS Tankers of Cannon mounted for sprinkling water on haul roads and yards to arrest the dust causing by the vehicular movement xvii. The Cargo stocks/heaps are covered with tarpaulin. xviii. 3 No of Heavy-Duty Sweeping Machines are being deployed at operational areas and all internal roads. xix. Erected & maintaining wind breaking wall of height 14 mtrs to prevent any dust nuisance towards habitation supported with high density greenbelt. xx. Greenbelt in an extent of 231.23 (April'26) Ha Developed & maintaining green belt along the port covering, yards, roads and all operational areas.
iii.	Shrouding shall be carried out in the work site enclosing the dock/proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.	AKPL will provide necessary mitigation measures as per operational requirement.
iv.	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.	AKPL will provide necessary mitigation measures as per operational requirement.
v.	The Vessels shall comply the emission norms prescribed from time to time.	Noted AKPL is complying with MARPOL guidelines.
vi.	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low Sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board.	It is proposed to implement DG sets under phase III. AKPL will comply with the DG sets guidelines.

vii.	A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments.	Complied AKPL appointed M/s. FP Project Management to study and prepare a Traffic Management and Decongestion Plan. Conclusion and recommendations of the study 1. Classified Traffic Volume Count was conducted at 5 locations within 5 Km radius of Krishnapatnam Port to assess current traffic levels on all major roads surrounding the Krishnapatnam port . 2. Daily traffic volume on the major roads varied from 3389 PCU to 15137 PCU. The highest traffic was recorded on Port Access Road since it serves as the main link connecting Port. 3. The traffic observed at CTVC-1 (North Gate) is mainly Two-wheelers and Car traffic. This is because it is majorly used by Port staff. Also 2-Axle trucks are higher as water tanker movement is observed from the North Gate. 4. West gate is the main gate for the Cargo/ truck traffic and the access to the same is provided through Krishnapatnam Port access road which is connected to NH-16. 5. Port traffic especially cargo traffic is not observed on SH-361 and is majorly used by the local traffic as per the survey. A copy of the report submitted to the Nellore urban development authority and R& B dept. on 11.07.2024 with vide letter no. AKPL/EC/EHS/032 dated 03.07.2024 to R & B Dept and NUDA. Copy of the Acknowledgement is attached as **Annexure -6.**
III. Water quality monitoring and preservation:		
i.	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.	The Kandaleru and Buckingham canals are not blocked.
ii.	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality. Silt curtains shall be used to contain the	Noted and will be complied

	spreading of suspended sediment during dredging within the dredging area.	
iii.	No ships docking at the proposed project site will discharge its on-board waste water untreated in to the estuary / channel. All such wastewater load will be diverted to the proposed Effluent Treatment Plant of the project site.	AKPL does not allow any ship to discharge wastewater within the port premises. AKPL complies with MARPOL guidelines.
iv.	Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.	Being complied. Port has oil spill response equipment to combat any oil spill supported by Indian Coast Guard to contain, control and recover the oil spill. Latest OPR drill was conducted at the port on 16.02.2026. Copy attached as **Annexure-7**
v.	The project proponents will draw up and implement a plan for the management of temperature differences between intake waters and discharge waters.	AKPL is not drawing any sea water or discharging any water into the creek or sea.
vi.	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.	Noted and will be complied.
vii.	Total freshwater use shall not exceed the proposed requirement as provided in the project details. Prior permission from competent authority shall be obtained for use of fresh water.	Complied. AKPL has obtained permission from Irrigation dept. AP for drawing 1000 KLD of fresh water from Muthukur Reservoir.
viii.	Sewage Treatment Plant shall be provided to treat the wastewater generated from the project. Treated water shall be reused for horticulture, flushing, backwash, HVAC purposes and dust suppression.	• Treated wastewater from the existing STP is being utilized for the green belt irrigation within port premises • AKPL has been operating 500 KLD STP (1 X 300 KLD & 1 X 200 KLD) at CVR Amenities Complex, 40 KLD STP Admin. Building.
ix.	A certificate from the competent authority for discharging treated effluent/ untreated effluents into the public sewer/ disposal/ drainage systems along with the final disposal point should be obtained.	AKPL is not discharging any treated effluent/ untreated effluent into the public sewer. The treated domestic wastewater is being utilized for greenbelt development and dust suppression.

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x.	No diversion of the natural course of the river shall be made without prior permission from the Ministry of Water resources.	The Kandaleru Creek and Buckingham Canal, which is part of Port area, are not diverted. Free flow of water is ensured.
xi.	All the erosion control measures shall be taken at waterfront facilities. Earth protection work shall be carried out to avoid erosion of soil from the shoreline/boundary line from the land area into the marine water body.	AKPL has developed 100m Casuarina boundary plantation at north and south shorelines to avoid the erosion of soil from the shoreline/boundary line from the land area.
IV. Noise Monitoring and prevention		
i.	The noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.	AKPL appointed a NABL Accredited Laboratory to monitor Noise quality at the following locations: AKPL is currently monitoring Noise levels at the following locations and submitting in six-monthly compliance reports. 1. Zero Point 2. Thamminapatnam 3. CVR Building 4. Gopalapuram 5. Chalivendram 6. Krishnapatnam 7. Krishnapatnam Village near Light House The ambient noise levels are within the standards.
ii.	Noise from vehicles, power machinery and equipment on-site should not exceed the prescribed limit. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.	Noted and will be complied.
iii.	Acoustic enclosures for DG sets, noise barriers for ground-run bays, ear plugs for operating personnel shall be implemented as mitigation measures for noise impact due to ground sources.	The DG Sets are being operated as back up for emergency lighting & safety during power breakdowns. i. Retrofitting certification was carried-out for the DG Sets. It is proposed to implement DG sets under phase III. AKPL will comply with the DG sets guidelines.
iv.	The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during daytime and 70 dB(A) during night time.	Being complied. • AKPL is currently monitoring Noise levels at the following locations and submitting in six-monthly compliance reports. • Zero Point

<table>
<tr><td></td><td></td><td>• Thamminapatnam
• CVR Building
• Gopalapuram
• Chalivendram
• Krishnapatnam
• Krishnapatnam Village near Light House
The ambient noise levels are within the standards.</td></tr>
<tr><td colspan="3">V. Energy Conservation measures</td></tr>
<tr><td>i.</td><td>Provide solar power generation on roof tops of buildings, for solar light system for all common areas, streetlights parking around project area and maintain the same regularly</td><td>
<table>
<tr><th>S.No</th><th>Source</th><th>Average monthl Power consumptio in KWH</th></tr>
<tr><td>1.</td><td>APSPDCL (Grid power)</td><td>29.10 Lakh units</td></tr>
<tr><td>2.</td><td>Renewable energy from AESL</td><td>5.4 Lakh Units</td></tr>
<tr><td>3.</td><td>Renewable energy from M/s Atria Power</td><td>25.50 Lakh Units</td></tr>
</table>
AKPL is already meeting its 50% of power requirement through above mentioned renewable sources.
</td></tr>
<tr><td>ii.</td><td>Provide LED lights in their offices and port areas.</td><td>All the existing office buildings, street lights and other operation buildings are provided with LED lights. Similar LED lighting will be provided under Phase – III implementation.</td></tr>
<tr><td colspan="3">VI. Waste Management</td></tr>
<tr><td>i.</td><td>Dredged material shall be disposed of safely in the designated areas.</td><td>AKPL is disposing of dredged material in designated areas.</td></tr>
<tr><td>ii.</td><td>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.</td><td>Noted and will be implemented.

AKPL appointed NIOT team for shoreline stability study. The study commenced in March 2023 and covered a 17.3 km stretch of coastline, extending from 14.322°N, 80.156°E (South) to 14.171°N; 80.126°E (North). Beach profiling and data collection were carried out five times over 22 months, from March 2023 to January 2025.
A copy of the same was submitted on 20.01.2026 to IRO Vijayawada through mail & 16.04.2025 to APPCB, RO Nellore. Vide Letter no. AKPL/EC/ENV/007/2025-26 dated 09.04.2025.</td></tr>
</table>

		Acknowledgments of the same attached as **Annexure - 8**
iii.	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 or State Pollution Control Board and under the Environment (Protection) Act, 1986.	• Treated wastewater from the existing STPs (AKPL has been operating 500 KLD STP (1 X 300 KLD & 1 X 200 KLD) at CVR Amenities Complex, 40 KLD STP Admin. Building) is being utilized for the green belt irrigation within port premises
iv.	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.	• AKPL arranged solid waste collection bins across strategic locations within the port area, supported by dedicated operational arrangements for regular waste collection. In strict adherence to statutory requirements, all collected solid waste is systematically segregated and disposed of in compliance with the Solid Waste Management Rules, 2016, along with all applicable amendments.
v.	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016.	AKPL will comply with Construction and Demolition Waste Construction and Demolition Waste Management (Management and Handling) Rules, 2016 during Phase - III implementation.
vi.	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.	Noted and being complied, the generated MSW is being disposed to APPCB authorized vendor, certificate of the same is being received.
vii.	Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination.	AKPL is implementing E- waste management for the existing facilities, similar procedure will be followed for proposed phase - III expansion. AKPL is regularly submitting Form - III, E- waste annual returns to APPCB
viii.	Oil spill contingency plan shall be prepared and part of DMP to tackle emergencies. The equipment and recovery of oil from a spill would be assessed. Guidelines given in MARPOL and Shipping Acts for oil spill management would be followed. Mechanism for integration of terminals oil contingency plan with the overall area contingency	AKPL has developed an Oil Spill Contingency Plan. This plan is being reviewed periodically and will be updated as per the Phase - III expansion facilities.

	plan under the co- ordination of Coast should be covered.	
VII. Greenbelt		
i.	Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCB guidelines.	AKPL is committed to complying with the conditions stipulated in Phase III EC & CRZ clearance, wherein 120 ha. of greenbelt will be developed. In which 39.73 Ha (up to April'26). of greenbelt area developed with native species. Latest Green Belt Drawing is attached as **Annexure-1**
ii.	Top soil shall be separately stored and used in the development of green belt.	AKPL is using coco peat, red soil and vermi compost for enriching the topsoil.
VIII. Marine Ecology		
i.	The dredging schedule shall be so planned that the turbidity developed is dispersed soon enough to prevent any stress on the fish population.	Being complied During dredging operations, AKPL ensures water quality protection by deploying silt curtains around the dredging area to contain suspended sediments and prevent dispersion beyond the designated zone. Continuous monitoring of turbidity and water quality is carried out by NABL-accredited laboratory of SV Enviro labs to ensure with APPCB and MoEF&CC standards. Annamalai University team conducted Marine Environmental Monitoring surveys Pre Dredging, during Dredging and Post Dredging phases for analyzing marine Environmental Status. And report of the same enclosed **Annexure - 9**
ii.	While carrying out dredging, an independent monitoring shall be carried out through a Government Agency/Institute to assess the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.	Being complied AKPL appointed NABL accredited 3rd party M/s Falcon Resilient Infra Consultants and Annamalai university team jointly to study and assess the impact of Pre, during and post dredging activity, Monitoring completed.And report of the same enclosed **Annexure -9** In addition to the above, AKPL appointed NABL accredited Laboratory of SV Enviro for environmental monitoring in which they are

		collecting and analyzing marine water samples monthly, the reports of the same were being submitted to statutory bodies.
iii.	A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, sub- tidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography.	Complied Comprehensive Marine Biodiversity Impact Assessment and management Plan was prepared by Sugandhi Devadason Marine Research Institute (SDMRI) and the same was submitted to AP State Biodiversity Board, Guntur and Member secretary, APCZMA and APPCB, RO, Nellore on 09.01.2025. Copy of acknowledgements attached as **Annexure -2**
iv.	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components including all micro, macro and mega floral and faunal components of marine biodiversity.	Being complied AKPL Appointed a NABL Accredited Laboratory for Monitoring the Terrestrial & Marine parameters viz., Marine water quality, Marine sediment quality, Surface Water Quality and ground water quality at regular intervals with NABL Laboratory. Comprehensive Marine Biodiversity Impact Assessment and management Plan was prepared by Sugandhi Devadason Marine Research Institute (SDMRI) and the same was submitted to AP State Biodiversity Board, Guntur and Member secretary, APCZMA and APPCB, RO, Nellore on 09.01.2025. Copy of acknowledgements attached as **Annexure - 2**
v.	The project proponent shall ensure that water traffic does not impact the aquatic wildlife sanctuaries that fall along the stretch of the river.	Being complied. • There are no aquatic wildlife sanctuaries in the vicinity of the Port. • AKPL has been ensuring that the water traffic does not impact the marine ecosystem for port operations.
IX. Public hearing and human health issues		
i.	The workspace shall be maintained as per international standards for occupational health and safety with provision of fresh	AKPL is certified in ISO 45001: 2018 Occupation Health and safety.

	air respirators, blowers, and fans to prevent any accumulation and inhalation of undesirable levels of pollutants including VOCs.	AKPL strictly enforcing all the workers, employees, stakeholders to wear PPEs at operational areas.
ii.	Workers shall be strictly enforced to wear personal protective equipment's like dust mask, ear muffs or ear plugs, whenever and wherever necessary/ required. Special visco-elastic gloves will be used by labour exposed to hazards from vibration.	Being complied. AKPL strictly enforcing all the workers, employees, stakeholders to wear PPEs at operational areas.
iii.	Safety training shall be given to all workers specific to their work area and every worker and employee will be engaged in fire hazard awareness training and mock drills which will be conducted regularly. All standard safety and occupational hazard measures shall be implemented and monitored by the concerned officials to prevent the occurrence of untoward incidents/ accidents.	AKPL provides the following as part of safety trainings • All the employees, workers & contractors are given daily toolbox talks, monthly review meetings, Job specific trainings with employees engaged in various activities of the Port. • Port is implementing mock drill to ensure compliance of safety measures. • AKPL is certified in ISO 45001: 2018 occupational health and safety management systems.
iv.	Emergency preparedness plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.	Port has developed Emergency Preparedness Plan based on the HIRA and Disaster Management Plan. This plan is being reviewed periodically and updated as per the Phase - III expansion facilities.
v.	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	AKPL will provide the following facilities during Phase - III construction. • Drinking water • Mobile Toilets • Mobile STP • Power facility • OHC facility
vi.	Occupational health surveillance of the workers shall be done on a regular basis.	AKPL has been conducting annual Occupational health checkups/training to the workers.
X. Environmental Responsibility		
i.	The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper	Complied. **Environmental Policy Summary**

	checks and balances and to bring into focus any infringements/ deviation/ violation of the environmental / forest /wildlife norms/ conditions. The company shall have defined system of reporting infringements / deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.	• **Exceed Regulations**: Build and run all facilities to meet or surpass all environmental laws. • **Assess & Mitigate Risks**: Evaluate climate impacts across all activities, including logistics, and create fix plans. • **Assign Responsibilities**: Clearly define staff roles for executing the environmental policy. • **Train Employees**: Educate staff on how business operations affect nature. • **Drive Continuous Improvement**: Set targets to cut waste, lower emissions, reduce noise, and save resources. • **Protect Local Habitats**: Work with stakeholders to conserve nature around operational sites. • **Conduct Due Diligence**: Run environmental checks for new projects, expansions, and mergers. • **Engage Stakeholders**: Build awareness with suppliers, customers, contractors, and local communities. • **Audit & Report**: Measure performance regularly, run audits, and share results with stakeholders. Copy of Environmental Policy is attached as **Annexure -10**
ii.	A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.	Being complied, the organogram is attached, this organogram will be upgraded during Phase - III expansion. Organogram attached as **Annexure -11**
iii.	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise	AKPL is maintaining and implementing EMP matrix during Operational Phase as per the recommendations made in the EIA/EMP report.

	funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.	The Funds & Expenditure earmarked for environment protection measures are being reported in Form – V Environmental Statement for the period 2024-25 and was submitted on 16-07-2025 to APPCB & MoEF& CC. Copy Attached as **Annexure-12.**
iv.	Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.	Noted and being complied.
XI. Miscellaneous		
i.	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.	**Complied.** Advertisement was published in District Newspapers namely "Vartha" in local language & "The New Indian Express" in English language dated 23.01.2021. Copy attached as **Annexure -13**
ii.	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in tum has to display the same for 30 days from the date of receipt.	Complied. A copy of the Environmental clearance is submitted to the District Collector vide our letter dated 03.02.2021 and local Panchayats vide letter dated 01.02.2021. Copy attached as **Annexure-14**
iii.	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.	Noted and being complied. Latest Self certified Half yearly compliance report for the period of Apr'25 to Sep'25 submitted on 24.11.2025. Submitting the 6 Monthly Self Certified & NABL Accredited 3rd Party Compliance Reports for the period from April to September & October to March respectively along with Terrestrial & Marine Monitoring reports submitted on 30.05.25 to MoEF & CC and APPCB. Copies of the acknowledgment is attached as **Annexure- 3**

iv.	The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.	Noted and being Complied. Latest Self certified Half yearly compliance report for the period of Apr'25 to Sep'25 submitted on 24.11.2025. Submitted the 6 Monthly NABL Accredited 3rd Party Compliance Reports for the period from October'24 to March'25 respectively along with Terrestrial & Marine Monitoring reports submitted on 30.05.25 to MoEF & CC and APPCB. Copies of the acknowledgments are attached as **Annexure-3**
v.	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.	Noted and complied Form – V Environmental Statement for the existing facilities is submitted to APPCB & MoEF& CC. Latest report submitted on 16.07.2025 for the period 2024-2025. Copy of the Acknd is Attached as **Annexure-15.**
vi.	The criteria pollutant levels namely; PM2.5, PM10, SO2, NOx (ambient levels) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	Complied. • The Port has been operating 5 No. of CAAQM stations at the below mentioned locations as suggested by APPCB within the Port premises to monitor the parameters viz., PM10, PM2.5, SO2, NH3, NO2, CO and the data is being uploaded to APPCB website. a. CVR Amenities Complex b. Thamminapatnam Village c. Krishnapatnam Village d. North side of the Port e. South side of the port AKPL has installed digital display board at publicly visible place at the zero point gate.
vii.	The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.	AKPL obtained CTE of APPCB for Order No. 633/APPCB/CFE/RO- NLR/HO/2010 dated 25.02.2021 and CTO Order No: APPCB/VJA/NLR/11344/CFO/HO/2019 11/11/2022, and expansion order vide order no.289514/APPCB/TPT/NLR/CTO/HO/2026 dated 20.05.2026. AKPL will intimate once the financial closure for implementing Phase III expansion is completed.

viii.	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.	AKPL will comply with the conditions stipulated by the State Pollution Control Board and the State Government
ix.	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitments made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.	Noted and will be complied.
x.	No further expansion or modifications in the port area shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).	Noted. AKPL will not carryout any modifications or expansion without obtaining the necessary approvals from the MoEFCC.
xi.	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Noted and will be complied.
xii.	The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.	Noted. AKPL as a responsible corporate citizen will abide with all the conditions stipulated in environmental clearance.
xiii.	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time-bound manner shall implement these conditions.	Noted
xiv.	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/ monitoring reports.	Noted.
xv.	The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and	Noted and being complied by AKPL.

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	Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.	
xvi.	Any appeal against this EC 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.

Compliance on the conditions stipulated in APCZMA – NOC vide letter no.202/CRZ/IND/2019-30 dated 21.05.2020

Part A- Specific Conditions		
Sl. No.	**Condition**	**Compliance**
i.	The project proponent shall comply with all the conditions stipulated in the Environment & CRZ clearances, CFEs, CFOs issued to M/s. KPCL Phase-I and Phase-II projects in this Phase-III project also	Being complied. AKPL is submitting compliance status of Phase-I & II conditions to statutory authorities on Half yearly basis. Phase III expansion is under implementation.
ii.	The proposed constructions shall conform to the norms prescribed in CRZ notification issued by the Ministry of Environment and Forests, Government of India as per S. No. 19E, dated 06.01.2011.	Being complied. AKPL is ensuring that all proposed constructions conform to the norms prescribed in the CRZ Notification issued by the Ministry of Environment and Forests, Government of India as per S. No. 19E, dated 06.01.2011
iii.	No activity on ground shall be undertaken without obtaining Environmental clearance from Ministry of Environment and Forests, Government of India as per S. No. 19(E), dated 06.01.2011.	AKPL has initiated construction activity after obtaining the EC&CRZ clearance, CTE & CTO for Phase III expansion, all the planned activities as part of Phase III EC have not been completed.
iv.	Continuous monitoring of circulation of seawater shall be carried out every six months by engaging reputed agencies like NIOT. The port shall undertake the study of multi-sensor, multi date data to study the sedimentation studies in the inner harbour channel in addition to the in-house studies undertaken as part of regular monitoring of sedimentation in the harbour channel. The monthly reports shall be submitted to APPCB.	• AKPL appointed NIOT for shoreline stability study. A copy of the same was submitted on 20.01.2026 to IRO Vijayawada through mail & 16.04.2025 to APPCB, RO Nellore. Vide Letter no. AKPL/EC/ENV/007/2025-26 dated 09.04.2025. • Acknowledgments of the same attached as **Annexure - 8**

v.	Study on marine biodiversity by engaging a reputed organization/ university having a proven expertise in the relevant field shall be taken up. Similar monitoring mechanism shall be developed for monitoring terrestrial part to determine the impacts.	AKPL appointed M/s. Suganthi Devadason Marine Research Institute (SDMRI) for conducting a Comprehensive Marine Biodiversity Assessment, Impact Assessment and Management Plan. Acknowledgment Copy of the report is attached as **Annexure - 2**
vi.	The Port authorities shall continue to nourish the beaches located on the north side of the North breakwaters within the port limits, which are vulnerable to sea erosion during the monsoon season and also during cyclone.	Being complied AKPL appointed NIOT team for shoreline stability study. The study commenced in March 2023 and covered a 17.3 km stretch of coastline, extending from 14.322°N, 80.156°E (South) to 14.171°N; 80.126°E (North). Beach profiling and data collection were carried out five times over 22 months, from March 2023 to January 2025. During the period (June 2024), about 1,08,698 cubic meters of sediment was nourished to the northern breakwater, as part of port-led coastal conservation. A copy of the same was submitted on 20.01.2026 to IRO Vijayawada through mail & 16.04.2025 to APPCB, RO Nellore. Vide Letter no. AKPL/EC/ENV/007/2025-26 dated 09.04.2025. Acknowledgments of the same attached as **Annexure - 8**
vii.	The Port shall also undertake the scientific studies by engaging reputed agencies like National Institute of Ocean Technology (NIOT) and Indian Institute of Technology, Chennai to study the feasibility of constructing submerged breakwaters to protect the beach road from seasonal erosion and also during cyclones.	Being Complied AKPL appointed NIOT for shoreline stability study which recommended sand nourishment as the most suitable option for AKPL. A copy of the same was submitted on 20.01.2026 to IRO Vijayawada through mail & 16.04.2025 to APPCB, RO Nellore. Vide Letter no. AKPL/EC/ENV/007/2025-26 dated 09.04.2025. Acknowledgments of the same attached as **Annexure - 8**

viii.	The applicant shall ensure that continuous monitoring systems of all likely affected parameters including air/fish/flora/fauna/water quality/ waste water discharges/solid waste disposal/construction material disposal etc., are installed and reports sharedwith the National Institute of Oceanography (NIO) on continuous basis and a monthly report submitted to the APPCB by the NIO, all through construction period and at least for one year after commencement of operations.	Being complied. • AKPL appointed an NABL Accredited Laboratory to conduct Environmental Monitoring i.e., Terrestrial & Marine parameters. • The reports are being submitted to APPCB on monthly basis and uploaded on MoEF&CC PARIVESH 2.0 portal on half-yearly basis. • Sample copy of the monitoring report for the month of April26 is attached as **Annexure-5**
ix.	A team of APPCB scientists and environmental engineers shall be kept continuously informed and apprised of the project by the applicant, so that environmental mitigation measures are adopted on a continuous basis.	Noted, AKPL will provide all necessary support to the team of APPCB environmental engineers during the visit to the port.
x.	The project proponent while executing this project shall not disturb any of the ecologically sensitive areas like mangroves, sand heaps sand dunes etc.	➢ Existing mangrove areas are being protected and conserved with suitable barricading, erection of display boards and ensuring the tidal flow exchange. ➢ Display boards and fencing have been arranged to protect the mangrove area. Photographs are attached as **Annexure-16**
xi.	No construction shall be taken in the No Development Zone. However, if any permitted activity is to be taken up, the proponent may apply to the competent authority separately. Permanent structures shall be avoided in this zone.	No construction activity is carried out in the No Development Zone.
xii.	Priority to be given to the maintenance of storm water drains from the surrounding area to prevent possible flooding of the surrounding areas.	Complied. AKPL is maintaining the storm water drains periodically and especially before monsoon season by removing the sludge accumulated to prevent possible flooding of the surrounding areas.
xiii.	Mechanization of Port operations shall be taken up to improve the air quality in the bowl area. SPM and RSPM levels to be	Adani Krishnapatnam port is not located in bowl area or Critically Polluted areas as per CPCB.

	maintained within the standards stipulated by the APPCB/CPCB.	However, majority of Port operations are carried out through mechanized cargo handling equipment so as to avoid cargo spillage and dust emissions during the cargo handling activities • Established mechanical conveyor system for handling coal & Iron ore. • Provided closed hoods for the conveyor system. • Stacker cum re-claimers is being used for loading and unloading the coal. • The railway wagons are being loaded mechanically. • Installed fully mechanized coal handling systems with gantry grab type ship loaders/unloaders. • Provided hooded conveyor belt for cargo transferring directly from ship to the designated stockyard by means of closed hopers and transfer towers. • Established closed warehouses for storage of weather sensitive cargoes. • The loading and discharge points of the conveyor carrying material are covered with exhaust hoods to prevent the formation of dust clouds. • All the conveyor galleries are covered to ensure zero dust emission during cargo transfer. • Provided water sprinkling system at transfer towers to arrest the dust spreading into the atmosphere. • Provided semi mechanized facilities for truck tarpaulin covering stations to ensuring all the outgoing cargos by trucks are covered with tarpaulin. • Ensuring all the outgoing Railway Rakes are covered with Tarpaulin. • Mist Canon systems provided for watering avenue plantations and road wetting on haul roads • Operating Mechanical dust suppression system comprises of 272 canons. • Installed MDSS system towards south side of the port. • Deploying DSS Tankers of Cannon mounted for sprinkling water on haul

		roads and yards to arrest the dust causing by the vehicular movement • The Cargo stocks/heaps are covered with tarpaulin. • 3 No of Heavy-Duty Sweeping Machines are being deployed at operational areas and all internal roads. • Erected & maintaining wind breaking wall of height 14 mtrs to prevent any dust nuisance towards habitation supported with high density greenbelt. • Greenbelt in an extent of 231.23 (April'26) Ha Developed & maintaining green belt along the port covering, yards, roads and all operational areas.
xiv.	Raising and maintenance of greenbelt within and outside the port area to be taken up on priority and necessary assistance shall be extended to the local agencies involved in the implementation of afforestation programme.	Being complied. ➢ As on date AKPL has developed Greenbelt to an extent of 231.23 Ha. ➢ Additional green belt development is planned. ➢ AKPL under its CSR foundation is helping surrounding villages with development of Miyawaki Plantations with fruit bearing trees.
xv.	The project proponent shall submit the half yearly compliance reports of CRZ clearance duly audited by the accredited consultants on the degree of compliance by the project proponent during and after construction of the project.	Complied. • AKPL is conducting half yearly compliance reports through NABL accredited agencies. The latest half yearly compliance report for the period of Oct'24 to Mar'25 was submitted on PARIVESH 2.0 portal 30.05.2024. Copy of Acknowledgement is **Annexure-3**
xvi.	Dredged material shall be utilized for nourishment of beaches.	Complied AKPL commissioned NIOT for conducting shoreline stability study. Beach profiling and data collection were carried out five times over 22 months, from March 2023 to January 2025. Based on the study, about 1,08,698 cubic meters of sediment was nourished to the northern breakwater (June 2024), as part of port-led coastal conservation.
xvii.	Full cooperation shall be extended to all inspecting authorities/ organizations such	Being complied.

	as APPCB, MoEF&CC, CPCB and local Environment Protection Organizations.	AKPL will extend full cooperation to the officers of APPCB/MOEF&CC/CPCB.
xviii.	A team of APPCB scientists and environmental engineers shall be kept continuously informed and apprised of the project by the applicant, so that environmental mitigation measures are adopted on a continuous basis.	Noted, AKPL will provide all necessary support to the team of APPCB environmental engineers during the visit to the port.
xix.	The project activity shall be carried out strictly as per the provisions of CRZ Notification, 2011, and shall not affect the coastal ecology of the area including flora and fauna.	Being complied. AKPL is strictly complying with the conditions of EC, Consents of PCB and CRZ Clearance. AKPL conducts regular monitoring of terrestrial and marine parameters through an NABL accredited laboratory. Copy of the sample report for the month of April'26 is attached as **Annexure-5**
xx.	The project proponent shall ensure that there is no destruction of mangroves during the construction as well as the operation phase of the project.	Being complied. ➢ Existing mangrove areas are being protected and conserved with suitable barricading, erection of display boards and ensuring the tidal flow exchange. ➢ Display boards and fencing have been arranged to protect the mangrove area.
xxi.	There shall be no dressing or alteration of the sand dunes and natural features, including landscape changes for beautification, recreation and other such purpose.	AKPL is not altering or not disturbing any sand dunes/ natural features on the seaward.
xxii.	All conditions/ recommendations stipulated by other statutory authorities shall strictly be complied with, as may be applicable.	AKPL is complying with the conditions stipulated by other statutory authorities
xxiii.	The project proponent shall obtain all necessary clearances/ permissions from the concerned authorities as applicable.	AKPL has obtained the necessary statutory permissions from competent authorities.
xxiv.	'Consent for Establishment' and CFO as may be applicable, shall be obtained from State Pollution Control Board under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.	Complied Obtained CTE for Phase-III expansion vide Order no. 633/ APPCB/CFE/RO- NLR/HO/2010 dated 25.02.2021. Under Phase III EC&CRZ clearance expansion one Liquid jetty and 24.5 MTPA capacity are developed. and CTO for the same has been obtained from APPCB

		vide CTO no. APPCB/VJA/NLR/11344/CFO/HO/2019 11/11/2022 and expansion order vide no.289514/APPCB/TPT/NLR/CTO/HO/2026 dated 20.05.2026.
xxv.	All waste (liquid and solid) arising from the proposed development will be disposed of as per the norms prescribed by State Pollution Control Board. There shall not be any disposal of untreated effluent into the sea/coastal water bodies.	Being complied. Generated Hazardous waste being disposed to APPCB Authorized vendors through APEMCL portal. There is no discharge/disposal untreated effluent into sea/coastal water bodies.
xxvi.	No permanent labour camp, machinery and material storage shall be allowed in CRZ area.	Being complied. AKPL has ensured that no labour camp/material storage is planned in CRZ area.
xxvii.	There shall no groundwater withdrawal within CRZ without prior approval of the State Groundwater Authority.	Noted and Being Complied. AKPL is not withdrawing ground water within CRZ area.
xviii.	Disposal of muck during construction phase should not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.	During construction of Phase III expansion, AKPL will ensure proper storage of muck/construction debris.
Part B - General Conditions		
i.	A copy of the clearance letter shall also be displayed on the website of the AP Pollution Control Board. The clearance letter shall also be displayed at the AP Pollution Control Board Regional Office, District Industries Centre and District Collector office/ Mandal Revenue Office for 30 days.	Complied. A copy of the Environmental clearance was submitted to • The Environmental Engineer, APPCB Regional office vide letter dated 12.01.2021, • The District Collector vide our letter dated 03.02.2021 and local panchayats vide letter dated 01.02.2021. A copy of the Environmental clearance is submitted to the District Collector vide our letter dated 03.02.2021 and local Panchayats vide letter dated 01.02.2021.Copy attached as **Annexure-14**
ii.	The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year wise expenditure shall be reported to the Andhra Pradesh Coastal Zone Management Authority	Being Complied. AKPL has budgeted Rs. 89 Crores earmarked towards implementation of Envi. Management Plan of Phase III which is under implementation.

	(APCZMA) and AP Pollution control Board Regional office.	However, AKPL has spent 11.04 cr. As recurring cost for implementation of EMP for FY 25-26.
iii.	Concealing factual data by the project proponent, any officer behalf of the project proponent and consultants hired by the project proponent or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.	Noted
iv.	The above 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, the EIA Notification, 2006 and the CRZ Notification, 2011.	Noted
v.	Full co-operation shall be extended to the officials from the APCZMA, APPCB and Regional office of MoEF&CC, during monitoring of implementation of environmental safeguards stipulated. It shall be ensured that documents/data sought pertinent is made available to the monitoring team. A complete set of all the documents submitted to APCZMA shall be forwarded to the AP Pollution Control Board Regional office.	AKPL will extend full support to the officials of APPCB, MoEFCC and APCZMA during their visit to the Port.
vi.	In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by the APCZMA.	Noted and will be complied.
vii.	The APCZMA reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environment clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.	Noted

viii.	All other statutory clearances shall be obtained, as applicable by project proponents from the respective competent authorities.	AKPL has obtained all other statutory clearances as applicable to project.
ix.	The project proponent should advertise in at least two local News papers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded CRZ clearance and copies of clearance letters are available with the AP Pollution Control Board and may also be seen on the website of APCZMA. 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 AP Pollution Control Board Regional office.	Complied Advertisement was published in District Newspapers namely "Vartha" & "The New Indian Express" dated 21.01.2021. **Copy attached as Annexure -13**
x.	This clearance is subject to any order passed by any Hon'ble Courts, as may be applicable to this project.	Noted
xi.	A copy of the clearance letter shall be sent by the proponent to concern panchayat, Zilla Parishad/Municipal corporation, Urban Local Body and the Local NGO, if any, from whom 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.	Complied. A copy of the Environmental clearance was submitted to • The Environmental Engineer, APPCB Regional office vide letter dated 12.01.2021, • The District Collector vide our letter dated 03.02.2021 and local panchayats vide letter dated 01.02.2021. • Copy attached as **Annexure 14**.
xii.	The proponent shall upload the status of compliance of the stipulated conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the AP Pollution Control Board Regional office and, the concerned District Collector and the APPCB.	Being complied. The results of the monitored data and compliance status to EC&CRZ/ APPCB conditions is regularly uploaded in website of AKPL.
xiii.	The environmental statement for each financial year ending 31st March in Form- V as is mandated to be submitted by the project proponent to the Andhra Pradesh Pollution Control Board as prescribed under the Environmental (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of clearance conditions and	Complied Form – V Environmental Statement for the period was submitted to APPCB on 16.07.2025. Copy of Ackd is attached as **Annexure -15**

	shall also be sent to the AP Pollution Control Board regional office, APCZMA and APPCB by email.	

Compliance Status of EC & CRZ Clearance (Phase II)

Compliance Status of EC & CRZ Clearance F. No. 11 – 62 / 2009 – IA.III dated: 13th November 2009 (Phase II)

S.No	MoEF Stipulations	Compliance Status
Specific Conditions		
1.	All the conditions as stipulated by the Forests & Environment Department, Govt. of Andhra Pradesh vide letter No.2286/CZMA/2009; dated 11.05.2009 shall be strictly complied.	Noted and being complied. The APCZMA recommended the project proposal to MoEF in this letter. All conditions stipulated therein are being strictly complied.
2.	All the details / information submitted by the project proponent vide letter No.KP/MOEF/PH-II/174, dated 17.08.2009 shall be strictly complied.	**Complied.** ➢ **Realignment of Dredge Disposal Area:** The southern boundary of the proposed Phase-II dredge disposal area has been shifted northward to align exactly with the northern boundary of the Phase-I dredge disposal area. ➢ **Mangrove Protection & Infrastructure:** Belt conveyors and road bridge crossings have zero impact on local mangroves. Additionally, the railway bridge alignment has been re-engineered specifically to avoid any disturbance to the mangrove ecosystem. ➢ **Coastal Impact Monitoring:** The Indian National Centre for Ocean Information Services (INCOIS) was engaged to conduct coastal monitoring. According to their 2008–2010 report, port development activities have caused no adverse impact on the coastline. ➢ **Coal Yard Runoff Management:** Surface runoff from the coal storage yards is channelled through peripheral drains into collection pits and guard (dump) ponds, which feature dedicated recycling systems to reuse the water for dust suppression. ➢ **Shoreline Stability Study Submission:** Adani Krishnapatnam Port Limited (AKPL) appointed the National Institute of Ocean Technology (NIOT) to conduct a shoreline stability study. The resulting report was

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S.No	MoEF Stipulations	Compliance Status
		officially submitted to the APPCB, Regional Office (RO) Nellore, on **April 16, 2025**, vide cover letter ref no: *AKPL/EC/ENV/007/2025-26*, dated **April 9, 2025**. ➢ **Documentation:** The official acknowledgement of the NIOT report submission is attached as **Annexure – 8.**
3.	The hydro-dynamic studies shall be undertaken to ascertain the impact to the shoreline in the stretch and ecologically sensitive areas and the report shall be submitted to the Ministry.	**Complied.** • **Hydrodynamic Studies:** Hydrodynamic studies were conducted by M/s. HR Wallingford, UK. The study concluded that there is no long-term impact on the coastline due to minimal net sediment drift. • **Coastal Monitoring & Alignment:** In line with the recommendations of the HR Wallingford report dated October 2007, a 14 km stretch of coastline (spanning 7 km both north and south of the port entrance) is being continuously monitored using satellite imagery. This monitoring is executed by the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad. • **Findings:** Findings from the INCOIS reports covering the period from October 2008 to January 2010 confirm that the coastline remains entirely stable. • **Ongoing Conservation:** Shoreline monitoring and marine biodiversity studies are conducted on a regular, ongoing basis to ensure proactive shore protection and ecological conservation.
4.	Ministry has taken a decision that the plantation of mangroves shall be undertaken on an area of 50 ha. as the Phase-II of the project spreads over 800 ha.	Complied. Mangrove's development in 50 Ha. has been undertaken within the port. Adequate budget allocation is provided in the Environment Health and safety Plan for mangrove development as

S.No	MoEF Stipulations	Compliance Status
		follows for the FY 2013-14 Rs. 26.49 Lakhs are budgeted towards mangrove protection. **Photographs attached as Annexure - 16**
5.	Six monthly monitoring shall be carried out and a comparative analysis shall be made to examine for any mitigative measures required.	Being complied. Latest self-certified half yearly compliance report submitted for the period of April'25 to September'25 in PARIVESH PORTAL on 24.11.2025. Submitting the half yearly NABL Accredited 3rd Party Compliance Reports for the period from October'24 to March'25 along with Terrestrial & Marine Monitoring reports to MoEF & CC and APPCB on 30.05.2025. Copies of the acknowledgments are **attached as Annexure – 3.**
6.	The temperature, salinity and tidal inflow shall be monitored weekly.	Complied. ➢ AKPL appointed a NABL Accredited SV Enviro Laboratory to conduct Environmental Monitoring i.e., Terrestrial & Marine parameters. ➢ Weekly monitoring of temperature, Salinity, and marine water quality during tidal cycle is being carried out and results of monitoring reports same submitting to APPCB RO Nellore on monthly and half yearly to MoEF&CC. ➢ Latest Monitoring report was submitted to APPCB in the Month of April'26. Copy Of same is attached as **Annexure – 5.**
7.	The greenbelt of 100 m. width shall be developed around the coal stack yard as per the request in the public hearing.	Complied. AKPL submitted a letter to MoEF&CC vide letter No.: KP/MOEF/113 dated 29.08.2012 to modify this condition. AKPL developed 100 m width green

S.No	MoEF Stipulations	Compliance Status
		belt along the port boundary, coastal area and 20 m wide green belt around coal stack yards. During public hearing AKPL committed to develop 100m greenbelt around periphery and 20m around coal stock and same is compiled by AKPL which is available in records as Public hearing minutes of meeting. **Copy of the letter is attached as Annexure - 24**
8.	Impact on the drawl of the water from the Kandaleru Creek shall be regularly monitored and report submitted to the Ministry.	**Complied.** Adani Krishnapatnam Port Limited (AKPL) does not abstract water from Kandaleru Creek. In strict compliance with the stipulated conditions, surface water quality is being continuously monitored, and comprehensive analysis reports are submitted to the APPCB and MoEF&CC on a half-yearly basis.
9.	Continuous monitoring on disposal of dredged material shall be put in place for both pre and post monsoon periods.	**Complied.** Bathymetric surveys of the designated dredged material disposal grounds are conducted periodically during both pre- and post-monsoon seasons to track and monitor seabed topography.
10.	No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	Being complied. AKPL has not constructed any constructional work other than permitted as per CRZ notification.
11.	Oil spills if any shall be properly collected and disposed as per the Rules.	**Complied.** • **Contingency Planning:** Oil spill responses are strictly managed in accordance with the approved Oil Spill Contingency Plan (OSCP). • **Mitigation Equipment:** Adani Krishnapatnam Port Limited (AKPL) has deployed state-of-the-art response equipment, including containment oil booms, skimmers, and specialized oil spill dispersants (chemicals) to effectively mitigate any accidental spills. • **Response Readiness & Training:** Port personnel undergo regular training to efficiently combat and manage Tier-I oil spill incidents. To maintain operational readiness, the latest Oil Pollution Preparedness, Response and Co-operation

S.No	MoEF Stipulations	Compliance Status
		(OPRC) drill was successfully conducted at the port on **February 16, 2026**. • **Inter-Agency Coordination:** In line with the approved Disaster Management Plan, the Indian Coast Guard (ICG) will be instantly alerted to coordinate responses for higher-tier incidents. • **Regulatory Reporting:** Complete details were previously submitted to the MoEF&CC Regional Office, Bangalore, vide letter ref no: *KP/MoEF/PH-II/20*, dated **February 2, 2010**. • A copy of the latest OPRC drill report and relevant documentation is enclosed herewith as **Annexure – 7.**
12.	The approach channel shall be properly demarcated with lighted buoys for safe navigation and adequate traffic control guidelines shall be framed. The fishermen shall be suitably educated and informed about the traffic guidelines.	**Complied.** • The approach channel is equipped with lighted navigational buoys to ensure safe transit. Furthermore, comprehensive traffic control guidelines have been established to manage vessel movement, with copies officially submitted to the Department of Fisheries to ensure timely dissemination of safety information to local fishermen.
13.	The project proponent shall set up separate environmental management cell for effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.	Complied. A separate Environmental Management cell was established headed by HOD & supporting staff for effective implementation of the stipulated environmental safeguard. **Copy of Organogram of Environment Cell attached as Annexure – 11.**
14.	No destruction of mangrove is permitted. The project proponent shall take up mangrove plantation / green belt in the project area, wherever possible. Adequate budget shall be provided in the Environment Management Plan for such mangrove development.	**Complied** • **Mangrove Afforestation:** In alignment with the Environmental Clearance (EC) conditions for Phase-II development, mangrove afforestation has been successfully carried out over an area of 50 hectares (Ha). • **Site Selection:** The plantation was executed in specific zones recommended

S.No	MoEF Stipulations	Compliance Status
		by the Government of Andhra Pradesh (GoAP), as mangrove species are highly sensitive to soil chemistry and tidal conditions and thrive only in distinct ecological niches. • **Budgetary Allocation:** As mandated by the Environment, Health, and Safety (EHS) Plan for mangrove conservation, a dedicated annual budget of **Rs. 26.49 Lakhs** was allocated and utilized for mangrove protection during the fiscal year 2013–14. • **Visual Evidence:** Photographic documentation displaying the establishment and growth of the mangrove areas is enclosed herewith as **Annexure – 16.**
15.	The funds earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.	Being complied. AKPL earmarked dedicated funds for environment management plan. Please find the last three years details. **FY 2025-26- 11.04 Cr.** **FY 2024-25- 20.82 Cr.** **FY 2023-24- 2.41 Cr.** **FY 2022-23- 17.38 Cr.** **FY 2021-22- 4.36 Cr.**
16.	There shall be no withdrawal of groundwater in Coastal Regulation Zone area, for this project. In case any groundwater is proposed to be withdrawn from outside the CRZ area, specific prior permission from the concerned State / Central Groundwater Board shall be obtained in this regard.	Complied. No Ground water is extracted for port operations in CRZ area as per Coastal Regulation Zone.
17.	The Hazardous waste generated shall be properly collected and handled as per the provisions of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.	Complied. Hazardous waste like used oils / grease and batteries are being collected and handled as per the provisions of Hazardous Waste (Management, Handling and Trans boundary Movement) Rules, 2016 and their amendments.

S.No	MoEF Stipulations	Compliance Status
18.	The wastewater generated from the activity shall be collected, treated and reused properly.	Complied. • AKPL has been operating 2 No. of Sewage Treatment Plants (STP) 1 X 500 KLD & 1 X 40 KLD for treatment of sewage generated in the port. • The Treated water is being reused for the green belt within port premises.
19.	Sewage Treatment facility should be provided in accordance with the CRZ Notification.	Complied. • AKPL has been operating 2 No. of Sewage Treatment Plants (STP) 1 X 500 KLD & 1 X 40 KLD for treatment of sewage generated in the port. The Treated water is being reused for the green belt within port premises.
20.	No solid waste will be disposed of in the Coastal Regulation Zone area. The solid waste shall be properly collected, segregated and disposed as per the provision of Solid Waste (Management and Handling) Rules, 2000.	**Being Complied With.** AKPL arranged solid waste collection bins across strategic locations within the port area, supported by dedicated operational arrangements for regular waste collection. In strict adherence to statutory requirements, all collected solid waste is systematically segregated and disposed of in compliance with the Solid Waste Management Rules, 2016, along with all applicable amendments.
21.	Installation and operation of DG set if any shall comply with the guidelines of CPCB.	Being complied. As per the CPCB guidelines, Port has installed Retrofit Emission Control Device (RECDs) for Greater than 125 KVA DGs. • The DG Sets are being operated as back up for emergency lighting & safety during power breakdowns. **DG Monitoring analysis reports are attached as Annexure – 17.**
22.	There shall be no reclamation / dredging of areas.	This condition was deleted by MoEF & CC vide letter no. F. No. 11-62/2009-IA.III dated 02.03.2010. **Copy attached as Annexure - 26**
23.	Air quality including the VOC shall be monitored regularly as per the guidelines of CPCB reported.	This condition was deleted by MoEF&CC vide letter F. No. 11-62/2009- IA.III dated 02.03.2010. **Copy attached as Annexure - 26**
24.	The project proponent shall undertake green belt development.	**Complied.**

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S.No	MoEF Stipulations	Compliance Status
		• Greenbelt development and canopy maintenance are executed as a continuous environmental process at AKPL. • **Total Acreage:** A total of **231.23 Ha** of greenbelt has been established to date, strategically distributed along port boundaries, coal yards, block plantations, roadsides (avenues), and medians. • **Shoreline Protection:** An area of **3.5 Ha** has been specifically afforested near the Phase-III liquid jetty along the shoreline. • **Documentation:** The current Greenbelt Layout Plan is attached as **Annexure - 1**.
25.	Necessary clearances from all the concerned agencies shall be obtained before initiating the project.	Noted. AKPL has obtained all Necessary clearances from all the concerned agencies.
26.	Project proponent shall install necessary oil spill mitigation measures in the shipyard. The details of the facilities provided shall be informed to this Ministry within 3 months from the date of receipt of this letter.	**Being Complied With.** • Oil spills are systematically managed under the approved Oil Spill Contingency Plan. • **Response Assets:** Containment booms, skimmers, and mitigation chemicals are maintained on-site for accidental spill prevention and control. • **Tier-I Training:** Dedicated personnel undergo regular training to handle Tier-I level incidents. • **Coast Guard Integration:** For higher-tier escalation, coordination procedures with the Indian Coast Guard are established under the Disaster Management Plan. • **Historical Filing:** Compliance details were furnished to the MoEF&CC Regional Office, Bangalore, via letter no. *KP/MoEF/PH-II/20* on **02.02.2010**. • **Documentation:** The latest OPRC drill report is attached as an **Annexure - 7**
27.	No hazardous chemicals shall be stored in the Coastal Regulation Zone area.	Point Noted

S.No	MoEF Stipulations	Compliance Status
		AKPL does not store any hazardous chemicals in the CRZ area.
28.	The project shall not be commissioned till the requisite water supply and electricity to the project are provided by the PWD / Electricity Department.	Complied. AKPL has a Power agreement from APSPDCL for electricity requirement.
29.	Specific arrangements for rainwater harvesting shall be made in the project design and the rainwater so harvested shall be optimally utilized.	Complied. • Rainwater harvesting ponds and guard ponds have been developed with capacity of 1.63 lakh m3 at various locations in Port premises. • The availability of water is in the rainy & winter seasons. Percolation is faster due to sandy soil. • The maximum harvested water is being utilized for dust suppression.
30.	The facilities to be constructed in the CRZ area as part of this project shall be strictly in conformity with the provisions of the CRZ Notification, 1991 and its amendment. The facilities such as office building and residential buildings which do not require waterfront and foreshore facilities shall not be constructed within the Coastal Regulation Zone area.	Being complied. All the construction activities are as per regulations including Coastal Regulation Zone Notification 1991 & its amendments.
	General Conditions	
I.	Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment	Complied. AKPL has provided infrastructure facilities including water supply, fuel and sanitation for construction workers during the construction phase of the project to avoid any damage to the environment.
II.	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	Being Complied. AKPL has Appointed an NABL accredited SV Enviro Laboratories to carry-out Terrestrial & Marine Monitoring
III.	Borrow sites for each quarry sites for road construction material and dump sites must be identified keeping in view the following:	Being Complied. Present port is in operational phase.
	a. No excavation or dumping on private property is carried out without written consent of the owner.	No excavation or dumping on private property was carried out.

S.No	MoEF Stipulations	Compliance Status
	b. No excavation or dumping shall be allowed on wetlands, forest areas or other ecologically valuable or sensitive locations.	Complied. There is no existence of wetlands, other ecologically valuable or sensitive locations.
	c. Excavation work shall be done in close consultation with the Soil Conservation and Watershed Development Agencies working in the area, and	Complied during construction. Now port is in operational phase.
	d. Construction spoils including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such materials must be secured so that they shall not leach into the groundwater.	**Complied.** AKPL strictly ensures that no construction spoils, including bituminous materials and other hazardous wastes, contaminate surrounding water bodies or the environment through rigorous site-containment protocols.
IV.	The construction material shall be obtained only from approved quarries. In case new quarries are to be opened, specific approvals from the competent authority shall be obtained in this regard.	Complied. Now port is in operational phase.
V.	Adequate precautions shall be taken during transportation of the construction material so that it does not affect the environment adversely.	Complied. AKPL has implemented environmental control measures during the transportation of materials to prevent any adverse environmental impact.
VI.	Full support shall be extended to the officers of this Ministry / Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation and other environmental protection activities.	**Being Complied With.** Senior officials from the APPCB inspect AKPL on a half-yearly basis to independently audit compliance status under the Random Inspection of Industries framework. Throughout these inspection periods, AKPL extends complete cooperation to the visiting officials, facilitating thorough verification of the premises and promptly submitting all requested documentation.
VII.	Ministry of Environment & Forests or any other competent authority may stipulate any additional conditions or modify the existing ones, if in the interest of environment and the same shall be complied with.	Noted
VIII.	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.	Noted

IX.	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment and Forests.	**Noted.** • **Commitment to Re-referencing:** In the event of any future modification to the project profile or a change in the implementing agency, Adani Krishnapatnam Port Limited (AKPL) will proactively submit a fresh reference to the MoEF&CC for the amendment of clearance conditions. • **Optimized Land Utilization:** Out of the 3,064 acres of designated project area, the Project Proponent (PP) is utilizing only 2,273 acres for core port operations, leaving a significant portion unutilized. • **Marginal Layout Readjustments:** To streamline operations, the cargo stockpiles and berthing front were marginally readjusted; however, these adjustments remain strictly within the overall approved designated port boundary. • **Statutory Clearances & Correspondence:** o **APCZMA Clearance:** The Andhra Pradesh Coastal Zone Management Authority (APCZMA) accorded its No Objection Certificate (NOC) for these layout modifications vide letter dated **February 2, 2013**. o **GoAP Land Verification:** The Principal Secretary, Infrastructure & Investment (Ports), Government of Andhra Pradesh (GoAP), vide letter no. *916/P.II/2012-2* dated **March 28, 2013**, officially clarified the factual position regarding the land transferred on lease to the port. o **State Government Recommendation:** The Environment, Forests, Science & Technology (EFS&T) Department of GoAP subsequently addressed a communication to the MoEF&CC on **May 17, 2013**, recommending approval for the layout modifications.

		• **Current Regulatory Status:** Formal requests submitted by the port authorities vide letters dated **May 28, 2013**, and **July 9, 2013**, are currently under active consideration by the MoEF&CC.
X.	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.	Complied. Financial Closure was completed on 17.03.2009. Details were furnished to the MoEF&CC, Regional Office, Bangalore, Approval of the Project by GoAP: 04.08.2009 Start of Land Development 11.08. 2009.
XI.	Andhra Pradesh Pollution Control Board shall display a copy of the Clearance letter at the Regional Office, District Industries Centre and Collector's Office / Tehsildar's Office for 30 days.	Complied. APPCB has displayed the copy of Environmental Clearance at Regional Office, District Industries Centre and Collector's Office / Tehsildar's Office.
XII.	These stipulations would be enforced among others under the provisions of 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 condition.
XIII.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of, 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.	Complied. Statutory clearances are obtained for storage of Diesel from Chief Controller of Explosives (CCE), Fire Department, Civil Aviation Department, and Forest Conservation Act. **Copy of approvals attached as Annexure 8**
XIV.	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available wi th the Andhra Pradesh State Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in The advertisement should be made within 10 days from the date of	Complied. Advertisement was given in Two Local Newspapers viz., Deccan Chronicle dated 22.11.2009 and Andhra Jyothi dated 22.11.2009. A copy of the advertisement was sent to Regional Office, Bangalore of MoEF vide Letter No.KP/MOEF/PH.II/08 dated 18.01.2009.

	receipt of the Clearance letter and a copy of the same should be forwarded to the Regional Office of this Ministry at Bangalore.	
XV.	Environmental Clearance is subject to 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 project.	Noted the condition.
XVI.	Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.	Noted the condition.
XVII.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad / Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom 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.	Complied.
XVIII.	The proponent shall upload the status of compliance of 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 MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant level namely; SPM, RSPM, SO_2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the Company in the public domain.	Being complied. Submitting the NABL Accredited 3rd Party Compliance Reports for the period from April to September & respectively along with Terrestrial & Marine Monitoring reports to MoEF & CC on 30.05.2025. AKPL has established display at Zero point location at Main gate of the Company. **Copy of the Acknowledgements are attached as Annexure – 3.**
XIX.	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	Being complied. Submitting the 6 Monthly Self Certified & NABL Accredited 3rd Party Compliance Reports for the period from April to September & October to March respectively along with Terrestrial & Marine Monitoring reports to statutory bodies. **Copies of the Acknowledgements are attached as Annexure - 3**
XX.	The environmental statement for each financial year ending 31st March in Form-V as is mandated	**Being Complied With.**

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	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 MoEF by e-mail.	• **Environmental Statement Submission:** The annual Environmental Statement in **Form-V** is regularly compiled and submitted to the Andhra Pradesh Pollution Control Board (APPCB). • **Latest Submission Details:** The latest Form-V statement for the financial year 2024–25 was officially submitted on **July 16, 2025**. • **Supporting Evidence:** An acknowledgement copy of this submission is enclosed herewith as an **Annexure**. • **Public Disclosure:** In compliance with statutory requirements, the environmental clearance compliance status is actively hosted and publicly available on the company's official website at: https://www.adaniports.com/Downloads
Specific Conditions vide MoEF&CC order F.No. 11-62/2009-IA.III (Pt) dated 16.03.2016		
I.	Construction activity shall be carried out strictly according to the provision 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.	Being complied. No construction works other than those permitted in Coastal Regulation Zone Notification is being carried out in CRZ Area.
II.	All the recommendations and conditions specified by AP Coastal Zone Management Authority (APCZMA) vide letter o.3160/Env/CZMA/2014 dated 14.08.2014 shall be complied with.	Noted the condition & being complied.

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Compliance on the conditions stipulated in EC & CRZ Clearance (For Phase – 1)

Compliance on the conditions stipulated in EC & CRZ Clearance vide MoEF & EC Order No.10-22/2005-IA-III dated 26.07.2006. (For Phase – 1).

S. No	MoEF Stipulations	Compliance Status
(A)	**Specific Conditions**	
1.	All the conditions stipulated by Andhra Pradesh State Pollution Control Board in their letter Order No. APPCB/VJA/NLR/633/HO/2004/9/467, dated 25.05.2004 should be strictly implemented.	Complied The conditions stipulated by Andhra Pradesh State Pollution Control Board in their letter Order No. APPCB/VJA/NLR/633/HO/2004/9/467, dated 25.05.2004 are being complied with the conditions.
2.	Detailed plan for protection of the 9 acres of the mangroves should be provided.	Complied. ➢ Area was not handed over to port authorities so far. ➢ 9 Acres of mangroves are under protection. ➢ Display boards and fencing have been erected to protect the mangrove area. ➢ The Mangrove Mapping study was carried out by NIOT, Chennai in the year 2017-18, 2019 and reported that no adverse impacts observed on the existing mangroves. ➢ A latest study for Mangrove Mapping and carbon sequestration was carried out by Falcon Resilient Infra Consultants, Hyderabad in the month of October – 2024 and reported that no adverse impacts observed on mangroves.
3.	The fisherman and salt pan workers should be rehabilitated as per the Rules of Government of Andhra Pradesh.	Complied. ➢ Rehabilitation (R&R) of fishing villages was carried out by Government of Andhra Pradesh (GoAP) as per government norms. ➢ R&R package to displaced families and a Project Affected Families were implemented by the GoAP Vide letter No. 2736/P.I(1)/2007. ➢ Port have developed 500 houses in 2009 with the infrastructural facilities such as road, drainage, drinking water, hospital, school and old age home. **Copy attached as Annexure – 20.**

S. No	MoEF Stipulations	Compliance Status
4.	Adequate shore protection measures, including construction of revetments/rip-raps, should be taken up based on the scientific studies. The action plan for implementing the shore protection measures should be submitted to this Ministry within 6 months from the date of receipt of this letter.	Complied. ➢ Hydro dynamic studies were conducted by M/s. HR Wallingford, UK, ➢ Shore line monitoring & Marine biodiversity studies are being carried out regularly for shore protection. ➢ M/s. Indian National Centre for Ocean Information Services (INCOIS), Hyderabad has been monitoring using satellite imagery ➢ As per the INCOIS Report for the period October 2008 to January 2010, the coastline is found to be stable. ➢ Long time Shore line stability study was conducted by NIOT, Chennai in 2017-18, 2019. ➢ Based on this study report coastal line is found to be stable and "cause negligible impacts on the environment". ➢ AKPL appointed NIOT for shoreline stability study and same report as submitted on 16.04.225 to APPCB, RO Nellore with vide letter no. AKPL/EC/ENV/007/2025-26 dated 09.04.2025 and same is **attached as Annexure - 8.** ➢ And the same report was submitted to IRO Regional office, Vijayawada on 11.2.2025 through email.
5.	Green belt area should be developed along the project and budget earmarked.	Complied. Greenbelt developed as per the budget earmarked. For environment protection a provision of Rs. 2.25 Crores have been made forming part of Phase -I. ➢ At present green belt of 231.23 Ha (April'26) developed along the port boundary, around coal yards. ➢ Budget spent towards green belt area development for FY **23 -24 is 78.90 Lakhs &** FY **24-25 is 82.41 Lakhs. FY 25-26 164 Lakhs** ➢ List of the species planted Kadamba, Badam, Tabebuia argentea, Polyalthia longifoloa. Spathodea campanulata, Samanea saman, Mangifera indica, Psidium guava, Bougainvillea, Pheonix palm, Ixora chinensis rosea, Pendanus Veitchi, Cocos Nucifera, Allamanda nerifolia,

S. No	MoEF Stipulations	Compliance Status
		Bougainvillea Pedilanthus, Cassia fistula, Peltophorum, Cassia siamea, Delonix regia, Hibiscus rosa-sinensis, Clitoria ternatea, Casuarina Equisetifolia. ➢ Latest Greenbelt Drawing is attached **as Annexure - 1**
6.	For rail and road connectivity of the project, separate application should be submitted to this Ministry.	Noted & complied. The Roads and Buildings (R&B) Department, Government of Andhra Pradesh (GoAP)—the competent regulatory authority—accorded permission for rail and road connectivity vide Letter No. 182/K.P.Port/ATO/04 dated 22.07.2005. Consequently, GoAP developed a 23 km, 4-lane connectivity road from NH-16 to the Krishnapatnam Port, which features a feasible provision for future widening to 6 lanes. **Copy attached as Annexure – 21.**
7.	The Bay is reported to be calm for most of the days of the year. Even on the day of the visit, having a deep depression in South-West Bay of Bengal, the basin was calm, though the Bay experienced high waves. Hence, dredging operation in the estuary should not have any adverse impact on the existing mangroves blocks.	Being Complied. ➢ **Mangrove Mapping (NIOT):** Conducted by NIOT, Chennai during 2017–18 and 2019, confirming zero adverse impacts on existing mangrove ecosystems. ➢ **Impact-Free Dredging:** Executed strictly in a phased manner to guarantee zero disturbance to the surrounding mangrove habitats. ➢ **Compliance Verification (NCSCM):** Validated through follow-up studies by NCSCM in May 2022 and May 2023, confirming full environmental compliance. ➢ **Routine Environmental Monitoring:** Managed by NCSCM on a four-year cycle, tracking land, air quality, noise, water, marine ecology, sediment parameters, and mangroves. **Official Report Submission:** Filed with the APPCB Regional Office, Nellore, vide Letter No. AKPL/EC/APPCB/1252024-25 dated 09.01.2025 (Acknowledgement attached as **Annexure - 22**).
8.	During the rough weather, resulting in high flood tides, dredging operation in the estuary should be stopped.	Noted & Being Complied. ➢ No dredging activity is carried out during high flood tides & during rough weather conditions.

S. No	MoEF Stipulations	Compliance Status
9.	Regarding the location of stock yard in the salt pan area to be acquired, the proponent should not take up any developmental works in the mangrove area and should ensure that no destruction of mangroves takes place.	Noted & Being Complied The transfer of salt pan lands on a lease basis by the Government of Andhra Pradesh (GoAP) remains pending. Concurrently, the mangrove ecosystem has been left entirely undisturbed, with no developmental activities undertaken within the mangrove zones.
10.	A disaster management plan covering emergency evacuation mechanism etc., to deal with natural disaster events should be prepared and furnished to the Ministry.	Complied. ➢ DMP covering emergency evacuation mechanisms etc., to deal with natural disasters was prepared and submitted to the Ministry vide letter No. KP/MOEF/275 dated 11.07.2008 same as regularly updated. ➢ Latest DMP update copy submitted to District Magistrate office on 30.08.2024. ➢ The last update was on 30.08.2024 and submitted to Collector & District Magistrate and MoEF&CC along with six monthly compliance report vide letter No. AKPL/CORPORATEAFFAIRS/DMP/071/2024-25 on 30.05.2025. **Copy attached as Annexure – 18.**
11.	The company must take up and earmark adequate funds for the socio-economic development and for welfare measures in the area including drinking water supply, vocational training, and fishery	Complied ➢ Disaster Management Plan (DMP): A comprehensive DMP covering emergency evacuation mechanisms and natural disaster mitigation was originally submitted to the Ministry vide Letter No. KP/MOEF/275 dated 11.07.2008 and is updated regularly. ➢ District Administration Submission: The latest updated copy of the DMP was submitted to the District Magistrate's office on 30.08.2024. ➢ Statutory Compliance Filing: The final updated plan (dated 30.08.2024) was formally submitted to the Collector & District Magistrate and the MoEF&CC. This was enclosed with the six-monthly compliance report vide Letter No. AKPL/CORPORATEAFFAIRS/DMP/071/2024-25 on 30.05.2025 (Acknowledgement attached as **Annexure - 23**)
12.	The fishing activities by the fishermen living in the settlement along the creek should not be hindered and a mechanism may be	Being complied. ➢ The fisherman has been rehabilitated by the GoAP. Mechanism for the movement of fishing

S. No	MoEF Stipulations	Compliance Status
	evolved for the movement of fishing boats vis-a-vis shipping activities.	boats vis-à-vis shipping has evolved keeping in mind the safety, security, ISPS and customs requirements and is being followed to ensure no hindrance to fishermen. ➢ The fishing activities of the locals are not hindered. Movement of fishing boats during shipping activities is regulated for safety, security and customs requirement. Port authorities have addressed the matter. Traffic control guidelines formulated. These are communicated to port office vide dated 01.03.2010 for expediting the registration/ color coding of fishing boats and issuance of identity cards for fisherman.
13.	The Relocation of the fishermen and local communities in the area should be done strictly in accordance with the norms prescribed by the State Government. The relocated communities should be provided with all facilities including health care, education, sanitation and livelihood.	Complied. ➢ R&R package to the displaced families and a Project Affected Families were implemented by the GoAP. ➢ AKPL provided infrastructure facilities under CSR activities at the Rehabilitation Colony in the form of development of Roads, Drains, drinking water supply, supply of cooking gas, housing, educational assistance, student hostels, old age homes, financial aid, imparting vocational trainings, women empowerment and public health, Malaria Control measures, Medical and Health camps.
14.	The company should take up green belt program in the project area including an ecological park and the plan may be submitted to the Ministry within one year.	Status: Complied. The Greenbelt Development Plan was submitted to the Ministry of Environment, Forest and Climate Change (MoEF) vide Letter No. KP/MOEF/275, dated 11.07.2008. The current development status is detailed below: ➢ Phase I & II: AKPL developed 191.50 Ha of greenbelt. ➢ Phase III (Expansion): Developed 39.73 Ha to date. ➢ Total Progress: Cumulative greenbelt development covers 231.23 Ha (as of April 2026). ➢ Target Areas: Block plantations are established along the port boundary, including a 100-meter-wide coastal plantation, coal yard perimeter,

S. No	MoEF Stipulations	Compliance Status
		avenue plots, and internal road network medians. An Ecological Park has also been successfully developed. The latest Greenbelt Layout Drawing is attached as **Annexure – 1.**
15.	The company may suitably modify the alignment of channel entrance including its width, turning circle, taking into consideration the wave traversal, its intensity etc., to facilitate smoother navigation of ships.	Complied. ➢ The channel alignment for well-ordered ship navigation is designed based on navigation simulation studies dated March 2009 by M/s. HR Wallingford, UK.
16.	The breakwater alignment and its design should be further modified based on relevant model studies, borehole data etc., keeping in view the tranquility condition required for berthing and maneuvering of ships and subsequent cargo handling operations.	Complied. ➢ The alignment and design of breakwaters are firmed up based on geotechnical investigations, stability analysis, Numerical model studies undertaken by M/s. HR Wallingford, UK. ➢ 3D model studies of tranquility conducted at Lanka Hydraulic Laboratories, Sri Lanka and Physical model studies of breakwaters at IIT Chennai.
17.	The height of dumping in the dumping site should be restricted to 30 cm against 90 cm proposed.	Complied. ➢ The bathymetry of dumping site is being monitored periodically to avoid build up.
18.	The project proponent will not undertake any destruction of mangroves during construction and operation of the project.	Complied. ➢ Existing mangrove areas are being protected and conserved with suitable barricading, erection of display boards and ensuring the tidal flow exchange. ➢ Display boards and fencing have been arranged to protect the mangrove area. ➢ The Mangrove Mapping study was carried out by NIOT, Chennai in the year 2017-18, 2019 and reported that no adverse impact observed on the existing mangroves. ➢ A latest study for Mangrove Mapping and carbon sequestration was carried out by Falcon Resilient Infra Consultants, Hyderabad.
19.	Sewage arising in the port area should be disposed off through septic tank – soak pit system or should be treated along with the industrial effluents to conform to the	**Compliance Status:** Complied. **Infrastructure and Operation:** • **CVR Amenities Centre:** A 300 KLD Sewage Treatment Plant (STP) utilizing a Fluidized Bed

<table>
<tr><th>S. No</th><th>MoEF Stipulations</th><th>Compliance Status</th></tr>
<tr><td></td><td>standards stipulated by Andhra Pradesh Pollution Control Board and should be utilized/ re-cycled for gardening, plantation and irrigation.</td><td>Bio-Reactor (FBBR) system has been operational since July 2011.
• Port Premises: AKPL operates two additional STPs with capacities of 500 KLD and 40 KLD to treat the sewage generated within the port area.
• Wastewater Recycling: 100% of the treated wastewater from the STPs is recycled and utilized for greenbelt irrigation within the port premises.
Monitoring and Compliance:
• Water Quality: Treated water characteristics are periodically monitored and analysed by an MoEF&CC-recognized laboratory, M/s. SV Enviro Labs & Consultants.
• Regulatory Submissions: Analysis reports are regularly submitted to the Andhra Pradesh Pollution Control Board (APPCB), Regional Office, Nellore.
<table>
<tr><th>Month</th><th colspan="2">STP Treated water Quantity (KL)</th><th></th></tr>
<tr><th></th><th>Admin Building</th><th>CVR Complex</th><th>Total</th></tr>
<tr><td>OCT'25</td><td>401</td><td>3675</td><td>4076</td></tr>
<tr><td>NOV'25</td><td>264</td><td>3558</td><td>3822</td></tr>
<tr><td>DEC'25</td><td>324</td><td>3606</td><td>3930</td></tr>
<tr><td>JAN'26</td><td>203</td><td>3318</td><td>3521</td></tr>
<tr><td>FEB'26</td><td>217</td><td>3344</td><td>3561</td></tr>
<tr><td>MAR'26</td><td>186</td><td>4012</td><td>4198</td></tr>
</table>
</td></tr>
<tr><td>20.</td><td>Adequate plantation should be carried out along the roads of the Port premises and a green belt should be developed.</td><td>Compliance Status: Complied.
Development Progress:
Greenbelt development is executed as a continuous, routine process at AKPL. The cumulative development status up to April 2026 is as follows:
• Phase I & II: 191.50 Ha developed.
• Phase III (Expansion): 39.73 Ha developed to date.
• Total Greenbelt Area: 231.23 Ha completed.
Financial Investment (Greenbelt Development):
• FY 2023–24: ₹78.90 Lakhs
• FY 2024–25: ₹82.41 Lakhs
• FY 2025–26: ₹164.00 Lakhs
Manpower Deployment:</td></tr>
</table>

S. No	MoEF Stipulations	Compliance Status
		• A dedicated team of 150 local workers is employed full-time for the development, watering, and upkeep of the greenbelt. **Flora Diversity (Key Species Planted):** The plantation includes a diverse mix of local and adaptive species: • *Trees & Fruit-bearing:* Kadamba, Badam, Mango (*Mangifera indica*), Guava (*Psidium guajava*), Coconut (*Cocos nucifera*), Ashoka (*Polyalthia longifolia*), Rain Tree (*Samanea saman*). • *Flowering & Ornamental:* Tabebuia argentea, Spathodea campanulata, Bougainvillea, Ixora, Allamanda, Cassia fistula, Peltophorum, Gulmohar (*Delonix regia*), Hibiscus. • *Coastal & Hardy Species:* Casuarina Equisetifolia, Phoenix Palm, Pandanus. The updated Greenbelt Layout Drawing is enclosed as **Annexure – 1.**
21.	Project proponent should prepare and regularly update the Disaster Management Plan from time to time.	Complied. A comprehensive Disaster Management Plan (DMP) covering emergency evacuation mechanisms and protocols for handling natural disasters has been successfully prepared. Initial Submission: The baseline DMP was submitted to the Ministry of Environment, Forest and Climate Change (MoEF&CC) vide Letter No. KP/MOEF/275, dated 11.07.2008. Continuous Updates: The DMP is a live document that is systematically reviewed and updated periodically to maintain operational readiness. Recent Submission Timeline: District Administration Submission: The updated DMP copy was submitted to the Office of the District Magistrate on 30.08.2024. Latest Regulatory Submission: The latest revised DMP (updated as of August 2024) was formally submitted to both the Collector & District Magistrate and the MoEF&CC. This was enclosed with the Six-Monthly Compliance Report vide Letter

B S ENVI-TECH PVT. LTD.

<table>
<tr><th>S. No</th><th>MoEF Stipulations</th><th>Compliance Status</th></tr>
<tr><td></td><td></td><td>No. AKPL/CORPORATE AFFAIRS/DMP/071/2024-25, dated 30.05.2025.
Copy attached as Annexure -18.</td></tr>
<tr><td>22.</td><td>Fire Fighting arrangements are examined to the new proposal.</td><td>Complied.
➢ Port has developed dedicated firefighting system with required equipment and trained professionals.
➢ Developed Fire contingency plan and implemented the same.
➢ Port Tugs are also having firefighting equipment.
➢ AKPL has obtained Fire NOC from consent department for within the premises of the port.
➢ Copy of approvals are attached as Annexure - 4</td></tr>
<tr><td>23.</td><td>There should be no withdrawal of ground water in CRZ area, for this project. The proponent should ensure that as a result of the proposed constructions, ingress of saline water into ground water does not take place. Piezometers should be installed for regular monitoring for this purpose at appropriate locations on the project site.</td><td>Complied.
➢ There is no withdrawal of ground water in CRZ area.
➢ AKPL is meeting operational water requirement from Nakkala kalava irrigation drain & Muthukur reservoir.
➢ Piezometer (Automatic water level monitoring system including temperature monitoring) has been installed at port and regular monitoring being carried out with NABL Accredited Laboratory.
➢ Half yearly monitoring reports being submitted to MoEF&CC regional office.</td></tr>
<tr><td>24.</td><td>The project should not be commissioned till the requisite water supply and electricity to the project are provided by the PWD/Electricity Department.</td><td>Complied.
➢ Port has obtained required necessary permissions like water supply from water resources department AP and electrical supply permission from APSPDCL.</td></tr>
<tr><td>25.</td><td>Specific arrangements for rainwater harvesting should be made in the project design and the rainwater so harvested should be optimally utilized. Details in this regard should be furnished to this Ministry's Regional Office at Bangalore within 3 months.</td><td>Complied.
➢ Rainwater harvesting ponds and guard ponds have been developed with capacity of 1.63 lakh m^3 at various locations in Port premises.
<table>
<tr><th>Rainwater Harvesting Ponds</th><th>No. of Ponds</th><th>Capacity (Cubic Meter)</th></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>S. No</th><th>MoEF Stipulations</th><th>Compliance Status</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Northwest of the Port - Level crossing 2 (LC 2) Pond</td><td>2</td><td>8470</td></tr>
<tr><td>Coal yard Zone 5 Pond 1</td><td>2</td><td>3200</td></tr>
<tr><td>Coal yard Zone 4 Pond</td><td>1</td><td>2000</td></tr>
<tr><td>Coal yard Zone 6 Pond 1</td><td>2</td><td>60000</td></tr>
<tr><td>Zero Point Pond</td><td>1</td><td>150</td></tr>
<tr><td>Natural Pond NEC Road</td><td>1</td><td>70000</td></tr>
<tr><td>NEC 1 railway Siding pond</td><td>1</td><td>10500</td></tr>
<tr><td>Pond Opposite to Berth No. 8</td><td>1</td><td>10500</td></tr>
<tr><td>South Thamminapatnam CAAQM 2</td><td>1</td><td>2000</td></tr>
<tr><td>South port Thamminapatnam CAAQM 5</td><td>1</td><td>5000</td></tr>
<tr><td>Total</td><td>13No.s</td><td>163350</td></tr>
</table>
Details being submitted to authorities through Half yearly compliance reports. Latest submission on 24.11.2025.
</td></tr>
<tr><td>26.</td><td>The facilities to be constructed in the CRZ area as part of this project should be strictly in conformity with the provisions of the CRZ Notification, 1991 as amended subsequently.</td><td>Complied with CRZ conditions.
AKPL has ensured that all facilities constructed strictly conform to the provisions of the CRZ Notification, 1991 and its subsequent amendments.</td></tr>
<tr><td>27.</td><td>Green buffer zone should be provided all around the project area in consultation with local forest department and the report submitted to this Ministry's Regional Office at Bangalore.</td><td>Complied.
Plan Submission: The Green Development Plan, detailing the perimeter green buffer zone, was submitted to the Ministry's Regional Office (RO) in Bangalore on 11 July 2008 (Letter No. KP/MOEF/275).
Ongoing Implementation: Greenbelt development is an ongoing, systematic process at AKPL.
Current Coverage: As of April 2026, the established greenbelt covers an area of 231.23 hectares.</td></tr>
</table>

S. No	MoEF Stipulations	Compliance Status
		➢ **Species Diversity:** Planted species include *Kadamba, Badam, Tabebuia argentea, Polyalthia longifolia, Spathodea campanulata, Samanea saman, Mangifera indica, Psidium guajava, Bougainvillea, Phoenix palm, Ixora chinensis 'Rosea', Pandanus veitchii, Cocos nucifera, Allamanda nerifolia, Pedilanthus, Cassia fistula, Peltophorum, Cassia siamea, Delonix regia, Hibiscus rosa-sinensis, Clitoria ternatea,* and *Casuarina equisetifolia.* ➢ **Documentation:** The latest updated Green Belt Layout Drawing is attached for reference as **Annexure - 1.**
28.	No product other than those permissible in the Coastal Regulation Zone Notification, 1991 should be stored in the Coastal Regulation Zone area.	Noted and complied. AKPL abides with Coastal Regulation Zone Notification, 1991.
(B) General Conditions		
1.	Construction of the proposed structures should be undertaken meticulously conforming to the existing Central/local rules and regulations including Coastal Regulation Zone Notification 1991 & its amendments. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments / Agencies	Complied. ➢ The constructions designs /drawings are in conformity to the detailed project reports approved by GoAP and consistent with the CRZ Notification.
2.	Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc., should be ensured for construction workers during the construction phase of the project so as to avoid felling of trees/mangroves and pollution of water and the surroundings.	Complied. ➢ Adequate provisions including water supply, fuel and sanitation were ensured for workers at the time of construction. ➢ The construction of Phase-I development was completed on 01.09.2009 and commercial operations started on 20.03.2009 and commercial operations started after obtaining CTO from APPCB vide letter dated APPCB/VSP/VJA/NLR/633/CFO/HO/2009.

<table>
<tr><th>S. No</th><th>MoEF Stipulations</th><th>Compliance Status</th></tr>
<tr><td>3.</td><td>The project authorities must take necessary arrangements for disposal of solid wastes and for the treatment of effluents by providing a proper waste water treatment plant outside the CRZ area. The quality of treated effluents, solid wastes and noise level etc., must conform to the standards laid down by the competent authorities including the Central / State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.</td><td>Complied.
Solid waste has been collected, segregated and disposed of as below
<table>
<tr><th>S. No</th><th>Material</th><th>Methods of Disposal</th></tr>
<tr><td>1</td><td>Biodegradable waste</td><td>Canteen waste: Composting & used as manure/sand to pig-farms</td></tr>
<tr><td>2</td><td>Non-Biodegradable waste</td><td>Disposal to appropriate recyclers</td></tr>
<tr><td>3</td><td>Used Oils/Used Batteries</td><td>Used oil is being disposed of to APPCB Authorized vendors through APEMCL portal. Batteries are procured on buy back basis and</td></tr>
</table>

Operating 2 No. of STPs (1 X 500 KLD & 1 X 40 KLD) outside the CRZ area.
Appointed an NABL accredited agency to carry-out Terrestrial & Marine Monitoring and STP inlet & outlet sample analysis.
Submitting the report to APPCB on monthly basis & on Half-yearly basis to MoEF & CC.
Treated water is being used for Green Belt development.

<table>
<tr><th>Month</th><th colspan="2">STP Treated water Quantity (KL)</th><th></th></tr>
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<tr><td>MAR'26</td><td>186</td><td>4012</td><td>4198</td></tr>
</table></td></tr>
<tr><td>4.</td><td>The proponents should provide for a regular monitoring mechanism so as to ensure that the treated effluents conform to the prescribed standards. The records of analysis reports must be properly maintained and</td><td>Complied.

AKPL has been Operating 2 No. of STPs (1 X 500 KLD & 1 X 40 KLD) outside the CRZ area.
Environmental Monitoring is being carried out through an NABL accredited agency and
</td></tr>
</table>

<table>
<tr><th>S. No</th><th>MoEF Stipulations</th><th>Compliance Status</th></tr>
<tr><td></td><td>made available for inspection to the concerned State / Central officials during their visits.</td><td>approved by MoEF&CC. Results of monitoring conform to norms and periodical Monitoring Reports are being submitted to APPCB regularly.
➢ Treated water is being used for Green Belt development.

<table><tr><th>Month</th><th colspan="2">STP Treated water Quantity (KL)</th><th></th></tr><tr><th></th><th>Admin Building</th><th>CVR Complex</th><th>Total</th></tr><tr><td>OCT'25</td><td>401</td><td>3675</td><td>4076</td></tr><tr><td>NOV'25</td><td>264</td><td>3558</td><td>3822</td></tr><tr><td>DEC'25</td><td>324</td><td>3606</td><td>3930</td></tr><tr><td>JAN'26</td><td>203</td><td>3318</td><td>3521</td></tr><tr><td>FEB'26</td><td>217</td><td>3344</td><td>3561</td></tr><tr><td>MAR'26</td><td>186</td><td>4012</td><td>4198</td></tr></table>
➢ Records were being maintained and made available for statutory Authorities during their visits.
➢ Latest Monitoring report was submitted to APPCB in the Month of April'26. Copy Of same is attached as Annexure - 5</td></tr>
<tr><td>5.</td><td>In order to carry out the environmental monitoring during the operational phase of the project, the project authorities should provide an environmental laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental parameters.</td><td>Complied.
➢ AKPL appointed NABL accredited Laboratory of SV Enviro for environmental monitoring and reports are being submitted to statutory bodies.
➢ AKPL is having inhouse laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental parameters.
➢ Latest Monitoring report was submitted to APPCB in the Month of April'26. Copy Of same is attached as Annexure – 5.</td></tr>
<tr><td>6.</td><td>The sand dunes and mangroves, if any, on the site should not be disturbed in any way.</td><td>Noted and being Complied.
Display boards and fencing have been erected to protect the mangrove area.</td></tr>
<tr><td>7.</td><td>A copy of the clearance letter will be marked to the concerned Panchayat/local NGO, if any, from whom any suggestion/ representation has been received while processing the proposal.</td><td>Complied.
➢ Copies of Environmental Clearance letters were submitted to Sarpanch, Krishnapatnam Grama Panchayat, Nellore and to the President, Nellore</td></tr>
</table>

S. No	MoEF Stipulations	Compliance Status
		District Mechanized Fishing Boat Operators Association on 10.08.2006.
8.	The Andhra Pradesh Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's Office/Tehsildar's Office for 30 days.	Condition is Noted
9.	The funds earmarked for environment protection measures should be maintained, in a separate account and there should be no diversion of these funds for any other purpose. A year-wise expenditure on environmental safeguards should be reported to this Ministry's Regional Office at Bangalore and the State Pollution Control Board.	Complied ➢ The expenditure incurred for the environmental safeguards for the year 2009-2010 is Rs. 260 Lakhs and during the year 2010-2011 is Rs. 225 Lakhs. ➢ Environmental expenditure for the year 2011-12 is Rs. 416.40 Lakhs. The budget for 2012-13 is Rs. 598 Lakhs. ➢ The Funds & Expenditure earmarked for environment protection measures are being reported in Form – V Environmental Statement and Submitting the same to APPCB Annually. ➢ In FY 24-25 AKPL has spent Rs. 20.82 crores towards environment protection measures. ➢ Latest Form – V submitted on 16.07.2025 for FY 2024-2025.
10.	Full support should be extended to the officers of this Ministry's Regional Office at Bangalore and the officers of the Central and State Pollution Control Boards by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.	**Noted and complied with.** • **Regular Inspections:** Senior officials from the APPCB conduct bi-annual inspections at AKPL to verify compliance status under the Random Inspection of Industries scheme. • **Full Cooperation:** AKPL consistently extends complete cooperation to the visiting officials during these inspection periods. • **Data Verification:** All requested documentation, records, and evidence are promptly submitted to ensure a transparent verification process.
11.	In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance	Noted

S. No	MoEF Stipulations	Compliance Status
	conditions or imposition of new ones for ensuring environmental protection.	
12.	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	Noted
13.	The Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which should be complied with.	Noted
14.	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen at Website of the Ministry of Environment & Forests at http://www.envfornic.in.The advertisement should be made within 7 days from the date of issue of the clearance letter and a copy of the same should be forwarded to the Regional Office of this Ministry at Bangalore.	Complied. ➢ Advertisement was published in Local Newspaper Andhra Jyothi dated 11.08.2006. ➢ A copy of the advertisement was submitted to the Regional Office, Bangalore of MoEF vide Letter No.KP/MOEF/346 dated 23.08.2007.
15.	The project proponents should inform the Regional Office at Bangalore as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.	**Complied.** • Financial Closure: Completed on 16 October 2006. • Ministry Notification: Details were submitted to the MoEF&CC Regional Office, Bangalore, via Letter No. KP/MOEF/60 dated 16 February 2007. • GoAP Approval: The Government of Andhra Pradesh approved the project on 17 September 2004. • Project Commencement: Land development activities commenced in June 2006.
16.	The above mentioned stipulations will be enforced among others under the Water (Prevention and Control of Pollution) Act	Noted and being complied.

S. No	MoEF Stipulations	Compliance Status
	1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (protection) Act, 1986, the Hazardous Chemicals (Manufacture, Storage and Import) Rules, 1989, the Coastal Regulation Zone Notification, 1991 and its subsequent amendments and the Public Liability Insurance Act, 1991 and the Rules made there under from time to time. The project proponents should also ensure that the proposal complies with the provisions of the approved Coastal Zone Management Plan of Andhra Pradesh State and the Supreme Court's order dated 18th April, 1996 in the Writ Petition No.664 of 1993 to the extent the same are applicable to this proposal.	

Consent for Establishment (CFE) Order for Phase – III

Consent for Establishment (CFE) Order for Phase – III Order No: 633/APPCB/CFE/RO-NLR/HO/2010 Dt. 25.02.2021 and amended vide order dated 06.04.2021 and 16.07.2021.

<table>
<tr><th>S.No</th><th>Condition</th><th>Compliance Status</th></tr>
<tr><td>1.</td><td>The proponent shall obtain Consents for Operation (CFO) from APPCB, as required Under Sec.25/26 of the Water (P&C of P) Act, 1974 and under sec. 21/22 of the Air (P&C of P) Act, 1981, before commencement of the activity.</td><td>Complied.
Obtained CTO from APPCB vide Order No. APPCB/ VJA/ NLR/11344/CFO/HO/2019 11/11/2022, valid up to 31.08.2027</td></tr>
<tr><td>2</td><td>Compensation is to be paid for any environmental damage caused by it, as fixed by the Collector and District Magistrate as civil liability.</td><td>Noted.</td></tr>
<tr><td>3</td><td>The rules and regulations notified by Ministry of Law and Justice, GOI, regarding the Public Liability Insurance Act, 1991 shall be followed.</td><td>Noted.</td></tr>
<tr><td>4</td><td>Water:

The source of water is Muthukur Reservoir of 1000 KLD and 4 MLD of water from Nakkala kalava irrigation drain. The maximum permitted water consumption after proposed expansion is as following:

<table>
<tr><th>S. No.</th><th>Purpose</th><th>Qty as per CFO (Phase-1 & 2) (KLD)</th><th>Proposed in Expansion under Phase-III (KLD)</th><th>Total after expansion (KLD)</th></tr>
<tr><td>1.</td><td>Dust suppressions & other utilities</td><td>1600.0</td><td>1700</td><td>3300</td></tr>
<tr><td>2.</td><td>Gardening</td><td>300</td><td>200</td><td>500</td></tr>
<tr><td>3.</td><td>Domestic</td><td>600</td><td>600</td><td>1200</td></tr>
<tr><td></td><td>Total:</td><td>2500 KLD</td><td>2500 KLD</td><td>5000KLD</td></tr>
</table>
Separate meters with necessary pipeline shall be provided for assessing the quantity of water used for each of the purposes viz., Dust</td><td>Noted.
AKPL has laid a pipeline from Nakalakalva drain to Port along with pumping system having separate water flow meter to measure the quantity of water being pumped from the drain. The water is being used for dust suppression, firefighting etc.
• The consented source of water is from Muthukur Reservoir with a withdrawal quantity of 1000 KLD and 4 MLD of water from Nakkala kalava drain.
• AKPL is submitting the water consumption details to APPCB on monthly basis and Half-yearly basis to MoEF & CC.</td></tr>
</table>

<table>
<tr><td></td><td>suppression, Domestic purposes, Washing and servicing, development of greenery.</td><td></td></tr>
<tr><td>5</td><td>Wastewater generation

<table>
<tr><th>S.No.</th><th>Purpose</th><th>Qty as per CFO (Phase -1 & 2) (KLD)</th><th>Proposed in Expansion under Phase-III (KLD)</th><th>Total after expansion (KLD)</th></tr>
<tr><td>1</td><td>Other Utilities</td><td>-</td><td>240</td><td>240</td></tr>
<tr><td>2</td><td>Domestic</td><td>300</td><td>450</td><td>750</td></tr>
<tr><td></td><td>Total</td><td>300 KLD</td><td>690 KLD</td><td>990 KLD</td></tr>
</table>

Treatment & Disposal (As per EC order)

<table>
<tr><th>Source of effluent</th><th>Treatment</th><th>Mode of final disposal</th></tr>
<tr><td>Domestic</td><td>Sewage Treatment Plant of capacity of 700 KLD consisting of Sewage collection Sump, Fluidized Bed Bio Reactor, Secondary clarifier, Clarifier Water Tank, Dual Media Filter, treated water tank, Sludge drying beds etc.</td><td>Treated domestic effluents shall be utilized for Green belt development and dust suppression</td></tr>
<tr><td>Utilities</td><td>Effluent Treatment Plant of 300 KLD capacity consisting of Neutralization tank, Equalization tank, Oil Grease trap, flash mixing tank, clariflocculator, aeration tank, secondary clarifier, holding tank, pressure sand filter, activated carbon filter, sludge drying beds etc. for treating effluents</td><td>Treated effluent shall be reused for green belt and for dust suppression.</td></tr>
</table>
</td><td>AKPL has been operating

- 500 KLD STP (1 X 300 KLD & 1 X 200 KLD) at CVR Amenities Complex
- 40 KLD STP Admin. Building
Treated water being used to Green belt development.</td></tr>
</table>

<table>
<tr>
<td>6</td>
<td>The effluent / sewage shall be treated to the on land for irrigation standards, as stipulated under Schedule VI of Environment (Protection) Rules, 1986, notified by Ministry of Environment and Forests, Government of India vide G.S.R.422 (E), dt.19.05.1993 and its amendments thereof. The treated wastewater shall be used for development of greenery, dust suppression, and re-used for various purposes within the premises.</td>
<td>Noted.
AKPL has been operating
- 500 KLD STP (1 X 300 KLD & 1 X 200 KLD) at CVR Amenities Complex
- 40 KLD STP Admin. Building
- The treated water details for the last six months are as below:
<table><tr><th rowspan="2">Month</th><th colspan="2">STP Treated water Quantity (KL)</th><th></th></tr><tr><th>Admin Building</th><th>CVR Complex</th><th>Total</th></tr><tr><td>OCT'25</td><td>401</td><td>3675</td><td>4076</td></tr><tr><td>NOV'25</td><td>264</td><td>3558</td><td>3822</td></tr><tr><td>DEC'25</td><td>324</td><td>3606</td><td>3930</td></tr><tr><td>JAN'26</td><td>203</td><td>3318</td><td>3521</td></tr><tr><td>FEB'26</td><td>217</td><td>3344</td><td>3561</td></tr><tr><td>MAR'26</td><td>186</td><td>4012</td><td>4198</td></tr></table></td>
</tr>
<tr>
<td>7</td>
<td><u>Air:</u>
The Air pollution Control equipment shall be installed along with the commissioning of the activity and shall comply with the following for controlling air pollution:
<table><tr><td>S. No.</td><td>Details of stack</td><td>Stack 01</td></tr><tr><td>a)</td><td>Attached to</td><td>D.G. Sets</td></tr><tr><td>b)</td><td>Capacity of D.G. set</td><td>5 x 2000 KVA, 1 x 1000 KVA, 2 x 750 KVA, 5x 500 KVA, 3 x 320 KVA, 3 x 250 KVA, 3 x 160 KVA, 10 x 125 KVA, 10 x 82.5 KVA, 3 x 380 KVA</td></tr><tr><td>c)</td><td>Fuel</td><td>Diesel</td></tr><tr><td>d)</td><td>Stack height above the ground</td><td>This condition has been amended vide CFE order No: 633/APPCB/CFE/RO-NLR/HO/2010 dated 06.04.2021 The Port shall provide stack heights for the DG sets based on the following formula.</td></tr></table></td>
<td>Being complied.
As per the CPCB guidelines, Port has installed Retrofit Emission Control Device (RECDs) for Greater than 125 KVA DGs.
• The Port is being supplied with non-conventional source of energy through Power Grid for uninterrupted power supply. (M/s Atria wind power private limited.)
• The DG Sets are being operated as back up for emergency lighting & safety during power breakdowns.
• Retrofitting certification was carried out for the DG Sets.
The DG Sets are being monitored once in 6 months through a NABL Accredited 3rd Party and submitting the analysis reports the concerned departments.
DG Monitoring analysis reports are attached as Annexure 17</td>
</tr>
</table>

			H=h+0.2√KVA Where H= Total height of the stack in meters, h= Height of the building in meters.	
	e)	Details of air pollution control equipment	Acoustic enclosures with silencers	
8	The proponent shall comply with the following for controlling fugitive emissions: • Vehicle movement shall be minimized / eliminated by implementing mechanical operation. • All the vehicles involved in transportation of cargo shall be covered with tarpaulin. • Vehicles shall be managed to avoid traffic congestion and shall provide empty dusting vehicle washings / dry cleaning system to clean all outgoing cargo vehicles. • Based on traffic density/ vehicular movements anticipated from the port, parking facilities shall be provided.			**Complied.** - Mechanized loading and unloading of cargo shall be implemented to avoid emission from vehicle movement. - All the loaded trucks and wagons shall be covered with tarpaulins. - Provided mechanized ship loaders & unloaders and conveyer systems - Provided Water sprinkler system in ship unloaders and conveyer system for dust suppression. - Provided GI sheet covering for all transfer towers and Conveyor. - Provided MDSS with 272 Nos sprinklers at yards - Deployed 35 Nos. of Truck mounted sprinklers for roads and transit areas & stock piles. - Provided No. 3 heavy duty vacuum sweeping machines for cleaning the roads and jetty areas..
9	All the transfer points, loading / unloading points and conveyer systems shall be housed completely with leak proof arrangements. Adequate dust suppression and containment measures shall be implemented for effective control of fugitive emissions.			**Being complied.** All the existing transfer tower points have been covered using GI sheets with openings as required for access and sprinklers have been installed for dust suppression.
10	Hazardous / Solid Waste details: The Port Authority shall comply with the following w.r.t disposal of solid waste after expansion:			**Complied** All the hazardous waste generated by the Port are collected, stored, and disposed to authorized recyclers/re-processors.

S.No.	Name of Waste	Quantity	Mode of disposal
1	Solid waste (degradable)	1800 kg/day	To reuse green belt as manure for
2	Solid waste (Non-degradable)	200 kg/day	To authorized recyclers
3	STP sludge	120 kg/day	To be used as manure
4	ETP sludge	50 kg/day	To TSDF for secured land fill
5	Oil containing cargo residue washing water and sludge	250 KLPA	To authorized recyclers/ reprocessors / TSDF
6	Chemical containing residue and sludge	carg o 100 KLPA	
7	Sludge and filters contaminated with oil	200 TPA	
8	Ballast water containing oil from ships	250 KLPA	
9	Used/ Spent Oil	350 KLPA	
10	Wastes / residues containing oil	100 KLPA	
11	Sludge from treatment of waste water arising out of cleaning/ disposal of barrels/ containers	100 TPA	
12	Discarded containers/ barrels/	100 TPA	To authorized

E – Waste is being collected and disposed to SPCB authorized E-waste recyclers and submitting the details in Form – 3 to SPCB regularly

Hazardous waste (Waste oil) – AKPL is quantifying the waste oil and disposing to SPCB authorized Waste oil recyclers through APEMCL portal and submitting the details in Form – 4 to SPCB regularly

For the FY 25-26, E waste and Hazardous waste returns submitted on 30.04.2026.

B S ENVI-TECH PVT. LTD. * SEC-BAD-11 *

			liners contaminated with Haz. Waste/ chemicals		recyclers/ reprocessors / TSDF
		13	Flue gas cleaning residue	10 TPA	
		14	Chemical wast sludge from e water treatment	100 TPA	
		15	Oil and grease skimming residues	20 T PA	
11	The following rules and regulations notified by the MOE&F, GOI shall be implemented.				**Noted.** The port shall comply with rules and regulations notified by the MOE&F, GOI
	a.	Regulation of Persistent Organic Pollutants Rules, 2018.			
	b.	Hazardous waste and other wastes (Management and Transboundary Movement) Rules, 2016.			
	c.	Plastic Waste Management Rules, 2016.			
	d.	Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989			
	e.	Fly Ash Notification, 2016.			
	f.	Batteries (Management & Handling) Rules, 2010.			
	g.	E-Waste (Management) Rules, 2016.			
	h.	Construction and Demolition waste Management Rules, 2016.			
	i.	Solid Waste Management Rules, 2016.			
	j.	The Public Liability Insurance Act, 1991 and its amendments thereof.			
	Other Conditions:				
12	The Port shall comply with the following conditions as committed during the CFE Committee meeting held on 23.02.2021:				
	•	M/s. KPCL shall implement Mechanized MDDS systems for effective dust control. Water meters and energy meters shall be installed to record the quantity of water consumed and electricity consumed for MDSS systems.			**Noted.** Port installed and operating Mechanical Dust Suppression System (MDSS) with 272 Nos. of sprinklers at coal stacking and wagon loading areas. Separate Energy meters are installed to record the electricity consumption for MDSS.

	•	M/s. KPCL shall conduct performance evaluation of MDSS systems.	**Being complied.** Conducting periodical performance evaluation of MDSS system.
	•	M/s. KPCL shall explore the possibility of usage of Chemical suppressants such as Sodium / Potassium Aluminates, for effectively mitigating the dust emissions during coal / dusty cargo handling.	Port installed and operating Mechanical Dust Suppression System (MDSS) with 272 Nos. of sprinklers at coal stacking and wagon loading areas. Separate Energy meters are installed to record the electricity consumption for MDSS.
	•	M/s. KPCL shall restrict the coal stack height to 10 m only. In future, APPCB will examine the increase in stack height of dusting cargo from 10 m to 12 m depending upon the justification submitted by the port.	**Being Complied.** AKPL is strictly restricting stack height up to 10m only.
	•	This condition has been amended vide CFE order No: 633/APPCB/CFE/RO-NLR/HO/2010 dated 06.04.2021 The Govt. of A.P allotted surface water i.e., 1000 KLD from Muthukur Reservoir and 4MLD of water from Nakkalakalva irrigation waste water drain, which is sufficient to meet the total water requirement for port utilization for Phase-III. Further, Nellore Municipal Corporation commissioned one STP of 5 MLD capacity to treat municipal sewage. STPs of capacity 70 MLD are under construction. The Port shall explore possibility of utilization of treated waste water for dust suppression purpose in the Port area. The KPCL shall not draw the ground water under any circumstances.	Being Complied. • The consented source of water is from Muthukur Reservoir with a withdrawal quantity of 1000 KLD and 4 MLD of water from Nakkala kalava drain. • AKPL is collecting 1000 KLD of water from Muthukur Reservoir through tankers and Nakkala Kaluva water is through pipeline directly to Port. • AKPL is submitting the water consumption details to APPCB on monthly basis and Half-yearly basis to MoEF & CC. AKPL has obtained permission from GoAP and valid NOC dated 17.06.2025 from Ground water and water audit department for withdrawal of ground water in Non CRZ area.
	•	M/s. KPCL shall allow the effluents / leachate generated from dust suppression / coal handling etc., into sea under any circumstances. The garland drains, settling tanks shall be de-silted regularly for free flow.	The port shall not allow the run off water from coal storage yards and water from dust suppression to the sea. The run off water shall be diverted to sedimentation pits and water shall be used for green belt, dust suppression.
	•	Greenbelt of width 100 m shall be developed along the boundary of the port as committed in the public hearing (para no. 5 of EC order dt.11.01.2021) and as stipulated in	AKPL has already developed 191.5 Ha. greenbelt as per the statutory requirement (Phase-I&II) with boundary plantation, avenue plantation and coal

		the CFE order dt.08.05.2010. The greenbelt shall be developed in an area not less than 120 Ha along the Port boundary and around the coal storage areas with native species, as stipulated in EC order dt.11.01.2021. Saline water-resistant saplings shall be planted as Bay-of-Bengal is located in the vicinity.	stockyard plantation. As part of Phase-III, 39.73 Ha. Greenbelt developed along the Port boundary and around coal storage areas with native species. As of now, the greenbelt developed to an extent of 231.23 Ha Latest Green Belt drawing attached as **Annexure 1**
	•	The liquid cargo / chemicals shall be stored in the port area complying with OISD norms. All precautions shall be taken to prevent any chemical accidents. The chemicals stored in the port premises and their capacities shall be informed to the EE, RO: Nellore from time to time.	**Noted.** The Port shall inform the type of chemicals and their capacities to the Environment Engineer, APPCB Regional office, Nellore up on commissioning of the same after obtaining CFO.
	•	This condition has been amended vide CFE order No: 633/APPCB/CFE/RO NLR/HO/2010 dated 06.04.2021 The Port shall implement effective dust suppression measures to meet National Ambient Air Quality standards.	**Complied.** AKPL has implementing effective DSS measures to meet the Ambient Air Quality standards.
	•	This condition has been amended vide CFE order No: 633/APPCB/CFE/RO-NLR/HO/2010 dated 06.04.2021 The Port shall maintain and operate 3 nos. of CAAQM stations properly, consistently and transmit the data to the APPCB server, online.	**Complied.** Port installed and operating 3 nos. CAAQM station towards Chalivendram village, Thamminapatnam village and Krishnapatnam village, South side and north side of port All 3 No's CAAQM stations consistently and transmit the data to the APPCB server, online.
	•	The Coal stock yard shall be enclosed suitably to have three layers of green belt of varying height on all the sides.	**Being complied.** Maintaining 20-meter width greenbelt around the coal stack yard zones.
	•	Dusty cargos shall be handled through mechanized handling equipment for loading & unloading operations.	**Being complied** AKPL is handling all dusty cargos through mechanized handling equipment for loading & unloading operations.
	•	Closed conveyor belt with water sprinkling arrangement shall be provided for conveying dusty cargos like coal& iron ore.	**Complied** Provided closed hooded conveyor system along with water sprinkling arrangement for conveying dusty cargos like coal& iron ore.
	•	The ship un-loader for unloading and transfer of material shall be provided with in-situ water sprinkling system to avoid dust nuisance.	**Being complied** Provided closed hooded conveyor system along with water sprinkling arrangement for transfer of dusty cargos like coal & iron ore.

	•	Mechanical stackers cum reclaimers for staking transfer and reclamation and conveyors for transfer of materials without manual handling.	**complied.** Provided Mechanical stackers cum reclaimers for staking transfer and reclamation and conveyors for transfer of materials.
	•	Dry fogging system shall be provided at transfer points.	**Complied.** Mist spraying systems are provided at all transfer points.
	•	Automatic water sprinkling shall be provided at all dusty cargo stock yards. There shall be interlocking between the CAAQM station values for particulate matter and MDSS.	**Noted.** Mechanical dust suppression system is in place in the Port, the same shall be enhanced for the future expansion. Port shall also explore the possibilities of installing automatic water sprinkling system.
	•	The facility shall maintain standby centrifugal pump with drive motor for uninterrupted dust suppression of the cargo.	**Being Complied.** Provided standby centrifugal pump with drive motor for uninterrupted dust suppression of the cargo.
	•	The coal & iron ore shall be transported by rail from the stacking area as far as possible. The residual cargo if any shall be transported by road through covered trucks duly complying with the following measures:	Port is transporting coal to the nearby Power plants through closed conveyors, and to the steel plants and cement plants the coal is being transferred through rail with tarpaulin covers, only a small quantity of coal is being transferred through truck covered with tarpaulins.
		i. Traffic congestion shall be avoided.	**Being complied.**
		ii. Automated mechanical water sprinkling shall be provided on roads and at dusty cargo storage areas, for suppression of dust.	Presently AKPL has been deploying DSS Tankers for dust suppression on the roads.
		iii. All the vehicles involved in transportation of cargo during the break downs shall be covered with tarpaulin and also ensure to manage vehicles	**Being Complied.** Ensuring 100% Tarpaulin coverage to Coal Trucks on par with the cargo handling capacity.
		iv. The truck movement shall be through a dedicated road meant for truck movement located and avoid movement of trucks closer to residential areas.	**Noted.** Port has dedicated 4 lane road connecting NH-16 for truck movement.
		v. The trucks shall be fully covered with tarpaulin while plying with cargo on the roads.	**Being Complied.** Ensuring 100% Tarpaulin coverage to Coal Trucks on par with the cargo handling capacity.
		vi. All cargo vehicles moving out from the port shall be passed through vehicle wheel wash area.	Port has installed two number of wheel washing facility for out going trucks leaving the Port.

	•	The port shall provide oil spill containment facilities around the SBM.	Port has oil spill response equipment to combat any oil spill supported by Indian Coast Guard to contain, control and recover the oil spill.
	•	The port shall take necessary environmental protection measures for the dump yard of the dredged material.	**Being Complied.** We are taking necessary environmental protection measures for the dump yard of dredged material.
13	The industry shall comply with all the conditions stipulated in the EC order dt.11.01.2021 issued by MoEF & CC, GoI, New Delhi under Phase-III.		Noted and Being complied.
14	Fire detection and fire fighting facilities with adequate water storage facility shall be provided in fire prone area in consultation with competent authorities.		AKPL has adequate firefighting facilities with water storage facilities for the entire Port area. For Phase-III expansion, Port shall enhance the firefighting facility as required.
15	Onsite & offsite Disaster Management plan shall be prepared to meet any eventuality in case of any accident. Mock drills shall be conducted atleast twice a year and modifications required if any shall be incorporated in Disaster Management Plan and shall submit to Board.		**Noted.** Onsite emergency plan has been prepared and submitted to District Collector for incorporating with Offsite emergency plan of District magistrate. ➢ Latest DMP update copy submitted to District Magistrate office on 30.08.2024. Copy Attached as **Annexure 18** Latest OPR drill was conducted at the port on 16.02.2026. Copy attached as **Annexure-7**
16	The Port Authorities shall prepare a safety report and carry out an independent safety audit report of the respective industrial activities including chemical storages / isolated storages by an expert not associated with such industrial activity as required under Rule 10 of MSIHC Rules, 1989 and get it approved by the Factories Dept., and submit the compliance along with copy of the safety report, safety audit report and safety certificate at concerned Regional Office, APPCB.		**Being Complied.** AKPL is not storing any chemicals within the port premises.
17	The Port Authorities shall submit a copy of the NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) at concerned Regional Office, APPCB.		**Being Complied.** AKPL has obtained Fire NOC from consent department for within the premises of the port. Copy of approvals are attached as **Annexure 4**
18	The Port Authorities shall submit risk assessment report covering worst scenario clearly describing impact within the industry premises and outside the industry premises and emergency response system.		**Complied.** Onsite emergency plan has been prepared and submitted to District Collector for incorporating with Offsite emergency plan of District magistrate.

		➢ Latest DMP update copy submitted to District Magistrate office on 30.08.2024. ➢ Copy Attached as **Annexure 18**
19	The Port Authorities shall obtain prior permission from MoEF&CC, GoI and APPCB for any changes in the cargo type / capacity.	**Noted.**
20	DO levels in the sea water at the dredging area shall be monitored at regular interval and the dredging time shall be suitably regulated to prevent depletion of DO levels in the sea water.	**Being complied.** • Appointed an NABL accredited agency to carry out Terrestrial & Marine Monitoring and STP inlet & outlet sample analysis. Copy of the sample report for the month of April'26 is attached as **Annexure-5** • In addition, NCSCM is Monitoring the Land, Air quality, Noise, Water, Marine, Marine sediment parameters and mangroves, ones in four years.
21	The industry shall submit compliance to the conditions stipulated in the EC and CFE orders to the concerned Regional Officer of APPCB every six months and shall upload the same at APPCB website viz., https://pcb.ap.gov.in/UI/Submission_Compliance_of_EC_CFE_CFO_Direction.aspx.	**Complied.** Latest half yearly EC compliance report submitted on 24.11.2025. Copies of the Acknowledgements are attached as **Annexure-3**
22	Concealing the factual data or submission of false information/ fabricated data and failure to comply with any of the conditions mentioned in this order may result in withdrawal of this order and attract action under the provisions of relevant pollution control Acts.	**Noted.**
23	Notwithstanding anything contained in this conditional letter or consent, the Board hereby reserves its right and power Under Sec. 27(2) of Water (Prevention and Control of Pollution) Act, 1974 and Under Sec.21(4) of Air (Prevention and Control of Pollution) Act, 1981 to revoke the order, to review any or all the conditions imposed herein and to make such modifications as deemed fit and stipulate any additional conditions.	**Noted.**
24	Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh	**Noted.**

	Water Rules, 1976 and Air Rules,1982, to such authority (hereinafter referred to as the Appellate Authority) constituted under Section 28 of Water (Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air (Prevention and Control of Pollution) Act, 1981.	

Compliance Report on conditions stipulated in the Consent to Operation (CTO)

Adani Krishnapatnam Port Limited

Compliance Report on conditions stipulated in the Consent to Operation (CTO) Order of APPCB Dt. 11.11.2022

S No	CFO conditions	Compliance
Schedule – A		
1	Any up-set condition in any industrial plant / activity of the industry, which result in, increased effluent / emission discharge and/ or violation of standards stipulated in this order shall be informed to this Board, under intimation to the Collector and District Magistrate and take immediate action to bring down the discharge / emission below the limits.	AKPL will intimate the District Collector and District Magistrate and the Board with respect to any up-set condition.
2	The port should carryout analysis of wastewater discharges or emissions through chimneys for the parameters mentioned in this order on quarterly basis and submit to the Board.	AKPL is conducting monthly monitoring of environmental parameters through a NABL accredited laboratory. The results of the monitoring are submitted to the Board as Monthly Reports.
3	All the rules & regulations notified by Ministry of Law and Justice, Government of India regarding Public Liability Insurance Act, 1991 should be followed as applicable.	Condition is Noted, AKPL abide with Public Liability Insurance Act, 1991.
4	Notwithstanding anything contained in this consent order, the Board hereby reserves the right and powers to review / revoke any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Acts by the Board.	Noted
5	The industry shall ensure that there shall not be any change in the process technology, source & composition of raw materials and scope of working without prior approval from the Board.	Noted. AKPL will obtain the requisite statutory clearances if there is any material changes in its operation.
6	The applicant shall submit Environment statement in Form V before 30th September every year as per Rule No.14 of E (P) Rules, 1986 & amendments thereof.	AKP is regularly submitting the Form V to the Board. The latest Form V FY 2024-2025 was submitted on 16.07.2025.
7	The applicant should make applications through Online for renewal of Consent (under Water and Air Acts) and Authorization under HWM Rules at least 120 days before the date of expiry of this order, along with prescribed fee under Water and Air Acts and detailed compliance of CFO conditions for obtaining Consent & HW Authorization of the Board.	AKPL is applying as per CTO condition for renewal of the consents on the online portal. The latest CFO and HWA consent was obtained from APPCB on vide order No APPCB/VJA/ NLR/ 11344/CFO/HO/2019 dated 11.11.2022 valid up to 31st August 2027.
8	The port should immediately submit the revised application for consent to this Board in the event of any change in the raw material used, processes employed, quantity of trade effluents & quantity of emissions. Any change in the management	AKPL will obtain the necessary statutory clearances in case there is material change in the Port Operations from the Environment Clearance and Consents received.

<table>
<tr><td></td><td>shall be informed to the Board. The person authorized should not let out the premises / lend / sell / transfer their industrial premises without obtaining prior permission of the State Pollution Control Board.</td><td></td></tr>
<tr><td>9</td><td>Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules 1982, to Appellate authority constituted under Section 28 of the Water(Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air(Prevention and Control of Pollution) Act, 1981.</td><td>Noted</td></tr>
<tr><td>10</td><td>The conditions stipulated are without prejudice to the rights and contentions of this Board in any Hon'ble court of law.</td><td>Noted</td></tr>
<tr><td>11</td><td>The port shall be liable to pay Environmental Compensation / Other Environmental Taxes, if any environmental damage caused to the surroundings, as fixed by the Collector & District Magistrate or any other competent authority as per the Rules in vogue.</td><td>Noted</td></tr>
<tr><td>12</td><td>The port may explore the possibility of tapping the solar energy for their energy requirements.</td><td>AKPL is already meeting its 50% of power requirement through above mentioned renewable sources.
<table>
<tr><th>S.No</th><th>Source</th><th>Average Power consumption per month in (KWH)</th></tr>
<tr><td>1.</td><td>APSPDCL (Grid power)</td><td>29.10 Lakh units</td></tr>
<tr><td>2.</td><td>Renewable energy from AESL</td><td>5.4 Lakh Units</td></tr>
<tr><td>3.</td><td>Renewable energy from M/s Atria Power</td><td>25.50 Lakh Units</td></tr>
</table></td></tr>
<tr><td>13</td><td>The port should educate the workers and nearby public of possible accidents and remedial measures.</td><td>Being complied.
AKPL is providing periodical training and awareness campaign to educate the workers and</td></tr>
</table>

		nearby public of possible accidents and remedial measures. Photographs attached as **Annexure - 19**

S. No	Conditions	Compliance
	Schedule – B	
1.	The port shall complete mechanizing of Berth No.6 by 31st March 2023.	Complied. Mechanization of berth no 6 is completed in December 2022 and present in operation.
2.	The port shall complete the mechanization of Berth No. 5 within 24 months from the date when the coal handled at Berth No. 5 is adequate to handle through mechanization system. Till the mechanization is completed, the port shall do sprinkling along with MDSS to control dust pollution due to handling of coal.	Being Complied. Due to geopolitical situation at international level, crane delivery schedule is impacted/delayed. So, it impacted the overall completion milestone also. Mechanization of North Berth 5 shall be completed by November'2026. Mechanization work at Berth No. 5 is currently underway. To mitigate dust emissions during coal handling operations, mobile atomizers and water tankers are actively deployed. Additionally, the site is scaling up the use of water sprinklers and implementing necessary dust suppression measures to match cargo handling capacity and control vehicular emissions during cargo evacuation.
3.	The port shall maintain the existing greenbelt of 100m width along the periphery. Further, development of 100m green belt at other expansion areas shall be taken up at the time of expansion of the port facility and shall be completed within 3 years.	Being Complied. AKPL has planted 32765 No. s of saplings for the period of October'25 to March'26 in FY 2025-26. 100 meters width of greenbelt developed around the port periphery with native species.
4.	The port shall develop the 20m width greenbelt along the existing coal stock yards as per EC & CFO conditions within a time period of 2 years	Being Complied. 20 meters width of greenbelt developed around the coal stack yard zones.
5.	The port shall maintain storm water drains and improvement of the storm water drains in new areas shall be taken up along with the expansion of the port.	Storm water drains under pre-monsoon cleaning to ensure proper drainage. AKPL will extend the storm water drains in the new areas as part of the Phase III expansion plan
6.	The source of water is Muthukur Reservoir 1000 KLD and 4 MLD of water from Nakkala kalava irrigation drain. The maximum permitted water consumption after proposed expansion is as following:	During the period from October 2025 to March 2026, the port operated strictly within its permitted limits, with average daily water consumption tracking well below the consented quantities. ➢ **Water Consumption Summary (Oct '25 – Mar '26)** ➢ **Industrial (DSS):** Average **1,683.3 KLD** (Consent: 1,950 KLD)

S. No.	Purpose	Quantity
1.	Dust suppressions & Miscellaneous (Fire protection services)	1950.0 KLD
2.	Gardening	400.0 KLD

	3. Domestic: 650.0 KLD Total: 3000.0 KLD Separate meters with necessary pipe-line shall be maintained for assessing the quantity of water used for each of the purposes mentioned above.	➢ **Industrial (Gardening):** Average **278.7 KLD** (Consent: 400 KLD) ➢ **Domestic:** Average **626.8 KLD** (Consent: 650 KLD) ➢ **Sustainability & Waste Circularity Measures** ➢ **Water Recycling:** 100% of STP treated water is reused for greenbelt irrigation within the port. ➢ **Solid Waste Management:** Both STP sludge and organic waste from the on-site Food Waste Converter are processed into manure for nursery and greenbelt development.
7.	The port shall comply the following effluent discharge standards based on the disposal points permitted: **Outlet 1** **Parameter No. / Limiting Standards** pH: 6.50 – 9.00 Total Suspended Solids (TSS at 103 – 105°C): <100.00 mg/l Oil and Grease: 10.00 mg/l Biochemical Oxygen Demand (BOD 3 days at 27°C): 30.00 mg/l Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml: <1000 MPN/100 ml	AKPL has been operating - 500 KLD STP (1 X 300 KLD & 1 X 200 KLD) at CVR Amenities Complex - 40 KLD STP Admin. Building ➢ STP Treated water has been utilized for greenbelt development. ➢ The STP inlet & outlet water quality is being analyzed through NABL Accredited 3rd party agency monthly and the values are within the limited standards.
8.	The port shall comply with emission limits for DG sets of capacity up to 800 KW as per the Notification G.S.R.520 (E), dated 01.07.2003 and ~S.R.448(E), dated 12.07.2004 under the Environment (Protection) Act Rules. In case of DG sets of capacity more than 800 KW shall comply with emission limits as per the Notification G.S.R.489 (E), dated 09.07.2002 at serial no.96, under the Environment (Protection) Act, 1986	As per the CPCB guidelines, Port has installed Retrofit Emission Control Device (RECDs) for Greater than 125 KVA DGs. AKPL appointed an NABL Accredited Laboratory for Environment, Terrestrial & Marine Monitoring. DG stack Emission is being monitored by the third party once in 6 months and submitting reports of the same to Board. Last monitoring carried out on March'26 and analysis reports attached as **Annexure -17**
9.	The port shall comply with ambient air quality standards of PM10 (Particulate Matter size less than 10µ.m) - 100 µg/ m3; PM2.5 (Particulate Matter size less than 2.5 µm) - 60 l.ig/ m3; S02 - 80 µg/ m3; NOx - 80 l.ig/m3, outside the factory premises at the periphery of the industry. Standards for other parameters as mentioned in the National Ambient Air Quality Standards CPCB	Being complied. AKPL is operating 5 no. of Continuous Ambient Air Quality Monitoring stations at 1. CVR Amenities Complex, 2. Thamminapatnam Village 3. Krishnapatnam Village 4. North side of the Port 5. Sout side of the port

	Notification No.E-29016/20/90/PCI-I, dated 18.11.2009. Noise Levels: Day time (6 AM to 10 PM) - 75 dE (A) Night time (10 PM to 6 AM) - 70 dB (A)	Parameter of PM2.5, PM10, SO2, NOx, CO and NH3 and connected to APPCB website. AKPL appointed an NABL Accredited Laboratory for Environment, Terrestrial & Marine Monitoring. Noise level monitoring carried out in 7 locations same reports submitting monthly basis to APPCB RO Nellore.
10.	The Port shall take all measures including latest available technologies to comply with above ambient air quality standards	AKPL mitigates fugitive dust emissions through the following structured environmental management measures: Dust Suppression Infrastructure • Fixed Sprinklers: Operating a Mechanical Dust Suppression System (MDSS) with 272 sprinklers at coal stacking yards and wagon loading areas. • Mobile Sprinklers: Deploying 35 truck-mounted sprinklers for transit pathways and haul roads. • Misting Systems: Operating 4 heavy-duty atomized mist sprayers for targeted airborne dust control. • Unloading Controls: Utilizing designated hoppers during cargo unloading to prevent spill dispersion. Enclosures & Mechanization • Berth Mechanization: Automated coal handling across 3 designated berths (Berths 6, 7, and 8). • Conveyor Hoods: Enclosing all operational conveyor routing systems with protective covering hoods. • Transit Security: Enforcing 100% mandatory tarpaulin coverage for all cargo-loaded trucks and rail rakes. Mechanical Cleaning & Physical Barriers • Road Sweeping: Operating a cleaning fleet of 3 heavy-duty vacuum sweeping machines.

		• Wind Barriers: Erected a 450-metre structural wind-breaking shield on the western boundary facing Krishnapatnam village. • Greenbelt Development: Development of 231.23 hectares of ecological buffer zones along port boundaries, coal yards, and road medians.
11.	The Port shall not increase the capacity beyond the permitted capacity mentioned in this order, without obtaining CFE & CFO of the Board	Being Complied. AKPL handle permitted Commodities as per the CTO order.
12.	Coal stack heights in all coal yards shall not be more than 12mts.	Noted and being complied AKPL is maintaining coal stack height of less than 12 m
13.	The port shall ensure required wetness all the time on the surface of stockpiles to avoid the dust emissions from the stockpiles.	AKPL has been carrying out sprinkling around the stockpiles and operating MDSS.
14.	The port shall install sufficient number of CAAQM stations in between the villages and the port area. The stations shall be located at the periphery of the villages to monitor all the parameters given in the consent order.	Complied. AKPL is operating 5 no. of Continuous Ambient Air Quality Monitoring stations at 1. CVR Amenities Complex, 2. Thamminapatnam Village 3. Krishnapatnam Village 4. North side of the Port 5. Sout side of the port CAAQMS data consistently configured to APPCB server.
15.	The port shall maintain properly the three CAAQM stations provided and shall be connected to APPCB website.	Complied. In addition to the 3 CAAQMS, AKPL provided additional 2 CAAQMS in the month of June'25. All 5 stations are connected to APPCB server. Latest Calibration performed on October 2025 April 2026.
16.	Unloading of iron ore from the railway wagons house should be carried out with wagon tipplers only, in case, handling of iron ore is more than 6 MTPA. As and when iron ore handling is to be done intermittently, it should be handled with water sprinkling system at high pressure with swiveling type nozzles operated regularly to cover entire stockpile. Nozzles shall be operated along stockpile at	Noted and being complied AKPL has been carrying out sprinkling around the stockpiles and operating MDSS during handling of Iron ore.

	regular Intervals to cover stockpile height and width.	
17.	The port shall take adequate air pollution control measures with respect to the enhanced dusty materials handling capacities	Being Complied. Engaged 35 Nos. of Truck mounted sprinkler tankers for water sprinkling on roads and transit areas to control dust emissions.
18.	The port shall stock all the dusty materials within the designated storage yards only.	Being Complied All the dusty cargos have been stored in Designated storage yards only.
19.	The port activities are concentrating in north quay by construction of 12th Berth, hence the stocking of dusty materials shall not be extended towards the residential areas around the port area.	Noted for compliance. We will not be extending dusty materials stocking towards the residential areas.
20.	The dusty materials transporting vehicles shall be closed in all respects/ covered with tarpaulin for controlling fugitive emissions	Being Complied. Provided 27 No. of Truck tarpaulin covering stations and ensuring all the outgoing cargo vehicles are properly covered with tarpaulin and tightened with rope to control fugitive emissions and transit spillages.
21.	The port shall provide wheel washing facility near the dusty cargo stocking area, to the freighted vehicles going outside the port.	Complied. Operating 2 No. of Truck wheel washing facilities and ensuring the outgoing trucks are cleaned properly before leaving the premises. i. One facility at Southern side ii. One facility at North side of the Port.
22.	The port shall inform the modifications made in port infrastructure developments to the MoEF&CC and to the Board time to time.	Being complied. AKPL will inform to MoEFCC and APPCB regarding any modifications in port infrastructure developments.
23.	The port shall obtain EC for any change of scope of the project and shall restrict the port activities as permitted vide EC Orders Dt.26.07.2006 for Phase - I, 13.11.2009 for Phase - II & Phase-III (Expansion) 11.01.2021	Being complied. All the facilities as envisaged under Phase III expansion have not been completed.
24.	The port shall continuously operate the 3 CAAQM stations installed in between villages and port area to monitor all the parameters given in the consent order and upload the data continuously to the APPCB / CPCB websites.	Complied. AKPL is operating 5 No's of Continuous Ambient Air Quality Monitoring stations at 1. CVR Amenities Complex, 2. Thamminapatnam Village 3. Krishnapatnam Village 4. North side of the Port 5. Sout side of the port CAAQMS data consistently configured to APPCB server.

25.	The MDSS system shall be in operation wherever the stock of any bulk material (Dusty cargo) is piled in a way to ensure wetness on the surface of stockpiles.	Being Complied. Water sprinklers are arranged all the stock yards and operated for maintaining wetness to control dust emission.
26.	As regards to deviation in location of facilities such as stockpiles and other facilities, from the originally envisaged plan, amendments for the EC and CFE have to be obtained immediately.	AKPL will follow the statutory guidelines and obtain amendments in case of any deviation in the original plan.
27.	The port shall maintain the existing green belt with adequate width and density and in vacant places	Complied. AKPL has Developed 231.23 Ha of Green belt along port boundary, around coal yards, avenue& median plantations.
28.	The port shall use road sweeping machines to clean all port internal roads regularly.	Being Complied. AKPL has been operating 3 no. of heavy-duty Vacuum Sweeping machines to clean all port internal roads regularly.
29.	The port shall ensure that the trucks transporting cargos to outside the port shall be covered with tarpaulin to avoid fugitive emissions / spillages.	Being complied. Provided 27 No. of Truck tarpaulin covering stations and ensuring all the outgoing cargo vehicles are properly covered with tarpaulin and tightened with rope to control fugitive emissions and transit spillages.
30.	All conveyor belts and other transfer points shall be covered with GI sheets to mitigate fugitive emissions generated during conveying of dusty cargos.	Complied Provided GI Sheet cladding for conveyors and transfer points along with sprinklers system to control fugitive emissions.
31.	The port shall maintain water sprinklers for effective control of fugitive emissions generated during handling of cargo and increased volume of vehicular traffic.	Complied. Engaged 35 Nos. of Truck mounted sprinkler tankers for water sprinkling on roads and transit areas to control dust emissions.
32.	The port shall maintain Mechanical Dust Suppression System (MDSS) for stock yards, dusty cargo berths and conveyor belts.	Maintaining Mechanical Dust Suppression System (MDSS) for stock yards, dusty cargo berths and conveyor belts.
33.	The port shall develop and maintain 100 m width greenbelt along the periphery & 20m width around coal stack yards as per EC / CFE condition.	Being complied. AKPL has developed and maintained 100 m width greenbelt along the periphery & 20m width around coal stack yard zones as per EC / CFE condition.
34.	The port shall maintain empty dusty cargo vehicles washing system to clean dusty cargo empty vehicles.	Noted
35.	The port shall record the energy consumption for the energy meters provided for Sewage Treatment Plant (STP), pump houses to water sprinklers / dust suppression measures and Air Pollution Control Equipment's (APCE)	Being complied. AKPL has been recording and maintaining the energy consumption for the energy meters provided for Sewage Treatment Plant (STP), pump houses to water sprinklers / dust suppression

		measures.
36.	The port shall not allow any hazardous wastes through the port other than waste oil from DG Set, Waste oil from Ship, Wastes / residues containing oil from ships, used oil generated in the Port without prior permission of Board and shall comply with EC conditions.	Being Complied. Hazardous waste generated in port premises is being disposed through APEMCL portal.
37.	The port shall not store any hazardous waste within the premises as per the time frame mentioned in HWM Rules	Being followed. AKPL is not storing any hazardous waste within the premises as per the time frame mentioned in HWM Rules.
38.	In case a leaky container of hazardous cargo is found, a separate permission of the Board may be obtained after establishing the quality and the type of waste for disposal	Noted and being complied.
39.	All types of the fertilizers should be stored in the closed warehouses only. The Port should ensure that there should not be any open storage of urea or any other fertilizer materials. There shall not be any effluent generation	Complied. Provided closed sheds to store the fertilizers.
40.	The port shall store fuel oils used for construction equipment, vessels and vehicles in a well-designed manner and protect them against fire hazards by construction of compound wall to prevent access to unauthorized elements. The surface run off from storage area shall pass through oil water separator before being discharged.	Complied AKPL is strictly implementing all safety measures and ensuring to avoid access to unauthorized elements. The entire port area is secured with compound wall, and 24/7 Security camera system.
41.	The port shall provide fire detection and firefighting facilities with adequate water storage in fire prone areas in consultation with Directorate of firefighting.	Complied. Port is equipped with Fire fighting and detection facilities. Infrastructure like trained Fire Team, Fire Tenders (Multi purpose Fire Tender), semi fire tender etc., available at Port. Fire NOC has been obtained for Buildings (Admin and ETS).
42.	The port shall comply latest technologies for controlling fugitive emissions including the following: a) Fully mechanized handling equipment for loading and unloading operations b) Closed conveyor belt with water sprinkling arrangement for suppression of dust while conveying dusty cargoes like coal, iron ore etc.	Complied. a. Provided coal ship unloaders and conveyor at berths 6,7 & 8 b. Provided water sprinkling system in ship unloaders and conveyor system for dust suppression c. Provided Mechanical water sprinkling at coal storage yard and tankers to suppress the dust.

	c) Specially designed iron ore ship loader with necessary precautions to reduce drop height of iron ore into the ship, while handling more than 6 Million Tons per annum. d) Mechanical water sprinkling shall be provided on roads and at dusty cargo storage areas for suppression of dust.	
43.	The port shall maintain adequate number of ground water monitoring location on scientific basis and the same shall be monitored every six months	Being Complied. There is no ground water withdrawal within the port premises. AKPL appointed a NABL Accredited Laboratory to monitor the Ground water at 4 locations outside the port. Six monthly reports are being regularly submitted to APPCB.
44.	The port shall construct the storm water drains to avoid the contamination of runoff with other effluents.	Being Complied. Storm water drains are being maintained periodically and during monsoon season.
45.	The port shall regularly clean the drains to avoid siltation.	Being complied. All the drains established within the port premises are being cleaned on periodic intervals to ensure free flow of storm water.
46.	The port shall monitor compliance through Environment Management Cell with qualified and trained staff.	Complied AKPL has established dedicated Environment Management Cell with qualified and trained staff to monitor compliance.
47.	The port shall maintain onsite emergency action plan after carrying out risk analysis and hazop studies	Complied Emergency action Plan was prepared based on risk analysis and HAZOP studies.
48.	The port shall comply with the conditions of CFE order dated 08.05.2010, 22.02.2018 and 25.2.2021.	Being complied. AKPL is complying with all conditions of CFE order dated 08.05.2010, 22.02.2018 and 25.2.2021.
49.	The port shall submit monthly monitoring reports to RO: Nellore	Being submitted on a monthly basis. Latest submission on 19.05.2026.
50.	The port shall comply with standards and directions issued by APPCB / CPCB / MoEF&CC as and when notifications are issued from time to time	Being complied. AKPL is complying with all directions issued by APPCB / CPCB / MoEF&CC.
51.	The port shall install digital display boards at publicly visible places at the main gate indicating the products manufactured Vs permitted quantities, treated effluent concentrations Vs discharge standards, Stack emission & AAQ concentrations Vs standards, hazardous waste generation, disposed, stock	Provided. AKPL has installed digital display board at publicly visible place at the zero point gate.

	Vs permitted quantities and validity of CFO; and exhibit the CFO order at a prominent place in the factory premises, as per Hon'ble Supreme Court order	
52.	The port shall submit Half yearly compliance reports to all the stipulated conditions in Environmental Clearance (EC), Consent for Establishment (CFE) and Consent for Operation (CFO) through website i.e., https://pcb.ap.gov.in by 1st of January and 1st July of every year. The first half yearly compliance reports shall be furnished by the port and second half yearly compliance reports shall be the audited through MoEF&CC recognized and National Accreditation Board for Laboratory Testing (NABL) accredited third party	Complied. AKPL submitted the self-certified compliance report for Environmental Clearance (EC), Consent to Establish (CTE), and Consent to Operate (CTO) covering April 2025 to September 2025. The report was emailed to the APPCB and CPCB, and uploaded to the Parivesh and APPCB portals on 24 November 2025. AKPL submitted the NABL-certified compliance report for EC, CTE, and CTO covering October 2024 to March 2025. The report was emailed to the APPCB and CPCB, and uploaded to the Parivesh and APPCB portals on 30 May 2025.
53.	The port shall possess valid NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) and submit a copy at concerned Regional Office, APPCB.	Complied. Fire NOC has been obtained for Buildings (Admin and ETS 1 & 2). Copy of approvals are attached as Annexure
54.	The port shall prepare a safety report and carry out an independent safety audit report of the respective industrial activities including chemical storages / isolated storages by an expert not associated with such industrial activity as required under Rule 10 of MSIHC Rules, 1989 and get it approved by the Factories Dept., and submit the compliance along with copy of the safety report, safety audit report and safety certificate at concerned Regional Office, APPCB.	Complied AKPL is not storing any Hazardous chemicals within the premises.
55.	The port shall extend training to the working personnel for the prevention of accidents and necessary antidotes to ensure safety, as per the MSIHC Rules, 1989.	Being Complied. AKPL is conduct in periodical training to the working personnel for the prevention of accidents and necessary antidotes to ensure safety.
56.	The port shall carryout calibration of safety equipment and leak detection systems at regular intervals and shall certify the same with the Factories Department. That certified copy shall be submitted to the APPCB, R & O.	Being complied. AKPL implements periodic calibration of safety equipment and leak detection systems.
57.	The port shall install fluorescent Wind Vane at the highest point in the port premises	Complied Fluorescent Wind Vane Installed in Port premises.
58.	The port shall submit Risk analysis and risk assessment covering worst scenario clearly describing impact within the port premises	Complied. DMP covering emergency evacuation mechanisms etc. to deal with natural disasters

	and outside the port premises and emergency response system.	was prepared. The last update was on 30.08.2024 and submitted to Collector & District Magistrate and MoEF&CC along with six monthly compliance report vide letter No. AKPL/CORPORATEAFFAIRS/DMP/071/2024-25 on 30.05.2025. Acknd copy is attached as **Annexure - 18**
59.	The port shall submit the copy of the safety audit report and On-Site / Off Site Emergency Plans as applicable after being certified by the Factories Department to the APPCB, Regional Office from time to time, if the storage quantity of hazardous chemicals is equal to or, in excess of the threshold quantities specified in schedule 2 & 3 of MSIHC Rules, 1989.	Complied. AKPL is not storing any Hazardous chemicals within the Port premises.

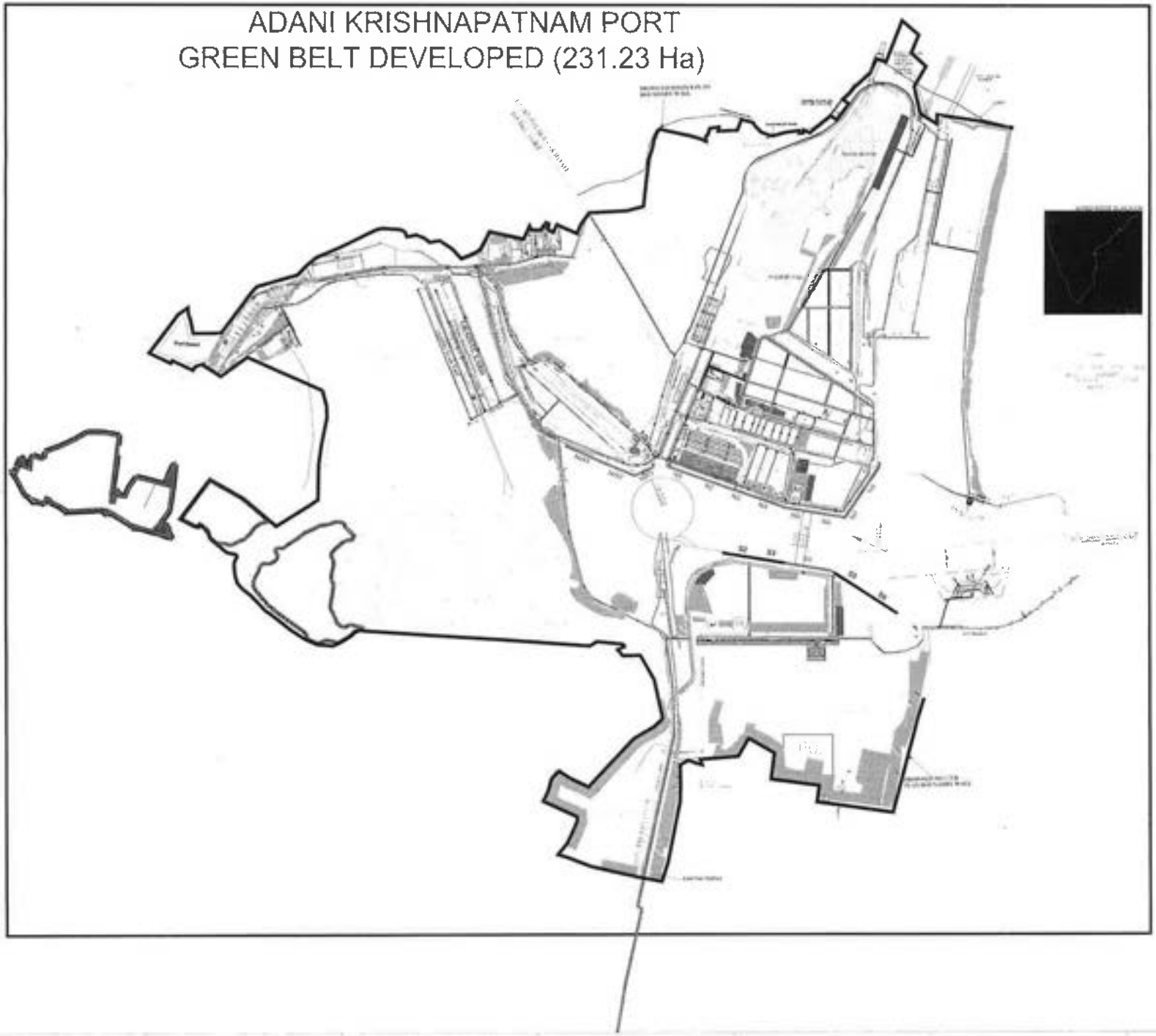
Schedule C		
1	The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.	Condition Noted, AKPL has nominated an Authorised Person to comply with Environment (Protection) Act, 1986, and the rules made there under.
2	The authorization or its renewal shall be produced for inspection at the request of an officer authorized by the State Pollution Control Board.	AKPL will provide the Authorization during inspection
3	The person authorized shall not rent, lend, sell, transfer, or otherwise transport the Hazardous and other wastes except what is permitted through this authorization.	Condition Noted AKPL will not rent, lend, sell, transfer, or otherwise transport the Hazardous and other wastes.
4	Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall con .stitute a breach of his authorization	Condition Noted, AKPL abide with this condition.
5	The person authorized shall implement Emergency Response Procedure (ERP) for which this authorization is being granted considering all site-specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time;	Complied. DMP covering emergency evacuation mechanisms etc., to deal with natural disasters was prepared. The last update was on 30.08.2024 and submitted to Collector & District Magistrate and MoEF&CC along with six monthly compliance report vide letter No. AKPL/CORPORATE AFFAIRS/DMP/071/2024-25 on 30.05.2025. Acknd copy is attached as **Annexure - 18**
6	The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing	Condition Noted, AKPL abide with Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental

	Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty".	Damages due to Handling and Disposal of Hazardous Waste and Penalty".
7	It is the duty of the authorized person to take prior permission of the State Pollution Control Board to close the facility.	Condition Noted,
8	An application for the renewal of an authorization shall be made as laid down under these Rules.	Condition noted.
9	Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.	Condition noted.
Specific conditions		
10	The port shall comply with the provisions of HWM Rules, 2016 in terms of interstate transport of Hazardous Waste and manifest document prescribed Under Rule 18 and 19 of the HWM Rules, 2016.	Condition Noted, AKPL abide with HWM Rules, 2016 in terms of interstate transport of Hazardous Waste and manifest document prescribed Under Rule 18 and 19 of the HWM Rules, 2016
11	The port shall not store hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.	Condition Noted, AKPL is not storing hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.
12	The port shall store Used / Waste Oil and Used Lead Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.	Complied. Form – 8 – Used Batteries Returns – Annual Statement for the FY 2025 – 2026.
13	The industry shall transport the hazardous waste to cement industries only through vehicle fitted with GPS tracking system.	Complied. AKPL is ensuring all hazardous waste vehicles with GPS tracking system to transport hazardous waste.
14	The industry shall maintain 7 copy manifest system for transportation of waste generated and a copy shall be submitted to concern Regional Office of APPCB. The driver who transports Hazardous Waste should be well acquainted about the procedure to be followed in case of an emergency during transit. The transporter should carry a Transport Emergency (TREM) Card	Being complied Waste oil generating from the port is being disposed of through APEMCL Portal authorized vendors

15	The industry shall maintain proper records for Hazardous and Other Wastes stated in Authorization in Form-3 i.e., quantity of Incinerable waste, land disposal waste, recyclable waste etc., and file annual returns in Form-4 as per Rule 20 (2) of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.	Complied. The following annual returns were submitted at APPCB, RO, SPSR Nellore on 30.04.2026 1. Form – 3 – E – Waste Annual Statement for the FY 2025 – 2026. 2. Form – 4 – Hazardous Waste Annual Statement for the FY 2025 – 2026. 3. Form – 8 – Used Batteries Returns – Annual Statement for the FY 2025 – 2026.
16.	Annual return shall be filed by June 30th for the period ensuring 31st March of the year.	Complied. The following annual returns were submitted at APPCB, RO, SPSR Nellore on 29.04.2025 1. Form – 3 – E – Waste Annual Statement for the FY 2025 – 2026. 2. Form – 4 – Hazardous Waste Annual Statement for the FY 2025 – 2026. 3. Form – 8 – Used Batteries Returns – Annual Statement for the FY 2025 – 2026.

ANNEXURES

ADANI KRISHNAPATNAM PORT
GREEN BELT DEVELOPED (231.23 Ha)



ANNEXURE-1

PORT BOUNDARY

COMPLETED

GREEN BELT

MANGROVES

NOT SUTABLE FOR AREA

BALANCE AREA

AS ON APRIL -2026

NO.	DATE	DESCRIPTION	CHKD	APPD
		ADANI KRISHNAPATNAM PORT LIMITED MUTHUKUR MANDAL SPSR NELLORE A.P. INDIA		DATE
PROJECT		PHASE - III DEVELOPMENT OF ADANI KRISHNAPATNAM PORT		DRN
TITLE		A.K.P. GREEN BELT LAYOUT		CHECKED APPROVED QA
DWG NO		KP-GN-14	REV NO 0	SCALE

adani
Ports and Logistics

o/c
Annexure- II

Ref. No. AKPL/EC/ENV/126/2024-25 **Date: 09.01.2025**

To

Ramakrishna, IFS,
CCF & Member Secretary,
AP State Biodiversity Board,
Nagarjuna Nagar, Nagarjuna University, NH-5,
Guntur District, Andhra Pradesh.

Dear Sir,

Sub:- Adani Krishnapatnam Port Limited (AKPL) – Complying with Phase III expansion of EC & CRZ clearance Condition No. VIII under Marine ecology stipulates – Submission of Marine Biodiversity Management Plan- Reg.

Ref:- EC & CRZ Clearance Order No.10-18/2016-IA-III dated 11.01.2021 accorded to AKPL by the Ministry of Environment, Forests & Climate Changes, New Delhi.

@@@

We submit that Adani Krishnapatnam Port Limited (AKPL) is an operational port located at Krishnapatnam (P), Muthukur (M), SPSR Nellore District.

The Ministry of Environment, Forests & Climate Changes, New Delhi has accorded Environmental & CRZ Clearance to AKPL vide reference cited above for the development of Port under Phase – III (Copy of the EC & CRZ Clearance is attached herewith for your kind reference).

As per the EC & CRZ Condition No. VIII under Marine ecology stipulates that:
"A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water and freshwater ecology and biodiversity and submitted to and implemented to the satisfaction of the State Biodiversity Board and the CRZ authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities,

Adani Krishnapatnam Port Ltd
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
Andhra Pradesh, India
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Fax +91 861 237 7046
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molluscs, sea grasses, sea weeds, sub-tidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography."

Complying with the above conditions, a study on Comprehensive Biodiversity Assessment, Impact Assessment and Management Plan was prepared through M/s. Suganthi Devadason Marine Research Institute (SDMRI). As per the MoEF & CC, EC & CRZ Clearance.

We, therefore submit herewith the study report to comply with the EC & CRZ Clearance stipulated condition.

Thanking You,

Yours Faithfully,
For **M/s Adani Krishnapatnam Port Limited**,

(Authorized Signatory)

Encl: a/a

Cc:
Environment Engineer,
A.P Pollution control Board,
Regional Office, SPSR Nellore.
Andhra Pradesh.

Adani Krishnapatnam Port Ltd
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
Andhra Pradesh, India
CIN: U45203AP1996PLC023529

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Annexure - III

Your (Half Yearly Compliance Report) has been Submitted with following details

Proposal No	IA/AP/MIS/566/2009
Compliance ID	134073212
Compliance Number(For Tracking)	EC/M/COMPLIANCE/134073212/2025
Reporting Year	2025
Reporting Period	01 Dec(01 Apr - 30 Sep)
Submission Date	24-11-2025
RO/SRO Name	V Geroge Jenner
RO/SRO Email	tr025@ifs.nic.in
State	ANDHRA PRADESH
RO/SRO Office Address	Integrated Regional Offices, Vijayawada

Note:- SMS and E-Mail has been sent to V Geroge Jenner, ANDHRA PRADESH with Notification to Project Proponent.

Annexure – IV

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पैसो)
Petroleum & Explosives Safety Organisation (PESO)
डोर न. ७-२०-१३, किरलामपुडी लेआउट
विशाखापट्टनम- 530017
Door No. 7-20-13,
Kirlampudi Layout,
Visakhapatanam - 530017

E-mail : dyccevizag@explosives.gov.in
Phone/Fax No : 0891-2722257

संख्या /No. : **P/SC/AP/14/5544 (P219323)** दिनांक /Dated : **29/10/2024**

सेवा में
/To,

M/s. ADANI KRISHNAPATNAM PORT LIMITED,
P.O.Bag No.1,
Muthukur Mandal,,
Nellore,
Taluka: Muthukur,
District: NELLORE,
State: Andhra Pradesh
PIN: 524344

विषय /Sub : **Plot No, S.No.440,442 & 444, NA, Krishnapatnam, Muthukur mandal, Muthukur, Taluka: Muthukur, District: NELLORE, State: Andhra Pradesh, PIN: 524344** में स्थित विद्यमान पेट्रोलियम वर्ग **A,B** Retail Outlet की अनुज्ञप्ति संख्या **P/SC/AP/14/5544 (P219323)** - नवीकरण के संदर्भ में ।

Existing Petroleum Class **A,B** Retail Outlet at **Plot No, S.No.440,442 & 444, NA, Krishnapatnam, Muthukur mandal, Muthukur, Taluka: Muthukur, District: NELLORE, State: Andhra Pradesh, PIN: 524344** - Licence No. **P/SC/AP/14/5544 (P219323)** - Reg Renewal of Licence.

महोदय
/Sir(s),

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या **OIN1795165** दिनांक **28/10/2024** का संदर्भ ग्रहण करें ।
Please refer to your letter No. **OIN1795165** dated **28/10/2024** on the subject.

अनुज्ञप्ति सं **P/SC/AP/14/5544 (P219323)** दिनांक **01/08/2011** दिनांक **31/12/2034** तक नवीनीकृत कर लौटाई जा रही हैं ।
Licence No. **P/SC/AP/14/5544 (P219323)** dated **01/08/2011** is returned herewith duly renewed upto **31/12/2034**.

कृपया पेट्रोलियम नियम,2002 के अधीन बनाए गए नियम 148 में दी गई प्रक्रिया का कडाई से पालन करें । अनुज्ञप्ति के नवीकरण हेतु समस्त दस्तावेजों को दिनांक **31/12/2034** या उससे पहले इस कार्यालय में प्रस्तुत करें ।
Please follow the procedure strictly as laid down in rule 148 of the Petroleum Rules, 2002 and submit complete documents for the Renewal of the licence so as to reach this office on or before **31/12/2034**.

कृपया पावती दें । Please acknowledge the receipt.

भवदीय /Yours faithfully,

((जय नंदन मिश्रा)
(J. N. Mishra))
उप विस्फोटक नियंत्रक
Dy. Controller of Explosives
कृते उप मुख्य विस्फोटक नियंत्रक
For Dy. Chief Controller of Explosives
विशाखापट्टनम/Visakhapatanam

(अधिक जानकारी जैसे आवेदन की स्थिति, शुल्क तथा अन्य विवरण के लिए हमारी वेबसाइट : http://peso.gov.in देखें)
(For more information regarding status,fees and other details please visit our website: http://peso.gov.in)
Note:-This is system generated document does not require signature.

प्ररूप XIV
(प्रथम अनुसूची का अनुच्छेद 5 देखिए)
FORM XIV
(see Article 5 of the First Schedule)

मोटर वाहनों में ईंधन डालने के लिए पम्प आउटफिट के संबंध में टैंक या टैंकों में पेट्रोलियम भंडारकरण के लिए अनुज्ञप्ति
LICENCE TO STORE PETROLEUM IN TANK/S IN CONNECTION WITH PUMP OUTFIT FOR FUELING MOTOR CONVEYANCES

अनुज्ञप्ति सं. (Licence No.) : **P/SC/AP/14/5544(P219323)** फीस रूपए (Fee Rs.) **18000/-** per year

पेट्रोलियम अधिनियम, 1934 के उपबंधों और उसके अधीन बनाए गए नियमों तथा इस अनुज्ञप्ति की अतिरिक्त शर्तों के अधीन रहते हुए **20.00 KL of Petroleum class A and 210.00 KL of Petroleum class B** को टैंक/टैंको में भण्डारकरण मात्र के लिए **M/s. ADANI KRISHNAPATNAM PORT LIMITED, P.O.Bag No.1, Muthukur Mandal,, Nellore, Taluka: Muthukur, District: NELLORE, State: Andhra Pradesh, PIN: 524344** को नीचे वर्णित अनुज्ञप्त परिसरों में जो कि इससे उपबध्द नक्शा संख्यां **P/SC/AP/14/5544(P219323)** तारीख **15/12/2021** में दिखाया गया है, के लिए विधिमान्य अनुज्ञप्ति अनुदत्त की जाती हैं।

Licence is hereby granted to **M/s. ADANI KRISHNAPATNAM PORT LIMITED, P.O.Bag No.1, Muthukur Mandal,, Nellore, Taluka: Muthukur, District: NELLORE, State: Andhra Pradesh, PIN: 524344** valid only for the storage of **20.00 KL of Petroleum class A and 210.00 KL of Petroleum class B** in tank/s in the licensed premises described below and shown on the plan no: **P/SC/AP/14/5544(P219323)** dated **15/12/2021** attached hereto subject to the provisions of the Petroleum Act, 1934 and the rule made thereunder and to the further conditions of this Licence.

यह अनुज्ञप्ति **31st day of December 2034** तक विधिमान्य रहेगी ।
The Licence shall remain in force till the **31st day of December 2034**

July 5, 2010

Jt. Chief Controller of Explosives
SC, Chennai

1). Amendment dated - 01/08/2011

अनुज्ञप्त परिसरों का विवरण और अवस्थान
DESCRIPTION AND LOCATION OF THE LICENSED PREMISES

अनुज्ञप्त परिसर जिसकी सीमाएं संलग्न नक्शे में दिखाई गई हैं **Plot No: S.No.440,442 & 444, NA, Krishnapatnam, Muthukur mandal, Muthukur, Taluka: Muthukur, District: NELLORE, State: Andhra Pradesh, PIN: 524344** में स्थित हैं और उसमें निम्नलिखित सम्मिलित हैं:

The licensed premises, the boundaries of which are shown in the attached plan, are situated at **Plot No: S.No.440,442 & 444, NA, Krishnapatnam, Muthukur mandal, Muthukur, Taluka: Muthukur, District: NELLORE, State: Andhra Pradesh, PIN: 524344** and consist of:

क पेट्रोलियम वर्ग क परिसर के लिए **20.00** किलोलिटर क्षमता के/क्रमश: **1** क्षमता के भूमिगत गैस टाईट टैंक, जो विद्युतचालित/हस्तचालित **2** डिस्पेन्सिंग पम्पो से जुडे हुए हैं ।

a **1** number(s) underground gas tight tanks of capacity **20.00** kilolitres respectively of petroleum Class A connected with **2** number(s) electrically/manually operated dispensing pump(s)

ख पेट्रोलियम वर्ग ख/ग परिसर के लिए **70.00+ 70.00+ 70.00** किलोलिटर क्षमता के/क्रमश: **3** क्षमता के भूमिगत गैस टाईट टैंक, जो विद्युतचालित/हस्तचालित **5** डिस्पेन्सिंग पम्पो से जुडे हुए हैं ।

b **3** number(s) underground gas tight tanks of capacity **70.00+ 70.00+ 70.00** kilolitres respectively of petroleum Class B connected with **5** number(s) electrically/manually operated dispensing pump(s).

ग एक विक्रय कक्ष/कियोस्क

c A sales room/kiosk

घ सर्विस सम्बन्धी सुविधाएं जिनमें **Kiosk, store, Elec. Room** सम्मिलित हैं ।

d Servicing facilities consisting of Kiosk, store, Elec. Room **As per attached plan**

Note:-This is system generated document does not require signature.

अनुज्ञप्ति संख्या-(Licence No.) P/SC/AP/14/5544 (P219323)

नवीनीकरण के पृष्ठांकन के लिए स्थान
SPACE FOR ENDORSEMENT OF RENEWALS

पेट्रोलियम अधिनियम, १९३४ के उपबन्धों या उनके अधीन बनाए गए नियमों या इस अनुज्ञप्ति की शर्तों का उल्लंघन न होने की दशा में यह अनुज्ञप्ति फिस में बिना किसी छूट के दस वर्ष तक नवीकृत की जा सकेगी। This licence shall be renewable without any concession in fee for ten years in the absence of contravention of any provisions of the Petroleum Act, 1934 or of the rules framed thereunder or of any of the conditions of this licence.	नवीकरण की तारीख Date of Renewal	समाप्ति की तारीख Date of Expiry of license	अनुज्ञापन प्राधिकारी के हस्ताक्षर और स्टाम्प Signature and office stamp of the licencing authority.
1).	11/02/2013	31/12/2015	Sd/- Basudev Basak Dy. Chief Controller of Explosives For Jt. Chief Controller of Explosives Secunderabad
2).	03/12/2015	31/12/2018	Sd/- Abdul Muttalib Controller of Explosives For Dy. Chief Controller of Explosives Visakhapatanam
3).	15/02/2019	31/12/2021	Sd/- Amol Jawaharlal Sonbarse Dy. Controller of Explosives For Dy. Chief Controller of Explosives Visakhapatanam
4).	15/12/2021	31/12/2024	Sd/- J. Sarkar Dy. Chief Controller of Explosives Visakhapatanam
5).	29/10/2024	31/12/2034	J. N. Mishra Dy. Controller of Explosives For Dy. Chief Controller of Explosives Visakhapatanam

यदि अनुज्ञप्ति परिसर इसमें उपाबद्ध विवरण और शर्तों के अनुरूप नहीं पाए जाते हैं और जिन नियमों और शर्तों के अधीन यह अनुज्ञप्ति मंजूर की गई है उनमें से किसी का उल्लंघन होने की दशा में यह अनुज्ञप्ति रद्द की जा सकती है और अनुज्ञप्तिधारी प्रथम अपराध के लिए साधारण कारावास से, जो एक मास तक हो सकता है, या जुर्माने से, जो एक हजार रुपये तक हो सकता है, या दोनों से, और प्रत्येक पश्चात्वर्ती अपराध के लिए साधारण कारावास से जो तीन मास तक हो सकता है, या जुर्माने से, जो पांच हजार रुपये तक हो सकता है, या दोनों से, दण्डनीय होगा।

This licence is liable to be cancelled if the licensed premises are not found conforming to the description given on the approved plan attached hereto and contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may be extend to one month, or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months, or with fine which may extend to five thousand rupees or with both.

Note:-This is system generated document does not require signature.

Digitally signed by JAI NANDAN MISHRA
Reason: Licence No. : P/SC/AP/14/5544
Location:Visakhapatanam [P219323]
Date:29-10-2024 13:26:31 PM

GOVERNMENT OF ANDHRA PRADESH
STATE DISASTER RESPONSE & FIRE SERVICES DEPARTMENT

From :
The Director General,
State Disaster Response and Fire Services,
Andhra Pradesh, Vijayawada.

To :
The Management,
M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District.

Rc.No.8010/MSB/SR/NLR/2022, Dt: 12.10.2022.

Sir,

Sub: A.P. State Disaster Response and Fire Services Department –MSB Section- Issue of No Objection Certificate for Occupancy to M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District - Regarding.

Ref: 1. AP Gazette Notification No. G.560 (W.No:2), Dated:18-01-2022
2. Application of M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District.

-oOo-

The Management has requested for issuance of No Objection Certificate for Occupancy to the Existing Building of M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District in the reference 2nd cited.

2) The Management constructed the Building with Ground + (05) Upper floors with a height of 18.90 Mtrs., with Built up area of 5424 Sq.Mtrs for Business Occupancy.

3) Previously, the Management has not obtained Provisional NOC from this Department and has now applied for No Objection Certificate for Occupancy.

4) **Particulars of the Building:**

a)	Address of the Building	:	M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District.
b)	No. of Blocks/Floors	:	01 Block/ Ground + (05) Upper floors
c)	Height of the Building	:	18.90 Mtrs
d)	Total Built up area	:	4670.866 Sq.Mtrs
e)	Type of Occupancy	:	Business Occupancy

5) The Management has provided the following Means of Escape

S.No.	Details of Staircases	Required	Provided
1.	Internal Staircase	01.50 Mtrs.	02.00 + 02.00 = 04.00 Mtrs
2.	External Staircase	01.50 Mtrs.	02.00 Mtrs
	Total:		06.00 Mtrs

6) The details of Occupant Load per Unit and Exit Width required and provided are furnished as below:

Sl. No.	Floor	Built up are in Sq. Mtrs.	Type of Occupancy	Occupant Load	Means of escape Required in Mtrs.	Provided in Mtrs.
1.	Ground	1058	Parking	Parking	Required	Provided
2.	First	1034	Business	103	01.03	06.00
3.	Second	1034	Business	103	01.03	06.00
4.	Third	1034	Business	103	01.03	06.00
5.	Fourth	690	Business	69	00.69	06.00
6.	Fifth	574	Business	57	00.57	06.00
	Total:	**5424**				

Contd...2p

7) It is submitted that as per instructions of kind Director General, State Disaster Response and Fire Services, A.P., Vijayawada vide this Office Rc.No.5708/MSB/2021. Dated: 16-11-2021 on Fire Fighting system, the following Fire safety Equipment suggested to the management for installation instead of conventional system keeping in view of practicality, maintenance and resilience.

S.No	Fire Fighting Equipment	Prescribed	Provided	Deficit
1	Fire Extinguishers	ABC/CO2 type	92 Nos.	Nil
2	Underground parking /Cellar / Basement	Temperature Sensors connected "Hooter" and that can give alerts through cell phone	NA	Nil
3	Manual Call point	One number per floor	36 Nos.	Nil
4	Under Ground Static Water Tank (or) Terrace Water Tank	10,000 Ltrs (minimum)	20,000 ltrs at Terrace Tank	Nil
5	2 HP (Pump + Electrical Motors connected) @ one per floor connected to normal plumbing system instead of down comer/special pipes.	One per each floor	03 Nos-2HP 03 Nos-5HP	Nil

8) The Management has provided the following Electrical Safety system:

(i)	All Electrical wirings in the building shall confirm the code of practise for Electrical wiring IS:732:1989 and also shall confirm for Fire Safety Wiring of the building Electrical Installations as per IS:1646:2015. Most common mistake is that the neutral wires to the three pin plugs are not of sufficient thickness to carry the current in case of any short circuits.	:	Provided
(ii)	Installation of Miniature Circuit Breakers, (MCBs) in all floors.	:	Provided
(iii)	No Overloading of power socket in any Existing Building.	:	Yes
(iv)	10 years old wiring to be changed specially where ever high power consuming appliances such as Air conditioners, shopping complex, Data Centers, etc.,	:	NA
(v)	Grounding /Earthing shall be done. For details refer IS 3043:1987.	:	Provided
(vi)	Lightening conductors may be provided for high rise buildings exceeding 5 floors.	:	Yes
(vii)	No High Tension Lines should run inside or in close proximity (6 meters) to any Educational institution buildings.	:	Yes
(viii)	All the above safety measures shall be certified by the authorized Electrical Engineer.	:	Certified

9) In view of the above and based on the affidavit submitted by the Management the No Objection Certificate for Occupancy is issued to the existing building of M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District for Business Occupancy that highest priority is accorded to Passive Safety measures such as ensuring two exits, not co-locating with highly inflammable shops having cloths, chemical or explosives and following Electrical Safety Checklist.

Contd...3p

10) It is informed that, the Management is requested to maintain the following conditions compulsorily for safety purpose.

Sl.No.	As Builder	As occupant	As Security Personnel
1	All the fire protection arrangements shall be maintained in good condition as seen during inspection.	All the escape/exit routes shall not be kept locked/blocked or encroached	All the occupants must trained in correct method of operation of the fire fighting system installed.
2	Any loss of life or property due to non-functioning of fire safety measures and other installations shall be the responsibility of the management.	All occupants shall be trained to operate the fire safety equipments during emergency.	Mock drills should be conducted once in 3 months for initial two years. Thereafter, once in every 6 months.
3	Addition / alteration, if any in the building may be verified by building authority.	Mock drills should be conducted once in 3 months for initial two years. Thereafter, once in every 6 months.	All security personnel shall be trained to operate the fire safety equipments during emergency.
4	This No objection Certificate for occupancy is issued from Fire safety point of view.	Raise the alarm if the fire cannot be controlled; Evacuate the area completely at once with nearest safe exit.	Attack the fire using available fire equipment only if you feel capable of controlling. If not, take all steps to isolate the area by closing doors and windows.

11) This No Objection Certificate is issued, subject to the outcome of O.As/W.Ps etc., if any, before Courts etc.,

12) This No Objection Certificate for Occupancy is valid for a period of Five years from the date of issue of this letter to the management of M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District. The Owner/ Occupier/ Builder/ Management concerned of the Building shall submit Self Declaration/Affidavit /Certification with regard to working condition of above Fire Safety System every year in the prescribed format and submit/upload the photographs of the Mock Drills conducted in the premises. It is the responsibility of the Builder to maintain the Fire Safety Equipment in good working condition at all times and apply for next Periodical Renewal of No Objection Certificate, duly remitting the User Charges as per G.O., two (02) months before expiry of this of No Objection Certificate.

13) The Management is hereby informed that this NO Objection Certificate is issued subjective to full compliance with provisions of Gazette Notification Vide No. G.560 (W.No.2), Dated.18-01-2022, including Mock Drills

Yours sincerely,

12/10/2022

Director General,
State Disaster Response and Fire Services,
Andhra Pradesh, Vijayawada.

Copy to the Management of M/s Adani Krishna Patnam Port Ltd, located at Muthukur (M), SPSR Nellore District.

Note: In case of any emergency call to 101 or State Fire Control Room-9100108101.

GOVERNMENT OF ANDHRA PRADESH
STATE DISASTER RESPONSE & FIRE SERVICES DEPARTMENT

From :
The Director General,
State Disaster Response and Fire Services,
Andhra Pradesh, Vijayawada.

To :
The Management,
M/s Engineering Technology & Services
(ETS-1 & 2), Krishnapatnam,
Muthukur (M), SPSR Nellore District.

Rc.No.5116/NLR/DFO/2018 (MSB-SR), Dated:12-10-2022.

Sir,

Sub: A.P. State Disaster Response and Fire Services Department-MSB Section-Issuance of Renewal of No Objection Certificate to the Existing Building of M/s Engineering Technology & Services (ETS-1 & 2) represented by G.Ravindranath belongs to Krishnapatnam Port Company Ltd., Krishnapatnam, Muthukur (M), SPSR Nellore District-Regarding.

Ref:
1. Occupancy NOC File No.5116/NLR/DFO/2018, Dt:20.11.2018 of District Fire Officer, SPSR Nelloe.
2. Renewal NOC File No.10067/NLR/DFO/2019, Dt:14.11.2019 of District Fire Officer, SPSR Nelloe.
3. AP Gazette Part II-Miscellaneous Notifications of interest to the Public vide No.G-560 (W.No.02), Dated:18.01.2022.
4. Application of M/s Engineering Technology & Services (ETS-1 & 2) represented by G.Ravindranath belongs to Krishnapatnam Port Company Ltd., Krishnapatnam, Muthukur (M), SPSR Nellore District.

* * * * * * *

The Management of M/s Engineering Technology & Services (ETS-1 & 2) represented by G.Ravindranath belongs to Krishnapatnam Port Company Ltd., Krishnapatnam, Muthukur (M), SPSR Nellore District has requested to issue Renewal of No Objection Certificate by duly remitting the Renewal Fee towards Fire Precautionary Fee vide reference 4th cited.

2) The No Objection Certificate for Occupancy Certificate was issued vide reference 1st cited to the Existing Building of M/s Engineering Technology & Services (ETS-1 & 2) represented by G.Ravindranath belongs to Krishnapatnam Port Company Ltd., Krishnapatnam, Muthukur (M), SPSR Nellore District with Ground + First Floor with a Height of 06.69 Mtrs., with Built-up area of 561.76 Sq.Mtrs., for Business Occupancy. Further, the Management has obtained Renewal of NOC from this Department vide reference 2nd cited.

3) The Management has submitted the Affidavit/Self Certification for Existing Building with Ground + First Floor with a Height of 06.69 Mtrs., with Built-up area of 561.76 Sq.Mtrs., and stated that they have provided the following Fire Safety measures also they declared that no additions or alterations have been made in the Building affecting Fire Prevention and Fire Safety measures including Means of Escape and that all Exits and Passages are free from any obstruction.

(contd....2p)

4) In view of the above and taking into consideration of the larger public interest and also based on the Affidavit/Self-Certification submitted by the management, the Renewal of No Objection Certificate is issued to the Existing Building of M/s Engineering Technology & Services (ETS-1 & 2) represented by G.Ravindranath belongs to Krishnapatnam Port Company Ltd., Krishnapatnam, Muthukur (M), SPSR Nellore District with Ground + First Floor with a Height of 06.69 Mtrs., with Built-up area of 561.76 Sq.Mtrs., for Business Occupancy that highest priority is accorded to Passive Safety measures such as ensuring two Exits, not Co-Locating with highly inflammable Shops having Cloths, Chemical or Explosives and following Electrical Safety Checklist.

5) It is suggested to the Management for providing the following Fire Safety measures keeping in view of Practicality, Maintanance and Resilience.

Sl. No.	Fire Fighting Equipment	Prescribed		Available with Nos.	Deficit
1	Staircases	Minimum (02) shall be Provided. If the Second Staircase is not possible, provide Slider or Tube Lift with Exhaust Fan (connected outside to Building) or German Chute or Horizontal connection between the neighborhood Buildings.		02 No.'s	Nil
2	Fire Extinguishers	ABC/CO2 type		26 No's.	Nil
3	Underground parking/ Cellar / Basement	Temperature Sensors connected to " Hooter " and that can be give alerts through Cell phone instead of Sprinklers.		Provided	Nil
4	Manual Call Point System	One Number per Floor		02 No.'s	Nil
5	Under Ground Static Water Tank (or) Terrace Water Tank	10,000 Ltrs. (Minimum)	U.G	-	Nil
			T.T	10,000 Ltrs.	
6	Smoke Exhaust (Mobile) Fan shall be procured to expel the smoke in case of Fire.	Required		Provided	Nil
7	2 HP (Pump + Electrical Motors connected) @ one per Floor connected to Normal Plumbing System instead of Down Comer/Special Pipes.	One per each Floor (Total 02 Floors)		01 No.	Nil
8	5 HP (Mobile Pump + Petrol Engine on wheels connected to Ground Floor Sump) shall provide instead of Down Comer/Wet Riser System:	NA		01 No.	Nil
9	A/c Centrally Air Conditioned:	Fire Dampers		Provided	Nil
		Separation of Air Ducts to different Floors		Provided	Nil
10	Display the mentioned Phone Nos. at important areas.	(i) Fire Department Number (ii) Ambulance (iii)Police		Displayed	Nil

(contd....3p)

6) The Management has provided the following Electrical Safety system.

(i)	All Electrical wirings in the Building shall confirm the code of practise for Electrical wiring IS:732:1989 and also shall confirm for Fire Safety Wiring of the Building Electrical Installations as per IS:1646:2015. Most common mistake is that the neutral wires to the Three Pin plugs are not of sufficient thickness to carry the current in case of any Short Circuits.	:	Provided
(ii)	Installation of Miniature Circuit Breakers (MCB's) and to protect high power intensive equipment etc.,	:	Provided
(iii)	No Overloading of Power Sockets.	:	Provided
(iv)	Electrical wiring to be changed for every ten years, wherever high power consuming appliances such as Air Conditioners etc.,	:	Provided
(v)	LED lights in Closed Rooms, Corridors, Staircases connected to Inverter (Battery) to ensure well light pathways for Exit or Evacuation inspite of regular power failure in any Emergency.	:	Provided
(vi)	Grounding/Earthing Shall be done. For details refer IS 3043:1987.	:	Provided
(vii)	To install non pressurized Aerosol suppression system (or) CO2 Flooding system in Electrical Panel Rooms.	:	Provided
(viii)	Lightening Conductors shall be provided for more than 05 Floors Building.	:	NA
(ix)	All the above Safety measures shall be Certified by the authorized Electrical Engineer.	:	Certified

7) The Management has provided the following LPG Safety system (if Kitchen is provided):

(i)	LPG Cylinders shall be located outside the kitchen with proper ventilation and protection from Rain and Sunlight.	:	NA
(ii)	LPG Detectors with Alarms shall be provided/installed.	:	NA
(iii)	There should be separation between Electrical Water Heaters and LPG Cylinders.	:	NA
(iv)	Five ways of putting up LPG Cylinder Fires (Pictorial/Cartoon) shall be displayed in the kitchen.	:	NA
(v)	Co2 Fire Extinguishers (Minimum 02 No's.) of 4.5 KG each shall be provided in the kitchen.	:	NA

8) It is informed that, the Management is requested to maintain the following conditions compulsorily for Safety purpose.

Sl. No.	As Builder	As Occupant	As Security personnel
1.	All the Fire protection arrangements shall be maintained in good working condition at all time.	The Escape/Exit roots shall not be kept Locked/Blocked or Encroached.	All the Occupants must be trained the correct method of operation of the Fire Fighting system installed.
2.	Any loss of life or property due to non-functioning of Fire Safety Measures and other Installations shall be the responsibility of the Management.	All Occupants shall be trained to operate the Fire Safety Equipment during Emergency.	Mock Drills should be conducted once in 03 months for initial two years. Thereafter, once in every 06 months.
3.	Addition/Alteration, if any in the Building may be verified by Building Authority.	Mock Drills should be conducted once in 03 months for initial two years. Thereafter, once in every 06 months.	All Security Personnel shall be trained to operate the Fire Safety Equipment during Emergency.
4.	This Renewal of No Objection Certificate is only from Fire Safety Point of View.	Raise the alarm If the Fire cannot be controlled, Evacuate the area completely at once with nearest Safe Exit.	Attack the Fire using available Fire Equipment only if you feel capable of controlling it. If not, take all steps to isolate the area by closing Doors and Windows.

9) The Management shall ensure the following conditions:

(i) The Management is responsible for all risks involved in case of Fire Accident.

(ii) This Renewal of NOC is given based on the information, Documents and Drawings provided by the Applicant. The Applicant confirms that the information provided and the Documents and Drawings submitted are correct. Any deviation noticed will lead to cancellation of NOC without any Notice.

(iii) The permission accorded does not confer any Ownership rights. If it is found that the information furnished is false and fabricated, the permission will be revoked at any stage and the Applicant will be liable for criminal prosecution as per IPC.

10) This Renewal of No Objection Certificate is Issued, subject to the outcome of O.As/ W.Ps etc., if any, before Courts etc.,

11) This Renewal of No Objection Certificate is valid for a period of Five (05) years from the date of issue of this letter subject to the Management of M/s Engineering Technology & Services (ETS-1 & 2) represented by G.Ravindranath belongs to Krishnapatnam Port Company Ltd., Krishnapatnam, Muthukur (M), SPSR Nellore District for Business Occupancy. *The Owner/Occupier/Builder/Management concerned of the Building shall submit Affidavit/ Self Declaration/Certification with regard to working condition of above Fire Safety system every year in the prescribed format and submit/upload the Photographs of the Mock Drills conducted in the premises.* It is the responsibility of the Builder to maintain the Fire Safety Equipment in good working condition at all times and apply for next Periodical Renewal of No Objection Certificate, duly remitting the User Charges as per G.O. two (02) months before expiry of this Renewal of No Objection Certificate.

12) The Management is hereby informed that, this Renewal of NO Objection Certificate is issued subjective to full compliance with provisions of Gazette Notification vide No.G-560 (W.No.02), Dated:18.01.2022 including Mock Drills.

Yours Sincerely,

12/10/2022

Director General,
State Disaster Response and Fire Services,
Andhra Pradesh, Vijayawada.

Copy to the Director of Ports, Government of Andhra Pradesh.

Note: In case of any Emergency Call to 101 or State Fire Control Room-9100108101.

Annexure - V

adani

Ports and
Logistics

Ref: AKPL/EHS/APPCB/12/2026-27 **Date: 18/05/2026**

To

The Environmental Engineer,
A.P. Pollution Control Board
Regional Office
SPSR Nellore.

Dear Sir,

Sub: AKPL – Submission of Monthly Environmental Marine & Terrestrial Monitoring Reports and Water Consumption details for the Month of April'26 – Reg.

Ref: CFO & HWA order no APPCB/VJA/NLR/11344/CFO/HO/2019 dated 11.11.2022 valid up to 31.08.2027

@@@

With reference to the above, we are herewith submitting the monthly Environmental Marine & Terrestrial monitoring reports along with Water Consumption details for the month of April -2026.

Thanking you,

Yours sincerely,

For **Adani Krishnapatnam Port Limited.,**

(Authorized Signatory)

Encl. a/a

Adani Krishnapatnam Port Ltd
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
Andhra Pradesh, India
CIN: U45203AP1996PLC023529

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info@adani.com
www.adaniports.com

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/01

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : AT ZERO POINT

DATE OF START : 13-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	68.1	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	27.4	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	12.6	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	13.8	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	12.2	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.22	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

CHECKED BY

AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/02

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : AT THAMMINAPATNAM VILLAGE

DATE OF START : 13-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	61.6	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	25.4	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	10.3	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	12.9	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	10.1	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.19	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

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Corporate Office and Laboratory: Enviro House, B-1, Block-B, IDA, Autonagar, Visakhapatnam - 530012
Hyderabad Office: #402, SaiKrishna Villa, Behind CMR Shopping Mall, AS Raju Nagar, Kukatpally, Hyderabad - 500072
Website: www.svenvirolabs.com
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Contacts 0891-2755528, +91 7207661444
PAN: ABQCS0643F
CIN: U74909AP2025PTC119098

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SVE LC/AKPL/26-04/03

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : AT CVR BUILDING

DATE OF START : 13-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	55.4	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	23.8	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	9.4	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	10.7	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	10.5	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.24	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

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Corporate Office and Laboratory: Enviro House, B-1, Block-B, IDA, Autonagar, Visakhapatnam - 530012
Hyderabad Office: #402, SaiKrishna Villa, Behind CMR Shopping Mall, AS Raju Nagar, Kukatpally, Hyderabad - 500072
Website: www.svenvirolabs.com
E-Mails : info@svenvirolabs.com, svenviro_labs@yahoo.co.in
Contacts 0891-2755528, +91 7207664444
PAN: ABQCS0643F
CIN: U74909AP2025PTC119098

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/04

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : AT GOPALPURAM VILLAGE

DATE OF START : 14-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	56.8	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	25.1	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	11.7	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	14.5	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	12.3	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.21	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Ref: SV/AKPL/26-04/05

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : AT CHALIVENDARAM

DATE OF START : 14-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	53.9	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	23.5	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	12.1	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	14.6	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	11.0	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.18	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/06

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : AT KRISHNAPATNAM

DATE OF START : 15-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	60.6	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	26.1	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	14.8	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	13.6	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	10.5	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.24	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/07

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **AMBIENT AIR QUALITY**

SOURCE OF COLLECTION : KRISHNAPATNAM VILLAGE
NEAR LIGHT HOUSE COLONY

DATE OF START : 15-04-2026

DURATION OF SAMPLING : 24 hours

ATMOSPHERE CONDITION : Clear Sky

TEST REPORT

S.No	PARAMETER	UNIT	RESULT	STANDARDS	METHOD
1.	Particulate Matter - (PM_{10})	$\mu g/m^3$	63.8	100	IS:5182 - P-23
2.	Particulate Matter - ($PM_{2.5}$)	$\mu g/m^3$	24.6	60	IS:5182 - P-24
3.	Sulphur Dioxide - (SO_2)	$\mu g/m^3$	13.5	80	IS:5182 - P-2
4.	Nitrogen Dioxide - (NO_2)	$\mu g/m^3$	14.2	80	IS:5182 - P-6
5.	Ammonia - (NH_3)	$\mu g/m^3$	<20.0	400	IS:5182 - P-25
6.	Ozone - (O_3)	$\mu g/m^3$	12.3	100	IS :5182 - P-9
7.	Lead - (Pb)	$\mu g/m^3$	< 0.01	01	IS:5182 - P-22
8.	Carbon Monoxide - (CO)	mg/m^3	0.20	2.0	IS:5182 - P-10
9.	Benzene - (C_6H_6)	$\mu g/m^3$	< 0.5	05	IS 5182 - P-11
10.	Benzo(a)pyrene - (BaP)	ng/m^3	< 0.5	01	IS 5182 - P-12
11.	Arsenic - (As)	ng/m^3	< 5.0	06	CPCB Guidelines
12.	Nickel - (Ni)	ng/m^3	< 5.0	20	IS 5182 - P-26

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/09 Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 02-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	pH	-	7.69	7.82	8.10	8.28
2.	Temperature	°C	28.3	28.7	29.0	29.1
3.	Salinity	ppt	32.3	31.4	31.9	33.1
4.	Density	gm/ml	1.031	1.033	1.036	1.042
5.	Secchi Disk Transparency	mts	10.3	10.6	9.6	8.2
II.	**Chemical**					
1.	Potassium	mg/l	290	306	315	327
2.	COD	mg/l	12.0	12.6	13.0	13.3
3.	BOD	mg/l	2.6	2.1	2.8	3.0
4.	Oil & Grease	mg/l	< 0.1	< 0.1	< 0.1	0.29
5.	D.O	mg/l	5.4	5.0	5.6	4.4
6.	Nitrates	mg/l	5.9	6.6	7.2	8.0
7.	Nitrites	mg/l	0.32	0.39	0.42	0.49
8.	Ammonia	mg/l	< 0.01	< 0.01	< 0.01	0.51
9.	Phosphates	mg/l	0.35	0.28	0.40	0.47
10.	Chlorides	mg/l	17910	17436	17685	18375
11.	Sodium	mg/l	7804	8274	7858	8543
12.	Sulphates	mg/l	3639	3467	3354	3762
13.	Silicates	mg/l	6.0	5.7	6.8	8.0
14.	Reactive Silica	mg/l	0.042	0.045	0.050	0.053

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/09

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 02-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

15.	Total Phosphorus	mg/l	0.41	0.36	0.43	0.48
16.	Total Nitrogen	mg/l	12.0	13.0	13.5	14.3
III.	**Biological**					
1.	Primary Productivity	mgC $m^{-2}d^{-1}$	52	42	44	30
2.	Chlorophyll	mg/m^3	1.57	1.50	1.43	1.23
3.	Phytoplankton					
	a. Numerical abundance	No./ml	243	240	236	198
	b. Diversity	-	2.29	2.20	2.26	2.0
4.	Zooplankton					
a.	Diversity	-	2.16	2.19	2.23	2.02
b.	Biomass	$ml/100m^3$	10.8	9.9	12.3	10.6
c.	Coliforms	CFU/100ml	13	11	16	20
d.	Fecal Coliforms	CFU/100ml	ND	ND	ND	ND
IV.	**Heavy Metals**					
1.	Lead	mg/l	< 0.01	< 0.01	< 0.01	< 0.01
2.	Cadmium	mg/l	< 0.01	< 0.01	< 0.01	0.40
3.	Copper	mg/l	< 0.02	< 0.02	0.036	0.042
4.	Zinc	mg/l	0.041	0.035	0.052	0.058

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AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/10

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 09-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	Physical					
1.	pH	-	7.78	7.96	8.25	8.36
2.	Temperature	℃	28.6	28.9	29.3	29.4
3.	Salinity	ppt	32.5	31.7	32.1	33.4
4.	Density	gm/ml	1.032	1.035	1.038	1.044
5.	Secchi Disk Transparency	mts	10.2	10.4	9.5	8.1
II.	Chemical					
1.	Potassium	mg/l	294	310	322	336
2.	COD	mg/l	12.3	12.9	13.5	13.7
3.	BOD	mg/l	2.8	2.4	3.0	3.2
4.	Oil & Grease	mg/l	< 0.1	< 0.1	< 0.1	0.31
5.	D.O	mg/l	5.2	4.8	5.4	4.2
6.	Nitrates	mg/l	6.3	7.0	7.6	8.4
7.	Nitrites	mg/l	0.35	0.43	0.47	0.52
8.	Ammonia	mg/l	< 0.01	< 0.01	< 0.01	0.54
9.	Phosphates	mg/l	0.39	0.33	0.44	0.51
10.	Chlorides	mg/l	17996	17532	17776	18481
11.	Sodium	mg/l	7838	8301	7889	8571
12.	Sulphates	mg/l	3662	3484	3373	3790
13.	Silicates	mg/l	6.5	6.1	7.5	8.7
14.	Reactive Silica	mg/l	0.046	0.049	0.055	0.059

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/10

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 09-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

15.	Total Phosphorus	mg/l	0.43	0.40	0.47	0.52
16.	Total Nitrogen	mg/l	12.6	13.4	14.1	14.8
III.	**Biological**					
1.	Primary Productivity	mgC $m^{-2}d^{-1}$	51	41	43	28
2.	Chlorophyll	mg/m^3	1.56	1.49	1.41	1.22
3.	Phytoplankton					
	a. Numerical abundance	No./ml	242	239	235	196
	b. Diversity	-	2.27	2.19	2.24	1.99
4.	Zooplankton					
a.	Diversity	-	2.15	2.16	2.21	2.01
b.	Biomass	$ml/100m^3$	10.6	9.8	12.1	10.5
c.	Coliforms	CFU/100ml	11	09	13	17
d.	Fecal Coliforms	CFU/100ml	ND	ND	ND	ND
IV.	**Heavy Metals**					
1.	Lead	mg/l	< 0.01	< 0.01	< 0.01	< 0.01
2.	Cadmium	mg/l	< 0.01	< 0.01	< 0.01	0.43
3.	Copper	mg/l	< 0.02	< 0.02	0.039	0.045
4.	Zinc	mg/l	0.044	0.039	0.055	0.062

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/11 Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 17-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	pH	-	7.65	7.81	8.12	8.19
2.	Temperature	°C	28.5	28.7	28.9	29.2
3.	Salinity	ppt	32.4	31.5	32.0	33.3
4.	Density	gm/ml	1.029	1.032	1.036	1.041
5.	Secchi Disk Transparency	mts	10.3	10.5	9.7	8.2
II.	**Chemical**					
1.	Potassium	mg/l	287	298	317	330
2.	COD	mg/l	12.0	12.6	13.2	13.4
3.	BOD	mg/l	2.6	2.2	2.8	3.1
4.	Oil & Grease	mg/l	< 0.1	< 0.1	< 0.1	0.27
5.	D.O	mg/l	5.4	5.0	5.7	4.6
6.	Nitrates	mg/l	6.1	6.7	7.2	8.0
7.	Nitrites	mg/l	0.32	0.41	0.45	0.49
8.	Ammonia	mg/l	< 0.01	< 0.01	< 0.01	0.51
9.	Phosphates	mg/l	0.36	0.30	0.41	0.47
10.	Chlorides	mg/l	17928	17464	17710	18423
11.	Sodium	mg/l	7810	8290	7865	8549
12.	Sulphates	mg/l	3648	3463	3350	3775
13.	Silicates	mg/l	6.0	5.8	7.0	8.2
14.	Reactive Silica	mg/l	0.043	0.045	0.052	0.056

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/11

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 17-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

15.	Total Phosphorus	mg/l	0.41	0.36	0.42	0.47
16.	Total Nitrogen	mg/l	12.3	12.9	13.5	14.6
III.	**Biological**					
1.	Primary Productivity	mgC $m^{-2}d^{-1}$	53	42	45	30
2.	Chlorophyll	mg/m^3	1.58	1.52	1.43	1.25
3.	Phytoplankton					
	a. Numerical abundance	No./ml	244	241	237	198
	b. Diversity	-	2.29	2.21	2.26	2.01
4.	Zooplankton					
a.	Diversity	-	2.17	2.18	2.23	2.03
b.	Biomass	$ml/100m^3$	10.8	10.2	12.5	10.8
c.	Coliforms	CFU/100ml	14	12	18	22
d.	Fecal Coliforms	CFU/100ml	ND	ND	ND	ND
IV.	**Heavy Metals**					
1.	Lead	mg/l	< 0.01	< 0.01	< 0.01	< 0.01
2.	Cadmium	mg/l	< 0.01	< 0.01	< 0.01	0.41
3.	Copper	mg/l	< 0.02	< 0.02	0.037	0.043
4.	Zinc	mg/l	0.042	0.037	0.053	0.060

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/12 Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 23-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	pH	-	7.84	7.95	8.25	8.33
2.	Temperature	°C	28.9	29.6	29.2	29.6
3.	Salinity	ppt	32.6	31.8	32.2	33.4
4.	Density	gm/ml	1.033	1.035	1.038	1.043
5.	Secchi Disk Transparency	mts	10.2	10.4	9.5	8.1
II.	**Chemical**					
1.	Potassium	mg/l	292	304	321	342
2.	COD	mg/l	12.5	13.1	3.6	14.0
3.	BOD	mg/l	3.0	2.7	3.2	3.6
4.	Oil & Grease	mg/l	< 0.1	< 0.1	< 0.1	0.33
5.	D.O	mg/l	5.0	4.8	5.6	4.4
6.	Nitrates	mg/l	6.6	7.4	8.0	8.7
7.	Nitrites	mg/l	0.36	0.46	0.51	0.57
8.	Ammonia	mg/l	< 0.01	< 0.01	< 0.01	0.58
9.	Phosphates	mg/l	0.41	0.36	0.45	0.53
10.	Chlorides	mg/l	18029	17575	17820	18510
11.	Sodium	mg/l	7852	8350	7930	8605
12.	Sulphates	mg/l	3673	3491	3378	3797
13.	Silicates	mg/l	6.6	6.2	7.8	9.0
14.	Reactive Silica	mg/l	0.046	0.051	0.058	0.063

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/12

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 23-04-2026

SAMPLE CODE : 1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

15.	Total Phosphorus	mg/l	0.48	0.41	0.50	0.55
16.	Total Nitrogen	mg/l	12.8	13.6	14.3	15.2
III.	**Biological**					
1.	Primary Productivity	mgC $m^{-2}d^{-1}$	52	40	43	29
2.	Chlorophyll	mg/m^3	1.56	1.50	1.41	1.24
3.	Phytoplankton					
	a. Numerical abundance	No./ml	242	240	235	197
	b. Diversity	-	2.28	2.20	2.24	1.99
4.	Zooplankton					
a.	Diversity	-	2.15	2.17	2.20	2.01
b.	Biomass	$ml/100m^3$	10.6	10.0	12.3	10.4
c.	Coliforms	CFU/100ml	12	09	14	18
d.	Fecal Coliforms	CFU/100ml	ND	ND	ND	ND
IV.	**Heavy Metals**					
1.	Lead	mg/l	< 0.01	< 0.01	< 0.01	< 0.01
2.	Cadmium	mg/l	< 0.01	< 0.01	< 0.01	0.37
3.	Copper	mg/l	< 0.02	< 0.02	0.035	0.041
4.	Zinc	mg/l	0.040	0.034	0.050	0.057

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Ref: SV/AKPL/26-04/13 Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : SURFACE WATER

DATE OF COLLECTION : 02-04-2026

SAMPLE CODE : 1. Buckingham Canal
2. Khandaleru Creek

TEST REPORT

S.No	PARAMETER	UNIT	1	2
I.	**Physical**			
1.	pH	-	8.04	7.88
2.	Temperature	°C	28.9	28.3
3.	Salinity	ppt	33.0	32.5
4.	Density	gm/ml	1.30	1.41
II.	**Chemical**			
1.	Potassium	mg/l	297	250
2.	COD	mg/l	13.0	13.8
3.	BOD	mg/l	3.3	3.7
4.	Oil & Grease	mg/l	< 0.1	< 0.1
5.	DO	mg/l	4.8	5.0
6.	Nitrates	mg/l	4.25	3.81
7.	Nitrites	mg/l	< 0.1	< 0.1
8.	Ammonia	mg/l	0.038	0.050
9.	Phosphates	mg/l	0.58	0.91
10.	Chlorides	mg/l	18280	17997
11.	Sodium	mg/l	7387	7220
12.	Sulphates	mg/l	2828	2387
13.	Silicates	mg/l	1.56	1.88
14.	Reactive Silica	mg/l	0.44	0.59
15.	Total Phosphorus	mg/l	0.36	0.52
16.	Total Nitrogen	mg/l	13.0	11.9

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Ref: SV/AKPL/26-04/13

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : SURFACE WATER

DATE OF COLLECTION : 02-04-2026

SAMPLE CODE : 1. Buckingham Canal
2. Khandaleru Creek

III.	**Biological**			
1.	Primary Productivity	mgC $m^{-2}d^{-1}$	43	40
2.	Chlorophyll	mg/m^3	2.68	2.21
3.	Phytoplankton			
	a. Numerical abundance	No./ml	250	271
	b. Diversity	-	2.25	2.52
4.	Zooplankton			
a.	Diversity	-	2.49	2.60
b.	Biomass	$ml/100m^3$	11.3	12.0
c.	Coliforms	CFU/100ml	13	10
d.	Fecal Coliforms	CFU/100ml	ND	ND
IV.	**Heavy Metals**			
1.	Lead	mg/l	<0.01	<0.01
2.	Cadmium	mg/l	<0.01	<0.01
3.	Copper	mg/l	<0.02	0.036
4.	Zinc	mg/l	0.038	0.045

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/08

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **NOISE LEVEL MONITOIRNG**

DATE OF START : 13-04-2026 to 15-04-2026

TEST REPORT

S.No	LOCATION	UNIT	Environmental Setting	CPCB STANDARD for Day	Day	CPCB STANDARD for Night	Night	METHOD
1.	Zero Point	dB(A)	Industrial	75.0	69.5	70.0	61.4	IS:4954 – 1968 Noise Level Meter
2.	Tamminipatnam	dB(A)	Industrial	75.0	65.7	70.0	57.1	
3.	CVR Building	dB(A)	Industrial	75.0	63.2	70.0	58.6	
4.	Gopalpuram	dB(A)	Residential	55.0	52.6	45.0	41.8	
5.	Chalivendram	dB(A)	Residential	55.0	49.3	45.0	37.5	
6.	Krishnapatnam	dB(A)	Residential	55.0	50.5	45.0	42.9	
7.	Krishnapatnam Village near Light House	dB(A)	Residential	55.0	51.7	45.0	40.4	

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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/14

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER (AT HARBOUR)

DATE OF COLLECTION : 02-04-2026

TEST REPORT

S.No	Parameters	Units	Port Entrance (Approach Channel)	Turning Circle	Coal Berth	Reclamation Area (Mutable)
	Low Tide					
1.	Turbidity	NTU	5.8	5.2	6.1	14.6
2.	Total Dissolved Solids	mg/l	29898	29738	29469	31266
3.	Total Suspended Solids	mg/l	13.0	13.9	14.5	16.4
	Medium Tide					
1.	Turbidity	NTU	4.2	5.0	5.7	14.3
2.	Total Dissolved Solids	mg/l	29688	29539	29264	31051
3.	Total Suspended Solids	mg/l	11.9	12.4	13.7	15.2
	High Tide					
1.	Turbidity	NTU	6.9	6.3	7.5	15.9
2.	Total Dissolved Solids	mg/l	30318	29985	29709	31522
3.	Total Suspended Solids	mg/l	13.6	14.3	15.7	17.1

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Hyderabad Office: #402, SaiKrishna Villa, Behind CMR Shopping Mall, AS Raju Nagar, Kukatpally, Hyderabad - 500072

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CIN: U74909AP2025PTC119098

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/15 Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER

DATE OF COLLECTION : 09-04-2026

TEST REPORT

S.No	Parameters	Units	Port Entrance (Approach Channel)	Turning Circle	Coal Berth	Reclamation Area (Mutable)
	Low Tide					
1.	Turbidity	NTU	6.1	5.4	6.3	15.0
2.	Total Dissolved Solids	mg/l	30058	29890	29618	31445
3.	Total Suspended Solids	mg/l	13.5	14.3	14.9	17.1
	Medium Tide					
1.	Turbidity	NTU	4.4	5.2	5.9	14.9
2.	Total Dissolved Solids	mg/l	29836	29684	29405	31220
3.	Total Suspended Solids	mg/l	12.3	12.8	14.2	16.0
	High Tide					
1.	Turbidity	NTU	7.2	6.5	7.8	16.3
2.	Total Dissolved Solids	mg/l	30290	30130	29858	31685
3.	Total Suspended Solids	mg/l	14.1	14.9	16.2	17.3

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/16

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER (AT HARBOUR)

DATE OF COLLECTION : 17-04-2026

TEST REPORT

S.No	Parameters	Units	Port Entrance (Approach Channel)	Turning Circle	Coal Berth	Reclamation Area (Mutable)
	Low Tide					
1.	Turbidity	NTU	5.5	5.0	5.9	14.3
2.	Total Dissolved Solids	mg/l	29928	29780	29500	31340
3.	Total Suspended Solids	mg/l	12.7	13.1	13.6	15.7
	Medium Tide					
1.	Turbidity	NTU	4.0	4.5	5.2	13.2
2.	Total Dissolved Solids	mg/l	29718	29556	29280	31125
3.	Total Suspended Solids	mg/l	11.9	12.3	13.0	14.9
	High Tide					
1.	Turbidity	NTU	6.7	6.2	7.3	16.0
2.	Total Dissolved Solids	mg/l	30174	30010	29746	31582
3.	Total Suspended Solids	mg/l	13.5	14.2	15.0	16.6

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/17 Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER (AT HARBOUR)

DATE OF COLLECTION : 23-04-2026

TEST REPORT

S.No	Parameters	Units	Port Entrance (Approach Channel)	Turning Circle	Coal Berth	Reclamation Area (Mutable)
	Low Tide					
1.	Turbidity	NTU	5.7	5.2	6.1	14.5
2.	Total Dissolved Solids	mg/l	30110	29984	29710	31520
3.	Total Suspended Solids	mg/l	13.0	13.4	14.2	16.0
	Medium Tide					
1.	Turbidity	NTU	4.2	4.8	5.5	13.6
2.	Total Dissolved Solids	mg/l	29890	29760	29495	31306
3.	Total Suspended Solids	mg/l	12.4	12.7	13.4	15.2
	High Tide					
1.	Turbidity	NTU	6.9	6.5	7.6	16.3
2.	Total Dissolved Solids	mg/l	30350	30228	29965	31775
3.	Total Suspended Solids	mg/l	13.9	14.6	15.5	17.2

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/18

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : MARINE WATER (AT DEEP SEA)

DATE OF COLLECTION : 02-04-2026

TEST REPORT

S.No	Parameters	Units	14°19'26"N & 80°15'43"E	14°16'52"N & 80°17'40"E	14°16'11"N & 80°17'40"E
	Low Tide				
1.	Turbidity	NTU	5.5	4.9	6.3
2.	Total Dissolved Solids	mg/l	30756	31155	31928
3.	Total Suspended Solids	mg/l	6.5	7.2	8.0
	Medium Tide				
1.	Turbidity	NTU	5.2	4.4	5.6
2.	Total Dissolved Solids	mg/l	30546	30910	31672
3.	Total Suspended Solids	mg/l	6.0	6.3	7.0
	High Tide				
1.	Turbidity	NTU	7.2	6.6	7.6
2.	Total Dissolved Solids	mg/l	30980	31415	32215
3.	Total Suspended Solids	mg/l	8.0	8.4	8.9

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/19

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEDIMENT**

SOURCE OF COLLECTION : MARINE SEDIMENT

DATE OF COLLECTION : 02-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	Sediment composition					
	a. Sand	%	35.6	31.9	34.1	32.7
	b. Silt + Clay	%	64.4	68.1	65.9	67.3
	c. Org. Matter	%	1.26	1.30	1.24	1.38
2.	pH	-	7.53	7.71	7.96	8.05
II.	**Chemical**					
1.	Nitrogen	mg/kg	394	391	386	428
2.	Phosphorus	mg/kg	232	244	252	196
3.	Potassium	mg/kg	342	355	370	382
4.	Sodium	mg/kg	17002	17408	17529	17721
III.	**Biological**					
1.	Benthos Communities					
a.	Macro Benthos	nos/m^2	1159	1164	1158	1134
b.	Epifauna numerical abundance	nos/haul	18	21	17	12
c.	Infauna numerical abundance	nos/m^2	744	720	723	705
IV	**Heavy Metals**					
1.	Lead	mg/kg	0.52	0.55	0.61	0.63
2.	Cadmium	mg/kg	0.058	0.061	0.063	0.075
3.	Copper	mg/kg	< 0.01	< 0.01	< 0.01	0.42
4.	Zinc	mg/kg	0.054	0.067	0.062	0.73

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Corporate Office and Laboratory: Enviro House, B-1, Block-B, IDA, Autonagar, Visakhapatnam - 530012
Hyderabad Office: #402, SaiKrishna Villa, Behind CMR Shopping Mall, AS Raju Nagar, Kukatpally, Hyderabad - 500072
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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/20

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEDIMENT**

SOURCE OF COLLECTION : MARINE SEDIMENT

DATE OF COLLECTION : 09-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	Sediment composition					
	a. Sand	%	36.3	34.5	35.9	33.2
	b. Silt + Clay	%	63.7	65.5	64.1	66.8
	c. Org. Matter	%	1.29	1.35	1.27	1.42
2.	pH	-	7.68	7.85	8.09	8.21
II.	**Chemical**					
i.	Nitrogen	mg/kg	397	394	390	431
2.	Phosphorus	mg/kg	236	248	256	200
3.	Potassium	mg/kg	344	358	375	386
4.	Sodium	mg/kg	17020	17424	17543	17733
III.	**Biological**					
1.	Benthos Communities					
a.	Macro Benthos	nos/m^2	1157	1162	1156	1132
b.	Epifauna numerical abundance	nos/haul	15	19	15	10
c.	Infauna numerical abundance	nos/m^2	742	718	721	703
IV	**Heavy Metals**					
1.	Lead	mg/kg	0.53	0.57	0.65	0.68
2.	Cadmium	mg/kg	0.060	0.064	0.067	0.078
3.	Copper	mg/kg	< 0.01	< 0.01	< 0.01	0.45
4.	Zinc	mg/kg	0.057	0.069	0.065	0.76

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Ref: SV/AKPL/26-04/21

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEDIMENT**

SOURCE OF COLLECTION : MARINE SEDIMENT

DATE OF COLLECTION : 17-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	Sediment composition					
	a. Sand	%	34.5	36.3	37.2	35.4
	b. Silt + Clay	%	65.5	63.7	62.8	64.6
	c. Org. Matter	%	1.27	1.33	1.25	1.40
2.	pH	-	7.82	7.93	8.19	8.35
II.	**Chemical**					
1.	Nitrogen	mg/kg	393	391	387	428
2.	Phosphorus	mg/kg	233	245	253	197
3.	Potassium	mg/kg	342	355	370	384
4.	Sodium	mg/kg	17015	17419	17536	17727
III.	**Biological**					
1.	Benthos Communities					
a.	Macro Benthos	nos/m^2	1158	1164	1157	1134
b.	Epifauna numerical abundance	nos/haul	16	21	17	12
c.	Infauna numerical abundance	nos/m^2	743	719	723	705
IV	**Heavy Metals**					
1.	Lead	mg/kg	0.50	0.55	0.63	0.66
2.	Cadmium	mg/kg	0.058	0.063	0.065	0.076
3.	Copper	mg/kg	< 0.01	< 0.01	< 0.01	0.43
4.	Zinc	mg/kg	0.055	0.067	0.063	0.75

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Ref: SV/AKPL/26-04/22

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEDIMENT**

SOURCE OF COLLECTION : MARINE SEDIMENT

DATE OF COLLECTION : 23-04-2026

SAMPLE CODE :
1. Port Entrance (Approach Channel)
2. Turning Circle
3. Coal Berth
4. Reclamation Area (Mutable)

TEST REPORT

S.No	PARAMETER	UNIT	1	2	3	4
I.	**Physical**					
1.	Sediment composition					
	a. Sand	%	35.6	37.1	38.7	36.9
	b. Silt + Clay	%	64.4	62.9	61.3	63.1
	c. Org. Matter	%	1.30	1.36	1.28	1.43
2.	pH	-	7.90	8.05	8.26	8.44
II.	**Chemical**					
1.	Nitrogen	mg/kg	400	398	392	434
2.	Phosphorus	mg/kg	237	249	256	201
3.	Potassium	mg/kg	346	358	373	388
4.	Sodium	mg/kg	17024	17425	17542	17732
III.	**Biological**					
1.	Benthos Communities					
a.	Macro Benthos	nos/m^2	1156	1163	1155	1133
b.	Epifauna numerical abundance	nos/haul	14	19	15	10
c.	Infauna numerical abundance	nos/m^2	741	718	721	704
IV	**Heavy Metals**					
1.	Lead	mg/kg	0.52	0.57	0.66	0.70
2.	Cadmium	mg/kg	0.061	0.066	0.069	0.079
3.	Copper	mg/kg	< 0.01	< 0.01	< 0.01	0.46
4.	Zinc	mg/kg	0.058	0.070	0.065	0.77

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Ref: SV/AKPL/26-04/23

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEWAGE WATER**

SOURCE OF COLLECTION : STP INLET – 500KLD

DATE OF COLLECTION : 17-04-2026

TEST REPORT

S.No	Parameter	Unit	Result	Method
1.	pH	-	7.38	APHA, 4500-H+B, 24th Edition 2023
2.	Total Suspended Solids	mg/l	132	APHA, 2540-D, 24th Edition 2023
3.	Chemical Oxygen Demand	mg/l	390	APHA, 5220-B, 24th Edition 2023
4.	BOD 3day 27°C	mg/l	148	IS 3025 P 44
5.	Oil & Grease	mg/l	7.0	APHA, 5520-D, 24th Edition 2023
MICROBIOLOGY TEST				
6.	*Fecal coliform*	MPN/100ml	$20X10^3$	IS 1622

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Ref: SV/AKPL/26-04/24

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEWAGE WATER**

SOURCE OF COLLECTION : STP OUTLET – 500KLD

DATE OF COLLECTION : 17-04-2026

TEST REPORT

S.No	Parameter	Unit	Result	Method	STANDARDS
1.	pH	-	7.61	APHA, 4500-H+B, 24th Edition 2023	6.5-9.0
2.	Total Suspended Solids	mg/l	41.0	APHA, 2540-D, 24th Edition 2023	<100
3.	Chemical oxygen demand	mg/l	110	APHA, 5220-B, 24th Edition 2023	250
4.	BOD 3day 27°C	mg/l	27.0	IS 3025 P 44	30
5.	Oil & Grease	mg/l	<1.0	APHA, 5520-D, 24th Edition 2023	10
MICROBIOLOGY TEST					
6.	*Fecal coliform*	MPN/100ml	170	IS 1622	<1000

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Ref: SV/AKPL/26-04/25

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEWAGE WATER**

SOURCE OF COLLECTION : STP INLET – 40KLD

DATE OF COLLECTION : 17-04-2026

TEST REPORT

S.No	Parameter	Unit	Result	Method
1.	pH	-	7.73	APHA, 4500-H+B, 24th Edition 2023
2.	Total Suspended Solids	mg/l	108	APHA, 2540-D, 24th Edition 2023
3.	Chemical oxygen demand	mg/l	290	APHA, 5220-B, 24th Edition 2023
4.	BOD 3day 27°C	mg/l	106	IS 3025 P 44
5.	Oil & Grease	mg/l	4.0	APHA, 5520-D, 24th Edition 2023
MICROBIOLOGY TEST				
6.	*Fecal coliform*	MPN/100ml	$18X10^3$	IS 1622

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formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-04/26

Date: 02-05-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : **SEWAGE WATER**

SOURCE OF COLLECTION : STP OUTLET – 40KLD

DATE OF COLLECTION : 17-04-2026

TEST REPORT

S.No	Parameter	Unit	Result	Method	STANDARDS
1.	pH	-	7.25	APHA, 4500-H+B, 24th Edition 2023	6.5-9.0
2.	Total Suspended Solids	mg/l	21.0	APHA, 2540-D, 24th Edition 2023	<100
3.	Chemical oxygen demand	mg/l	97.1	APHA, 5220-B, 24th Edition 2023	250
4.	BOD 3day 27°C	mg/l	25.0	IS 3025 P 44	30
5.	Oil & Grease	mg/l	<1.0	APHA, 5520-D, 24th Edition 2023	10
MICROBIOLOGY TEST					
5.	*Fecal coliform*	MPN/100ml	50	IS 1622	<1000

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Annexure – VI

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Ports and Logistics

Letter. No. AKPL/EC/EHS/032 **Date: 03.07.2024**

To

The Superintendent Engineer
Roads & Buildings Department,
Sujathamma Colony, Dargamitta
SPSR Nellore, 524002.

Dear Sir,

Sub:- AKPL – Complying with the MoEF & CC Conditions –Traffic Management and Traffic Decongestion Plan – Submitted – Validation & Certification – Requested - Reg.

Ref:- EC & CRZ Clearance Order No.10-08/2016-IA-III dated 11.01.2021 accorded to AKPL by the Ministry of Environment, Forests & Climate Changes, New Delhi.

We submit that Adani Krishnapatnam Port Limited (AKPL) is an operational port located at Krishnapatnam (P), Muthukur (M), SPSR Nellore District.

The Ministry of Environment, Forests & Climate Changes, New Delhi has accorded Environmental & CRZ Clearance to AKPL vide reference cited above for the development of Port under Phase – III. (Copy of the EC & CRZ Clearance is attached herewith for your kind reference).

As per the EC & CRZ Condition No. vii, under Air Quality Monitoring and Preservation stipulates that:

"A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments."

Complying with the above condition, a study on Traffic Management and Traffic Decongestion Plan was prepared through M/s. FP Project Management (formerly Frischemann Prabhu (India) Private Limited).

Adani Krishnapatnam Port Ltd
(Formerly, Krishnapatnam Port Company Ltd)
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
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As per the MoEF & CC EC & CRZ Clearance, the Traffic Management and Traffic Decongestion Plan to be validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation.

We therefore, submitting herewith the study report for validation & certification and request your good self to validate & certify the study.

Thanking You,

Yours sincerely,

For **Adani Krishnapatnam Port Limited.,**

Dr.D. Jyothi
Vice President - Environment

Encl: a/a

Copy submitted to the Environmental Engineer, A.P. Pollution Control Board, Regional Office, SPSR Nellore for kind information.

Adani Krishnapatnam Port Ltd
(Formerly Krishnapatnam Port Company Ltd)
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
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Ports and Logistics

Letter. No. AKPL/EC/EHS/032 **Date: 03.07.2024**

To

The Nellore Urban Development Authority (NUDA),
Municipal Corporation Office,
SPSR Nellore, 524002.

Dear Sir,

Sub:- AKPL – Complying with the MoEF & CC Conditions –Traffic Management and Traffic Decongestion Plan – Submitted – Validation & Certification – Requested - Reg.

Ref:- EC & CRZ Clearance Order No.10-08/2016-IA-III dated 11.01.2021 accorded to AKPL by the Ministry of Environment, Forests & Climate Changes, New Delhi.

We submit that Adani Krishnapatnam Port Limited (AKPL) is an operational port located at Krishnapatnam (P), Muthukur (M), SPSR Nellore District.

The Ministry of Environment, Forests & Climate Changes, New Delhi has accorded Environmental & CRZ Clearance to AKPL vide reference cited above for the development of Port under Phase – III. (Copy of the EC & CRZ Clearance is attached herewith for your kind reference).

As per the EC & CRZ Condition No. vii, under Air Quality Monitoring and Preservation stipulates that:

"A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments."

Complying with the above condition, a study on Traffic Management and Traffic Decongestion Plan was prepared through M/s. FP Project Management (formerly Frischemann Prabhu (India) Private Limited).

Nellore Urban Development Authority * NELLORE * 04/7/24

Adani Krishnapatnam Port Ltd
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As per the MoEF & CC EC & CRZ Clearance, the Traffic Management and Traffic Decongestion Plan to be validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation.

We therefore, submitting herewith the study report for validation & certification and request your good self to validate & certify the study.

Thanking You,

Yours sincerely,

For **Adani Krishnapatnam Port Limited.,**

Dr.D. Jyothi
Vice President - Environment

Encl: a/a

Copy submitted to the Environmental Engineer, A.P. Pollution Control Board, Regional Office, SPSR Nellore for kind information.

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(Formerly Krishnapatnam Port Company Ltd)
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Annexure - VII

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MOCK DRILL AND OIL SPILL CLEAN UP REPORT

Name of the Mock Drill	**Oil Spill during Operations MT CHEAM STAR**
Type of Mock Drill	Mock Drill - Marine
Date	16.02.2026
Location of the Event	Northwest Berth-02
Description of the event	**MT CHEAM STAR** at approximately 06:10 Hrs., Oil overflowed and spilled from Tank No. 8S hatch cover, resulting in an estimated spillage of around 4000 liters (4 Tons) into the sea. The incident occurred between 06:05 Hrs. and 06:15 Hrs. on 16-02-2026. The situation was treated as an emergency, and response procedures were activated.
Event	**Spilled oil clean-up operations**
Mock drill conducted by	Junead. Shaik
Name of the Observers	Capt. Rajat Garg
Command/control	Capt. B Sahoo
Emergency declared at (Time)	16/0630 Hrs.
All Clear declared at (Time)	171700 Hrs.

Emergency Actions:	**16 February 2026**
Time: 16/0600 hrs.	Received information from Berthing officer and Vessel Master that Oil overflow observed from Tank No. 8S hatch cover during discharge operations.
Time: 16/0605 hrs.	Port Control escalated to HOD, HOS, Port Control In-charge, and Oil Pollution Response Team. Fire & Medical Services informed.
Time: 16/0610 hrs.	Noted. Spillage into sea identified.
Time:16/0612 hrs.	Discharge operations stopped immediately.
Time: 16/0615 hrs.	Oil Spill Emergency Response activated.
Time: 16/0620 hrs.	Response team mobilized with equipment.
Time: 16/0630 hrs.	Containment booms deployed around vessel.
Time: 16/0645 hrs.	Oil recovery commenced using skimmers and absorbent pads.
Time: 16/0730 hrs.	Additional manpower deployed for shoreline monitoring.
Time: 16/0900 hrs.	Throughout the day – Continuous containment and recovery operations carried out.

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	17 February 2026
Time: 17/0600 hrs.	Morning inspection conducted.
Time: 17/0730 hrs.	Booms inspected and repositioned where necessary.
Time: 17/0800 hrs.	Residual oil patches recovered using absorbents and skimmers.
Time: 17/1030 hrs.	Shoreline and berth area were inspected for remaining traces.
Time: 17/1200 hrs.	Recovered oily waste disposed of as per environmental norms.
Time: 17/1330 hrs.	Continuous monitoring around vessel and berth limits.
Time: 17/1615 hrs.	Situation brought under control and satisfactory conditions were achieved.
Time: 17/1700 hrs.	OPR Team confirmed recovery completed. Approx. 4000 liters collected and handed over to Liquid operations and EHS for disposal.

Items/ resource consumed	Boats
No. of persons reported at assembly point (Attach list)	20 Members
No. of people inside the area/ building (Attach list)	Nil
No. of vehicles/ equipment evacuated	Nil
No. of vehicle /equipment inside the area	Boats used (617, 821 and 4 fiber Boats)
No of the people sent outside at safe place from assembly point	Nil
No. of victims rescued	Nil
No. of people injured. a. Minor injuries b. Major injuries c. Fatal	Nil
No. of the Rescue team involved.	Department: Safety and Security — No. of persons: 1+ 1
Type of vehicle / equipment used in drill.	Vehicle/ Equipment: Boats / OPR Eqip. — No's: 2+4 — Reg. Number: IV & IRS Class

Time taken for the (Oil collection) :**23 hours.**

Task	People Evacuation	Vehicle/ Equipment Evacuation	Fire Extinguishing	Cleanup Operation	Total Time
Actual	Min	N/A	N/A	23 Hours	23 Hours

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Observations	Observer-1: • **Timely Response**: Vessel crew and Port Control acted promptly, ensuring the spill was contained without spreading. • **Coordination**: Communication between vessel, Port Control, and Oil Pollution Response Team was effective and continuous. • **Equipment Readiness**: OPRC equipment (booms, skimmers, fiber boats) was available and deployed quickly, reflecting good preparedness. • **Waste Handling**: Collected oil (4000 liters) was properly handed over to EHS for safe disposal, complying with environmental protocols. • **Training Need**: Some gaps were noticed in immediate logging/documentation, indicating the need for refresher training for Radio Officers and Berthing Officers. • **Overall Performance**: The drill was completed successfully within 65 minutes, demonstrating operational efficiency. • No major environmental impact reported beyond the immediate berth area.

	Action Plan/ Preventive Measures	**Responsibility**	**Target Date**
	1. Immediate stoppage of cargo discharge upon detection of overflow. 2. Activation of Oil Spill Contingency Plan without delay. 3. Deployment of containment booms around vessels during discharge as a preventive practice. 4. Toolbox talk and safety briefing to vessel crew and terminal staff. 5. Recommendation for vessels to ensure proper communication and monitoring of tank levels. 6. Periodic checks of OPRC equipment for immediate deployment. 7. Strict adherence to communication and escalation protocols. 8. Safe disposal of collected oil through EHS. 9. Conduct post-drill debriefing to identify gaps and corrective actions.	Port Control	Immediate

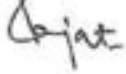
Report prepared by:

Junead. Shaik
In charge – Port Control
Marine.

Report reviewed by:

Capt. B Sahoo
HoS Marine

Approved by:



Capt. Rajat Garg
HoD Marine

adani

Pictures of the Event

9/c copy

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ANNEXURE 2
Annexure - VIII

Ref. No. AKPL/EC/ENV/007/2025-26 **Date: 09.04.2025**

To

The Environmental Engineer,
A.P. Pollution Control Board,
Regional Office,
SPSR Nellore,
Andhra Pradesh

Dear Sir,

Sub: Adani Krishnapatnam Port Limited (AKPL) – Complying with Phase III expansion of EC & CRZ clearance Conditions – Submission of NIOT Study reports - Reg.

Ref: EC & CRZ Clearance Order No.10-18/2016-IA-III dated 11.01.2021 and APCZMA NOC letter no. 202/CRZ/IND/2019 -30 dated 21.05.2020 accorded to AKPL by the Ministry of Environment, Forests & Climate Changes, New Delhi and APCZMA.

@@@

Adani Krishnapatnam Port Limited had obtained Environmental and Coastal Regulatory Zone clearances from MoEF&CC and Andhra Pradesh Coastal Zone Management Authority (APCZMA) for Phase III expansion of Port. The clearances were subjected to fulfilling of conditions for environmental monitoring as stipulated by the above authorities. In this regard AKPL has approached NIOT to carry out various monitoring studies letter dated 27.05.2021.

S.No.	Condition	Reference
A	Continuous monitoring of circulation of seawater shall be carried out every six months by engaging in a reputed agency like NIOT. The port shall undertake the study of multi-sensor, multi-data data to study the sedimentation studies in the inner harbour channel in addition to the in-	CRZ Clause: PART A: Specific Condition (iv)

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S.No.	Condition	Reference
	house studies undertaken as part of regular monitoring of sedimentation in the harbour channel. The monthly reports shall be submitted to APPCB.	
B	The Port shall also undertake the scientific studies by engaging reputed agencies like National Institute of Ocean Technology (NIOT) and Indian Institute of Technology, Chennai to study the feasibility of constructing submerged breakwaters to protect the beach road from seasonal erosion and also during cyclones.	CRZ Clause: PART A: Specific Condition (vii)
C	The applicant shall ensure that continuous monitoring systems of all likely affected parameters including air/fish/flora/fauna/water quality/ waste water discharges/solid waste disposal/construction material disposal etc., are installed and reports shared with the National Institute of Oceanography (NIO) on continuous basis and a monthly report submitted to the APPCB by the NIO, all through construction period and at least for one year after commencement of operations.	CRZ Clause: PART A: Specific Condition (viii)
D	The proposed expansion entails 60 million cu m of dredging in soft soil. As proposed, the PP shall utilize 26 million cu m of dredged sand for reclamation of low-lying areas of port, stockpile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT and disposal of balance 32 million cu m of dredged spoil in the identified dredge disposal area of 56 Km2 beyond (-) 20 m contour. The impact of dredging on the marine environment should be monitored and necessary measures shall be taken on priority basis if any adverse impact is observed. NIOT will oversee the work as scientific body and continue to monitor its impact/benefits for at least 5 years post project completion. Necessary financial assistance to be provided by project proponent to NIOT. The report of the same to be submitted to regional office of MoEF&CC by project proponent.	EC Clause: Specific conditions (vii)

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S.No.	Condition	Reference
E	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.	EC Clause VI: Waste management (ii)

Complying with the above conditions, a study on Shore line changes from satellite imageries and monitoring of shoreline from field measurements and Shoreline protection from erosion report was prepared through National Institute of Ocean Technology (Ministry of Earth Sciences, Government of India) As per the MoEF & CC, EC & CRZ Clearance.

We therefore, submit herewith the study report to comply with the EC & CRZ Clearance stipulated condition.

Thanking You,
Yours Faithfully,
For **M/s Adani Krishnapatnam Port Limited,**

(Authorized Signatory)

Encl: a/a

Copy to:
SHRI N.S. MURALI, IFS
Inspector General of Forests (C),
Ministry of Environment, Forest and Climate Change,
Integrated Regional Office, Vijayawada Green House Complex,
Gopalareddy Road, Vijayawada – 520010, Andhra Pradesh

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Outlook

FW: NIOT - Shoreline monitoring Report of AKPL

From Bolla Srinu <Bolla.Srinu@adani.com>
Date Tue 1/20/2026 1:28 PM
To AKPL ENV <akpl.env@adani.com>; Vinay Sai Gottapu <VinaySai.Gottapu@adani.com>
Cc Kaushal Singh <Kaushal.Singh@adani.com>

1 attachment (5 MB)
NIOT - Shore line Monitoring Report.pdf;

Dear Team,
For information and records please.

From: Bolla Srinu
Sent: Tuesday, January 20, 2026 1:27 PM
To: '"iro.vijayawada-mefcc@gov.in"' <iro.vijayawada-mefcc@gov.in>
Cc: APPCB RO Nellore <ronlr-ee1@appcb.gov.in>; Kaushal Singh <Kaushal.Singh@adani.com>
Subject: NIOT - Shoreline monitoring Report of AKPL

Dear Sir,
With reference to the above subject, we are herewith sharing shoreline monitoring study report of Adani Krishnapatnam Port Limited., done by NIOT.

For Kind information and records please.

With Best Regards,

Bolla. Srinu,
Manager – Environment,
Adani Krishnapatnam Port Limited (AKPL)
Mobile: +91 9121398072
Email:bolla.srinu@adani.com

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C24021
DL002,Rev.E

Annexure-IX

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Adani Krishnapatnam Port Limited

AKPL – Marine Environmental Studies during Pre-Dredging, Dredging and Post dredging Scenarios

Final Report
March, 2026
Submitted by

FALCON RESILIENT
INFRA CONSULTANTS

CENTRE FOR ADVANCED STUDY
IN MARINE BIOLOGY,
ANNAMALAI UNIVERSITY

Document Control

Project Number and Name	C24021 Marine Environmental Monitoring Studies during Pre Dredging, Dredging and Post Dredging Scenarios		
Client	Adani Krishnapatnam Port Limited		
Document Title	Final Report		
Document Number	DL003		
Revision	B		
Date	31-03-2026		
Name/Initial	MDS NSM	VVH	SAM
	Prepared	Reviewed	Approved

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1 Introduction

Adani Krishnapatnam Port Limited (AKPL) is a multi-purpose port located in the east coast of SPSR Nellore District of Andhra Pradesh. Krishnapatnam port is an All-Weather Port with Deep Draft capable of handling capesize and panamax vessels. Round-the clock navigation and provides two-way traffic for both onshore & offshore logistics, State of the art infrastructure with bulk cargo handled by mechanized handling systems. The geographical position of the Krishnapatnam Port is extending from 14.218° N to14.295° N Latitude, and 80.064° E to 80.142° E Longitude.

Figure 1-1: Adani Krishnapatnam Port Site Location

Dredging is the process of excavating materials from the bottom of bodies of water, either underwater or partially submerged, in shallow or ocean waters. Type of Dredging carried out at Adani Krishnapatnam Port is a Maintenance Dredging a common necessity in water ways around the world as sedimentation (accumulation of sand and silt) reduces the depth of waters and makes difficult for larger vessels or ships to navigate. Maintenance Dredging will be carried out to maintain required depth of water, to improve the existing features, reshaping of land and water features to alter drainage, navigability and commercial use, recovering valuable mineral or sediments such as sand and gravel.

The Dredging process involves three different phases, they are Pre-Dredging, Dredging and post dredging. Each phase is essential for the success and long-term sustainability of the dredging operation. Pre-Dredging phase involves site assessment and surveys, Environmental impact assessment (EIA) and planning. Dredging phase involves removal/digging out sediment or siltation in channel, berthing areas etc. Monitoring of water quality, environmental control and safety management is required in this phase. Post Dredging Phase involves Disposal and reuse of dredged material. Environmental Monitoring, sediment deposition management and Habitat Restoration is required in this phase.

In this connection, Adani Krishnapatnam Port Limited (AKPL) awarded the work for Marine Environmental Monitoring to Falcon Resilient Infra Consultants (FRICS). FRICS in association with Centre for Advanced Study in Marine Biology (CASMB), Annamalai University has initiated the Marine Environmental Monitoring during pre-dredging, dredging and post dredging phases.

2 Purpose of the Study

AKPL intends to establish a marine environmental status by conducting Marine Environment Monitoring during Pre dredging, dredging and post dredging activities. As per the conditions stipulated under Phase III of the Environmental and Coastal Regulation Zone (CRZ) Clearance, as outlined in EC Order No. 10-08/2016-IA-III dated 11th January 2021 and issued by the Ministry of Environment, Forest and Climate Change (MoEFCC), the following conditions are as follows:

Special condition no. vii:

i. The proposed expansion entails 60 million cum of dredging in soft soil. The PP shall utilize 26 million cu m of dredged sand for reclamation of low-lying areas of port, stockpile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT.
ii. Disposal of balance 32 million cu m of dredged spoil in the identified dredge disposal area of 56 Km^2 beyond (-) 20 m contour.
iii. The impact of dredging on the marine environment should be monitored and necessary measures shall be taken on priority basis if any adverse impact is observed.
iv. NIOT will oversee the work as scientific body and continue to monitor its impact/benefits for at least 5 years post project completion. Necessary financial assistance to be provided by project proponent to NIOT

Water quality monitoring and preservation condition no. ii:

Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality. Silt curtains shall be used to contain the spreading of suspended sediment during dredging within the dredging area.

Marine Ecology condition no. ii:

While carrying out dredging, an independent monitoring shall be carried out through a Government Agency/Institute to assess the impact, and necessary measures shall be taken on priority basis if any adverse impact is observed.

3 Marine Environmental Monitoring

FRICS in association with Centre for Advanced Study in Marine Biology (CASMB), Annamalai University conducted Marine Environmental Monitoring surveys during Pre Dredging, Dredging and Post Dredging phases for analysing marine Environmental Status at Adani Krishnapatnam Port Limited. The Marine Monitoring was carried out at thirteen locations (13) The Monitoring locations were given in the **Table 3-1** and shown in **Figure 3-1.**

Table 3-1: Marine Sampling location with Latitudes and Longitudes

Marine Sampling Locations				
Sl. No	**Name**	**Location Type**	**Latitude**	**Longitude**
1	MS1	Creek	14°13'42.16"N	80°4'39.38"E
2	MS(ITL) 2	ITL	14°16'26.16"N	80°8'24.37"E
3	MS3	Creek	14°15'3.47"N	80°5'57.77"E
4	MS4	Creek	14°14'42.91"N	80°7'46.94"E
5	MS(ITL)5	ITL	14°17'39.34"N	80°8'42.69"E
6	MS6	Open Ocean	14°14'54.30"N	80°9'30.91"E
7	MS7	Open Ocean	14°16'56.79"N	80°9'36.44"E
8	MS8	Open Ocean	14°12'39.42"N	80°8'56.22"E
9	MS9	Open Ocean	14°18'47.23"N	80°9'56.10"E
10	MS10	Open Ocean	14°15'47.95"N	80°11'43.05"E
11	MS11	Open Ocean	14°12'42.16"N	80°16'3.89"E
12	MS12	Open Ocean	14°19'14.15"N	80°16'51.26"E
13	MS(ITL) 13	ITL	14°13'29.15"N	80°7'56.86"E

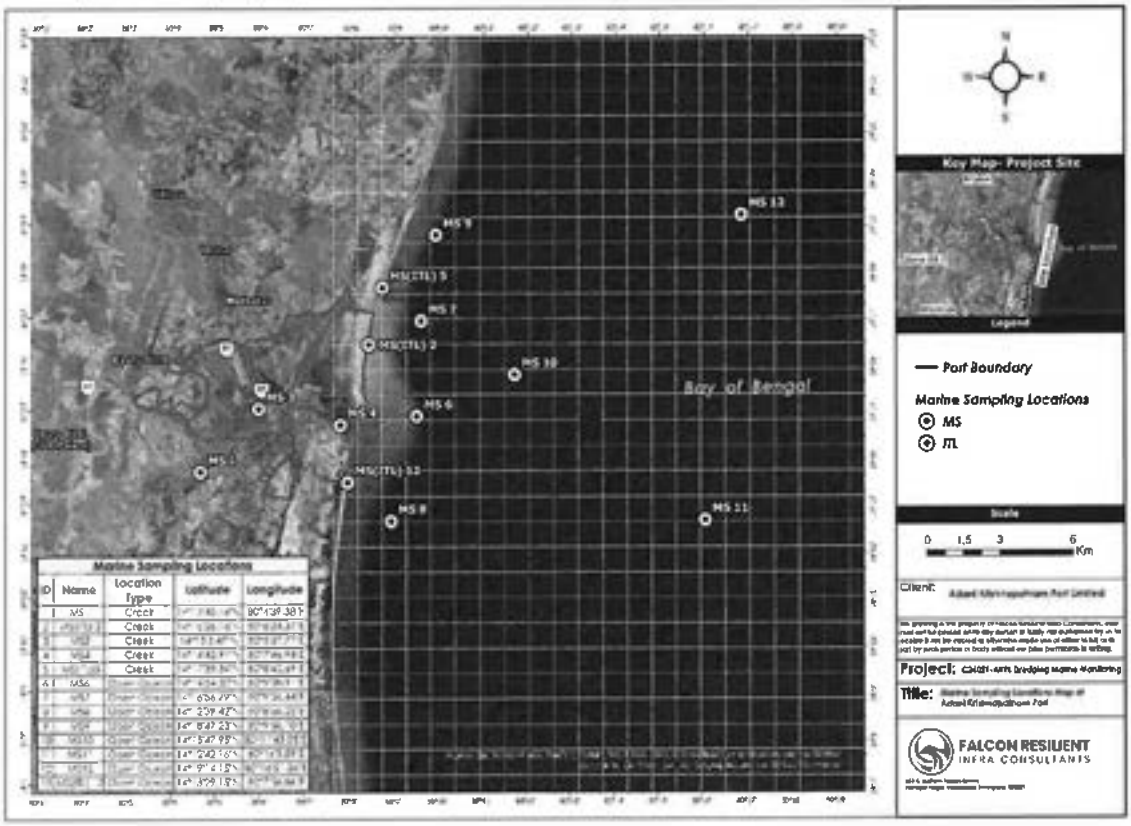


Figure 3-1: Marine Sampling locations

3.1 Approached Methodology

The marine monitoring allows for real-time tracking of changes in key metrics, such as physio-chemical parameters and biological parameters, which are immediately impacted by sediment resuspension and water column disruption during dredging operations. The various methods used for analysing the marine samples were mentioned below.

Marine Water Quality

Water samples were collected at the surface and sub-surface level using Universal water sampler and transferred to the pre-cleaned polypropylene and glass containers. Sediment samples were collected using van Veen Grab, transferred to clean polythene bags and transported to the shore. The samples were air-dried, and the plant root and other debris were removed and stored for further analysis.

Temperature, Salinity and pH

The physical parameters such as temperature, salinity and pH were measured in-situ in the field. The sub-surface temperature was measured with a mercury thermometer (0.02 ^{0}C accuracy) and the pH was measured by a calibrated pH pen (pH ep-3 model). Salinity was estimated using a Hand Refractometer (Atago, Japan). Water samples collected for dissolved oxygen estimation were transferred carefully to DO bottles. The DO was immediately fixed and brought to the shore for further analysis. TSS was measured using Millipore vacuum filtration unit and the values are expressed in ppm. Turbidity was measured using turbidity meter and expressed in NTU.

Preservation and Laboratory Analysis

After collection, the samples were immediately cooled to 4^{0}C and then brought to the Lab, in an insulated thermocol box. On reaching the shore, water samples were filtered through Whattman GF/C filter paper and analysed for organic matter and other nutrients. Unfiltered samples were used for the estimation of total nitrogen and total phosphorus. All the analyses were carried out by adopting Standard procedures for samples of aquatic origin.

Dissolved Oxygen

The modified Winkler's method as described by Strickland and Parsons (1972) was adopted for the estimation of dissolved oxygen. The values are expressed in mg/l.

Sulphate

The sulphates content of samples were analysed by following the method described by APHA (1995).

Nitrate and Nitrite

The nitrate and nitrite content of samples were analysed by following the method described by Grasshoff et al. (1999). The nitrite was estimated from highly coloured azo dye formed by the addition of N (1-Napthyl) ethylene diaminedihydro-chloride and sulphanilamide into the solution which was then measured at 543 nm in a spectrophotometer. Same procedure was followed for the estimation of nitrate. For this, nitrate was reduced to nitrite by passing the sample through copper coated cadmium column. The calculated values were expressed as µmol of Nitrogen/l.

Ammonia and Total nitrogen

Ammonia present in water reacts with sodium hypochlorite and phenol in alkaline condition to produce indophenol blue. Sodium nitroprusside is used as a catalyst and colour intensifier. The methodology described in Grasshoff et al. (1999) was followed for the determination of Ammonia and Total nitrogen. Organically bound nitrogen is oxidized to nitrate during alkaline persulphate digestion. The nitrate content of the sample is determined after reduction to nitrite. The calculated values are expressed in µmol of Nitrogen/l for both the parameters.

Inorganic Phosphate

The single solution mixed reagent procedure developed by Grasshoff et al. (1999) was followed for the estimation of dissolved inorganic phosphate levels in water samples. This involves the conversion of phosphate into phosphomolybdic acid, which was then reduced to molybdenum blue colour complexes and then the intensity of colour was measured at 882 nm in a spectrophotometer. The calculated values are expressed in µmol of Phosphate/L.

Total Phosphorus

The Total Phosphorus in water samples was estimated by adopting the method described by Grasshoff et al. (1999). This procedure involves the conversion of organically bound phosphate into inorganic phosphate by wet oxidation of samples with potassium persulphate in an autoclave for 30 min at 15 lbs pressure. The converted inorganic phosphate was then estimated by using the method described by Murphy and Riley (1962). The subtraction of original dissolved inorganic phosphate from total phosphate yielded the organic phosphate in the water sample. The calculated value is expressed in µmol of Phosphorus/L.

Reactive Silicate

The reactive silicate content of water was estimated by following the method of Grasshoff et al. (1999). In this method, the intensity of blue colour formed by silico-molybdate complex was measured at 810 nm in a spectrophotometer and the calculated values are expressed in µmol of Silica/l.

Sediment Analysis

For the analysis of soil textural composition and pH, the air-dried sediment samples were used as such. For all other analyses, sediment samples were ground to fine powder and dried in an oven at 110^{0}C to constant weight for an hour and the parameters such as soil texture, TOC, PHC, Heavy metals were analysed using the sediment samples.

Total Organic Carbon

The estimation of total organic carbon in sediment was performed by adopting the method of El Wakeel and Riley (1956). The procedure involves chromic acid digestion and subsequent titration against ferrous ammonium sulphate solution in the presence of 1-10 ferrous phenonthroline indicator. The values calculated are expressed in mgC/g of sediment.

Chlorophyll `a' & Phaeo-pigments

The detailed methodology as described in APHA manual (1989) was followed for estimating Chlorophyll'a' and phaeo-pigments content. The samples were filtered through Whattman GF/C filter papers, and the chlorophyll was extracted into 90% acetone. The resulting-coloured acetone extract was measured in a spectrophotometer at different wave lengths and the same acetone extracts were acidified and measured for the Phaeo-pigments.

Phytoplankton

Phytoplankton samples were collected from the surface waters of the study area by towing a plankton net (mouth diameter 0.35 m) made of bolting silk [No.30 mesh size 48 µm) for half an hour. These samples were preserved in 5% neutralized formalin and used for qualitative analysis. For the quantitative analysis of phytoplankton, the settling method as described by Sukhanovo (1978) was adopted. Numerical plankton analysis was carried out using Utermohl's inverted plankton microscope.

Phytoplankton species was identified using the standard works of Hustedt (1930-1966), Venkataraman (1939), Cupp (1943), Subramanian (1946), Prescott (1954), Desikachary (1959 and 1987), Hendey (1964), Steidinger and Williams (1970) and Taylor (1976) and Anand et al. (1986).

Zooplankton

Zooplankton samples were collected from the surface waters of the study area by horizontal towing of plankton net with mouth diameter of 0.35 m, made of bolting silk (No. 70 mesh size 200 µm) for half an hour. After collection, the samples were preserved in 5% neutralized formalin and used for quantitative analysis. The zooplankton collected were identified to the species level using the classical works of Dakin and Colefax (1940), Davis (1955), Kasthurirangan (1963) and Wickstead (1965) and Damodara Naidu (1981). For the quantitative analysis of zooplankton, a known quantity of water (100 L) was filtered through a bag net (0.33 mm mesh size) and filtrate was made up to 1 litre in a wide mouthed bottle and then enumerated using Utermohl's inverted plankton microscope. The plankton density is expressed as number of organisms/m^3.

Benthic Community

For studying the benthic organisms, sediment samples were collected using Van veen grab which covered an area of 0.1m2. The wet sediment was sieved with varying mesh sizes (0.5mm -macrofauna and 0.062mm-meiofauna) for segregating the organisms. The organisms retained in the sieve were fixed in 5-7% formalin and stained further with Rose Bengal solution for easy spotting at the time of sorting. The number of organisms in each grab sample was expressed as number per meter square. All the species were sorted, enumerated and identified to the advanced taxonomic level possible with the consultation of available literature. The works of Fauvel (1953), Day (1967) were referred for polychaetes; Barnes (1980) and Lyla et al. (1999) for crustaceans; Subba Rao et al. (1991) and Ramakrishna (2003) for molluscs.

Sampling Equipments:

- **PH** meter is used to measure the acidity and basicity of sea water which is very important for identifying the water quality. These measurements help to know the health of marine ecosystems and helps in monitor marine pollution.
- **Thermometers** are used to measure the temperature of the marine water.
- A **salinity refractometer** is a device used to measure the concentration of dissolved salts in a liquid, typically water. It works by measuring the refractive index of the sample, which changes based on the salt content.
- A **plankton net** is shaped like a cone and made with very fine mesh, kind of like a soft screen. It has a strong metal frame to help it stay together. When pulled through the water, the net lets water go through but catches tiny plankton, like little sea creatures.
- The Niskin Sampler is specifically designed to collect water samples from different depths. Its horizontal orientation makes it particularly effective in stratified waters or regions with strong currents. Available in five different sizes, the sampler is constructed to minimize metal contact with the water, helping to maintain the purity and integrity of the sample.

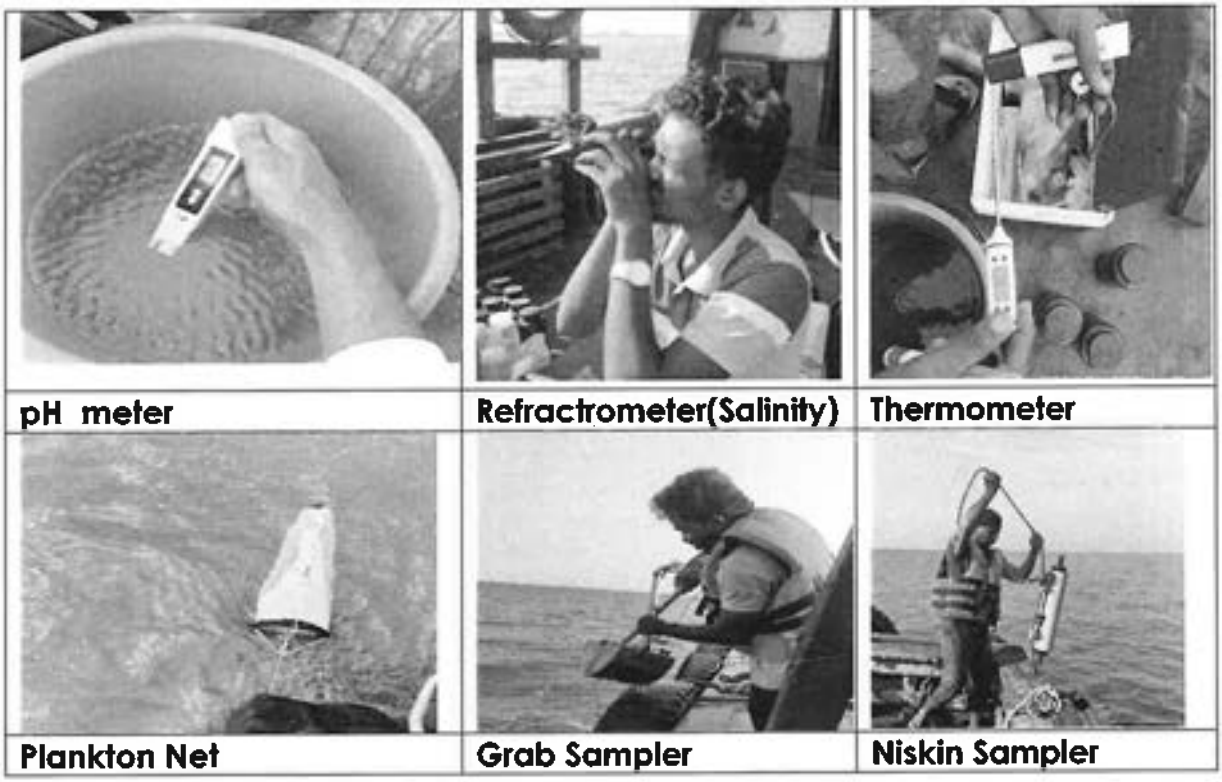


Exhibit 3-1:Equipments used for sampling

The marine environmental monitoring surveys during Pre dredging phase was conducted on **December 10, 2024**, during dredging phase on **January 27,2025** and during post dredging on **April 07,2025.** The marine sampling during three phases i.e. Pre Dredging, Dredging and Post Dredging are shown in **Exhibit 3-2, Exhibit 3-3** and **Exhibit 3-4**

Exhibit 3-2: Marine sampling during Pre Dredging

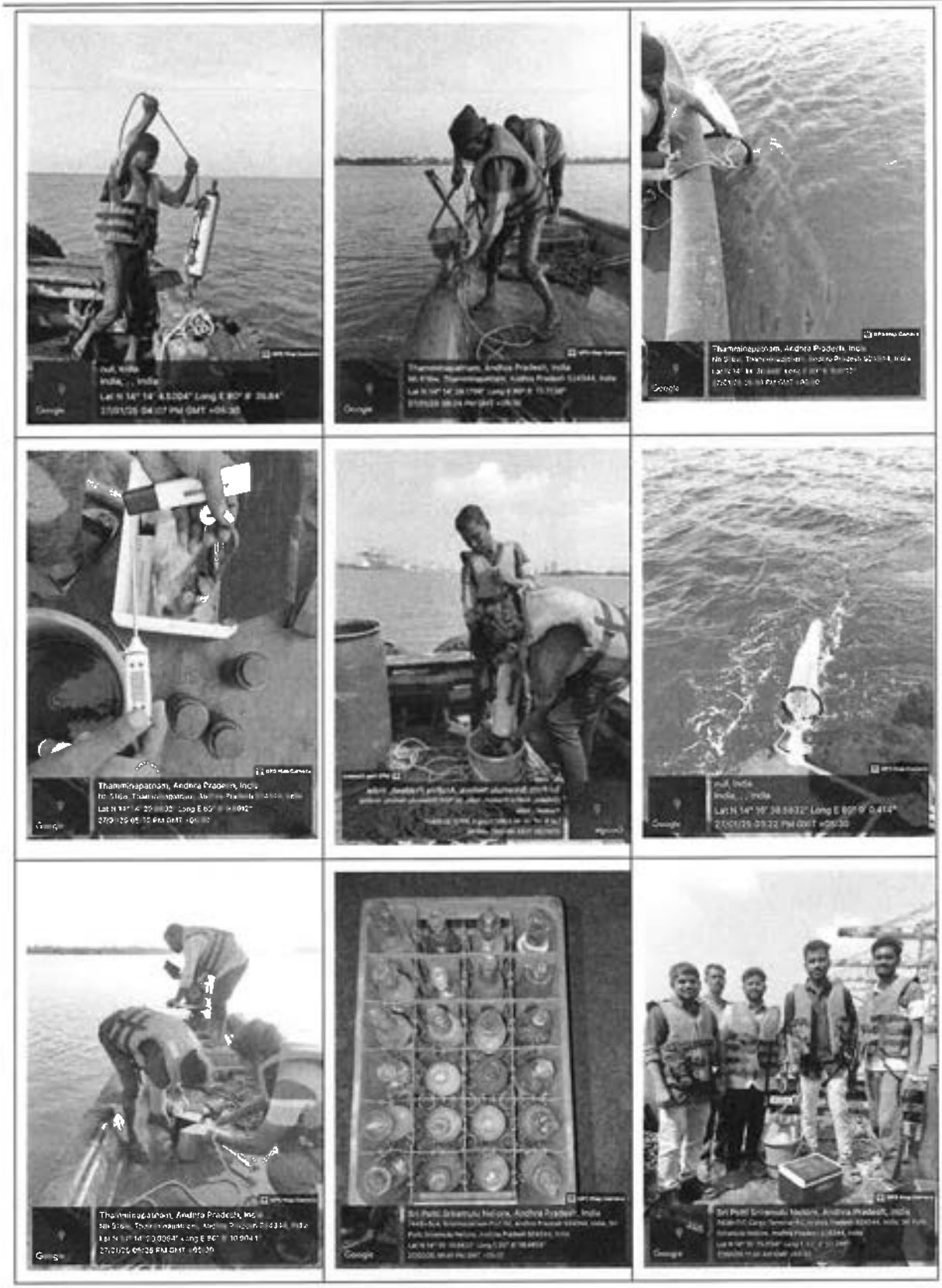


Exhibit 3-3: Marine sampling during Dredging

Exhibit 3-4: Marine Sampling during Post Dredging

3.2 Monitoring analysis and results

Water Quality

The physical parameters like pH, temperature and salinity were measured in-situ in field condition. Water samples collected for dissolved oxygen estimation were transferred carefully to BOD bottles. The DO is immediately fixed, and these were brought to the laboratory for further analysis. All the analysis were carried out as per suitable standardisation procedures. The Physio-chemical parameters of marine water at Creek locations are given in **Table 3-2,** at Intertidal locations are given in **Table 3-3** and Coastal water locations are given in **Table 3-4,Note:** *S= Surface; B = Bottom*

Table 3-5, and Error! Reference source not found..

Table 3-2: Physio-Chemical Parameters of Marine Water at Creek Area

Parameters	Unit	Creek Area																	
		MS1						MS3						MS4					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B
		Low tide		High tide		High tide		Low tide		High tide		High tide		Low tide		High tide		High tide	
Temperature	^{0} C	27.80	27.50	28.50	28.30	29.50	28.90	27.90	27.60	28.40	28.20	29.50	29.10	29.00	28.80	28.00	27.80	31.10	31.00
Salinity	PPT	12.00	12.00	22.00	23.00	18.30	17.50	20.00	20.00	25.00	24.00	23.00	22.00	12.50	12.80	22.00	23.00	25.00	24.00
pH	-	7.70	7.80	8.10	8.15	7.90	8.00	7.90	8.00	8.12	8.15	8.10	7.90	7.90	8.00	8.14	8.16	8.13	8.14
Turbidity	NTU	38.00	42.00	47.00	51.00	35.00	39.00	40.00	52.00	55.00	58.00	39.00	41.00	51.00	62.00	65.00	67.00	52.00	58.00
TDS	mg/L	26.00	29.00	55.00	62.00	24.00	29.00	20.00	22.00	34.00	37.00	22.50	28.60	26.00	29.00	70.00	79.00	23.60	29.60
TSS	mg/L	11800.00	12040.00	1790 0.00	2050 0.00	1190 0.00	1211 0.00	1260 0.00	1281 0.00	3010 0.00	3150 0.00	1284 0.00	1296 0.00	1260 0.00	1281 0.00	2220 0.00	2300 0.00	1426 0.00	1458 0.00
DO	mg/L	4.50	4.52	3.41	3.23	4.51	4.56	4.35	4.59	3.42	3.28	4.66	5.10	4.50	4.40	3.60	3.24	4.80	4.40
COD	mg/L	20.50	22.30	30.20	32.50	19.24	20.56	15.40	17.20	28.90	29.30	17.28	21.56	22.80	24.60	33.40	34.70	23.21	24.56
BOD	mg/L	3.20	3.40	3.90	3.60	3.32	3.49	3.20	3.00	3.37	3.56	3.67	3.70	2.80	3.10	2.95	3.18	3.16	3.37
Ammonical nitrogen	µmol/L	0.35	0.37	0.82	0.97	0.35	0.37	0.46	0.54	0.72	0.98	0.41	0.47	0.42	0.46	0.52	0.57	0.36	0.37
Nitrite	µmol/L	2.16	2.65	3.01	3.11	2.05	2.06	1.19	2.11	2.41	2.65	2.22	2.24	2.12	2.13	2.39	2.63	2.10	2.20
Nitrate	µmol/L	4.33	5.76	6.10	6.30	3.25	3.97	2.69	3.74	4.92	5.01	2.06	2.52	2.04	4.20	3.90	2.75	1.89	2.31
TN	µmol/L	12.35	13.89	17.34	18.46	12.45	12.92	7.33	8.87	11.58	11.43	7.54	7.81	5.45	5.46	7.40	7.35	4.96	4.96
Inorganic Phosphate	µmol/L	1.46	1.46	1.51	1.55	1.23	1.24	1.85	1.24	2.15	2.41	1.15	1.18	1.51	1.45	2.06	1.97	1.48	1.97
TP	µmol/L	3.20	3.45	4.25	4.58	2.34	2.63	2.15	2.39	3.35	3.86	3.41	3.59	2.33	2.54	3.46	3.67	2.93	3.04
Chlorides	mg/L	78400.00	80400.00	1176 00.00	1246 00.00	8100 0.00	8674 0.00	1267 0.00	1257 0.00	1650 0.00	1705 0.00	8740 0.00	9040 0.00	7640 0.00	8460 0.00	1705 0.00	1733 0.00	8430 0.00	8640 0.00
Sodium	mg/L	666.00	680.00	5500.00	6100.00	920.00	930.00	910.00	830.00	9200.00	9400.00	920.00	980.00	694.00	710.00	9500.00	9650.00	950.00	965.00
Sulphates	mg/L	620.00	620.00	1380.00	1540.00	810.00	850.00	935.00	1040.00	2310.00	2380.00	2312.00	2394.00	645.00	660.00	1690.00	1770.00	2390.00	2430.00
Silica	µmol/L	9.93	10.19	14.49	15.27	9.18	9.33	6.01	6.54	7.84	8.54	6.85	7.10	6.87	7.64	8.76	9.67	6.79	6.95
Reactive Silica	µmol/L	5.38	6.64	10.83	10.65	5.80	6.35	6.87	8.13	10.41	10.39	4.02	4.40	5.29	6.55	10.33	10.34	4.70	5.15
Oil &Grease	µg/l	0.40	0.48	0.83	0.65	0.54	0.74	0.23	0.30	0.41	0.39	0.58	0.44	0.28	0.35	0.33	0.34	0.65	0.37
Lead	µg/l	2.45	2.48	2.58	2.77	2.30	2.79	2.64	2.67	2.47	2.17	2.41	1.17	1.48	1.59	1.99	1.87	1.47	1.41
Cadmium	µg/l	1.29	1.31	1.95	2.19	1.77	1.61	0.96	0.50	1.08	1.21	0.98	1.19	0.78	1.06	0.96	1.08	0.87	0.69
Copper	µg/l	4.58	4.63	5.13	5.74	3.90	3.21	4.98	5..15	3.46	3.35	3.26	3.95	3.84	4.39	4.98	5.44	4.11	4.94
Zinc	µg/l	18.56	18.76	20.56	20.76	15.63	17.30	15.46	15.67	18.02	17.21	15.46	15.67	10.87	11.04	13.87	13.04	10.84	10.02

Parameters	Unit	Creek Area																	
		MS1						MS3						MS4					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B
		Low tide		High tide		High tide		Low tide		High tide		High tide		Low tide		High tide		High tide	
Iron		21.67	21.95	25.67	25.95	23.01	22.42	21.42	22.02	23.42	29.02	20.98	21.07	24.14	24.81	27.14	28.81	24.32	24.89
Mercury		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: S= Surface; B = Bottom

Table 3-3: Physio-Chemical Parameters of Marine Water at MS2 (ITL), MS5 (ITL) and MS13 (ITL)

Parameters	Unit	Intertidal Area								
		MS2 (ITL)			MS5 (ITL)			MS13 (ITL)		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Temperature	⁰ C	28.6	28.5	31.2	28.2	28.2	31.2	27.8	28.2	31.5
Salinity	PPT/PSU	29	30	32	30	31	32	32	31	32
pH	-	7.9	8.12	8.22	8	8.23	8.21	7.9	8.1	8.24
Turbidity	(NTU)	52	38	39	58	62	44	52	58	39
TDS	mg/L	42	62	46.4	41	73	42.6	48	66	42.8
TSS		28700	31700	29360	29050	31000	30500	30980	32100	31280
DO		4.6	3.8	4.7	4.8	3.52	4.9	4.8	3.7	5.6
COD		13.6	18.6	14.3	10.5	22.5	12.6	14.9	19.3	16.52
BOD		2.8	3.15	2.72	2.7	3.84	2.28	2.9	3.11	2.24
Ammonical nitrogen		0.67	0.83	0.51	0.71	0.94	0.65	0.61	0.87	0.72
Nitrite	µmol/L	1.122	1.98	1.3	1.522	2.05	1.18	1.168	2.168	1.163
Nitrate		2.191	3.01	2.18	2.524	2.62	1.75	3.665	3.665	2.08
TN		6.89	10.5	9.75	6.108	15.5	5.82	4.65	9.56	8.52
Inorganic Phosphate		1.148	2.19	2.04	1.148	2.19	1.11	1.547	2.6	1.53
TP		2.513	3.78	3.13	3.244	3.84	3.15	2.878	2.95	2.5
Chlorides	mg/L	14500	16500	14600	14500	17050	14700	14600	17050	14700
Sodium		1610	9200	6700	1665	9400	6700	1675	9470	6250
Sulphates		1500	2340	2160	1550	2388	2170	1650	2385	2165
Silica	µmol/L	9.383	10.51	9.26	6.674	7.51	6.45	6.91	7.75	6.25
Reactive Silica		6.001	7.476	4.8	5.419	6.349	4.48	4.729	7.422	5.52

Parameters	Unit	Intertidal Area								
		MS2 (ITL)			MS5 (ITL)			MS13 (ITL)		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Oil &Grease	µg/L	0.393	0.476	0.354	0.234	0.349	0.475	0.367	0.422	0.554
Lead		1.86	2.58	1.74	1.42	1.49	1.33	2.07	2.18	1.94
Cadmium		0.45	0.52	0.47	0.65	0.83	0.76	1.04	1.24	1.13
Copper		3.18	3.56	3.4	4.08	4.57	4.37	4.02	4.5	4.3
Zinc		16.94	16.94	14.26	13.31	15.23	12.82	13.12	16.11	13.56
Iron		25.41	35.41	31.73	26.71	32.67	29.27	20.13	24.53	21.98
Mercury		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Table 3-4: Physio-Chemical Parameters of Marine Water at MS6, MS7 and MS8

Parameters	Unit	Offshore Area																	
		MS6						MS7						MS8					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B
		Low tide		High tide		High tide		Low tide		High tide		High tide		Low tide		High tide		High tide	
Temperature	⁰C	28.4	28.1	28.3	28.1	32.2	31.9	27.7	26.5	27.7	26.5	30	29.8	28.3	28.1	27.8	27.2	32	31.8
Salinity	PPT	25	25.3	24.1	25.6	32	32.5	31	32	32.5	32.1	31	31.5	28	28.2	31	32	30.5	31.5
pH	-	8.1	8.1	8.29	8.21	8.22	8.25	8.15	8.19	8.25	8.27	8.26	8.25	8.21	8.25	8.31	8.28	8.27	8.29
Turbidity	NTU	35	41	51	53	26	36	35	40	48	50	30	34	38	42	45	46	29	31
TSS	mg/L	36	39	45	48	31.5	34.5	42	44	52	58	38	39	34	32	43	40	27.5	29.5
TDS		25020	25260	31400	29200	23080	23100	23200	23100	29200	29100	24020	23300	28040	28180	29700	29800	29400	29600
DO		4.8	4.98	4.21	4.12	5.02	4.58	5.12	4.85	3.81	3.68	5.1	5.02	4.79	4.98	4.12	4.09	5.04	4.82
COD		8.2	10	21.8	22.1	13.45	14.57	11.8	11.6	15.8	16.6	12.68	12.93	17.4	18.8	23.4	24.8	15.42	16.17
BOD		1.8	2.4	2.95	3.07	2.2	2.38	2.48	2.94	3.05	3.15	2.8	2.94	2.5	2.9	2.63	2.86	2.48	2.7
Ammonical nitrogen	µmol/L	0.46	0.48	0.74	0.79	0.39	0.44	0.49	0.51	0.58	0.61	0.33	0.36	0.45	0.49	0.51	0.53	0.39	0.42
Nitrite		1.36	1.37	1.93	1.92	1.24	1.25	1.27	1.31	1.68	1.61	1.22	1.32	1.843	1.93	1.53	1.78	1.24	1..26
Nitrate		2.049	2.76	2.32	2.45	2.94	2.59	2.14	2.13	2.24	2.38	2.86	2.27	2.346	2.07	3.8	3.94	2.8	3.42
TN		3.642	4.182	4.78	6.84	4.15	4.56	4.538	5.078	5.67	7.56	4.58	5.4	5.189	5.729	6.48	7.25	5.62	6.68
Inorganic Phosphate		1.554	1.897	1.59	1.87	1.42	1.74	1.35	1.41	1.53	1.61	1.38	1.48	1.42	1.461	1.46	1.53	1.4	1.34
TP		2.102	2.312	2.35	2.57	2.97	2.46	1.873	2.32	2.2	2.49	1.66	2.15	2.559	2.769	2.27	2.45	2.22	2.62
Chlorides	mg/L	12745	12982	13582	15254	14280	14350	12480	12640	14020	14560	13540	13800	12860	12480	13450	13950	12840	12970

Parameters	Unit	Offshore Area																	
		MS6						MS7						MS8					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B
		Low tide		High tide		High tide		Low tide		High tide		High tide		Low tide		High tide		High tide	
Sodium		3388	3400	4800	5100	4750	4800	3665	3670	4500	4780	3750	3910	3550	3565	4480	4790	4500	4720
Sulphates		1290	1305	2405	2480	1472	1500	2388	2460	2288	2260	2395	2430	1450	1460	2290	2265	2198	2065
Silica	µmol/L	5.856	6.199	6.43	6.95	5.45	5.63	7.94	7.64	8.94	9.64	8.7	8.95	5.129	5.382	5.73	6.49	5.5	5.63
Reactive Silica		4.364	5.621	5.294	5.248	2.71	2.96	2.272	2.262	3.272	3.262	3.24	3.54	3.274	4.531	4.284	4.297	4.55	5.97
Oil &Grease	µg/l	0.233	0.304	0.494	0.348	0.339	0.355	0.272	0.262	0.372	0.362	0.272	0.227	0.218	0.289	0.384	0.297	0.226	0.306
Lead		1.39	1.51	1.99	1.57	1.77	1.53	1.42	1.47	1.82	1.47	1.52	1.43	1.41	1.36	1.62	1.52	1.44	1.48
Cadmium		0.51	0.52	0.68	0.65	0.53	0.64	0.54	0.52	0.64	0.62	0.58	0.51	0.46	0.46	0.62	0.65	0.56	0.69
Copper		2.86	4.5	5.2	5.58	3.06	5.07	2.77	3.51	3.77	3.91	2.65	3.55	2.51	2.72	2.81	3.38	2.69	3.07
Zinc		10.44	10.17	11.84	12.78	9.97	9.78	5.72	7.05	8.72	10.05	7.34	8.27	5.97	5.61	6.97	7.61	5.87	7.02
Iron		20.58	22.57	22.58	26	19.34	22.46	16.82	20.58	18.92	23.78	16.95	20.55	14.75	18.47	16.75	20.85	15.01	18.01
Mercury		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: S= Surface; B = Bottom

Table 3-5: Physio-Chemical Parameters of Marine Water at MS9, MS10 and MS11

Parameters	Unit	Offshore Area																	
		MS9						MS10						MS11					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B
		Low tide		High tide		High tide		Low tide		High tide		High tide		Low tide		High tide		High tide	
Temperature	⁰C	28.3	28	27.7	27.1	32	31.8	28.8	28.5	27.8	27.2	31.5	31.2	28.1	27.9	28.4	28	32	31.8
Salinity	PPT	25	25.2	31	33	32	32.5	25	25.1	32	32	31	31.5	30	30.5	32	33	32	32.5
pH	-	8.22	8.26	8.29	8.31	8.25	8.28	8.22	8.23	8.27	8.29	8.23	8.25	8.22	8.24	8.28	8.31	8.24	8.27
Turbidity	NTU	41	48	49	51	31	24	12	14	15	18	9	14	10	12	12	14	8	15
TSS	mg/L	26	28	32.8	41	25.5	26.8	25	27	62	69	36.8	38.9	23	25	45	52	21	23.5
TDS		25120	25180	31700	31900	30600	30800	25080	25120	30500	30100	31480	31050	30020	30480	31500	31100	30600	30800
DO		4.87	4.65	4.03	3.89	5.04	4.98	4.5	4.4	3.84	3.57	4.68	4.87	4.92	4.58	3.9	3.38	4.7	4.28
COD		7.8	9.2	12.5	13.7	10.14	11.82	7.2	9	11.5	11.8	10.52	10.51	6.2	8	8.5	9.7	8.41	8.24
BOD		2.5	2.6	2.63	2.74	2.56	2.54	2.3	2.4	2.42	2.59	3.04	2.41	2.12	2.24	2.47	2.84	2.18	2.14

Parameters	Unit	Offshore Area																	
		MS9						MS10						MS11					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B	S	B
		Low tide		High tide		High tide		Low tide		High tide		High tide		Low tide		High tide		High tide	
Ammonical nitrogen	µmol/L	0.41	0.47	0.51	0.57	0.32	0.33	0.48	0.51	0.56	0.43	0.4	0.45	0.44	0.48	0.51	0.52	0.4	0.44
Nitrite		1.56	1.61	1.8	1.78	1.42	1.53	1.468	1.618	1.82	1.84	1.34	1.31	1.656	1.725	1.81	1.99	1.26	1.28
Nitrate		2.479	3.04	2.52	2.68	1.94	2.37	2.153	2.48	2.37	2.47	1.83	2.23	1.98	2.29	1.93	2.02	1.52	1.86
TN		4.642	5.182	4.83	6.43	4.28	4.6	7.573	8.113	8.64	10.47	7.24	8.23	3.827	4.367	4.28	5.28	4.08	4.08
Inorganic Phosphate		1.86	1.78	1.81	1.85	1.86	1.89	1.417	1.26	1.45	1.28	1.37	1.41	0.99	1.647	1.05	1.69	0.98	1.52
TP		2.736	2.946	2.85	2.27	2.41	2.59	2.239	2.449	2.3	2.62	2.19	2.34	2.056	2.266	2.18	2.43	2.12	2.38
Chlorides	mg/L	13750	13860	15020	15400	14020	14084	13750	13805	15020	15240	14005	14070	12050	12840	13080	13480	14300	14520
Sodium		2400	3400	9450	10100	9700	9800	1390	1390	9800	9800	9800	9830	1670	1690	9080	9140	9760	9800
Sulphates		1290	1303	2392	2540	2470	2500	1295	1297	2465	2460	2390	2430	1550	1577	2460	2540	2365	2405
Silica	µmol/L	5.486	5.743	6.27	6.52	5.65	5.95	5.746	6.001	6.52	6.81	6.2	6.49	3.437	3.692	3.89	4.28	4.8	4.85
Reactive Silica		3.328	4.585	5.246	5.224	3.97	4.35	4.965	5.222	5.251	5.218	1.78	1.94	2.02	3.277	2.204	2.196	2.93	3.2
Oil &Grease	µg/l	0.16	0.231	0.246	0.224	0.324	0.298	0.136	0.208	0.251	0.218	0.281	0.234	0.108	0.179	0.204	0.196	0.247	0.219
Lead		1.53	1.55	1.61	1.37	1.43	1.34	0.82	0.83	0.86	0.31	0.77	0.31	0.56	0.57	0.59	0.49	0.53	0.51
Cadmium		0.33	0.41	0.35	0.39	0.32	0.38	0.28	0.36	0.3	0.34	0.27	0.33	0.26	0.22	0.28	0.31	0.25	0.21
Copper		2.36	2.77	2.64	3.43	2.52	3.11	2.17	2.6	2.43	3.22	2.32	2.92	1.97	2.39	2.21	2.97	2.11	2.17
Zinc		5.41	6.44	6.49	7.68	5.46	5.08	5.72	6.05	5.74	7.15	4.33	6.59	4.17	4.26	5.28	5.66	4.45	5.22
Iron		15.32	16.76	16.29	18.46	14.6	15.95	13.75	16.05	15.71	17.95	14.08	15.51	13.74	15.01	13.22	15.31	11.85	13.23
Mercury		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: S= Surface; B = Bottom

Table 3-6: Physio-Chemical Parameters of Marine Water at MS12

Parameters	Unit	Offshore Area					
		MS12					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B
		Low tide		High tide		High tide	
Temperature	^{0}C	28.3	28	28.4	28	32	31.7
Salinity	PPT	30	31	33	33	30	31

Parameters	Unit	Offshore Area					
		MS12					
		Pre Dredging Dec' 24		Dredging Jan'25		Post Dredging Apr'25	
		S	B	S	B	S	B
		Low tide		High tide		High tide	
pH	-	8.22	8.24	8.27	8.29	8.21	8.25
Turbidity	NTU	8	11	10	13	6	12
TSS	mg/L	22	28	57	63	22.6	24.9
TDS		30040	30050	31500	31800	30200	30600
DO		5.02	4.86	4.25	4.15	4.8	4.68
COD		6.5	8.3	8.4	9.3	7.44	7.4
BOD		1.95	1.98	1.75	2.21	1.56	1.89
Ammonical nitrogen	µmol/L	0.48	0.49	0.52	0.58	0.38	0.42
Nitrite		1.54	1.79	1.89	1.91	1.48	1.59
Nitrate		1.82	2.184	2.3	2.41	2.13	2.23
TN		4.723	5.263	4.8	5.263	3.62	4.57
Inorganic Phosphate		1.571	1.452	1.58	1.49	1.51	1.34
TP		2.184	2.394	2.28	2.51	2.94	2.18
Chlorides	mg/L	12140	12450	13470	13600	12600	12700
Sodium		1665	1720	9420	9850	8460	8840
Sulphates		1555	1603	2530	2530	2310	2392
Silica	µmol/L	3.02	3.274	3.25	3.62	9.64	9.49
Reactive Silica		2.783	4.04	3.13	4.38	4.91	4.37
Oil &Grease	µg/l	0.127	0.1989	0.195	0.186	0.128	0.162
Lead		0.49	0.5	0.52	0.54	0.46	0.24
Cadmium		0.21	0.29	0.28	0.2	0.16	0.2
Copper		1.68	2.17	1.88	2.69	1.8	2.44
Zinc		4.71	4.83	5.67	5.82	4.77	5.37
Iron		11.91	12.75	12.97	14.57	11.62	12.59
Mercury		BDL	BDL	BDL	BDL	BDL	BDL

Note: S= Surface; B = Bottom

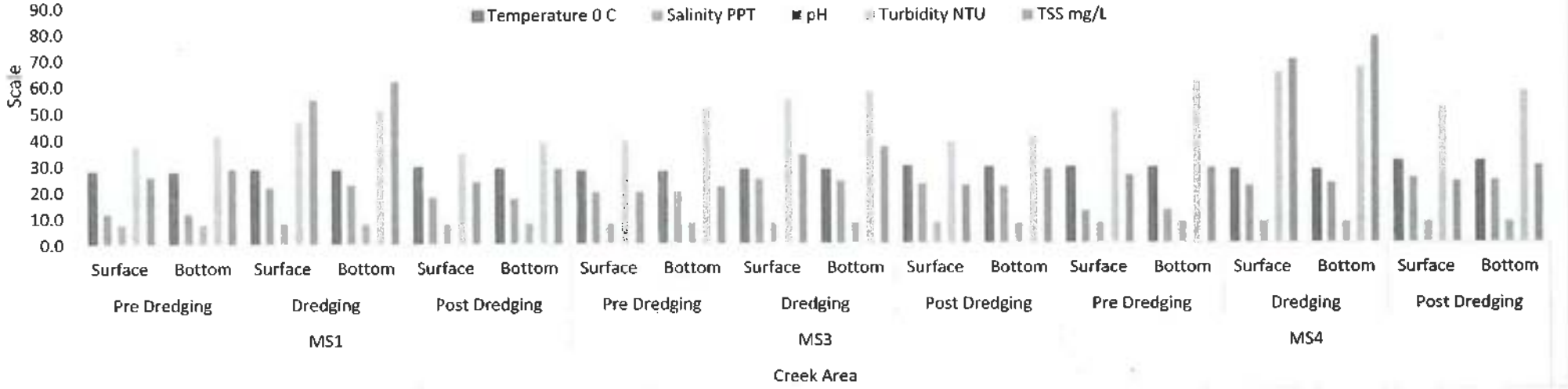


Figure 3-2: Variations in Water Temperature, Salinity, pH, Turbidity & TSS for Creek Area

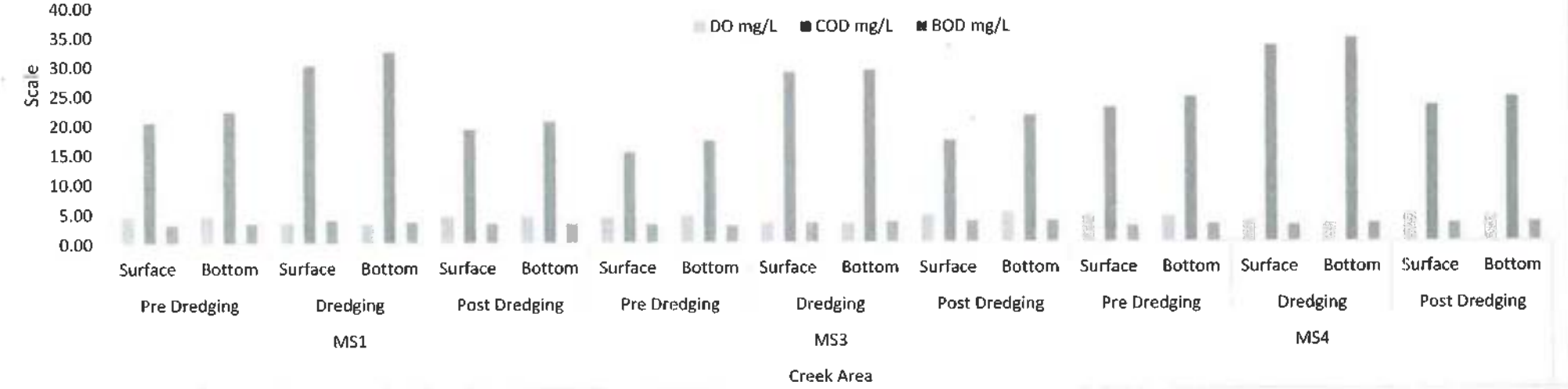


Figure 3-3: Variations in TSS, DO, COD & BOD for Creek Area

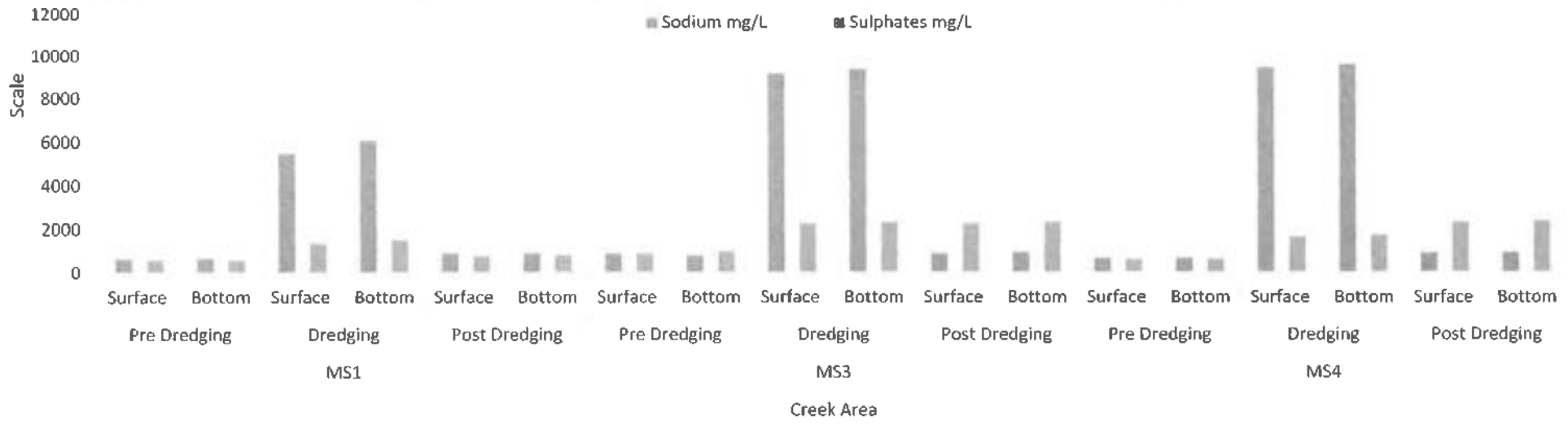


Figure 3-4: Variations in Sodium & Sulphate for Creek Area

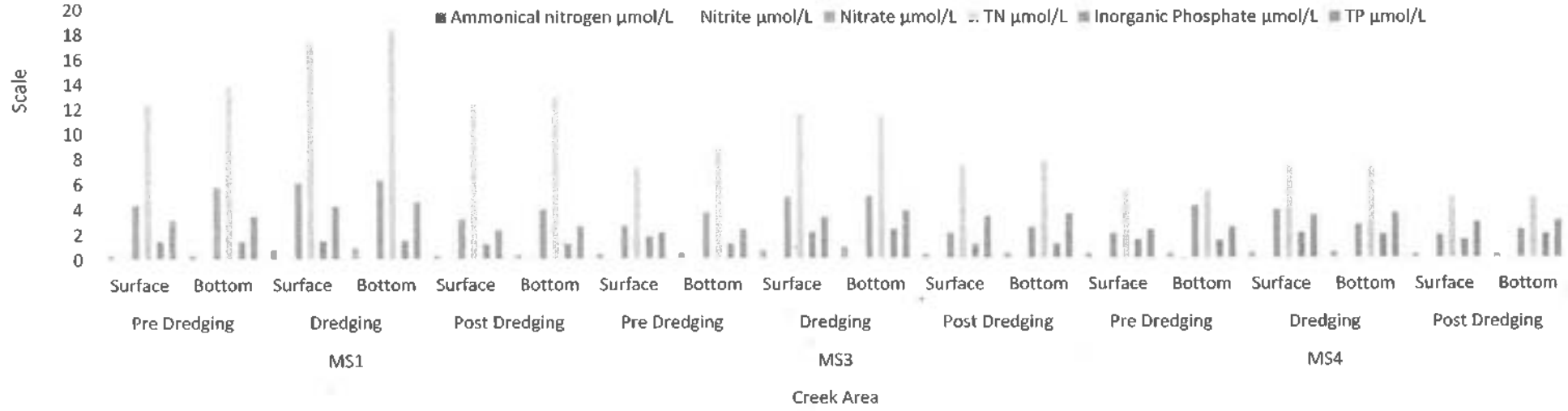


Figure 3-5: Variations in Nitrite, Nitrate, Ammonia, TN, Inorganic Phosphate & TP for Creek Area

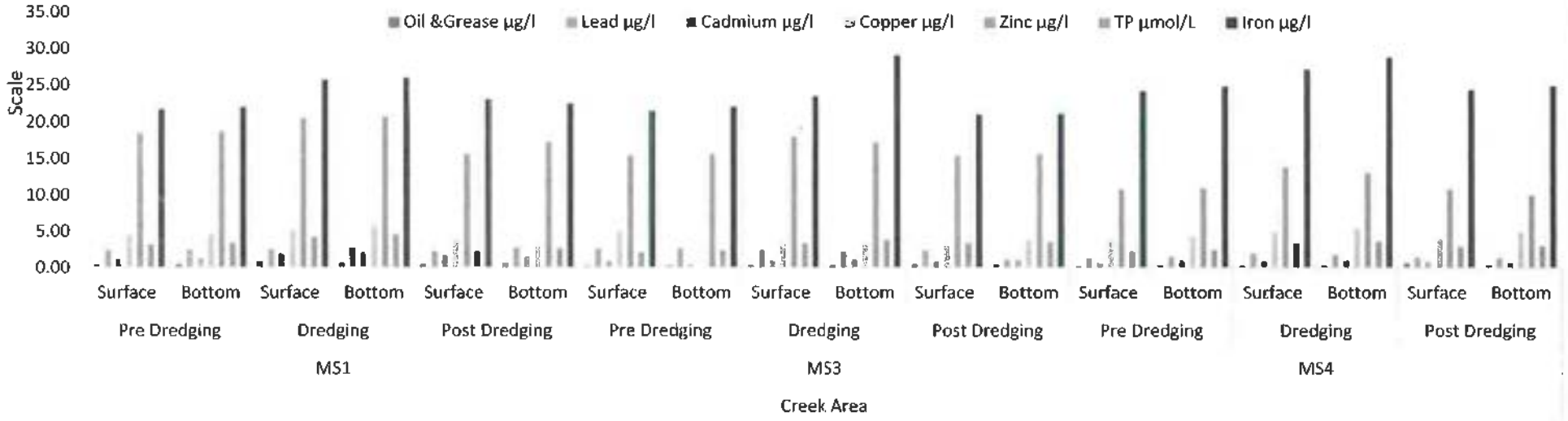


Figure 3-6: Variations in Oil & grease, Heavy Metals like Ld, Ca, Co, Zn & Iron for Creek Area

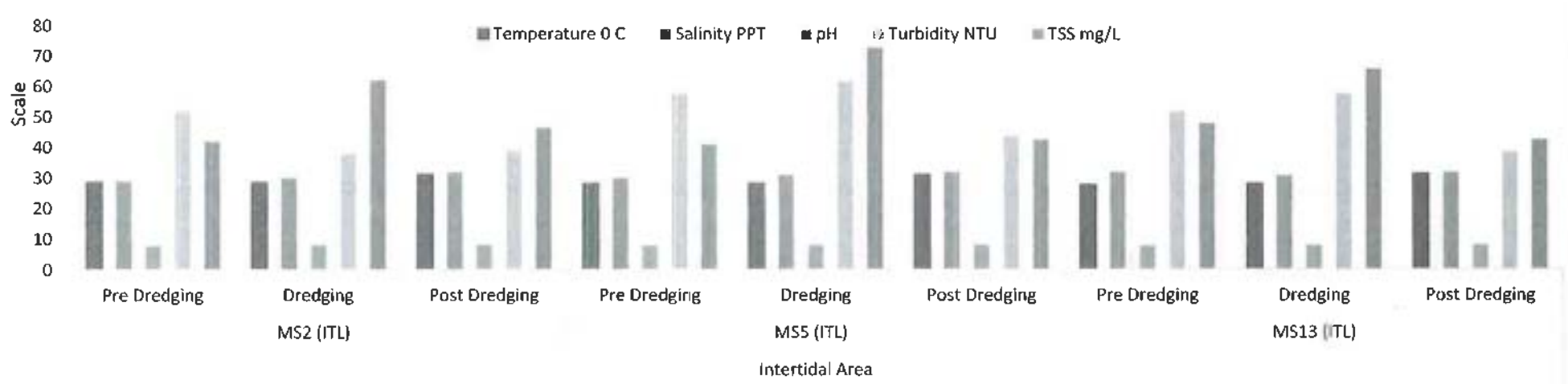


Figure 3-7: Variations in Water Temperature, Salinity, pH, Turbidity & TSS for Intertidal Area

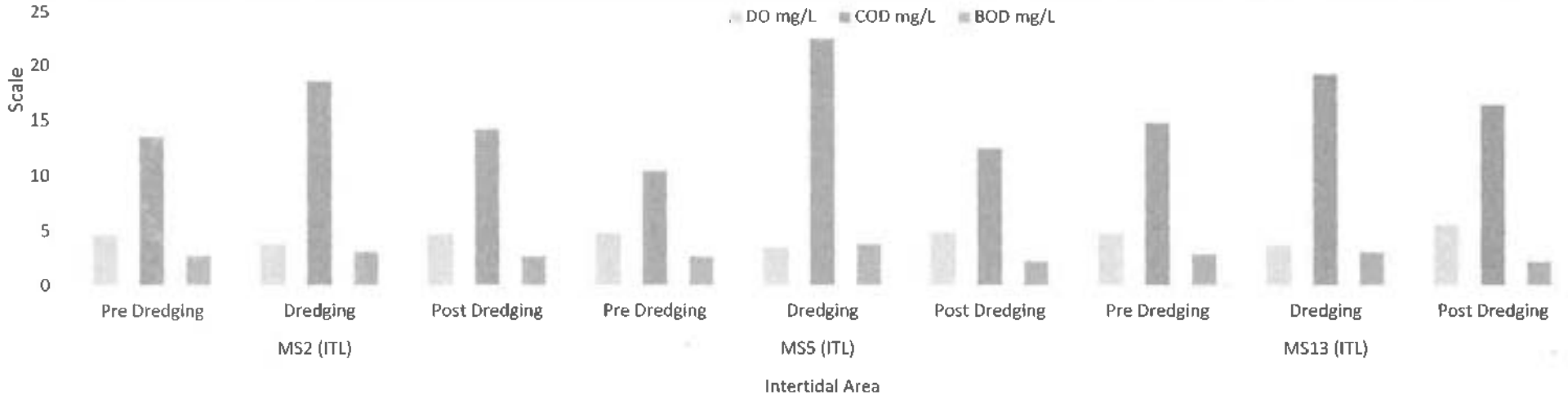


Figure 3-8: Variations in TSS, DO, COD & BOD for Intertidal Area

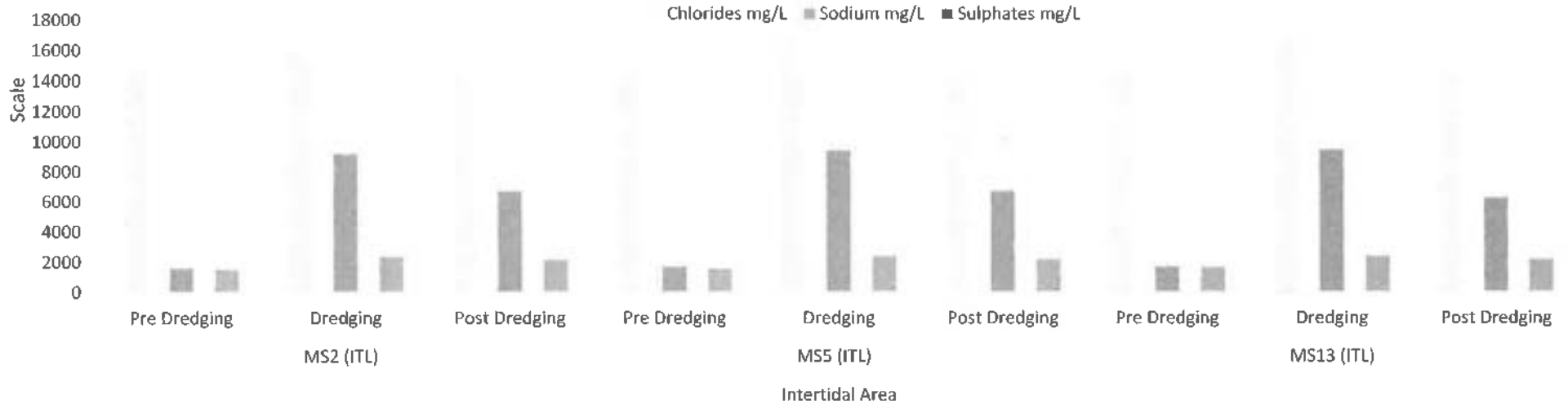


Figure 3-9: Variations in Chlorides, Sodium & Sulphate for Intertidal Area

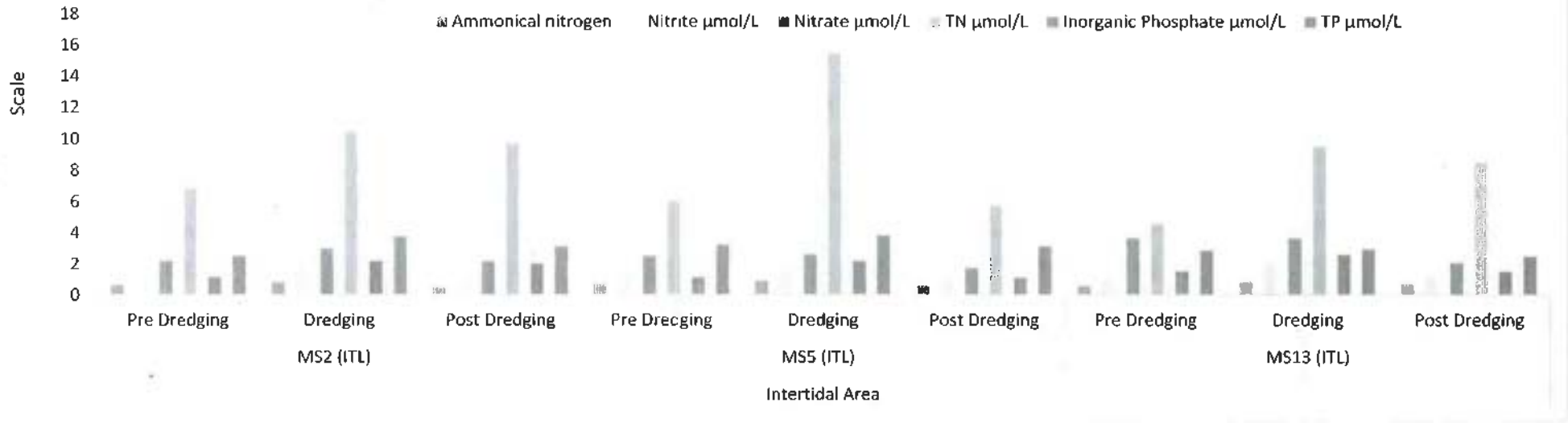


Figure 3-10: Variations in Nitrite, Nitrate, Ammonia, TN, Inorganic Phosphate & TP for Intertidal Area

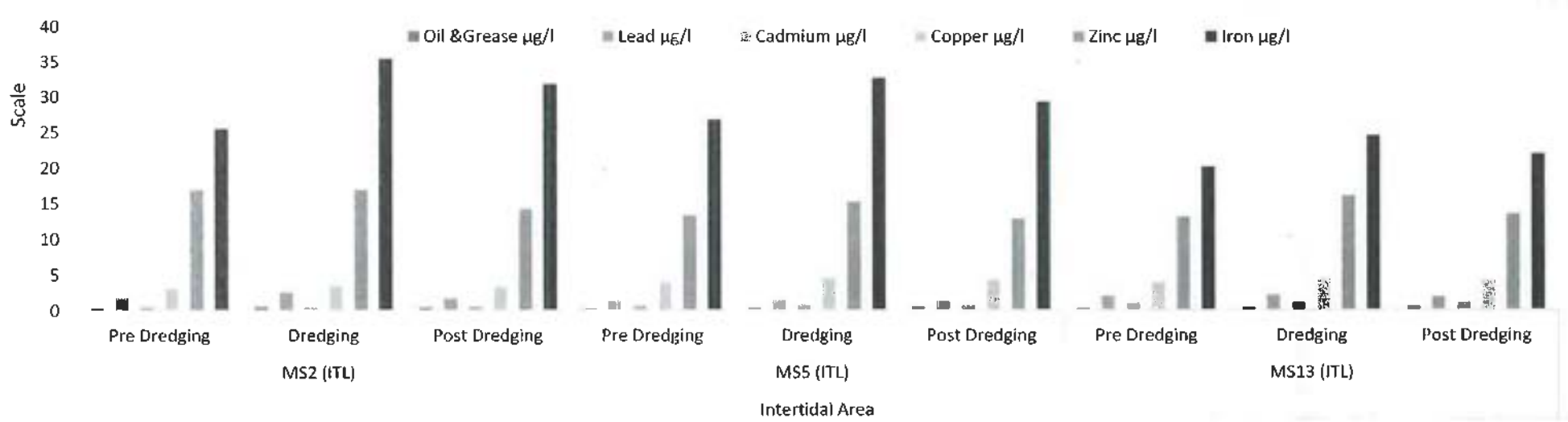


Figure 3-11: Variations in Oil & grease, Heavy Metals like Ld, Ca, Co, Zn & Iron for Intertidal Area

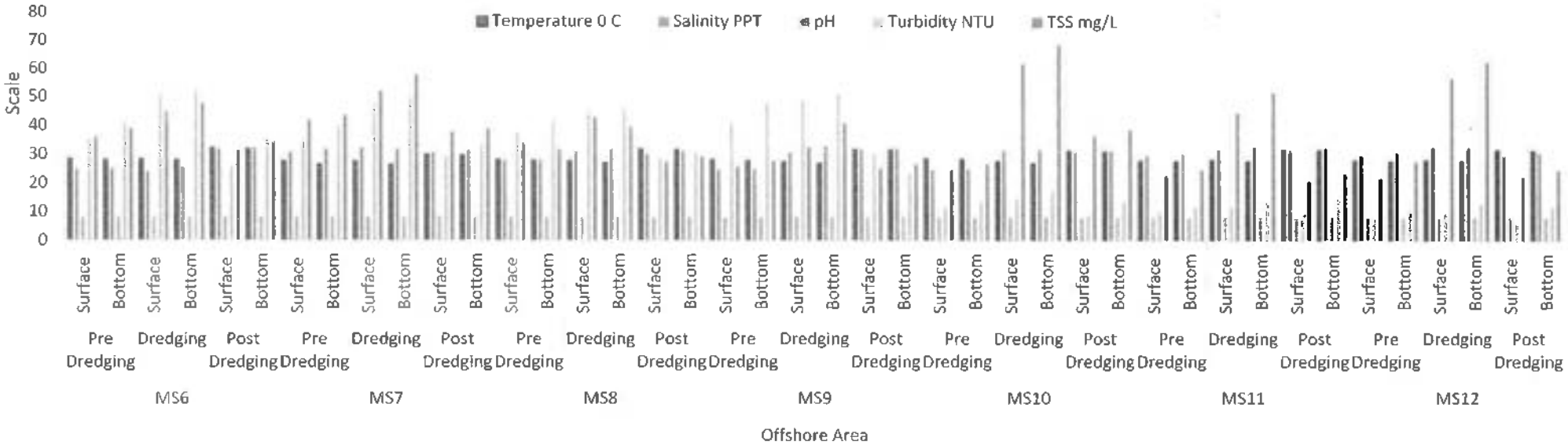


Figure 3-12: Variations in Water Temperature, Salinity, pH, Turbidity & TSS for Offshore Area

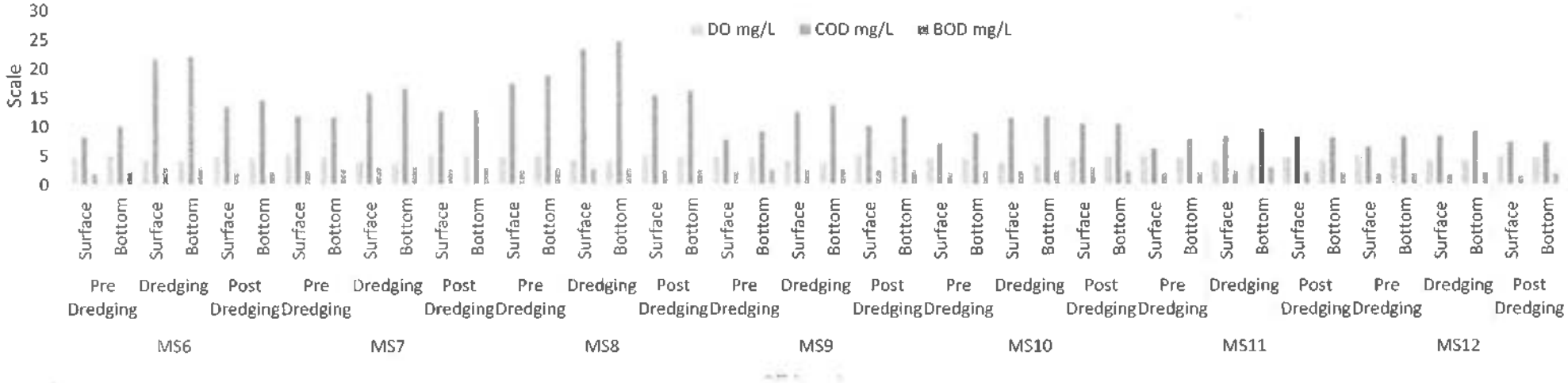


Figure 3-13: Variations in TSS, DO, COD & BOD for Offshore Area

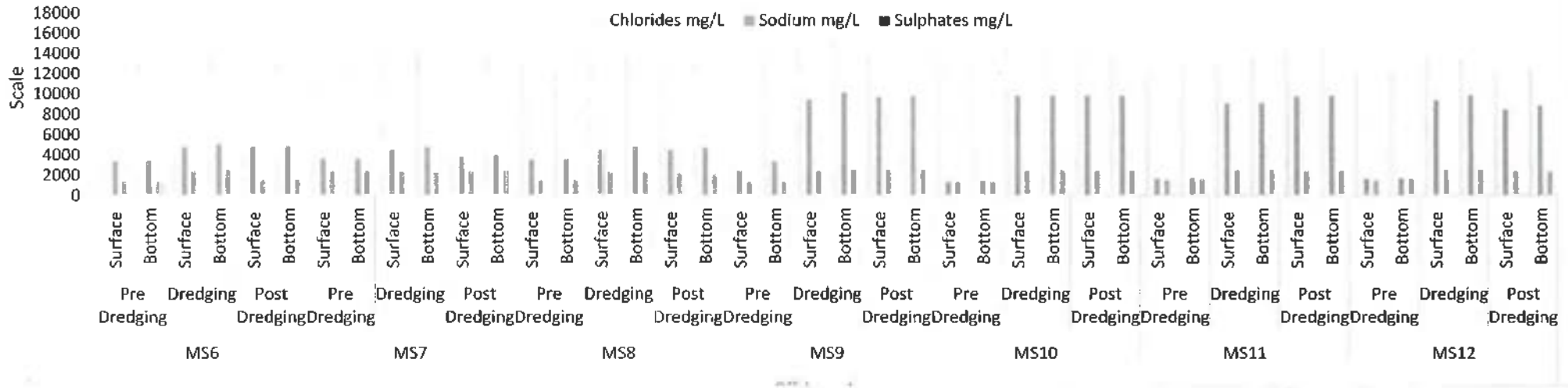


Figure 3-14: Variations in Chlorides, Sodium & Sulphate for Offshore Area

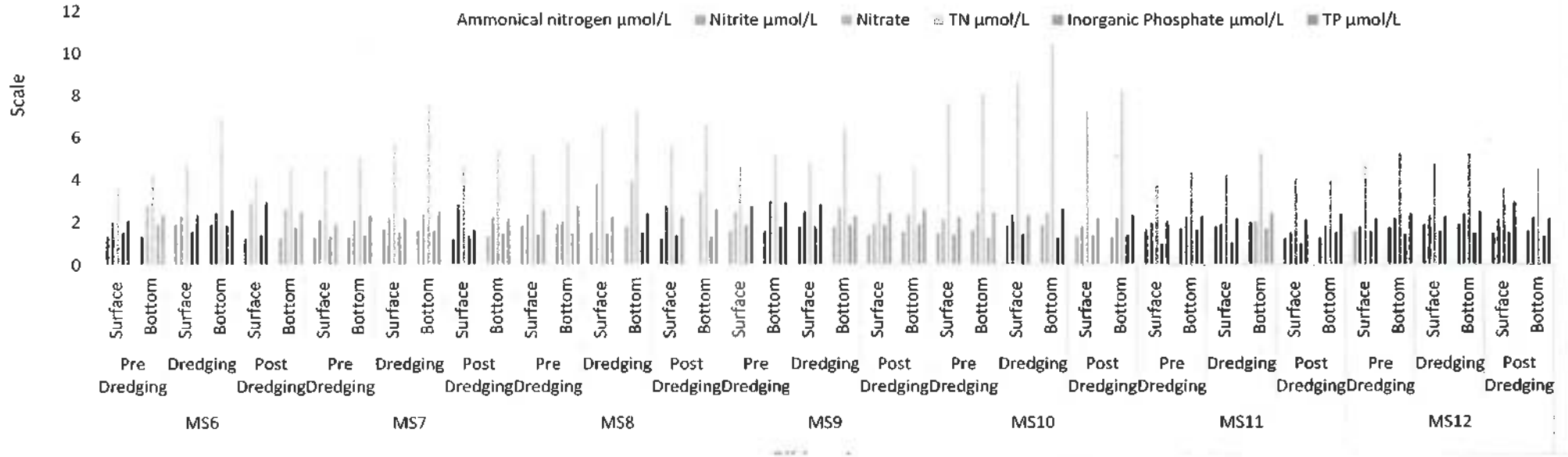


Figure 3-15: Variations in Nitrite, Nitrate, Ammonia, TN, Inorganic Phosphate & TP for Offshore Area

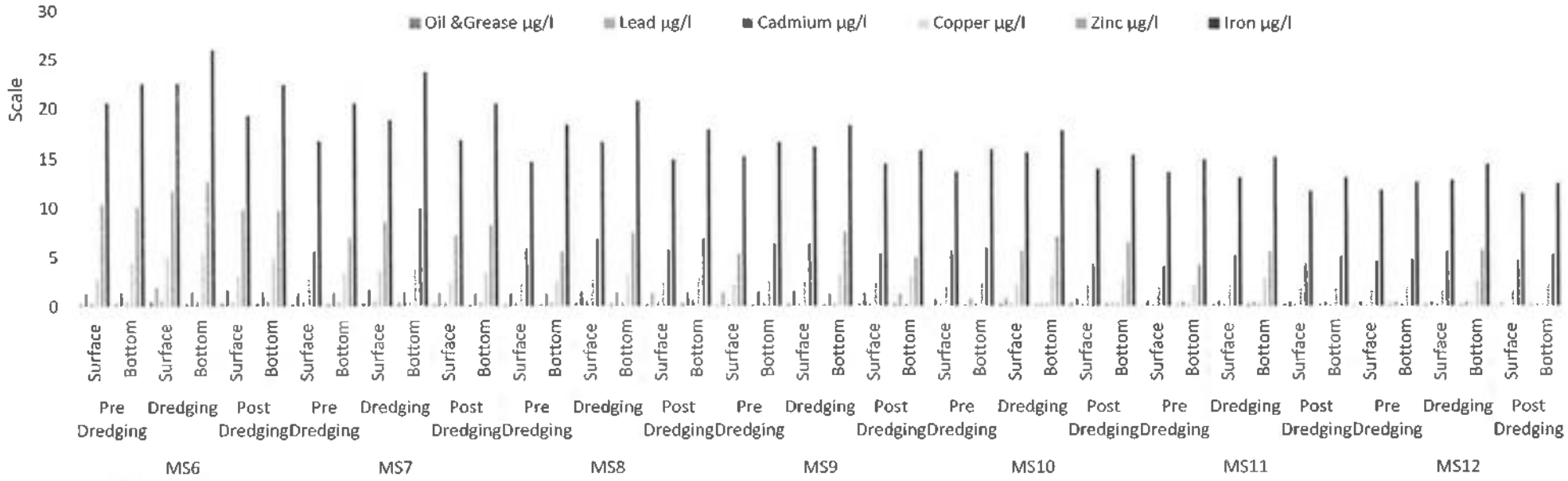


Figure 3-16: Variations in Oil & grease, Heavy Metals like Ld, Ca, Co, Zn & Iron for Offshore Area

Inference:

- The temperature for creek areas varied between 27.50 to 31.10 °C, for intertidal areas varied between 27.80 to 31.50 °C and for offshore areas varied between 26.50 to 32.20°C. Minimum during pre-dredging and dredging period at MSL-7 in Offshore area and Maximum during post dredging at MSL-6 were reported in offshore areas respectively.
  - During Pre Dredging period temperatures ranged between 26.50°C at MSL-7 in Offshore area to 29.0°C at MSL-4 in Creak area. During Dredging period temperature ranged between 26.50°C at MSL-7 in Offshore area to 31.5°C at MSL-4 in Intertidal areas. During Post Dredging period temperature ranged between 28.9°C at MSL-1 in Creek area and at MSL-7 in Offshore area respectively to 32.2°C at MSL-4 in Intertidal areas.
- Salinity levels for creek areas varied between 12.0 to 25.0 PPT, for intertidal areas varied between 29.0 to 32.0 PPT and for offshore areas varied between 24.1 to 33.0 PPT. Minimum values were reported during pre-dredging period at MSL-1 in creek area and maximum values were reported during dredging period at MSL-9, MSL-11 & MSL-12 respectively in offshore areas.
  - During Pre Dredging period salinity ranged between 12 PPT at MSL-1 in creek area to 32 PPT at MSL-13 in Intertidal area and at MSL-7 in Offshore area respectively. During Dredging period salinity ranged between 22 PPT at MSL-1 and MSL-4 in creek area respectively to 33 PPT at MSL-9, MSL-11 and MSL-12 in Offshore areas respectively. During Post Dredging period salinity ranged between 17.5 PPT at MSL-1 in Creek area to 32.2 PPT at MSL-9 and MSL-11 in Offshore areas respectively.
- pH concentration for creek areas varied between 7.70 to 8.16, for intertidal areas varied between 7.9 to 8.24 and for offshore areas varied between 8.10 to 8.31. Minimum values were reported during pre-dredging period in creek area at MSL-1 and Maximum values were reported during dredging period at MSL-8, MSL-9 and MSL-11 respectively in offshore areas.
  - During Pre Dredging period pH ranged between 7.7 at MSL-1 in creek area to 8.26 at MSL-7 and MSL-9 in offshore areas respectively. During Dredging period pH ranged between 8.1 at MSL-1 in creek area to 8.31 at MSL-8, MSL-9 and MSL-11 in offshore area respectively. During Post Dredging period pH ranged between 7.9 at MSL-1 and MSL-3 in Creek area respectively to 8.29 at MSL-8 in Offshore area.
- Turbidity Levels for creek areas varied between 35.0 to 67.0 NTU, for intertidal areas varied between 38.0 to 62.0 NTU and for offshore areas varied between 6.0 to 53.0 NTU. Minimum values were reported during pre-dredging period in creek area at MSL-1 and Maximum values were reported during dredging period at MSL-8, MSL-9 and MSL-11 respectively in offshore areas.
  - During Pre Dredging period turbidity ranged between 8.0 NTU at MSL-12 in offshore area to 62.0 NTU at MSL-12 in offshore area. During Dredging period turbidity ranged between 10 NTU at MSL- 12 in Offshore area to 67.0 NTU at

MSL-4 in creek area respectively. During Post Dredging period turbidity ranged between 6.0 NTU at MSL-12 in Offshore area to 58.0 at MSL-4 in creek area.

- Total Suspended Solids (TSS) for creek areas varied between 20.0 to 79.0 mg/l, for intertidal areas varied between 41.0 to 73.0 mg/l and for offshore areas varied between 21.0 to 69.0 mg/l. Minimum values were recorded during pre-dredging period at MSL-3 and Maximum values were reported during dredging period at MSL-4 in creek area respectively.
  - During Pre Dredging period TSS ranged between 20.0 mg/l at MSL-3 in creek area to 48.0 mg/l at MSL-13 in intertidal area. During Dredging period TSS ranged between 32.8 mg/l at MSL- 9 in Offshore area to 79.0 mg/l at MSL-4 in creek area. During Post Dredging period TSS ranged between 21.0 mg/l at MSL-1 in Offshore area to 46.4 mg/l at MSL-2 in intertidal area.
- Total Dissolved Solids for creek areas varied between 11800.0 to 31500.0 mg/l, for intertidal areas varied between 28700.0 to 32100.00 mg/l and for offshore areas varied between 2520.0 to 31900.0 mg/l. Minimum values were reported during pre-dredging period in offshore area at MSL-10 and Maximum values were reported during dredging period at MSL-3 in Intertidal areas
  - During Pre Dredging period TDS ranged between 11800.0 mg/l at MSL-1 in creek area to 30980.0 mg/l at MSL-13 in intertidal area. During Dredging period TDS ranged between 17900.0 mg/l at MSL- 1 in Creek area to 32100.0 mg/l at MSL-13 in Intertidal area. During Post Dredging period TDS ranged between 11900.0 mg/l at MSL-1 in Creek area to 31480.0 mg/l at MSL-10 in Offshore area.
- DO concentration for creek areas varied between 3.23 to 5.10 mg/l, for intertidal areas varied between 3.52 to 5.60 mg/l and for offshore areas varied between 3.38 to 5.12 mg/l. Maximum values are reported during post dredging period and minimum during dredging period. Minimum values were reported during dredging period in creek area at MSL-1 and Maximum values were reported during post dredging period at MSL-13 in Intertidal areas
  - During Pre Dredging period DO ranged between 4.35 mg/l at MSL-3 in creek area to 5.12 mg/l at MSL-7 in Offshore area. During Dredging period DO ranged between 3.23 mg/l at MSL- 1 in Creek area to 4.25 mg/l at MSL-12 in Offshore area. During Post Dredging period DO ranged between 4.28 mg/l at MSL-12 in Offshore area to 5.60 mg/l at MSL-13 in Intertidal area.
- BOD concentration for creek areas varied between 2.8 to 3.9 mg/l, for intertidal areas varied between 2.24 to 3.84 mg/l and for offshore areas varied between 1.56 to 3.15 mg/l. Minimum values were reported during post dredging period at MSL-12 in offshore area and Maximum values were reported during dredging period at MSL-1 in creek areas.
  - During Pre Dredging period BOD ranged between 1.80 mg/l at MSL-6 in Offshore area to 3.40 mg/l at MSL-11 in Creek area. During Dredging period BOD ranged between 1.75 mg/l at MSL- 12 in Offshore area to 3.90 mg/l at MSL-1 in Creek area. During Post Dredging period BOD ranged between 1.56 mg/l at MSL-12 in Offshore area to 3.70 mg/l at MSL-3 in Creek area.

- COD concentration for creek areas varied between 15.4 to 34.7 mg/l, for intertidal areas varied between 10.5 to 22.5 mg/l and for offshore areas varied between 6.2 to 24.8 mg/l. Minimum values were reported during pre-dredging period at MSL-11 in offshore area and Maximum values were reported during dredging period at MSL-4 in creek areas.
  - During Pre Dredging period COD ranged between 6.20 mg/l at MSL-11 in Offshore area to 24.60 mg/l at MSL-14 in Creek area. During Dredging period COD ranged between 8.40 mg/l at MSL- 12 in Offshore area to 34.70 mg/l at MSL-4 in Creek area. During Post Dredging period COD ranged between 7.40 mg/l at MSL-12 in Offshore area to 24.56 mg/l at MSL-4 in Creek area.
- Ammonical Nitrogen concentration for creek areas varied between 0.35 to 0.98 µmol/L, for intertidal areas varied between 0.51 to 0.94 µmol/L and for offshore areas varied between 0.32 to 0.79 µmol/L. Minimum values were reported during post dredging period at MSL-9 in offshore area and Maximum values were reported during dredging period at MSL-3 in creek areas.
  - During Pre Dredging period Ammonical nitrogen ranged between 0.35 µmol/L at MSL-1 in Creek area to 0.71 µmol/L at MSL-5 in Intertidal area. During Dredging period Ammonical nitrogen ranged between 0.43 µmol/L at MSL- 10 in Offshore area to 0.98 µmol/L at MSL-3 in Creek area. During Post Dredging period Ammonical nitrogen ranged between 0.32 µmol/L at MSL-9 in Offshore area to 0.72 µmol/L at MSL-13 in Intertidal area.
- Nitrite concentration for creek areas varied between 1.19 to 3.11 µmol/L, for intertidal areas varied between 1.12 to 2.17 µmol/L and for offshore areas varied between 1.22 to 1.99 µmol/L. Minimum values were reported during pre-dredging period at MSL-2 in intertidal area and Maximum values were reported during dredging period at MSL-1 in creek areas.
  - During Pre Dredging Period Nitrite ranged between 1.12 µmol/L at MSL-2 in Intertidal area to 2.65 µmol/L at MSL-1 in Creek area. During Dredging period Nitrite ranged between 1.93 µmol/L at MSL- 16 in Offshore area to 3.11 µmol/L at MSL-1 in Creek area. During Post Dredging Period Nitrite ranged between 1.16 µmol/L at MSL-13 in Intertidal area to 2.24 µmol/L at MSL-3 in Creek area.
- Nitrate concentration for creek areas varied between 1.89 to 6.30 µmol/L, for intertidal areas varied between 1.75 to 3.67 µmol/L and for offshore areas varied between 1.52 to 3.94 µmol/L. Minimum values were reported during pre-dredging period at MSL-11 in offshore area and Maximum values were reported during dredging period at MSL-1 in creek areas.
  - During Pre Dredging Period Nitrate ranged between 1.82 µmol/L at MSL-12 in Offshore area to 5.76 µmol/L at MSL-1 in Creek area. During Dredging period Nitrate ranged between 1.93 µmol/L at MSL- 11 in Offshore area to 6.30 µmol/L at MSL-1 in Creek area. During Post Dredging Period Nitrate ranged between 1.52 µmol/L at MSL-11 in Offshore area to 3.97 µmol/L at MSL-1 in Creek area.
- Total Nitrogen levels for creek areas varied between 4.96 to 18.46 µmol/L, for intertidal areas varied between 4.65 to 15.50 µmol/L and for offshore areas varied between 3.62 to 10.47 µmol/L. Minimum values were reported during post

dredging period at MSL-12 in offshore area and Maximum values were reported during dredging period at MSL-1 in creek areas.

- During Pre Dredging Period Total Nitrogen ranged between 3.64 µmol/L at MSL-6 in Offshore area to 13.89 µmol/L at MSL-1 in Creek area. During Dredging period Total Nitrogen ranged between 4.28 µmol/L at MSL- 11 in Offshore area to 18.46 µmol/L at MSL-1 in Creek area. During Post Dredging Period Total Nitrogen ranged between 3.62 µmol/L at MSL-12 in Offshore area to 12.92 µmol/L at MSL-1 in Creek area.

- Inorganic Phosphate concentration for creek areas varied between 1.15 to 2.41 µmol/L, for intertidal areas varied between 1.11to 2.60 µmol/L and for offshore areas varied between 0.98 to 1.90 µmol/L. Minimum values were reported during post dredging period at MSL-11 in offshore area and Maximum values were reported during dredging period at MSL-13 in intertidal areas.
  - During Pre Dredging Period Inorganic Phosphate ranged between 0.99 µmol/L at MSL-11 in Offshore area to 1.89 µmol/L at MSL-6 in Offshore area. During Dredging period Inorganic Phosphate ranged between 1.50 µmol/L at MSL-11 in Offshore area to 2.60 µmol/L at MSL-13 in Intertidal area. During Post Dredging Period Inorganic Phosphate ranged between 0.98 µmol/L at MSL-12 in Offshore area to 2.04 µmol/L at MSL-2 in Intertidal area.
- Total Phosphate levels for creek areas varied between 2.15 to 4.58 µmol/L, for intertidal areas varied between 2.50 to 3.84 µmol/L and for offshore areas varied between 1.66 to 2.97 µmol/L. Minimum values were reported during post dredging period at MSL-7 in offshore area and Maximum values were reported during dredging period at MSL-1 in creek areas.
  - During Pre Dredging Period Total Phosphate ranged between 1.87 µmol/L at MSL-7 in Offshore area to 3.45 µmol/L at MSL-1 in Creek area. During Dredging period Total Phosphate ranged between 2.18 µmol/L at MSL- 11 in Offshore area to 4.58 µmol/L at MSL-1 in Creek area. During Post Dredging Period Total Phosphate ranged between 1.66 µmol/L at MSL-7 in Offshore area to 3.59 µmol/L at MSL-3 in Creek area.
- Chlorides concentration for creek areas varied between 12570.0 to 124600.0 mg/L, for intertidal areas varied between 14500.0 to 17050.0 mg/L and for offshore areas varied between 12050.0 to 15400.0 mg/L. Minimum values were reported during pre-dredging period at MSL-11 in offshore area and Maximum values were reported during dredging period at MSL-1 in creek areas.
  - During Pre Dredging Period Chlorides ranged between 12050 mg/L at MSL-10 in Offshore area to 84600 mg/L at MSL-4 in Creek area. During Dredging period Chlorides ranged between 13080 mg/L at MSL- 11 in Offshore area to 124600 mg/L at MSL-1 in Creek area. During Post Dredging Period Chlorides ranged between 126000 mg/L at MSL-12 in Offshore area to 90400 mg/L at MSL-3 in Creek area.
- Sulphate concentration for creek areas varied between 620.0 to 2430.0 mg/L, for intertidal areas varied between 1500.0 to 2388.0 mg/L and for offshore areas varied between 1290.0 to 2540.0 mg/L. Minimum values were reported during

pre-dredging period at MSL-1 in creek area and Maximum values were reported during dredging period at MSL-9 in offshore areas.

- During Pre Dredging Period Sulphate ranged between 620 mg/L at MSL-11 in Creek area to 2460 mg/L at MSL-7 in Offshore area. During Dredging period Sulphate ranged between 1380 mg/L at MSL- 1 in Creek area to 2540 mg/L at MSL-9 in Offshore area. During Post Dredging Period Sulphate ranged between 810 mg/L at MSL-1 in Creek area to 2500 mg/L at MSL-9 in Offshore area.

- Sodium concentration for creek areas varied between 666.0 to 9650.0 mg/L, for intertidal areas varied between 1610.0 to 9470.0 mg/L and for offshore areas varied between 1380.0 to 10100.0 mg/L. Minimum values were reported during pre-dredging period at MSL-1 in creek area and Maximum values were reported during dredging period at MSL-9 in offshore areas.
  - During Pre Dredging Period Sodium ranged between 666 mg/L at MSL-1 in Creek area to 3670 mg/L at MSL-7 in Offshore area. During Dredging period Sodium ranged between 4480 mg/L at MSL- 8 in Offshore area to 10100 mg/L at MSL-9 in Offshore area. During Post Dredging Period Sodium ranged between 920 mg/L at MSL-1 in Creek area to 9830 mg/L at MSL-10 in Offshore area.
- Silica concentration for creek areas varied between 6.01 to 15.27 µmol/L , for intertidal areas varied between 6.25 to 10.51 µmol/L and for offshore areas varied between 3.02 to 9.64 µmol/L. Minimum values were reported during pre-dredging period at MSL-12 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.
  - During Pre Dredging Period Silica ranged between 302 µmol/L at MSL-12 in Offshore area to 10.19 µmol/L at MSL-1 in Creek area. During Dredging period Silica ranged between 3.25 µmol/L at MSL- 12 in Offshore area to 15.27 µmol/L at MSL-1 in Creek area. During Post Dredging Period Silica ranged between 4.80 µmol/L at MSL-11 in Offshore area to 9.64 µmol/L at MSL-12 in Offshore area.
- Reactive Silica concentration for creek areas varied between 4.02 to 10.83 µmol/L, for intertidal areas varied between 4.48 to 7.48 µmol/L and for offshore areas varied between 1.78 to 5.97 µmol/L. Minimum values were reported during post dredging period at MSL-11 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.
  - During Pre Dredging Period Reactive Silica ranged between 2.02 µmol/L at MSL-11 in Offshore area to 8.13 µmol/L at MSL-3 in Creek area. During Dredging period Reactive Silica ranged between 2.20 µmol/L at MSL- 11 in Offshore area to 10.83 µmol/L at MSL-1 in Creek area. During Post Dredging Period Reactive Silica ranged between 1.78 µmol/L at MSL-10 in Offshore area to 6.35 µmol/L at MSL-11 in Creek area.
- Oil & Grease concentration for creek areas varied between 0.23 to 0.83 µg/L, for intertidal areas varied between 0.23 to 0.55 µg/L and for offshore areas varied between 0.11 to 0.49 µg/L. Minimum values were reported during pre-dredging

period at MSL-11 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.

- During Pre Dredging Period Oil & Grease ranged between 0.11 µg/L at MSL-11 in Offshore area to 0.48 µg/L at MSL-1 in Creek area. During Dredging period Oil & Grease ranged between 0.19 µg/L at MSL- 12 in Offshore area to 0.83 µg/L at MSL-1 in Creek area. During Post Dredging Period Oil & Grease ranged between 0.13 µg/L at MSL-12 in Offshore area to 0.74 µg/L at MSL-1 in Creek area.

- Lead concentration for creek areas varied between 1.17 to 2.79 µg/L, for intertidal areas varied between 1.33 to 2.58 µg/L and for offshore areas varied between 0.24 to 1.99 µg/L. Minimum values were reported during post dredging period at MSL-12 in offshore areas area and Maximum values were reported during post dredging period at MSL-1 in creek area.
  - During Pre Dredging Period Lead ranged between 0.49 µg/L at MSL-12 in Offshore area to 2.67 µg/L at MSL-3 in Creek area. During Dredging period Lead ranged between 0.31 µg/L at MSL- 10 in Offshore area to 2.77 µg/L at MSL-1 in Creek area. During Post Dredging Period Lead ranged between 0.24 µg/L at MSL-12 in Offshore area to 2.79 µg/L at MSL-1 in Creek area.
- Cadmium concentration for creek areas varied between 0.50 to 2.19 µg/L, for intertidal areas varied between 0.45 to 1.24 µg/L and for offshore areas varied between 0.16 to 0.69 µg/L. Minimum values were reported during post dredging period at MSL-12 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.
  - During Pre Dredging Period Cadmium ranged between 0.21 µg/L at MSL-12 in Offshore area to 1.31 µg/L at MSL-1 in Creek area. During Dredging period Cadmium ranged between 0.20 µg/L at MSL- 12 in Offshore area to 2.19 µg/L at MSL-1 in Creek area. During Post Dredging Period Cadmium ranged between 0.16 µg/L at MSL-12 in Offshore area to 1.77 µg/L at MSL-1 in Creek area.
- Copper concentration for creek areas varied between 3.21 to 5.74 µg/L, for intertidal areas varied between 3.18 to 4.57 µg/L and for offshore areas varied between 1.68 to 5.58 µg/L. Minimum values were reported during pre-dredging period at MSL-12 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.
  - During Pre Dredging Period Copper ranged between 1.68 µg/L at MSL-12 in Offshore area to 4.98 µg/L at MSL-3 in Creek area. During Dredging period Copper ranged between 1.88 µg/L at MSL- 12 in Offshore area to 5.74 µg/L at MSL-1 in Creek area. During Post Dredging Period Copper ranged between 1.80 µg/L at MSL-12 in Offshore area to 5.07 µg/L at MSL-6 in offshore area.
- Zinc concentration for creek areas varied between 10.02 to 20.76 µg/L, for intertidal areas varied between 12.82 to 16.94 µg/L and for offshore areas varied between 4.17 to 12.78 µg/L. Minimum values were reported during pre-dredging period at MSL-11 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.

  - During Pre Dredging Period Zinc ranged between 4.17 µg/L at MSL-11 in Offshore area to 18.76 µg/L at MSL-1 in Creek area. During Dredging period Zinc ranged between 5.28 µg/L at MSL- 11 in Offshore area to 20.76 µg/L at MSL-1 in Creek area. During Post Dredging Period Zinc ranged between 4.33 µg/L at MSL-10 in Offshore area to 17.30 µg/L at MSL-1 in Creek area.
- Iron concentration for creek areas varied between 20.98 to 29.02 µg/L, for intertidal areas varied between 20.13 to 35.41µg/L and for offshore areas varied between 11.62 to 26.0 µg/L. Minimum values were reported during post dredging period at MSL-12 in offshore areas area and Maximum values were reported during dredging period at MSL-1 in creek area.
  - During Pre Dredging Period Iron ranged between 11.91 µg/L at MSL-12 in Offshore area to 26.71 µg/L at MSL-5 in Intertidal area. During Dredging period Iron ranged between 12.97 µg/L at MSL- 12 in Offshore area to 35.41 µg/L at MSL-2 in Intertidal area. During Post Dredging Period Iron ranged between 11.62 µg/L at MSL-12 in Offshore area to 31.73 µg/L at MSL-2 in Intertidal area.
- Mercury concentration at the sampling locations are observed as below detection limits

Biological Parameters

The details of the various biological parameters monitored and the rang of values observed are given from **Table 3-7, Table 3-8 and Table 3-9**

Table 3-7: Biological Parameters of Marine Water at MS1(Creek), MS3(Creek), MS4(Creek),

Parameters	Unit	Creek Area								
		MS1			MS3			MS4		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Primary Productivity	(g C/m²/day)	0.65	0.58	0.65	0.75	0.69	0.77	0.69	0.63	0.71
Chloro-A	(µg/L)	1.43	1.25	1.43	1.65	1.56	1.79	1.52	1.43	1.86
Chloro-B	(µg/L)	0.59	0.52	0.58	0.68	0.64	0.72	0.62	0.59	0.66
Chloro-C	(µg/L)	0.33	0.29	0.32	0.38	0.34	0.38	0.35	0.32	0.36
Water THB	CFU/ml	5800	9800	4900	6300	7900	5400	6200	9300	7800
Total coliforms	CFU/ml	3500	4560	2530	4200	4840	3940	4240	4950	3950
Faecal coliform	CFU/ml	194	350	194	107	130	125	210	240	160
E. coli	CFU/ml	87	90	56	73	85	47	69	80	44
Vibirio sp.	CFU/ml	15	18	10	17	20	11	8	10	6

Table 3-8: Biological Parameters of Marine Water at MS2(ITL), MS5(ITL), MS13(ITL)

Parameters	Unit	Intertidal Area								
		MS2			MS5			MS13		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Primary Productivity	(g C/m²/day)	0.73	0.67	0.71	0.82	0.68	0.79	0.75	0.67	0.71
Chloro-A	(µg/L)	1.83	1.68	1.72	1.74	1.58	1.68	1.69	1.45	1.59
Chloro-B	(µg/L)	0.75	0.64	0.71	0.71	0.65	0.68	0.68	0.61	0.63

Parameters	Unit	Intertidal Area								
		MS2			MS5			MS13		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Chloro-C	(µg/L)	0.42	0.36	0.39	0.41	0.33	0.38	0.38	0.32	0.34
Water THB	CFU/ml	6000	11000	7560	6700	12000	7240	9600	11000	9840
Total coliforms	CFU/ml	4100	5820	4366	1950	2800	2155	2500	3360	2860
Faecal coliform	CFU/ml	830	1500	600	950	1700	980	790	1100	150
E. coli	CFU/ml	42	75	65	58	102	84	52	95	64
Vibirio sp.	CFU/ml	11	15	12	10	13	11	9	12	10

Table 3-9: Biological Parameters of Marine Water at MS6, MS7, MS8

Parameters	Unit	Offshore Areas								
		MS6			MS7			MS8		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Primary Productivity	(g $C/m^2/day$)	0.93	0.86	0.96	0.82	0.79	0.88	0.93	0.89	0.96
Chloro-A	(µg/L)	2.05	1.89	2.12	1.85	1.71	1.92	2.05	1.89	2.12
Chloro-B	(µg/L)	0.84	0.78	0.87	0.74	0.74	0.83	0.84	0.72	0.92
Chloro-C	(µg/L)	0.47	0.36	0.51	0.41	0.38	0.42	0.47	0.42	0.47
Water THB	CFU/ml	4800	7500	6450	4650	6970	5994	4300	6450	5547
Total coliforms	CFU/ml	2600	3440	1900	2010	2880	1600	3100	5840	3240
Faecal coliform	CFU/ml	980	1200	650	800	1500	830	980	1600	750
E. coli	CFU/ml	51	60	33	43	50	28	28	35	19
Vibirio sp.	CFU/ml	7	11	6	7	9	5	6	9	5

Table 3-10: Biological Parameters of Marine Water at MS9, MS10, MS11

Parameters	Unit	Offshore Areas								
		MS9			MS10			MS11		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
Primary Productivity	(g C/m²/day)	0.99	0.88	1.1	0.87	0.81	0.91	0.85	0.78	0.87
Chloro-A	(µg/L)	2.18	2.08	2.33	1.91	1.68	1.88	1.87	1.65	1.85
Chloro-B	(µg/L)	0.89	0.79	0.88	0.78	0.73	0.82	0.77	0.72	0.84
Chloro-C	(µg/L)	0.52	0.48	0.54	0.44	0.41	0.47	0.43	0.38	0.45
Water THB	CFU/ml	3700	5550	4770	3300	4900	4210	3200	4800	4120
Total coliforms	CFU/ml	3300	4080	2260	1400	2280	1710	1600	2240	1244
Fecal coliform	CFU/ml	450	800	600	550	830	700	850	960	610
E. coli	CFU/ml	24	28	16	20	25	14	12	15	8
Vibirio sp.	CFU/ml	4	5	3		1	1		2	1

Table 3-11: Biological Parameters of Marine Water at MS12

Parameters	Unit	Offshore Area		
		MS12		
		Pre dredging	Dredging	Post dredging
Primary Productivity	(g C/m²/day)	0.83	0.79	0.87
Chloro-A	(µg/L)	1.83	1.68	1.88
Chloro-B	(µg/L)	0.75	0.71	0.81
Chloro-C	(µg/L)	0.42	0.41	0.46
Water THB	CFU/ml	3600	5200	4160
Total coliforms	CFU/ml	800	1120	620
Fecal coliform	CFU/ml	450	680	500
E. coli	CFU/ml	16	20	11
Vibirio sp.	CFU/ml	BDL	BDL	BDL

Inference

- Primary Productivity during Pre Dredging Period Primary Productivity ranged between 0.65 C/m²/day at MSL-1 in Creek area to 0.99 C/m²/day at MSL-9 in Offshore area. During Dredging period Primary Productivity ranged between 0.58 C/m²/day at MSL- 1 in Creek area to 0.89 C/m²/day at MSL-8 in Offshore area. During Post Dredging Period Primary Productivity ranged between 0.65 C/m²/day at MSL-1 in Creek area to 1.1 C/m²/day at MSL-9 in offshore area.
- Chlorophyll -A during Pre Dredging Period Chlorophyll-A ranged between 1.43 µg/L at MSL-1 in Creek area to 2.18 µg/L at MSL-9 in Offshore area. During Dredging period Chlorophyll-A ranged between 1.25 µg/L at MSL- 1 in Creek area to 2.08 µg/L at MSL-9 in Offshore area. During Post Dredging Period Chlorophyll-A ranged between 1.43 µg/L at MSL-1 in Creek area to 2.33 µg/L at MSL-9 in offshore area.
- Chlorophyll -B during Pre Dredging Period Chlorophyll-B ranged between 0.59 µg/L at MSL-1 in Creek area to 0.89 µg/L at MSL-9 in Offshore area. During Dredging period Chlorophyll-B ranged between 0.52 µg/L at MSL- 1 in Creek area to 0.79 µg/L at MSL-9 in Offshore area. During Post Dredging Period Chlorophyll-B ranged between 0.58 µg/L at MSL-1 in Creek area to 0.92 µg/L at MSL-8 in offshore area.
- Chlorophyll -C during Pre Dredging Period Chlorophyll-C ranged between 0.33 µg/L at MSL-1 in Creek area to 0.52 µg/L at MSL-9 in Offshore area. During Dredging period Chlorophyll-C ranged between 0.29 µg/L at MSL- 1 in Creek area to 0.48 µg/L at MSL-9 in Offshore area. During Post Dredging Period Chlorophyll-C ranged between 0.32 µg/L at MSL-1 in Creek area to 0.54 µg/L at MSL-9 in offshore area.
- Water THB during Pre Dredging Period Water TBH ranged between $32x10^2$ CFU/ml at MSL-11 in offshore area to $96x10^2$ CFU/ml at MSL-13 in intertidal area. During Dredging period Water TBH ranged between $48x10^2$ CFU/ml at MSL- 11 in Offshore area to $12x10^3$ CFU/ml at MSL-5 in Intertidal area. During Post Dredging Period Water TBH ranged between $41x10^2$ CFU/ml at MSL-10 in offshore area to $98x10^2$ CFU/ml at MSL-13 in intertidal area.
- Total Coliforms during Pre Dredging Period Water Coliforms ranged between $80x10^1$ CFU/ml at MSL-12 in offshore area to $42x10^2$ CFU/ml at MSL-11 in Creek area. During Dredging period Water Coliforms ranged between $11x10^2$ CFU/ml at MSL- 12 in Offshore area to $58x10^2$ CFU/ml at MSL-8 in Offshore area. During Post Dredging Period Water Coliforms ranged between $62x10^1$ CFU/ml at MSL-12 in offshore area to $43x10^2$ CFU/ml at MSL-2 in intertidal area.
- Faecal Coliforms during Pre Dredging Period Faecal Coliforms ranged between $10x10^1$ CFU/ml at MSL-3 in Creek area to $98x10^1$ CFU/ml at MSL-6 in Offshore area. During Dredging period Faecal Coliforms ranged between $13x10^1$ CFU/ml at MSL-3 in Creek area to $35x10^1$ CFU/ml at MSL-1 in Creek area. During Post Dredging Period Faecal Coliforms ranged between $12x10^1$ CFU/ml at MSL-3 in Creek area to $98x10^1$ CFU/ml at MSL-5 in intertidal area.

- E.Coli during Pre Dredging Period E. Coli ranged between 12 CFU/ml at MSL-11 in Offshore area to 87 CFU/ml at MSL-1 in Creek area. During Dredging period E. Coli ranged between 15 CFU/ml at MSL- 11 in Offshore area to 102 CFU/ml at MSL-5 in Intertidal area. During Post Dredging Period E. Coli ranged between 8 CFU/ml at MSL-11in Offshore area to 84 CFU/ml at MSL-5 in intertidal area.
- Vibrio during Pre Dredging Period Vibrio ranged between 4 CFU/ml at MSL-9 in Offshore area to 17 CFU/ml at MSL-3 in Creek area. During Dredging period Vibrio ranged between 1 CFU/ml at MSL- 10 in Offshore area to 20 CFU/ml at MSL-3 in Creek area. During Post Dredging Period Vibrio ranged between 1 CFU/ml at MSL-10 and 11 in Offshore area to 12 CFU/ml at MSL-2 in intertidal area.

Phytoplankton Density and Species

The phytoplankton community observed across the sampled stations displayed significant spatial variation in total density and species composition, reflecting the ecological gradients in the creek and adjacent coastal waters. The Distribution and Abundance of Phytoplankton during all three phases are given in

Table 3-12: Phytoplankton population density (Cells/ L) at MS1(Creek), MS3 &MS4

Phytoplankton (Cells/L)	MS1			MS3			MS4		
	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Bacillariophyceae									
Asterionella glacialis	0	0	298	0	0	304	0	0	302
Bacillaria sp	230	219	284	161	153	351	127	121	370
Bacteriastrum comosum	0	0	356	0	0	150	0	0	291
Bellerochea malleus	248	236	190	0	0	237	176	167	360
Chaetoceros coarctatus	0	0	249	189	170	189	207	150	297
Coscinodiscus radiatus	0	0	310	0	0	313	0	0	293
Cyclotella sp	126	120	288	107	102	255	73	69	268
Ditylum brightwelli	0	0	66	0	0	445	0	0	238
Eucampia zodiacus	0	0	131	0	0	164	0	0	283
Gyrosigma sp.	0	0	147	85	77	316	206	187	237
Leptocylindrus danicus	0	0	284	214	185	235	241	210	311
Lithodesmium undulatum	362	329	202	0	0	221	0	0	268
Melosira	0	0	395	0	0	384	99	90	316
Navicula directa	135	123	304	373	339	396	121	110	224
Nitzschia closterium	0	0	178	0	0	325	0	0	309
Pleurosigma directum	0	0	270	0	0	539	0	0	240
Pleurosigma normanii	0	0	0	0	0	0	0	0	0
Rhizosolenia alata	147	143	434	0	0	384	168	163	145
Skeletonema costatum	0	0	478	0	0	346	0	0	336
Stephanopyxis sp	0	0	375	0	0	241	0	0	320
Streptotheca thamensis	0	0	0	0	0	0	0	0	0
Thalassionema nitzschioides	405	393	159	437	424	240	329	319	257
Thalassiosira sp.	0	0	141	248	241	285	246	239	82
Thalassiothrix frauenfeldii	245	238	359	363	352	158	374	363	257
Triceratium favus	0	0	370	0	0	288	0	0	380
Dianophyseae									
Ceratium furca	106	103	50	103	96	194	97	94	298
Ceratium longipes	0	0	357	0	0	310	0	0	220
Ceratium macroceros	89	86	-	97	94	-	82	80	0
Dinophysis caudata	117	113	316	0	0	317	78	76	445

Phytoplankton (Cells/L)	MS1			MS3			MS4		
	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Gymnodinium sp	0	0	199	0	0	253	0	0	262
Noctiluca sp.	0	0	117	0	0	320	0	0	304
Peridinium claudicans	0	0	361	83	75	267	0	10	287
Protoperidinium sp.	89	86	0	62	60	0	43	42	0
Cynophyceae									
Oscillatoria sp	443	450	277	323	325	297	256	350	275
Trichodesmium erytheaum	0	0	267	0	0	333	0	0	260
Phormidium sp	0	0	317	0	0	383	0	0	358

Table 3-13: Phytoplankton population density (Cells/ L) at MS-6, MS-7 &MS-8

Phytoplankton (Cells/L)	MS6			MS7			MS8		
	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Bacillariophyceae									
Asterionella glacialis	305	250	194	0	0	345	353	332	272
Bacillaria sp	168	160	304	222	200	290	340	320	291
Bacteriastrum comosum	0	0	334	152	144	484	227	213	465
Bellerochea malleus	193	183	276	683	649	337	233	219	426
Chaetoceros coarctatus	163	132	290	558	452	178	313	254	373
Coscinodiscus radiatus	83	79	274	187	178	263	319	300	305
Cyclotella sp	83	79	188	102	97	274	139	131	180
Ditylum brightwelli	0	0	247	0	0	326	98	50	241
Eucampia zodiacus	128	106	222	180	152	524	142	133	195
Gyrosigma sp.	59	54	368	123	112	438	110	103	333
Leptocylindrus danicus	243	218	389	113	100	431	200	175	300
Lithodesmium undulatum	358	326	205	223	203	239	142	133	347
Melosira	155	141	85	128	116	146	218	205	291
Navicula directa	173	157	404	206	187	509	194	182	213
Nitzschia closterium	140	127	158	348	317	309	85	80	97
Pleurosigma directum	0	0	114	218	198	200	64	60	377
Pleurosigma normanii	90	82	0	133	121	0	77	72	0
Rhizosolenia alata	278	270	177	125	121	147	257	242	552
Skeletonema costatum	0	0	250	170	165	376	302	284	325
Stephanopyxis sp	0	0	298	0	0	267	0	0	348

Phytoplankton (Cells/L)	MS6			MS7			MS8		
	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Streptotheca thamensis	0	0	0	0	0	0	0	0	0
Thalassionema nitzschioides	308	299	219	313	304	313	445	432	469
Thalassiosira sp.	518	502	497	298	289	189	430	417	329
Thalassiothrix frauenfeldii	618	599	240	221	214	343	323	313	206
Triceratium favus	94	80	216	58	48	146	103	89	296
Dianophyseae									
Ceratium furca	142	138	335	133	125	460	78	76	373
Ceratium longipes	0	0	328	38	37	57	103	100	105
Ceratium macroceros	164	159	-	58	56	-	137	133	-
Dinophysis caudata	110	107	279	51	49	290	130	126	66
Gymnodinium sp	0	0	115	70	68	291	108	105	375
Noctiluca sp.	0	0	525	171	166	342	105	102	268
Peridinium claudicans	0	0	176	134	125	293	114	102	277
Protoperidinium sp.	140	136	0	0	0	0	100	97	0
Cynophyceae									
Oscillatoria sp	553	550	365	418	410	386	0	0	161
Trichodesmium erytheaum	0	0	213	0	0	316	240	233	410
Phormidium sp	0	0	269	0	0	262	450	437	122

Table 3-14: Phytoplankton population density (Cells/ L) at MS9, MS10 &MS11

Phytoplankton (Cells/L)	MS9			MS10			MS11		
	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Bacillariophyceae									
Asterionella glacialis	391	371	433	324	314	347	447	425	146
Bacillaria sp	239	227	279	0	0	371	291	276	109
Bacteriastrum comosum	133	126	127	147	143	262	185	176	249
Bellerochea malleus	119	113	140	231	224	422	289	275	269
Chaetoceros coarctatus	289	234	397	263	213	349	198	160	277
Coscinodiscus radiatus	219	208	316	233	226	282	271	257	295
Cyclotella sp	140	133	310	154	149	300	192	182	213
Ditylum brightwelli	129	89	314	143	125	275	181	156	325
Eucampia zodiacus	0	0	278	227	210	237	265	235	274

Phytoplankton (Cells/L)	MS9			MS10			MS11		
	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Gyrosigma sp.	93	85	412	107	104	186	145	132	143
Leptocylindrus danicus	150	132	165	164	145	225	202	180	146
Lithodesmium undulatum	253	230	346	267	259	368	305	278	100
Melosira	164	149	222	178	173	283	100	91	222
Navicula directa	237	216	331	251	243	126	288	262	331
Nitzschia closterium	204	186	442	191	185	121	126	115	243
Pleurosigma directum	248	226	194	262	254	261	116	106	188
Pleurosigma normanii	169	154	0	183	178	0	93	85	-
Rhizosolenia alata	161	156	484	175	170	248	91	88	158
Skeletonema costatum	203	197	320	217	210	331	255	247	187
Stephanopyxis sp	134	130	314	148	144	364	0	0	173
Streptotheca thamensis	365	354	0	105	102	0	0	0	0
Thalassionema nitzschioides	337	327	354	351	340	399	389	377	194
Thalassiosira sp.	323	313	415	337	327	223	375	364	217
Thalassiothrix frauenfeldii	251	243	228	265	257	317	302	293	151
Triceratium favus	99	80	292	113	102	285	151	135	134
Dianophyseae									
Ceratium furca	169	160	240	183	175	296	221	210	192
Ceratium longipes	0	0	259	94	91	342	132	128	208
Ceratium macroceros	98	95	-	112	109	0	95	92	0
Dinophysis caudata	92	89	319	106	103	260	121	117	220
Gymnodinium sp	110	107	488	124	120	229	45	44	217
Noctiluca sp.	204	198	362	218	211	334	117	113	150
Peridinium claudicans	170	155	199	184	172	330	91	84	298
Protoperidinium sp.	0	0	0	283	275	0	86	83	0
Cynophyceae									
Oscillatoria sp	0	0	413	0	0	242	0	0	178
Trichodesmium erytheaum	146	142	115	160	155	230	197	191	161
Phormidium sp	342	332	306	356	345	125	393	381	281

Table 3-15: Phytoplankton population density (Cells/ L) at MS-12

Phytoplankton (Cells/L)	MS12		
	Predredging	Dredging	Postdredging
Bacillariophyceae			
Asterionella glacialis	0	0	317
Bacillaria sp	298	283	165
Bacteriastrum comosum	0	0	275
Bellerochea malleus	226	215	149
Chaetoceros coarctatus	293	250	197
Coscinodiscus radiatus	140	133	265
Cyclotella sp	179	170	299
Ditylum brightwelli	0	15	262
Eucampia zodiacus	252	215	116
Gyrosigma sp.	132	120	195
Leptocylindrus danicus	189	170	113
Lithodesmium undulatum	292	266	68
Melosira	203	185	213
Navicula directa	276	251	222
Nitzschia closterium	409	372	108
Pleurosigma directum	287	261	114
Pleurosigma normanii	208	189	0
Rhizosolenia alata	201	195	233
Skeletonema costatum	243	236	266
Stephanopyxis sp	0	0	215
Streptotheca thamensis	0	0	0
Thalassionema nitzschioides	376	365	404
Thalassiosira sp.	362	351	198
Thalassiothrix frauenfeldii	290	281	397
Triceratium favus	138	130	216
Dianophyseae			
Ceratium furca	208	200	216
Ceratium longipes	119	115	153
Ceratium macroceros	138	134	0
Dinophysis caudata	116	113	268
Gymnodinium sp	112	109	351
Noctiluca sp.	99	96	262
Peridinium claudicans	209	201	239
Protoperidinium sp.	101	98	0
Cynophyceae			
Oscillatoria sp	0	0	223
Trichodesmium erytheaum	185	179	188
Phormidium sp	381	370	252

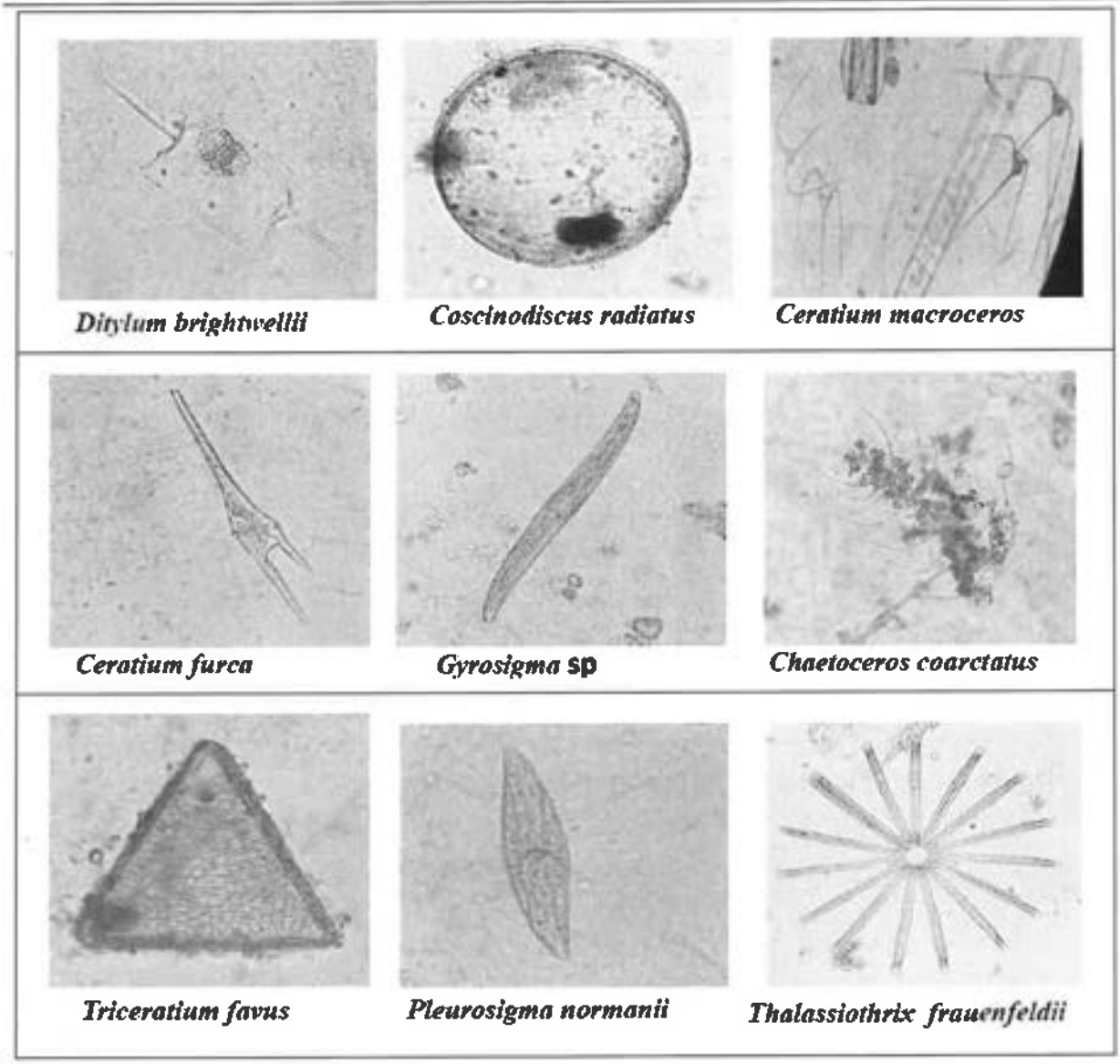
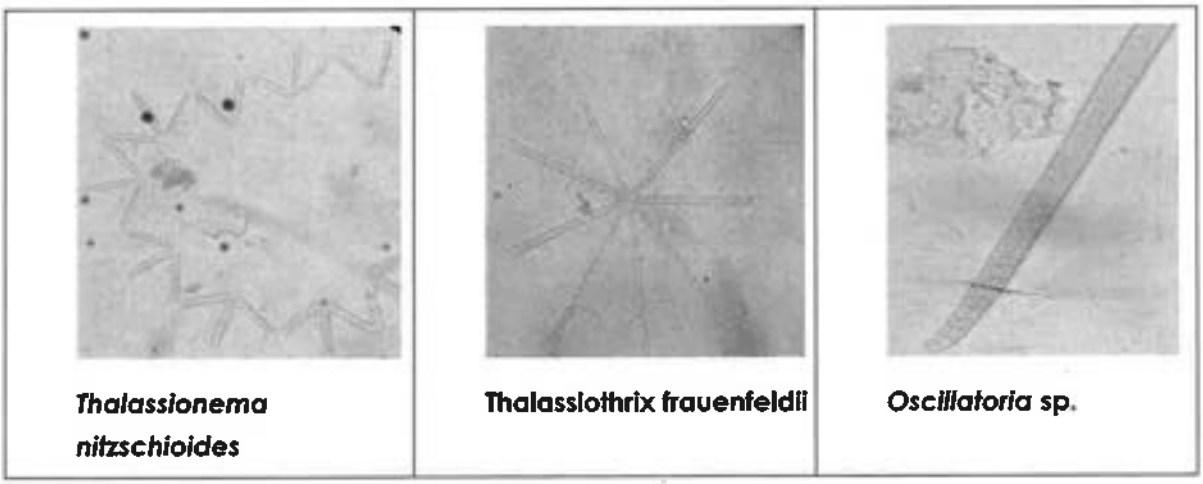


Figure 3-17: Phytoplankton recorded during Pre Dredging



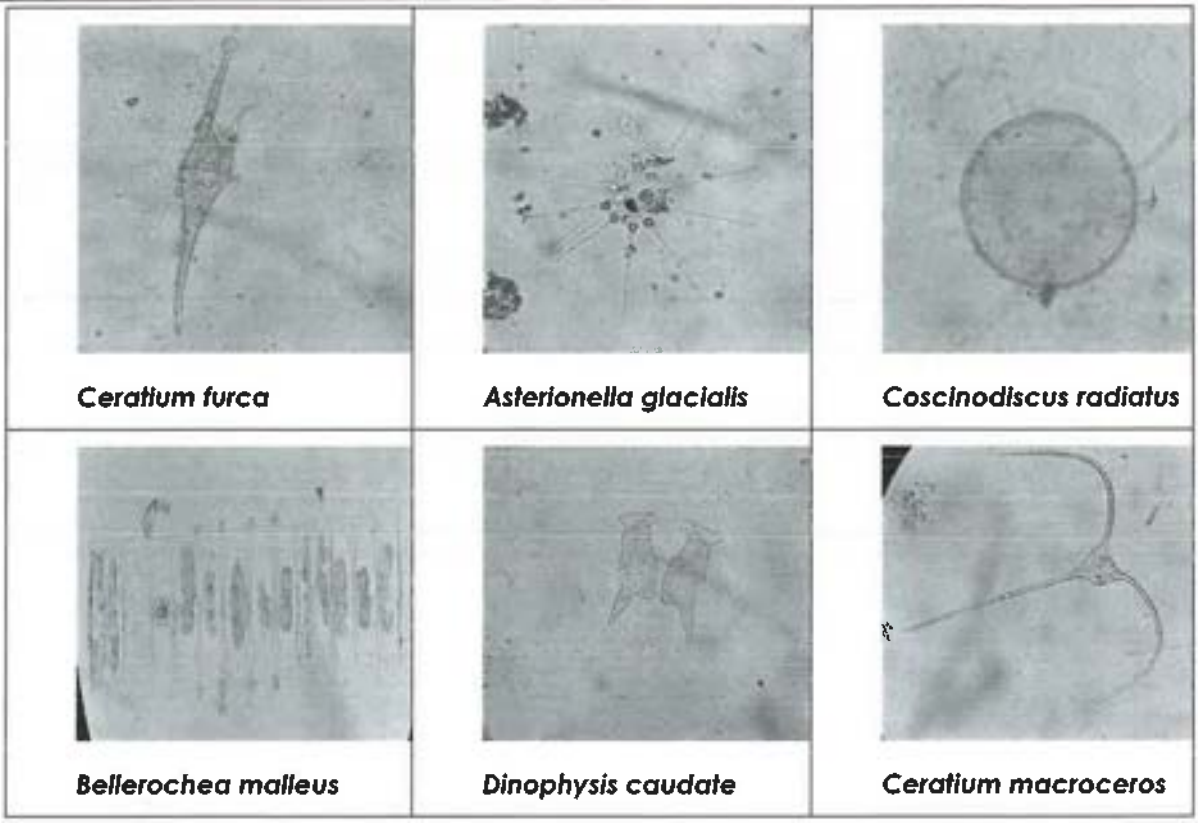
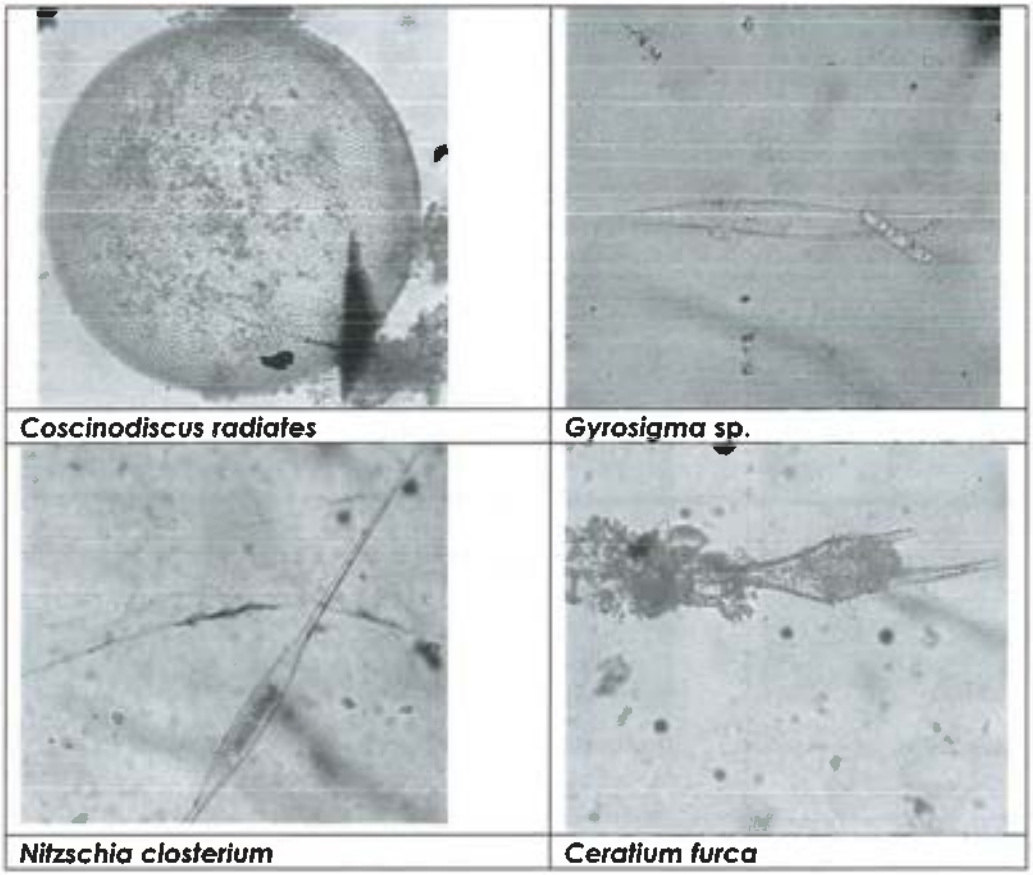


Figure 3-18: Phytoplankton recorded during Dredging



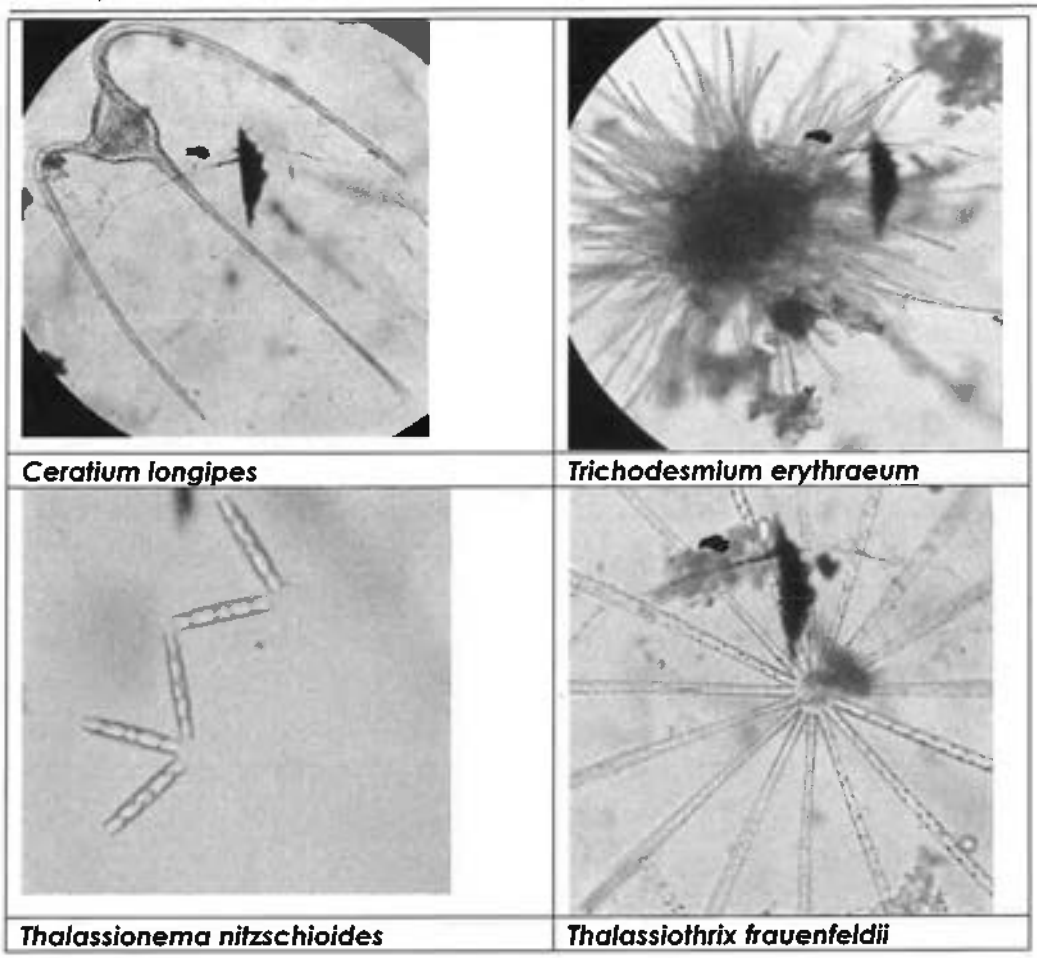


Figure 3-19: Phytoplankton recorded during Post Dredging

Inference

- During the pre-dredging phase, the highest cell density was recorded at station ST-9 (6,857 cells/L), while creek stations MS1, MS3, and MS4 exhibited relatively low cell counts, possibly due to nutrient limitations. During dredging, overall cell density ranged from 2,638 cells/L (MS1) to 6,554 cells/L (MS10). Creek stations experienced a decline in density, whereas coastal stations showed a noticeable increase, likely driven by tidal mixing. In the post-dredging phase, cell density rose markedly across the study area, ranging from 6,649 to 10,559 cells/L.stations MS9 and MS12 indicated signs of peak ecological recovery.
- In the pre-dredging phase, diatoms were overwhelmingly dominant, accounting for 77% of the phytoplankton community. Key species included Thalassiosira, Thalassionema, and Thalassiothrix. During dredging, diatoms continued to dominate, with 29 taxa recorded. Notably, Skeletonema, Chaetoceros, and Asterionella emerged, indicating adaptive responses to environmental disturbance. Post-dredging, 23 diatom species were identified, with Asterionella, Pleurosigma, Rhizosolenia, and Skeletonema demonstrating robust recolonization and ecological recovery.
- During the pre-dredging phase, dinoflagellates constituted a moderate proportion of the phytoplankton community (14%), with Ceratium furca and Noctiluca sp. being dominant, particularly at offshore stations. During dredging, eight dinoflagellate taxa were identified. Ceratium macroceros,

Protoperidinium, and Noctiluca were especially prominent at creek stations MS7 through MS12, potentially indicating localized bloom events. Post-dredging, six species were recorded, including Dinophysis, Peridinium, and Gymnodinium, whose presence suggests a recovery in ecosystem health and responsiveness to nutrient enrichment.

- In Pre dredging, cyanobacteria made up 9% of the phytoplankton community. Oscillatoria sp. and Phormidium sp. were common at stations MS-6 to MS-8, pointing to eutrophic (nutrient-rich) conditions. During dredging, three species were noted. Oscillatoria was mostly found in creek areas, while Trichodesmium and Phormidium appeared in saltier zones. After dredging, species diversity remained similar. Trichodesmium and Phormidium spread to mid and outer stations, indicating a shift in nutrient distribution and ecosystem response.
- In Pre dredging, offshore stations exhibited greater species diversity and higher phytoplankton densities, while creek stations were constrained by hydrodynamic limitations. During dredging, a transitional gradient developed from freshwater to saline environments. Coastal stations displayed enhanced diversity and productivity, likely driven by tidal mixing and nutrient redistribution. Post-dredging, a broad ecological recovery was observed across all stations, with both creek and coastal zones showing improved community structure and elevated cell densities.
- During Pre dredging, the phytoplankton community was primarily composed of stable producers such as diatoms, along with a moderate presence of bloom-forming species and cyanophytes. During the dredging phase, stress-induced shifts were observed, with certain zones exhibiting signs of eutrophication and the emergence of bloom-forming taxa. Following dredging, the ecosystem demonstrated strong recovery and recolonization, with the phytoplankton community reflecting increased resilience and a return to a stable, productive equilibrium.

Zooplankton Abundance and Diversity Across Stations

The zooplankton community across the study stations exhibited marked spatial variability in abundance and species composition, reflecting the influence of hydrological gradients, salinity regimes, and nutrient dynamics. Nearly,a total of 40 zooplankton taxa were recorded, belonging to Copepoda, Crustacea, Mollusca, Rotifera, Foraminifera, Annelida, Branchiopoda, and Chaetognatha, among others. The Distribution and Abundance of zooplankton during three phases i.e. Pre Dredging, Dredging and Post Dredging are given in **Table 3-16,Table 3-17** and **Table 3-18** .

Table 3-16: Distribution and Abundance of zooplankton during Pre Dredging Phase

Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS8	MS9	MS10	MS11	MS12
Calanoid Copepods										
Acartia danae	0	0	0	226	208	170	220	225	247	200
A. spinicauda	0	0	0	182	191		203	208	253	183
Acrocalanus gibber	0	0	0	174	156	178	228	233	207	208
A. gracilis	0	0	0	0	182	145	195	200	245	175
Labidocera pavo	0	0	0	122	252	0	0	267	223	242
Nannocalanus minor	252	191	208	356	443	325	475	558	583	550
Paracalanus parvus	356	252	330	547	1380	1925	1458	2025	1683	1458
Pseudodiaptomus aurivilli	0	0	0	0	156	0	187	192	237	167
Temora stylifera	0	0	0	217	217	0	228	233	208	208
Cyclopoid copepods										
Corycaeus danae	165	0	200	174	191	153	203	208	253	183
C. catus	130	217	0	252	217	120	170	175	220	150
Oithona brevicornis	0	182	0	226	182	145	195	200	245	175
O. rigida	0	0	0	200	252	173	262	267	282	242
O. similis	226	130	339	252	477	258	478	483	283	217
Oncaea sp.	148	0	226	373	191	153	203	208	253	183
Harpacticoid copepods										
Euterpina acutifrons	286	156	156	269	191	270	320	325	242	275
Longipedia sp.	0	252	0	252	200	0	0	233	225	192
Microsetella rosea	0	260	217	339	182	145	195	200	245	175
Macrosetella sp.	87	0	200	252	252	212	262	267	312	242
Decapoda										0
Lucifer hanseni	0	0	0	313	295	178	228	233	278	208
Hydrozoa										
Diphyes sp.	0	0	0	234	165	0	178	183	228	158
Oligotrichea										0
Favella brevis	0	0	0	0	191	153	203	208	253	183
Tintinnopsis mortenseni	0	165	174	217	182	145	195	200	245	175
Other Crustacean forms										0
Crab Zoea	95	113	130	95	191	138	188	200	238	167
Copepod nauplii	304	234	313	286	191	153	203	208	253	183
Molluscs										
Bivalve veliger	122	191	234	365	217	178	228	233	278	208

Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS8	MS9	MS10	MS11	MS12
Gastropod veliger	139	252	208	304	165	128	178	183	228	158
Rotifera										0
Brachionus sp.	148	200	0	0	191	153	203	208	253	183
B. rubens	165	113	0	0	217	178	228	233	175	183
Foraminifera										0
Globigernia sp.	0	0	0	252	252	0	170	175	220	150
G. bulloides	0	0	0	165	191	153	203	208	253	183
G. opima	0	0	0	252	191	115	165	175	198	150
Annelids										0
Polychaete larvae	43	78	78	130	217	178	228	233	278	208
Branchiopoda										0
Evadne spinifera	0	113	200	208	191	153	203	208	253	183
Chaetognatha										0
Sagitta sp	0	0	0	0	165	128	178	183	228	158
Appendicularia										0
Oikopleura dioica	0	0	0	0	191	153	203	208	253	183
Total	**2665**	**3099**	**3212**	**7231**	**8924**	**6662**	**8870**	**10192**	**10563**	**8450**

Table 3-17: Distribution and Abundance of zooplankton during Dredging Phase

Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS8	MS9	MS10	MS11	MS12
Calanoid Copepod										
Acartia danae	0	0	0	198	202	158	214	221	234	186
A. spinicauda	0	0	0	175	182	50	205		240	178
Acrocalanus gibber	0	0	0	170	151	168	218	228	201	198
A. gracilis	0	0	0	0	178	137	182	192	238	168
Labidocera pavo	0	0	0	118	243	0	0	259	218	238
Nannocalanus minor	243	186	186	259	390	296	359	448	452	490
Paracalanus parvus	333	248	324	526	960	1296	1248	1846	1528	1357
Pseudodiaptomus aurivilli	0	0	0	0	156	0	176	183	228	142
Temora stylifera	0	0	0	219	222	52	205	220	198	176
Cyclopoid copepods										
Corycaeus danae	154	16	189	164	186	147	210	198	242	178
C. catus	123	210	56	245	211	102	119	156	232	147
Oithona brevicornis	0	170	45	210	176	136	180	194	237	162
O. rigida	0	0	0	186	234	173	253	270	276	238

Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS8	MS9	MS10	MS11	MS12
O. similis	210	128	324	242	425	251	464	480	279	212
Oncaea sp.	142	19	226	354	195	148	195	201	252	175
Harpacticoid copepods										0
Euterpina acutifrons	272	148	148	256	181	257	304	309	230	261
Longipedia sp.	0	239	0	239	190	0	0	221	214	182
Microsetella rosea	0	247	206	322	173	138	185	190	233	166
Macrosetella sp.	83	0	190	239	239	201	249	254	296	230
Decapoda										0
Lucifer hanseni	0	0	0	278	262	158	203	207	247	185
Hydrozoa	0	0	0	0	0	0	0	0	0	0
Diphyes sp.	0	0	0	208	147	0	158	163	203	140
Oligotrichea	0	0	0	0	0	0	0	0	0	0
Favella brevis	0	0	0	0	170	136	180	185	225	163
Tintinnopsis mortenseni	0	147	155	193	162	129	173	178	218	156
Other Crustacean forms	0	0	0	0	0	0	0	0	0	0
Crab Zoea	84	100	116	84	170	123	167	178	212	148
Copepod nauplii	270	208	278	254	170	136	180	185	225	163
Molluscs	0	0	0	0	0	0	0	0	0	0
Bivalve veliger	108	170	208	324	193	158	203	207	247	185
Gastropod veliger	124	224	185	270	147	114	158	163	203	140
Rotifera	0	0	0	0	0	0	0	0	0	0
Brachionus sp.	132	178	0	0	170	136	180	185	225	163
B. rubens	147	100	0	0	193	158	203	207	156	163
Foraminifera	0	0	0	0	0	0	0	0	0	0
Globigernia sp.	0	0	0	224	219	0	153	152	193	133
G. bulloides	0	0	0	147	170	136	175	185	225	163
G. opima	0	0	0	224	170	102	147	156	171	135
Annelids	0	0	0	0	0	0	0	0	0	0
Polychaete larvae	38	65	67	116	190	156	203	207	247	185
Branchiopoda	0	0	0	0	0	0	0	0	0	0
Evadne spinifera	0	102	178	185	170	139	182	183	225	160
Chaetognatha	0	0	0	0	0	0	0	0	0	0
Sagitta sp	0	0	0	0	142	114	155	162	204	144
Appendicularia	0	0	0	0	0	0	0	0	0	0

Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS8	MS9	MS10	MS11	MS12
Oikopleura dioica	0	0	0	0	170	135	180	185	224	162
Total	**2463**	**2905**	**3081**	**6629**	**7909**	**5690**	**7966**	**9370**	**9678**	**7772**

Table 3-18: Distribution and Abundance of zooplankton during Post Dredging Phase

S.NO	Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS-8	MS9	MS 8	MS11	MS12
	Copepods Calanoid										
1	*Acartia danae*	207	230	167	110	294	253	118	47	143	176
2	*Acartia erythraea*	178	299	114	196	93	181	260	137	243	71
3	*Agetus limbatus*	198	88	185	217	141	267	213	161	179	77
4	*Bestiolina similis*	185	140	219	156	189	55	107	125	188	146
5	*Centropages sp.*	83	94	131	141	101	116	147	235	92	183
6	*Paracalanus parvus*	163	97	73	155	117	260	197	196	189	137
7	*Nannocalanus minor*	80	52	86	142	204	250	189	122	310	173
	Paracalanus parvus	215	142	210	154	274	294	304	228	315	280
8	*Pseudodiaptomus aurivilli*	110	208	114	128	38	249	68	190	165	31
9	*Temora stylifera*	187	173	142	193	165	106	157	165	134	209
	Cyclopoid										
10	*Corycaeus limbatus*	169	143	185	508	508	565	486	384	390	387
11	*C. catus*	98	135	89	792	792	540	178	306	612	402
12	*Corycaeus danae*	188	174	124	288	288	750	424	633	399	714
13	*Oithona similis*	223	232	38	632	632	1310	274	483	432	480
14	*Oithona brevicornis*	191	167	99	720	720	665	228	144	543	450
15	*Oncaea sp.*	181	94	147	280	280	870	200	315	129	75
16	*Farranula orbisa*	192	191	167	744	744	875	454	183	657	414
	Harpacticoid										
17	*Euterpina acutifrons*	166	77	154	175	118	245	152	128	50	176
18	*Longipedia sp.*	56	199	42	192	174	199	61	89	202	179
19	*Microsetella rosea*	175	128	126	187	256	205	79	289	215	172
20	*Macrosetella sp.*	105	87	225	264	298	299	305	261	345	290
	Decapoda										
21	*Lucifer hanseni*	260	83	182	129	143	93	64	93	216	189
	Oligotrichea (Ciliates)										
22	*Favella brevis*	137	131	150	87	50	142	110	119	27	94
23	*Tintinnopsis mortenseni*	206	161	59	87	173	97	210	167	123	231

S.NO	Zooplankton (Nos/m3)	MS1	MS3	MS4	MS 6	MS 7	MS-8	MS9	MS 8	MS11	MS12
	Copepods Calanoid										
	Crustacean										
24	Crab Zoea	187	146	235	103	240	167	263	119	148	147
25	Copepod nauplii	100	80	199	162	184	100	337	189	47	180
	Molluscs										
26	Bivalve veliger	199	266	166	167	114	135	80	137	114	277
27	Gastropod veliger	147	156	314	65	129	182	169	160	170	215
	Rotifera										
28	*Brachionus rubens*	236	221	128	169	129	147	96	69	193	82
	Foraminifera										
29	*Globigerina bulloides*	84	215	125	91	192	224	96	62	82	131
30	*G. bulloides*	0	0	41	202	178	192	178	154	228	174
31	*G. opima*	45	14	23	261	194	180	157	120	192	154
	Annelids										
32	Polychaete larvae	130	150	202	114	255	194	171	158	109	198
	Branchiopoda										
33	*Evadne spinifera*	182	112	190	50	123	86	91	138	86	164
	Chaetognatha										
34	*Sagitta sp.*	83	138	99	202	95	56	121	119	112	116
	Appendicularia										
35	*Oikopleura dioica*	87	203	244	173	161	281	320	198	107	168
	Total	**5433**	**5226**	**5194**	**8436**	**8786**	**10830**	**7064**	**6823**	**7886**	**7742**

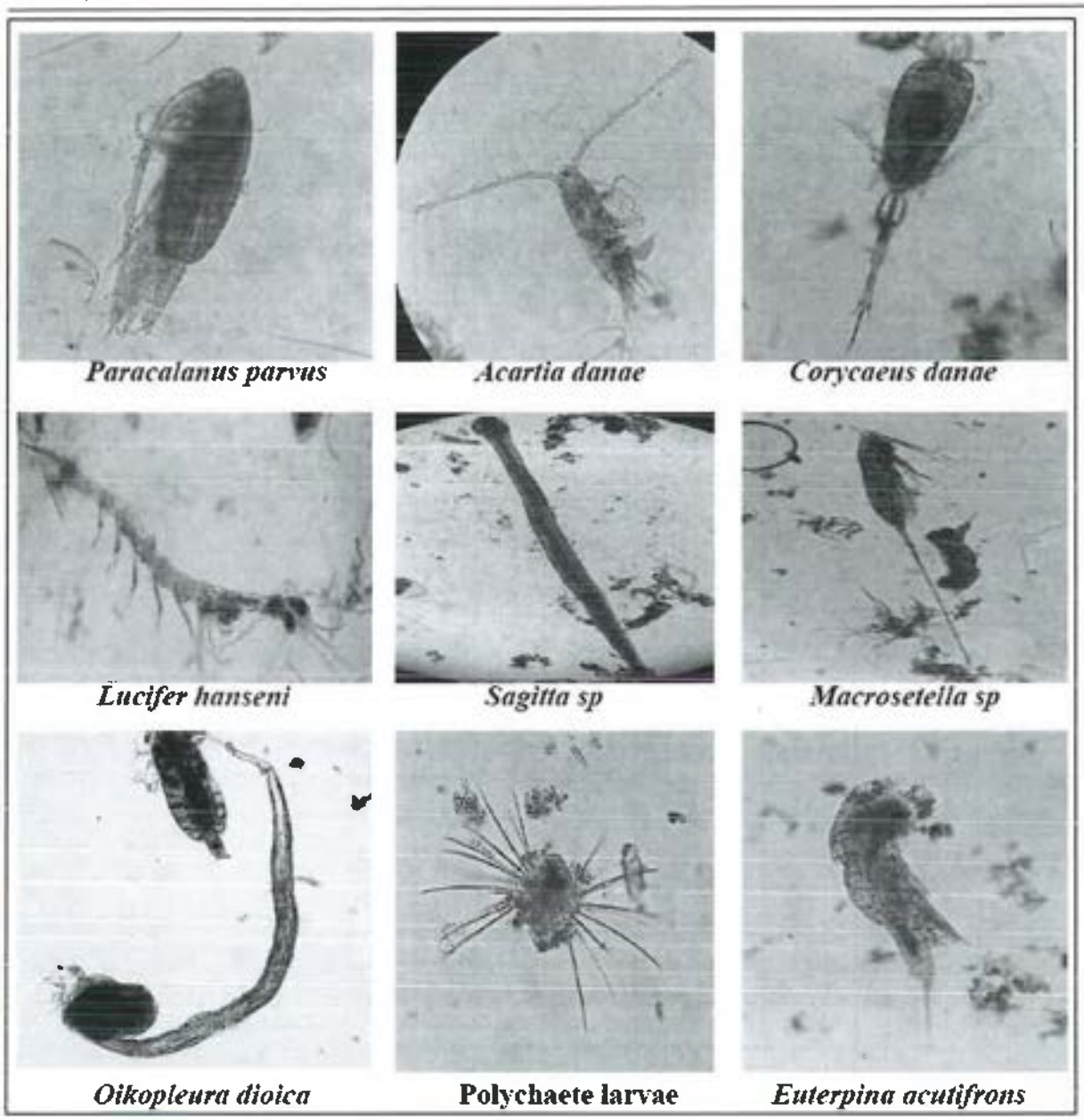


Figure 3-20:Zooplanktons recorded during Predredging

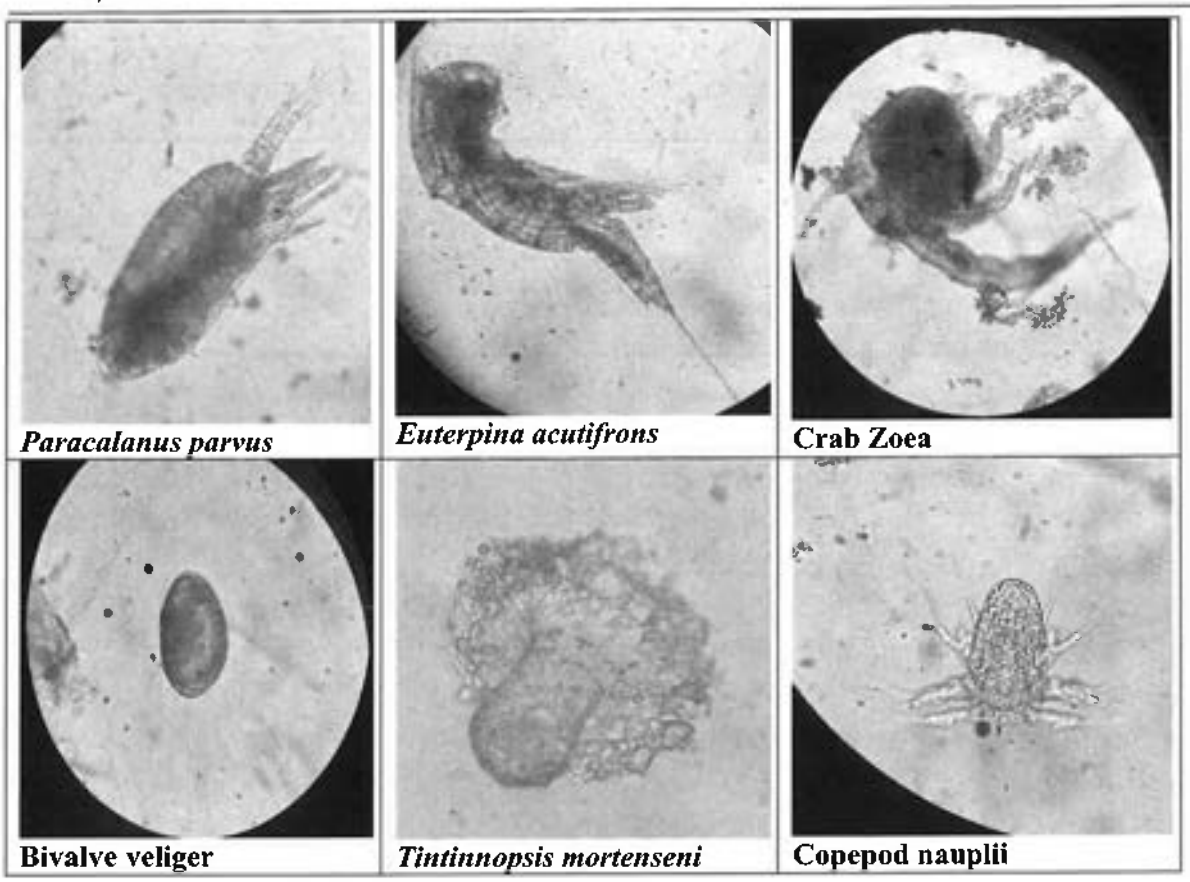


Figure 3-21:Zooplanktons recorded during Dredging

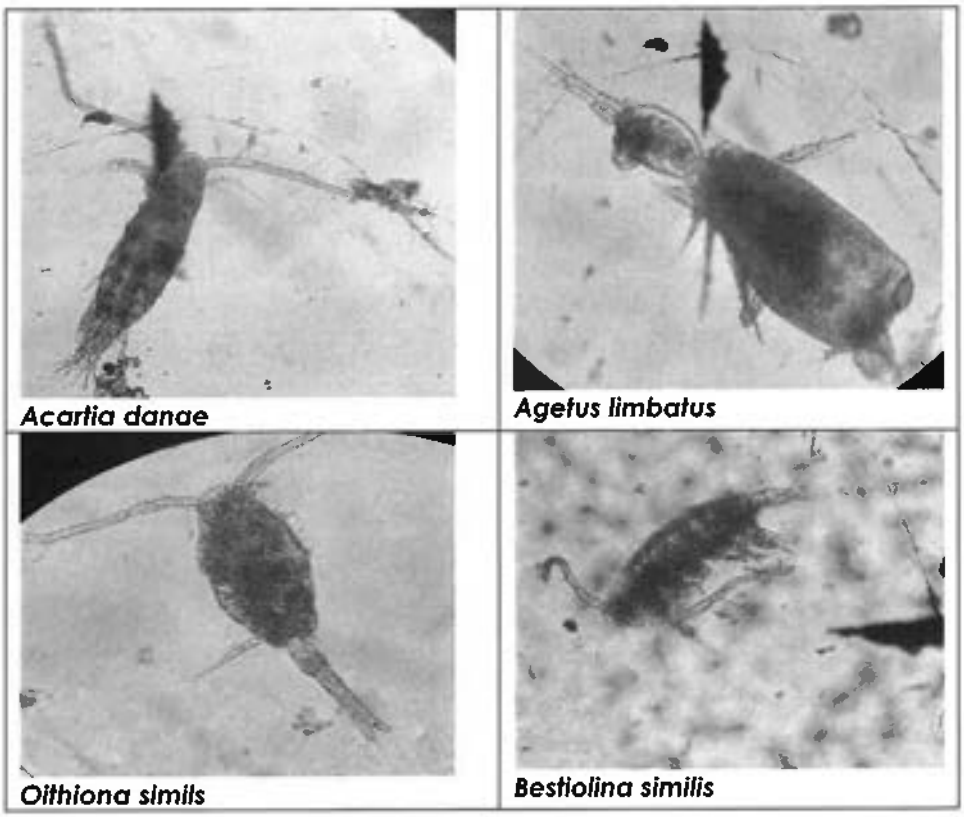


Figure 3-22: Zooplanktons recorded during Post dredging

Inference:

- Zooplankton abundance peaked at MS10 during Pre dredging, MS11 during dredging, and MS8 during Post dredging, showing shifting productivity hotspots over time.
- Copepods remained the dominant group throughout all phases, with Paracalanus parvus consistently abundant and Calanoida showing resilience and adaptability across conditions.
- Cyclopoid, copepods like Oithona similis were widespread in pre- dredging and post-dredging stages and surged in midstream zones during dredging due to tolerance to salinity changes.
- Harpacticoids such as Euterpina acutifrons and Microsetella rosea maintained distribution from pre-dredging through to post-dredging, indicating benthic coupling and sediment dynamics.
- Decapod larvae like Lucifer hanseni peaked at MS6 before dredging, at MS6 during dredging, and shifted to MS1 and MS11 afterward, suggesting changing recruitment patterns.
- Molluscan larvae were most abundant in MS6 in pre- and post-dredging phases, with continued presence during dredging in downstream stations, marking stable benthic spawning grounds.
- Rotifers were scarce before dredging, present in creek zones during dredging, and abundant post-dredging at MS1 and MS3, reflecting nutrient-enriched recovery zones.
- Foraminifera, though limited before dredging, increased during and especially after dredging in MS6,MS12, indicating improved benthic interactions and salinity stability.
- Oligotrich ciliates like Favella and Tintinnopsis were moderately present in all phases, peaking post-dredging and serving as indicators of nutrient cycling and microbial activity.
- Crustacean and mollusk larvae showed consistent presence across all phases, with highest densities shifting from MS6 (Predredging) to MS8 (post Dredging), emphasizing active spawning corridors.
- Stations MS1 to MS4 consistently showed lower zooplankton densities across all phases, indicating persistent freshwater influence and slower ecological recovery.
- Coastal stations like MS9, MS10, and MS11 showed high diversity during and after dredging, as they did before, underlining their role as resilient and productive ecosystems.
- Zooplankton community composition shifted subtly across all three phases, but copepods remained keystone species, anchoring the aquatic food web throughout.
- Environmental drivers like salinity, turbidity, and organic content varied across phases, influencing species composition more stable offshore, more variable in creeks.

- The ecosystem transitioned from stable (pre-dredging) to stressed (during dredging) and toward recovery (post-dredging), marked by recolonization and trophic restructuring.

Sediment Analysis

Sediment analysis across the marine sampling locations reveals significant spatial variation in sediment composition. Regular monitoring of sediment grain size is important for understanding sediment transport dynamics and for assessing habitat suitability for benthic organisms.

Physico-Chemical Parameters of Sediment

The Physico-Chemical Parameters of Sediment during three phases are given in following tables **Table 3-19,Table 3-20,Table 3-21,Table 3-22 and Table 3-23**

Table 3-19: Marine Sediment Physio-chemical Parameters at MS1(Creek), MS3(Creek), MS4(Creek)

Parameters	Unit	Creek Area								
		MS1			MS3			MS4		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
TOC	mg/g	17.45	21.81	16.18	23.43	29.45	21.62	21.34	25.78	18.42
PH	-	7.6	7.8	7.9	7.7	8.2	8.2	7.8	8.2	8.2
Nitrogen	mg/g	0.92	2.65	2.38	0.87	3.05	2.08	0.71	2.6	1.82
Phosphorus	mg/g	0.43	1.22	0.98	0.49	1.15	0.81	0.42	0.88	0.62
Potassium	mg/g	3.36	7.2	7.1	12.76	15.95	11.18	3.69	4.61	3.23
Sodium	mg/g	4.54	10.25	10.11	7.65	13.94	12.81	15.96	28.64	20.09
Lead	µg/g	12.46	26.46	12.67	18.12	28.51	14.95	10.82	20.41	15.57
Cadmium	µg/g	1.98	2.13	2.07	1.01	1.21	1.09	0.98	1.02	0.93
Copper	µg/g	12.94	16.40	15.90	11.84	14.25	12.97	11.72	13.75	12.51
Zinc	µg/g	40.92	43.59	41.77	31.67	35.87	34.79	22.54	29.86	26.96
Iron	µg/g	7991	8291	8043	7066	7565	7138	8222	8766	8503
Mercury	µg/g	<0.01	BDL	BDL	<0.01	BDL	BDL	<0.01	BDL	BDL

Table 3-20: Marine Sediment Physio-chemical Parameters MS2(ITL), MS5(ITL), MS13(ITL)

Parameters	Unit	Intertidal Area								
		MS2			MS5			MS13		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
TOC	mg/g	13.45	17.52	12.68	15.49	19.24	13.97	15.35	18.56	19.45
PH	-	7.9	8.1	8.2	7.9	8.2	8.1	7.9	8.2	7.9
Nitrogen	mg/g	1.75	3.65	2.54	1.65	2.85	2.02	1.83	2.4	1.72
Phosphoru	mg/g	0.59	0.95	0.69	0.46	0.84	0.67	0.52	0.98	0.71
Potassium	mg/g	15.56	19.14	13.86	17.67	22.11	15.5	17.05	18.68	6.09
Sodium	mg/g	26.96	32.54	27.15	23.87	35.42	24.84	18.93	30.78	20.71

Parameters	Unit	Intertidal Area								
		MS2			MS5			MS13		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
Lead	µg/g	18.09	20.09	19.49	12.36	15.34	13.96	20.51	22.36	21.69
Cadmium	µg/g	0.53	0.69	0.61	0.79	0.85	0.81	1.21	1.28	1.24
Copper	µg/g	10.38	11.34	10.94	12.94	14.61	13.29	12.91	14.39	13.96
Zinc	µg/g	37.08	39.30	38.12	30.36	35.33	30.03	35.52	37.38	36.25
Iron	µg/g	10428.4	11437.4	11094.0	8552.4	10552.4	8570.0	7423.2	7923.2	7695.0
Mercury	µg/g	<0.01	BDL	BDL	<0.01	BDL	BDL	<0.01	BDL	BDL

Table 3-21: Marine Sediment Physio-chemical Parameters at MS6, MS7, MS8

Parameters	Unit	Offshore Area								
		MS6			MS7			MS8		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
TOC	mg/g	11.32	14.8	10.86	11.12	15.53	11.4	12.35	17.25	12.66
PH	-	7.9	8.1	8.2	7.8	8.2	8.2	7.8	8.2	8.2
Nitrogen	mg/g	1.58	2.55	1.79	1.23	1.74	1.22	1.05	1.53	1.08
Phosphoru	mg/g	0.41	0.82	0.57	0.47	0.75	0.53	0.41	0.68	0.52
Potassium	mg/g	14.98	18.85	13.22	18.95	23.72	17.45	16.64	20.14	14.12
Sodium	mg/g	34.54	38.83	37.24	39.95	40.52	38.42	37.76	39.72	38.97
Lead	µg/g	18.12	20.41	18.57	11.84	12.68	11.54	10.32	11.63	10.59
Cadmium	µg/g	0.65	0.75	0.68	0.56	0.66	0.60	0.67	0.70	0.64
Copper	µg/g	9.88	10.24	9.32	8.06	8.84	8.05	8.15	8.99	8.18
Zinc	µg/g	23.68	27.47	23.35	18.04	20.23	17.20	13.63	16.17	13.74
Iron	µg/g	5370.37	6970.34	5425.00	5817.06	6111.16	5904.00	5120.21	5410.25	4529.00
Mercury	µg/g	<0.01	BDL	BDL	<0.01	BDL	BDL	<0.01	BDL	BDL

Table 3-22: Marine Sediment Physio-chemical Parameters MS9, MS10, MS11

Parameters	Unit	Offshore Area								
		MS9			MS10			MS11		
		Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging	Pre dredging	Dredging	Post dredging
TOC	mg/g	11.27	13.54	9.94	11.39	13.75	11.15	10.26	12.42	9.12
PH	-	8	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.2
Nitrogen	mg/g	0.59	1.14	0.8	0.51	1.26	0.88	0.48	1.14	0.85
Phosphoru	mg/g	0.48	0.78	0.55	0.33	0.72	0.5	0.35	0.54	0.38
Potassium	mg/g	13.19	16.48	11.56	14.07	17.58	12.32	18.9	23.54	16.51
Sodium	mg/g	35.09	40.25	28.23	36.43	42.85	34.84	40.32	43.64	35.48
Lead	µg/g	10.14	10.52	10.21	8.56	8.86	8.59	5.81	6.05	5.87
Cadmium	µg/g	0.52	0.57	0.55	0.48	0.52	0.41	0.42	0.50	0.39
Copper	µg/g	8.19	8.45	8.20	6.78	7.77	6.06	6.05	7.05	5.50
Zinc	µg/g	14.54	15.06	14.61	10.24	11.92	9.30	10.21	12.25	9.55
Iron	µg/g	5124.64	5261.67	5104.00	4014.23	5074.33	3908.00	3281.07	4270.06	3371.00
Mercury	µg/g	<0.01	BDL	BDL	<0.01	BDL	BDL	<0.01	BDL	BDL

Table 3-23: Marine Sediment Physio-chemical Parameters at MS12

Parameters	Unit	Offshore Area		
		MS12		
		Pre dredging	Dredging	Post dredging
TOC	mg/g	9.45	11.48	11.33
PH	-	8.2	8.2	8.2
Nitrogen	mg/g	0.41	0.75	0.53
Phosphoru	mg/g	0.28	0.51	0.36
Potassium	mg/g	17.76	15.45	10.83
Sodium	mg/g	41.49	45.87	38.47
Lead	µg/g	5.22	5.29	5.13
Cadmium	µg/g	0.45	0.45	0.35

Parameters	Unit	Offshore Area		
		MS12		
		Pre dredging	Dredging	Post dredging
Copper	µg/g	5.01	6.01	4.69
Zinc	µg/g	11.11	13.15	10.26
Iron	µg/g	3189.11	4189.31	3248.00
Mercury	µg/g	<0.01	BDL	BDL

Marine Sediment Biological Parameters

Table 3-24: Marine Sediment Pathogenic load at MS1(Creek), MS2(ITL), MS3

Parameters	Unit	Creek Area								
		MS1(Creek)			MS3(Creek)			MS4(Creek)		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
THB	CFU/g	36000	57000	45000	640000	88000	58000	52000	78000	69000
Total coliforms	CFU/g	14000	21000	16000	15000	12000	14000	17000	19000	15000
Fecal coliform	CFU/g	1530	1700	1300	1620	1900	1420	1340	1550	1200
E. coli	CFU/g	138	145	132	129	135	125	116	139	115
Vibrio	CFU/g	260	480	310	240	460	310	250	380	290

Table 3-25: Marine Sediment Marine Sediment Pathogenic load at MS2(ITL), MS5(ITL), MS13(ITL)

Parameters	Unit	Intertidal Area								
		MS2(ITL)			MS5(ITL)			MS13(ITL)		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
THB	CFU/g	13000	16000	14000	21000	35000	27650	25000	42000	33000
Total coliforms	CFU/g	11000	14000	12000	9000	10000	8000	10000	12300	9000
Fecal coliform	CFU/g	1940	8000	1500	1200	2500	1000	1000	3500	980
E. coli	CFU/g	124	140	121	114	138	113	130	180	120
Vibrio	CFU/g	130	190	150	190	250	170	210	350	280

Table 3-26: Marine Sediment Pathogenic load at MS6, MS7, MS8

Parameters	Unit	Offshore Area								
		MS6			MS7			MS8		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
THB	CFU/g	28300	43000	33970	13900	36000	28440	12000	73000	28440
Total coliforms	CFU/g	7100	9000	6800	5800	7700	5500	3500	4200	2850
Fecal coliform	CFU/g	1400	2500	1100	1100	1400	1200	1200	3600	1100
E. coli	CFU/g	110	160	120	120	150	110	110	160	100
Vibrio	CFU/g	110	140	120	110	180	130	150	190	160

Table 3-27: Marine Sediment Pathogenic load at MS9, MS10, MS11

Parameters	Unit	Offshore area								
		MS9			MS10			MS11		
		Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging	Predredging	Dredging	Postdredging
THB	CFU/g	15000	51000	25000	12000	16000	11000	18000	28000	11000
Total coliforms	CFU/g	3100	3700	4503	2900	3500	1700	2200	2600	2100
Fecal coliform	CFU/g	980	1200	720	1100	1400	1000	1300	1500	1100
E. coli	CFU/g	120	150	110	110	140	120	100	140	120
Vibrio	CFU/g	130	180	150	120	160	100	110	180	110

: Marine Sediment Pathogenic load at MS12

Parameters	Unit	Offshore Area		
		MS12		
		Predredging	Dredging	Postdredging
THB	CFU/g	10000	14000	11000
Total coliforms	CFU/g	1900	2200	1730
Fecal coliform	CFU/g	970	1100	890
E. coli	CFU/g	110	130	120
Vibrio	CFU/g	100	140	110

Inference

- Total organic carbon during Pre Dredging ranged between 9.45 mg/g at MSL-12 in offshore area to 23.43 mg/g at MSL-3 in creek area, during Dredging Total organic carbon ranged between 11.48 mg/g at MSL-12 in offshore area to 29.45 mg/g at MSL-3 in creek area and during Post Dredging Total organic carbon ranged between 9.12 mg/g at MSL-11 in offshore area and 21.62 mg/g at MSL-3 in creek area.
- pH during Pre Dredging ranged between 7.6 at MSL-1 in Creek area to 8.2 at MSL-12 in offshore area, during Dredging pH ranged between 7.8 at MSL-1 in Creek area to 8.2 at MSL-12 in offshore area and during Post Dredging pH ranged between 7.9 at MSL-1 in creek area and also at MSL-13 in Intertidal area respectively to 8.2 at MSL-3&4 in creek area, MSL-2 in intertidal area and also at MSL-6,7,8,11 & 12 in offshore areas respectively.
- Nitrogen during Pre Dredging ranged between 0.41 mg/g at MSL-12 in offshore area to 1.83 mg/g at MSL-13 in Intertidal area, during Dredging Nitrogen ranged between 0.75 mg/g at MSL-12 in offshore area to 3.65 mg/g at MSL-2 in intertidal area and Post Dredging Nitrogen ranged between 0.53 mg/g at MSL-12 in offshore area to 2.54 mg/g at MSL-2 in intertidal area.
- Phosphorus levels during Pre Dredging ranged between 0.28 mg/g at MSL-12 in offshore area to 0.59 mg/g at MSL-2 in intertidal area, during Dredging Phosphorus levels ranged between 0.51 mg/g at MSL-12 in offshore area to 1.22 mg/g at MSL-1 in creek area and during Post Dredging Phosphorus levels ranged between 0.36 mg/g at MSL-12 in offshore area to 0.98 mg/g at MSL-1 in creek area.
- Potassium during Pre Dredging ranged between 3.36 mg/g at MSL-1 in creek area to 18.95 mg/g at MSL-7 in offshore area, during Dredging Potassium ranged between 4.61 mg/g at MSL-4 in creek area to 23.72 mg/g at MSL-7 in offshore area and during Post Dredging Potassium ranged between 3.23 mg/g at MSL-4 in creek area to 17.45 mg/g at MSL-7 in offshore area.
- Sodium during Pre Dredging ranged between 4.54 mg/g at MSL-1 in creek area to 41.49 mg/g at MSL-12 in offshore area, during Dredging Sodium ranged between 10.25 mg/g at MSL-1 in creek area to 45.87 mg/g at MSL-12 in offshore area and during Post Dredging Sodium ranged between 10.11 mg/g at MSL-1 in creek area to 38.97 mg/g at MSL-8 in offshore area.
- Lead during Pre Dredging ranged between 5.22 µg/g at MSL-12 in offshore area to 20.51 µg/g at MSL-13 in Intertidal area, during Dredging Lead ranged between 5.29 µg/g at MSL-12 in offshore area to 28.51 µg/g at MSL-3 in creek area and during Post Dredging Lead ranged between 5.13 µg/g at MSL-12 in offshore area to 21.69 µg/g at MSL-13 in Intertidal area.
- Cadmium during Pre Dredging ranged between 0.42 µg/g at MSL-11 in offshore area to 1.98 µg/g at MSL-1 in creek area, during Dredging Cadmium ranged between 0.45 µg/g at MSL-12 in offshore area to 2.13 µg/g at MSL-1 in creek area and during Post Dredging Cadmium ranged between 0.35 µg/g at MSL-12 in offshore area to 2.07 µg/g at MSL-1 in creek area.

- Copper during Pre Dredging ranged between 5.01 µg/g at MSL-12 in offshore area to 12.94 µg/g at MSL-1 in creek area, during Dredging Copper ranged between 6.01 µg/g at MSL-12 in offshore area to 16.40 µg/g at MSL-1 in creek area and during Post Dredging Copper ranged between 4.69 µg/g at MSL-12 in offshore area to 15.9 µg/g at MSL-1 in creek area.
- Zinc during Pre Dredging ranged between 10.21 µg/g at MSL-11 in offshore area to 40.92 µg/g at MSL-1 in creek area, during Dredging Zinc ranged between 11.92 µg/g at MSL-10 in offshore area to 43.59 µg/g at MSL-1 in creek area and during Post Dredging Zinc ranged between 9.3 µg/g at MSL-10 in offshore area to 41.77 µg/g at MSL-1 in creek area.
- Iron during Pre Dredging ranged between 3189.11 µg/g at MSL-12 in offshore area to 104828.43 µg/g at MSL-2 in Intertidal area, during Dredging Iron ranged between 4189.31 µg/g at MSL-12 in offshore area to 11437.4 µg/g at MSL-2 in Intertidal area and during Post Dredging Iron ranged between 3248.0 µg/g at MSL-12 in offshore area to 11094.0 µg/g at MSL-2 in Intertidal area.
- Mercury is found to be <0.01 µg/g during Pre Dredging, Dredging and Post Dredging at in all locations.
- Total heterotrophic bacteria (THB) during Pre Dredging ranged between $10x10^3$ CFU/g at MSL-12 in offshore area to $64 x10^4$ CFU/g at MSL-3 in Creek area, during Dredging THB ranged between $14x10^3$ CFU/g at MSL-12 in offshore area to $88x10^3$ CFU/g at MSL-4 in Creek area and during Post Dredging THB ranged between $11x10^3$ CFU/g at MSL-10, 11 & 12 in offshore areas respectively to $69x10^3$ CFU/g at MSL-4 in Creek area.
- Total coliforms (TC) during Pre Dredging ranged between $19x10^2$ CFU/g at MSL-12 in offshore area to $17x10^3$ CFU/g at MSL-4 in Creek area, during Dredging TC ranged between $22x10^2$ CFU/g at MSL-12 in offshore area to $21x10^3$ CFU/g at MSL-1 in Creek area and during Post Dredging TC ranged between $17x10^2$ CFU/g at MSL-10 in offshore area to $16x10^3$ CFU/g at MSL-1 in Creek area.
- Faecal coliform (FC) during Pre Dredging ranged between $97x10^1$ CFU/g to $19x10^2$ CFU/g at MSL-2 in Intertidal area, during Dredging FC ranged between $11x10^2$ CFU/g at MSL-12 in offshore area to $80x10^2$ CFU/g at MSL-2 in Intertidal area and during Post Dredging FC ranged between $72x10^1$ CFU/g at MSL-9 in offshore area to $15x10^2$ CFU/g at MSL-2 in Intertidal area.
- E. coli during Pre Dredging ranged between $10x10^1$ CFU/g at MSL-11 in offshore area to $13x10^1$ CFU/g at MSL-1 in creek area, during Dredging EC ranged between $13x10^1$ CFU/g at MSL-11 in offshore area to $18x10^1$ CFU/g at MSL-13 in Intertidal area and during Post Dredging EC ranged between $10x10^1$ CFU/g at MSL-8 in offshore area to $13x10^1$ CFU/g at MSL-1 in creek area.
- Vibrio during Pre Dredging ranged between $10x10^1$ CFU/g at MSL-12 in offshore area to $26x10^1$ CFU/g at MSL-1 in creek area, during Dredging Vibrio ranged between $14x10^1$ CFU/g at MSL-6 & 12 in offshore areas respectively to $48x10^1$ CFU/g at MSL-1 in creek area and during Post Dredging Vibrio ranged between $10x10^1$ CFU/g at MSL-10 in offshore area to $31x10^1$ CFU/g at MSL-3 in creek area.

Benthos

Results of the Macro Benthic and Meio Benthic community sampled during the Pre dredging, Dredging and Post Dredging phases are given in the **Table 3-28,Table 3-29,Table 3-30,Table 3-31,Table 3-32, Table 3-33**. The Macro Benthos and Meio Benthos recorded during Pre Dredging, Dredging and Post Dredging are shown in **Figure 3-23, Figure 3-24, Figure 3-25, Figure 3-26, Figure 3-27.**

Macro Benthos

Table 3-28 : Distribution and Abundance of Macrobenthos in Sediment during Pre Dredging

S. No	Taxon	Macro Benthos (Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
1	*Capitella capitata*	0	50	0	0	50	0	0	75	0	0	0	0	0
2	*Euclymene annandalei*	75	0	50	0	0	0	0	0	0	0	25	50	0
3	*Eunice tubifex*	50	0	50	0	25	0	0	0	25	50	50	0	50
4	*Glycera alba*	75	50	50	50	0	25	75	0	0	0	0	0	0
5	*Goniada emerita*	75	0	0	50	0	0	75	0	0	0	50	0	0
6	*Lumbriconereis heteropoda*	50	0	50	0	0	0	50	50	0	50	25	50	0
7	*Nephtys polybranchia*	50	50	25	75	0	50	0	0	75	0	50	50	75
8	*Nereis capensis*	0	0	0	50	0	0	0	0	0	75	0	0	75
9	*Nereis diversicolor*	75	0	0	25	0	0	75	75	75	0	0	0	0
10	*Onuphis erumita*	0	25	0	0	50	0	0	0	50	0	0	0	0
11	*Paraprionospio pinnata*	75	0	75	0	50	0	0	100	0	50	50	0	25
12	*Pereneries cultrifera*	0	50	0	50	0	0	75	0	0	75	0	0	0
13	*Phyllodoce malmgreni*	0	75	75	0	0	0	50	0	0	0	0	0	0
14	*Platynereis sp.*	50	0	50	0	0	50	0	0	0	0	0	0	0
15	*Pista sp.*	0	0	0	0	50	0	0	0	0	0	0	0	0
16	*Scololepis squamata*	75	0	50	0	75	0	25	75	25	0	25	50	0
	Gastropods	0	0	0	0	0	0	0	0	0	0	0	0	0
17	*Turitella duplicata*	0	0	0	0	0	0	0	0	0	0	0	0	50
18	*Babylonia spirata*	0	0	0	0	0	0	0	0	25	0	0	0	0
	Bivalves	0	0	0	0	0	0	0	0	0	0	0	0	0
19	*Anadara inequalis*	0	50	0	0	0	50	0	0	50	0	0	0	50
20	*Meretrix meretrix*	75	0	75	0	75	0	0	100	0	0	50	50	0
	Amphipods	0	0	0	0	0	0	0	0	0	0	0	0	0
21	*Gammarus locusta Urothoe sp.*	150	200	200	150	950	0	0	75	50	50	100	75	100
22	*Urothoe sp.*	50	0	0	150	275	0	75	0	0	0	0	0	0
23	*Pontharoinia sp.*	0	100	200	100	0	300	100	0	150	125	0	50	50
24	*Caprella mutica*	300	200	50	0	325	0	75	0	50	50	50	0	50
25	*Phoxocephalus holbolli*	100	100	0	200	450	0	100	0	0	0	0	50	75
26	**Isopods**	0	0	0	0	0	0	0	0	0	0	0	0	0

S. No	Taxon	Macro Benthos (Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
27	*Anthura gracilis*	0	50	0	50	50	0	50	0	0	0	0	0	0
	Others	0	0	0	0	0	0	0	0	0	0	0	0	0
28	*Balanus amphitrite*	0	0	50	0	0	0	0	0	0	0	0	0	0
29	*Lepas sp.*	0	0	25	0	0	0	0	0	0	0	0	0	0
30	Mysis Larva	0	25	0	0	150	0	0	0	0	0	0	0	0
	Total	**1325**	**1025**	**1075**	**950**	**2575**	**475**	**825**	**550**	**575**	**525**	**475**	**425**	**600**

Table 3-29: Distribution and Abundance of Macrobenthos in Sediment during Dredging

S. No	Taxon	Macro Benthos (Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
1	*Ancistrosyllis parva*	50	25	25	50	50	25	25	0	0	0	0	0	75
2	*Armandia longicaudata*	50	75	0	50	50	0	0	0	0	0	50	0	0
3	*Boccardia polybranchia*	0	75	25	0	0	0	25	50	0	50	25	50	50
4	*Capitella capitata*	0	25	50	25	75	50	50	0	50	0	50	50	0
5	*Drilonereis monroi*	50	50	0	50	25	0	50	0	0	75	0	0	50
6	*Euclymene annandalei*	0	0	25	25	0	0	0	25	50	0	0	0	0
7	*Eulalia macroceros*	0	75	0	0	25	0	0	0	50	0	0	0	25
8	*Eunice tubifex*	25	0	50	0	0	0	25	25	0	50	50	0	0
9	*Glycera alba*	0	75	50	50	75	0	25	0	0	50	0	0	75
10	*Goniada emerita*	50	0	0	0	0	0	0	0	0	0	0	0	50
11	*Lumbriconereis heteropoda*	75	0	0	0	75	50	25	0	0	0	0	0	25
12	*Nephtys hombergii*	0	50	0	0	50	0	0	0	0	0	0	0	0
13	*Nereis capensis*	0	0	50	0	0	0	0	75	25	0	25	50	25
14	*Nereis diversicolor*	0	75	75	0	50	0	0	0	0	0	0	0	0
15	*Onuphis erumita*	0	0	0	25	0	0	50	0	0	0	0	0	25
16	*Paraprionospio pinnata*	0	25	25	50	25	0	25	0	25	0	25	0	50
17	*Pereneries cultrifera*	0	0	0	25	0	0	0	25	0	0	0	25	0
18	*Phyllodoce malmgreni*	0	0	0	0	25	50	50	0	50	0	0	0	0
19	*Pista sp*	50	0	0	0	0	0	0	25	0	0	50	50	0
20	*Polydora ciliata*	25	75	75	0	75	50	25	25	0	0	0	0	50
21	*Platynereis sp.*	0	50	0	50	50	0	0	0	0	0	0	0	0
22	*Scololepis squamata*	0	0	50	0	0	0	25	75	25	0	25	50	25

S. No	Taxon	Macro Benthos (Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
	Gastropods													
23	*Turritella attenuata*	50	0	50	25	25	50	0	0	0	0	0	0	25
24	*Turitella duplicata*	0	25	0	0	50	0	25	0	0	25	0	0	0
25	*Babylonia spirata*	75	50	50	25	0	0	25	0	25	0	25	50	25
	Bivalves													
26	*Donax scortum*	25	50	50	50	25	0	0	0	0	25	0	25	50
27	*Anadara inequalis*	0	25	0	25	50	0	25	0	25	25	25	0	0
28	*Meretrix meretrix*	50	75	25	25	75	0	25	50	25	25	25	50	75
	Amphipods													
29	*Gammarus locusta*	50	75	25	25	75	25	25	25	0	50	0	25	75
30	*Urothoe sp*	0	0	25	25	50	0	25	0	25	0	25	0	25
31	*Pontharoinia sp.*	25	50	0	0	75	50	25	0	0	0	0	0	0
32	*Phoxocephalus holbolli*	25	25	50	0	25	0	0	50	25	0	25	50	0
	Isopods													
33	*Anthura gracilis*	25	50	0	50	50	0	25	0	0	25	0	0	0
34	*Microjaera anisopoda*	0	25	25	25	50	25	25	0	25	0	25	0	25
	Others													
35	*Ophiocnemus mormorata*	25	0	25	25	25	0	25	0	25	0	25	0	25
36	*Lepas sp.*	25	50	0	0	25	0	0	0	0	0	0	0	0
37	*Balanus amphitrite*	0	0	25	50	0	0	0	0	0	0	0	0	0
38	Penaeus larva	0	25	0	0	25	0	0	0	25	0	25	0	0
	Total	**750**	**1200**	**850**	**750**	**1275**	**375**	**650**	**450**	**475**	**400**	**500**	**475**	**850**

Table 3-30: Distribution and Abundance of Macrobenthos in Sediment during Post Dredging

S. No	Taxon	Macro Benthos(Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
1	*Ancistrosyllis parva*	0	50	0	0	25	0	0	0	50	0	0	0	25
2	*Armandia longicaudata*	25	0	50	0	0	0	25	25	0	50	50	0	0
3	*Boccardia polybranchia*	0	25	50	50	75	0	25	0	0	50	0	0	75
4	*Capitella capitata*	50	75	25	0	0	0	0	0	0	25	0	0	50
5	*Cirratulus concinnus*	75	0	0	0	75	50	25	0	0	0	0	0	25
6	*Drilonereis monroi*	0	50	0	0	50	0	0	0		0	0	0	0
7	*Dorvillea sp.*	0	0	50	25	0	25	0	75	25	0	25	50	25

S. No	Taxon	Macro Benthos(Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
8	*Euclymene annandalei*	25	75	75	0	50	0	0	25	0	0	0	0	0
9	*Eulalia macroceros*	0	0	0	25	0	0	50	25	0	0	0	0	25
10	*Exogone clavator*	25	25	25	50	25	0	25	0	25	25	25	0	50
11	*Glycera alba*	0	0	0	25	0	0	0	25	0	0	0	25	0
12	*Goniada emerita*	0	0	0	0	25	50	50	0	50	0	25	0	25
13	*Lumbriconereis heteropoda*	50	0	0	25	0	0	0	25	0	0	50	50	0
14	*Nephtys hombergii*	0	75	50	0	75	50	25	25	0	0	0	0	50
15	*Nereis capensis*	25	50	25	50	50	0	0	0	0	0	0	0	0
16	*Nereis diversicolor*	0	25	50	0	0	0	25	75	25	0	25	50	25
17	*Onuphis erumita*	25	25	0	50	50	25	25	0	0	0	0	0	75
18	*Paraprionospio pinnata*	50	50	0	50	50	0	0	0	0	0	50	0	0
19	*Pereneries cultrifera*	0	25	25	0	0	0	25	50	0	50	25	50	50
20	*Phyllodoce malmgreni*	0	25	50	25	75	50	50	0	50	0	50	50	0
21	*Pista sp*	50	25	0	50	25	0	50	0	0	75	0	0	50
22	*Polydora ciliata*	0	0	25	25	0	0	0	25	50	0	0	0	0
23	*Platynereis sp.*	25	50	75	0	75	50	25	25	0	0	0	0	50
24	*Scololepis squamata*	25	50	0	50	50	0	0	0	0	0	0	0	0
	Gastropods													
25	*Turritella attenuata*	25	25	25	0	50	25	0	25	50	50	25	25	50
26	*Turitella duplicata*	0	0	25	50	50	0	0	0	25	25	0	0	25
27	*Babylonia spirata*	0	25	0	0	25	50	25	0	0	0	0	25	0
	Bivalves													
28	*Donax scortum*	50	25	25	25	25	0	25	0	25	0	25	0	25
29	*Anadara inequalis*	25	50	0	0	50	0	50	0	0	50	0	50	25
30	*Cardium setosum*	25	50	25	50	0	0	0	25	0	0	25	0	25
31	*Meretrix meretrix*	50	75	0	0	25	0	0	0	25	25	25	0	0
	Amphipods													
32	*Gammarus locusta*	100	75	100	50	75	25	50	25	50	50	0	50	75
33	*Urothoe sp*	0	0	25	25	50	0	25	0	25	0	25	0	25
34	*Pontharoinia sp.*	25	50	0	0	75	50	25	0	0	0	0	0	0
35	*Phoxocepholus holbolli*	25	25	50	25	25	0	0	50	25	0	25	50	0
	Isopods													

S. No	Taxon	Macro Benthos(Nos/m²)												
	Polychaetes	**MS1**	**MS 2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
36	*Anthura gracilis*	25	50	0	0	26	25	0	25	75	25	25	0	50
37	*Microjaera anisopoda*	25	50	25	50	25	0	0	25	25	0	0	25	50
	Others													
38	*Ophiocnemus mormorata*	25	0	25	25	0	25	0	0	0	0	0	25	0
39	*Meretrix Veliger*	25	50	25	75	50	50	25	25	25	0	25	0	25
40	*Balanus amphitrite*	0	0	0	0	75	25	25	0	0	25	0	25	25
41	Penaeus larva	0	25	25	25	25	0	0	75	25	0	25	75	0
	Total	**875**	**1275**	**950**	**900**	**1426**	**575**	**675**	**675**	**650**	**525**	**550**	**625**	**1000**

Meio Benthos:

Table 3-31: Distribution and Abundance of Meio benthos in Sediment during Pre Dredging

S. No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	**MS2**	**MS3**	**MS4**	**MS5**	**MS6**	**MS7**	**MS8**	**MS9**	**MS10**	**MS11**	**MS12**	**MS13**
	Nematodes													
1	*Astomonema* sp.	0	0	0	0	0	0	2	6	0	0	2	1	2
2	*Daptonema conicum*	2	4	5	0	2	2	8	23	18	16	34	12	0
3	*Desmodora* sp.	12	18	22	8	14	12	4	12	3	0	14	6	0
4	*Desmoscolex falcatus*	2	3	6	1	3	0	0	5	4	2	6	2	0
5	*Dracoma* sp.	0	1	1	0	4	2	2	2	0	2	2	0	0
6	*Greeffiella* sp.	2	2	3	0	3	0	3	1	2	0	0	2	0
7	*Halalaimus film*	0	2	0	0		2	8	14	22	20	32	13	6
8	*Oncholaimus* sp.	10	6	5	10	12	6	6	4	20	18	12	11	3
9	*Oxystomina* sp.	8	5	7	3	0	0	0	0	2	1	5	4	0
10	*Pandolaimus* sp.	1	2	0	1	0	2	12	16	18	14	18	12	12
11	*Polygastrophora septembulba*	10	13	18	12	18	12	10	12	6	3	12	8	6
12	*Theristus* sp.	6	10	12	3	22	6	8	8	12	10	24	6	12
13	*Tricoma* sp.	8	15	13	5	24	14	2	0	4	0	8	2	0
14	*Viscosia* sp.	3	0	1	0	2	0	4	8	14	12	14	12	6
	Foraminiferans													
15	*Adelosina laevigata*	0	2	3	0	1	0	2	0	2	1	3	0	0
16	*Ammobaculites exiguous*	11	6	3	0	3	2	2	3	1	3	6	2	

S. No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	MS2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13
17	*Ammonia beccarii*	52	64	58	12	22	14	12	16	24	28	62	16	10
18	*Amphisorus sp.*	3	5	2	5	20	6	8	10	16	18	34	12	2
19	*Ammonia dentata*	4	8	6	0	2	0	2	6	8	4	26	6	3
20	*Asterorotalia trispinosa*	68	56	62	24	32	12	12	24	26	20	72	22	8
21	*Cibicides lobatulus*	6	13	14	16	12	6	14	12	20	28	34	12	12
22	*Globigerinoides glutinata*	6	12	8	8	26	4	8	10	24	16	24	8	3
23	*Elphidium advena*	32	30	41	12	36	0	4	16	6	3	28	4	0
24	*Elphidium macellum*	12	8	22		13	2	3	4	4	2	20	0	0
25	*Elphidium norvangi*	8	12	18	3	0	2	2	0	2	0	12	0	0
26	*Lagena striata*	4	8	11	0	6	4	12	6	2	1	12	2	0
27	*Planorbulinella larvata*	42	36	32	22	24	12	16	14	11	16	34	8	6
28	*Nonionella labradorica*	36	42	44	20	16	8	12	18	14	12	36	4	8
29	*Quinqueloculina agglutinans*	48	58	53	10	18	6	8	12	8	8	42	8	4
30	*Rosalina bradyi*	16	8	7	0	4	2	2	4	0	1	13	2	6
31	*Spiroloculina communis*	8	3	7	0	3	0	4	0	0	2	0	1	0
32	*Spirillina limbata.*	5	2	0	2	0	2		3	0	1	0	1	4
33	*Textularia agglutinans*	13	11	8	18	12	2	6	8	6	8	16	6	6
34	*Triloculina striatitrigonula*	5	0	3	14	3	0	2	0	4	0	6	0	0
35	*Triloculina trigonula*	0	1	0	1	0	2	0	3	0	1	4	0	5
36	*Trochammina globige riniformis*	2	0	1	1	0	2	3	0	3	2	2	1	0
	Ostrocodes													
37	*Keijella oertlii*	6	5	2	2	4	2	4	6	4	3	16	2	6
38	*Leptocythere sp.*	3	1	0	0	0	1	0	3	6	4	12	0	4
39	*Tanella estuarii*	0	3	4	0	6	0	4	7	0	2	22	4	2
40	*Tanella kingmaii*	5	5	2	4	0	1	2	5	2	1	16	2	3
41	*Cyprideis sp.*	2	6	2	2	6	0	2	6	4	6	12	2	2
	Tanaidacea													
42	Pogurapseudes largoensis	0	1	1	0	2	1	1	0	0	0	2	0	1
43	Apseudes setosus	2	0	0	0	0	2	2	1	1	2	4	0	0
44	Fish Eggs	64	82	88	36	22	18	12	26	46	28	56	12	16
45	Polychaete Larvae	0	0	2	0	0	2	2	3	0	2	0	1	0
46	Bivalve Veliger	3	0	0	4	0	6	4	6	0	3	0	0	0
	Total	**535**	**571**	**597**	**265**	**417**	**187**	**237**	**343**	**372**	**325**	**811**	**229**	**158**

Table 3-32: Distribution and Abundance of Meio Benthos in Sediment during Dredging

S.No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	MS 2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13
	Nematodes													
1	*Astomonema sp.*	3	5	2	0	4	2	0	2	0	2	2	3	4
2	*Daptonema conicum*	18	32	12	10	26	24	18	12	22	26	32	18	28
3	*Desmodora sp*	12	10	4	0	14	3	5	3	2	2	0	8	12
4	*Desmoscolex falcatus*	12	14	8	12	22	14	6	3	12	18	22	16	24
5	*Dracoma sp*	3	5	2	5	2	0	3	2	2	4	6	0	4
6	*Enoploides sp.*	4	8	6	0	2	0	2	6	0	4	2	0	3
7	*Greeffiella sp*	28	16	12	0	4	2	2	0	6	0	2	0	4
8	*Halalaimus film*	8	24	14	16	12	4	12	12	22	32	26	22	32
9	*Haplaomus sp.*	6	2	8	0	6	4	0	10	2	6	0	4	3
10	*Oncholaimus sp*	14	10	2	4	16	4	0	0	0	3	0	4	6
11	*Oxystomina sp.*	12	8	22	0	13	2	3	4	4	2	20	0	0
12	*Pandolaimus sp*	8	12	18	3	0	2	2	0	2	0	12	0	0
13	*Polygastrophora septembulba*	4	8	11	0	6	4	12	6	2	1	12	2	0
14	*Theristus sp*	16	32	22	28	20	10	18	10	8	22	18	18	26
15	*Tricoma sp*	0	6	2	6	12	16	18	0	0	18	14	12	22
16	*Viscosia sp*	4	8	6	0	2	0	2	6	8	4	6	6	3
	Foraminiferans													
17	*Adelosina laevigata*	6	2	4	10	1	0	0	0	2	0	3	0	0
18	*Ammobaculites exiguous*	8	6	3	8	3	2	6	3	6	3	6	2	6
19	*Ammonia beccarii*	48	52	42	62	28	24	22	26	20	18	12	24	32
20	*Amphisorus sp.*	4	6	2	6	6	6	8	2	12	22	16	22	28
21	*Ammonia dentata*	36	42	58	64	38	42	56	24	18	14	38	34	68
22	*Asterorotalia trispinosa*	52	38	42	52	64	56	44	32	28	22	52	62	52
23	*Cibicides lobatulus*	6	3	6	3	12	0	14	10	6	8	0	2	12
24	*Globigerina bulloides*	8	15	6	12	28	5	10	12	22	14	21	6	5
25	*Elphidium advena*	34	33	39	16	38	1	6	18	4	1	25	2	2
26	*Elphidium macellum*	14	11	20	4	15	3	5	6	2	0	17	0	2
27	*Elphidium norvangi*	10	15	16	7	2	3	4	2	0	4	9	0	2
28	*Lagena qudrata*	6	11	9	4	8	5	14	8	0	2	9	0	2
29	*Planorbulinella larvata*	44	39	30	26	26	13	18	16	9	14	31	6	8
30	*Nonionella labradorica*	38	45	42	24	18	9	14	20	12	10	33	2	10

S.No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	MS 2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13
31	*Quinqueloculina agglutinans*	50	61	51	14	20	7	10	14	6	6	22	6	6
32	*Rosalina bradyi*	18	11	5	4	6	3	4	6	2	2	2	0	8
33	*Spiroloculina communis*	10	6	5	4	5	1	6	2	2	0	0	0	2
34	*Spirillina limbata*	7	5	0	6	2	3	2	5	2	2	0	0	6
35	*Textularia agglutinans*	15	14	6	22	14	3	8	10	4	6	0	4	8
36	*Triloculina striatitrigonula*	7	3	1	18	5	1	4	2	2	0	3	0	2
37	*Triloculina trigonula*	2	4	2	5	2	3	2	5	0	0	1	0	7
38	*Trochammina globigeriniformis*	3	2	0	1	0	2	0	0	2	2	2	0	3
36	*Adelosina laevigata*	6	2	4	10	1	0	0	0	2	0	3	0	0
37	*Ammobaculites exiguous*	8	6	3	8	3	2	6	3	6	3	6	2	6
37	*Tanella estuarii*	48	52	42	62	28	24	22	26	20	18	12	24	32
38	*Tanella kingmaii*	4	6	2	6	6	6	8	2	12	22	16	22	28
	Ostrocodes													
39	*Keijella oertlii*	4	3	8	4	16	2	4	4	4	3	2	2	22
40	*Tanella estuarii*	2	6	2	2	10	0	4	7	0	2	3	4	2
41	*Tanella kingmaii*	6	8	0	4	8	2	2	5	2	2	0	2	3
42	*Cyprideis sp*	8	12	14	12	16	10	2	6	4	6	4	2	22
	Tanaidacea													
43	*Apseudes setosus*	4	0	2	0	2	2	0	0	2	2	0	0	4
44	**Polychaete Larvae**	2	3	2	4	0	2	0	0	0	2	0	0	2
45	**Bivalve Veliger**	2	4	4	2	2	4	6	2	0	0	2	0	4
	Total	**606**	**660**	**572**	**484**	**556**	**305**	**378**	**323**	**265**	**311**	**487**	**295**	**501**

Table 3-33: Distribution and Abundance of Meio Benthos in Sediment during Post Dredging

S.No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	MS 2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13
	Nematodes													
1	*Astomonema sp.*	22	28	21	14	32	16	12	14	8	16	18	20	24
2	*Daptonema conicum*	18	52	14	22	46	38	24	26	42	20	16	32	38
3	*Desmodora sp*	12	16	12	14	24	16	16	22	16	12	10	18	32
4	*Desmoscolex falcatus*	18	12	8	26	22	20	32	42	22	12	8	4	26
5	*Enoploides sp.*	12	24	16	22	14	12	18	10	14	6	0	4	8
6	*Greeffiella sp*	16	12	10	18	4	0	4	2	2	0	0	0	2
7	*Halalaimus film*	12	14	12	4	22	12	14	5	0	8	6	0	10

S.No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	MS 2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13
8	*Oncholaimus sp*	2	2	0	4	2	0	4	2	2	2	2	0	2
9	*Oxystomina sp.*	4	6	4	8	2	0	2	0	2	0	2	0	2
10	*Pandolaimus sp*	8	12	3	12	0	0	16	3	6	3	6	2	8
11	*Polygastrophora septembulba*	18	24	32	22	28	24	22	26	20	18	12	24	32
12	*Theristus sp*	14	16	18	26	26	16	8	2	12	22	16	22	28
13	*Viscosia sp*	32	12	38	34	38	32	26	24	18	14	32	34	38
	Foraminiferans													
14	*Adelosina laevigata*	26	12	42	14	12	10	14	10	16	18	1	14	32
15	*Ammobaculites exiguous*	28	26	26	22	38	36	42	52	22	14	21	26	36
16	*Ammonia beccarii*	44	53	28	26	42	28	26	28	24	32	22	32	48
17	*Amphisorus sp.*	14	0	20	4	0	2	4	6	2	0	0	0	10
18	*Ammonia dentata*	52	68	46	36	22	42	38	32	20	24	26	58	62
19	*Asterorotalia trispinosa*	46	72	48	32	58	56	38	42	54	62	58	64	70
20	*Cibicides lobatulus*	12	14	30	26	26	13	18	16	9	14	31	6	8
21	*Globigerina bulloides*	38	46	42	24	18	18	14	20	12	10	32	36	42
22	*Elphidium advena*	42	38	42	32	64	22	24	32	28	22	20	24	22
23	*Elphidium macellum*	0	14	0	12	22	14	0	2	12	12	0	16	24
24	*Elphidium norvangi*	12	14	12	10	12	10	12	12	14	14	16	10	18
25	*Lagena qudrata*	14	18	16	10	12	10	12	18	10	12	14	12	16
26	*Planorbulinella larvata*	28	32	28	40	42	26	26	20	22	20	12	10	14
27	*Nonionella labradorica*	18	32	16	22	18	14	12	10	20	26	0	24	28
28	*Quinqueloculina agglutinans*	26	22	28	20	26	24	20	22	24	26	20	24	28
29	*Rosalina bradyi*	24	28	22	23	16	14	10	8	8	4	0	2	18
30	*Spiroloculina communis*	10	12	20	10	12	14	12	14	14	12	20	14	24
31	*Spirillina limbata.*	8	12	0	2	0	2	4	0	2	0	6	0	0
32	*Textularia agglutinans*	4	8	11	0	6	4	12	6	2	1	12	2	0
33	*Triloculina striatitrigonula*	16	32	22	28	20	10	18	10	8	22	18	18	26
34	*Triloculina trigonula*	18	23	12	22	26	22	32	12	36	26	42	18	42
35	*Trochammina globigeriniformis*	12	10	4	0	14	3	5	3	2	2	0	8	12
	Ostrocodes													
36	*Keijella oertlii*	10	14	12	4	16	12	14	4	4	8	2	10	22
37	*Tanella estuarii*	2	6	2	2	12	0	12	8	12	2	3	4	2
38	*Tanella kingmaii*	4	8	0	4	8	2	2	5	2	2	0	2	3
39	*Cyprideis sp*	8	10	12	10	16	10	12	6	14	6	4	12	16

S.No	Taxon	Meio Benthos (Nos/10 cm²)												
		MS1	MS 2	MS3	MS4	MS5	MS6	MS7	MS8	MS9	MS10	MS11	MS12	MS13
	Tanaidacea													
40	*Apseudes sefosus*	0	4	2	2	2	2	0	2	2	2	0	2	4
41	**Polychaete Larvae**	4	3	2	0	4	2	0	0	0	4	0	0	4
42	**Bivalve Veliger**	2	2	4	2	2	0	6	2	4	0	2	0	4
	Total	**710**	**863**	**737**	**665**	**826**	**608**	**637**	**580**	**563**	**530**	**510**	**608**	**885**

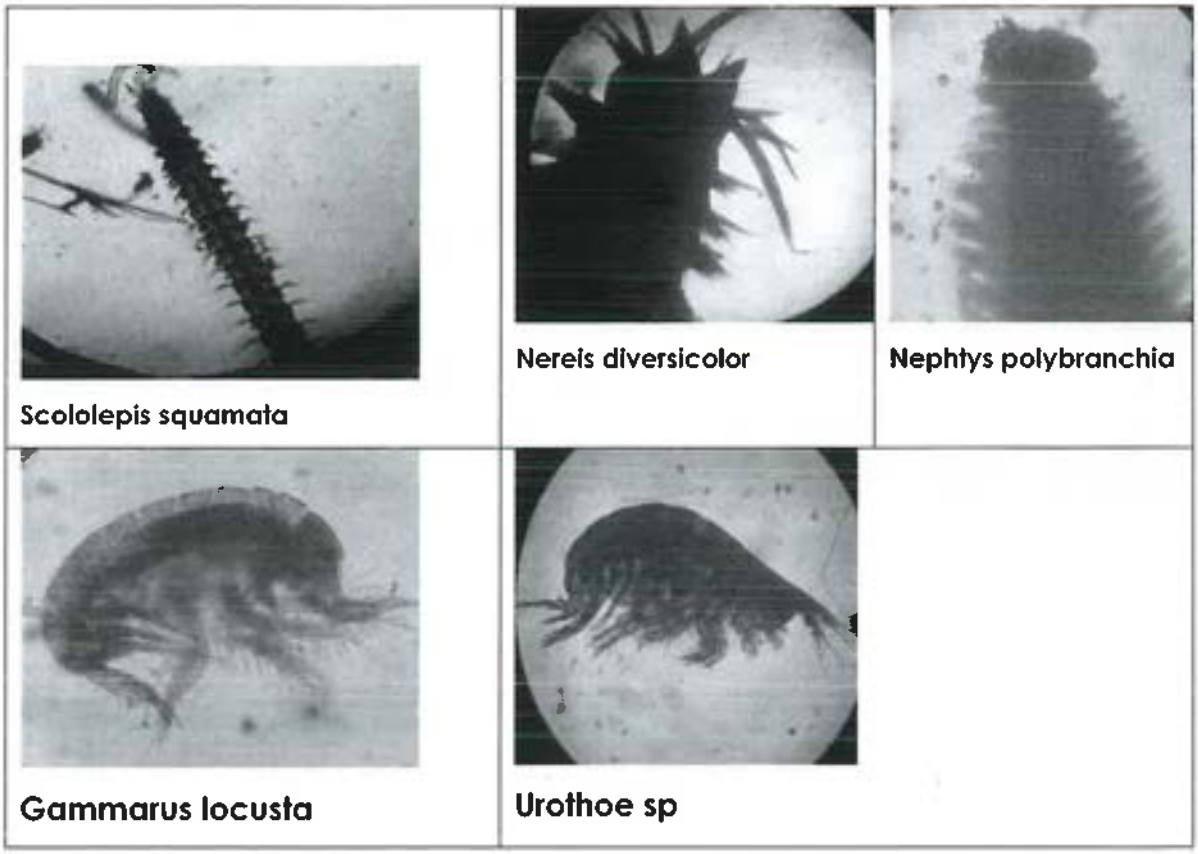
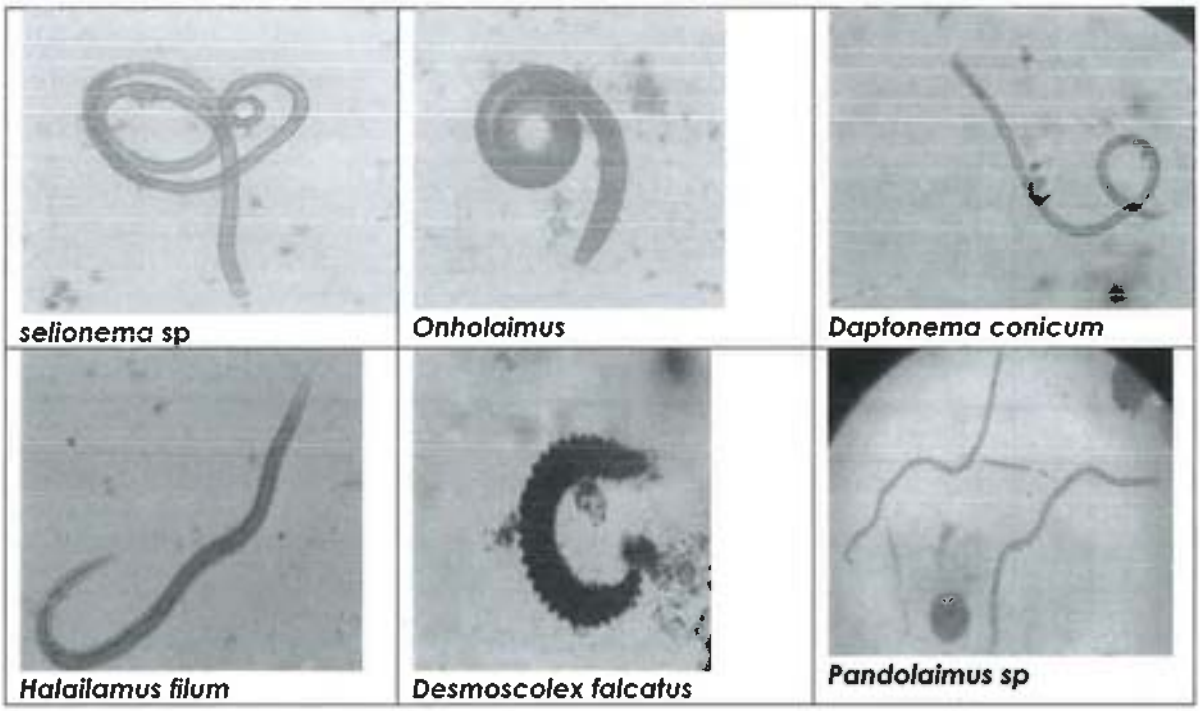


Figure 3-23:Macro Benthos recorded during Pre Dredging



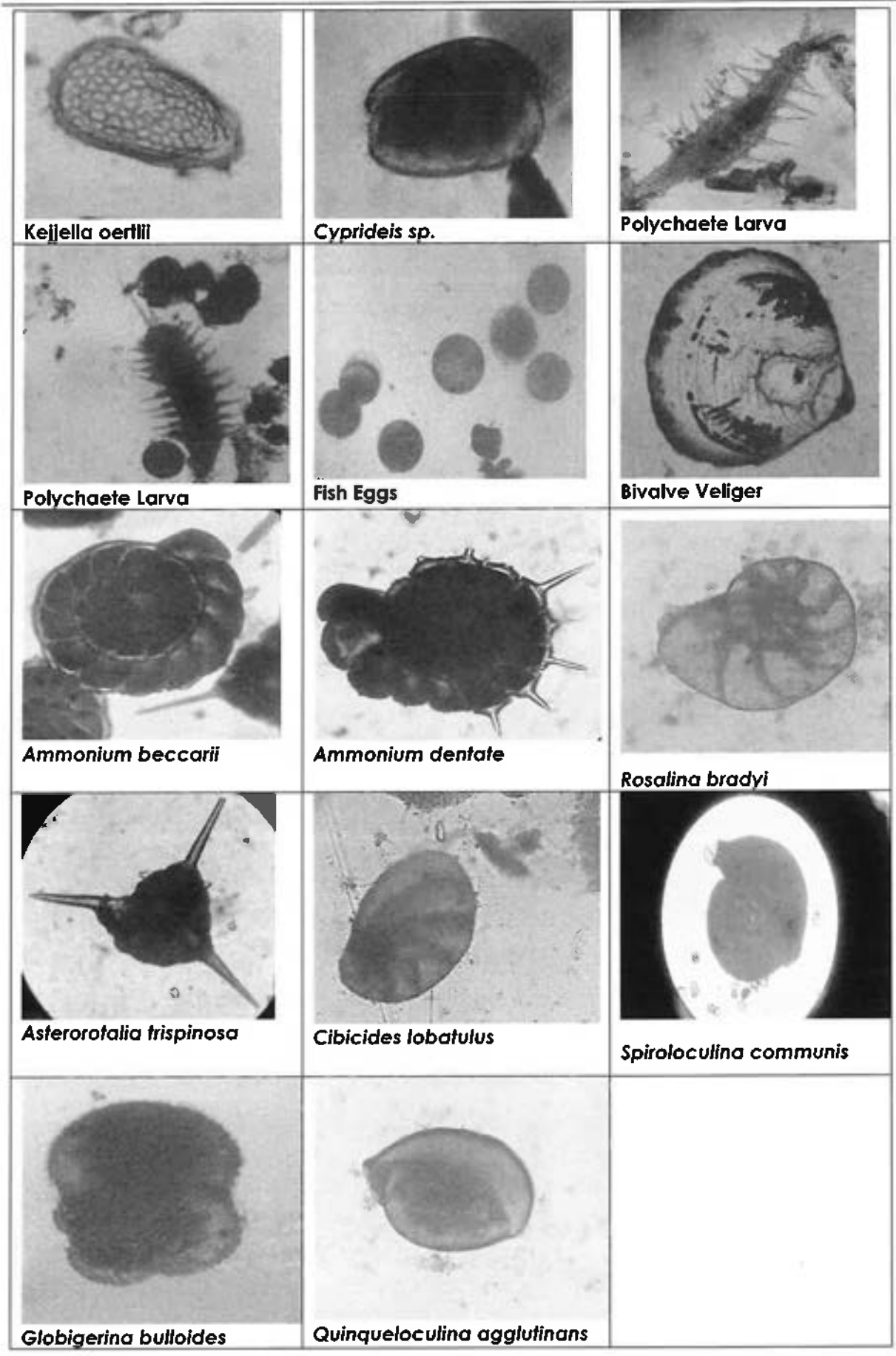


Figure 3-24: Meio Benthos recorded during Pre Dredging

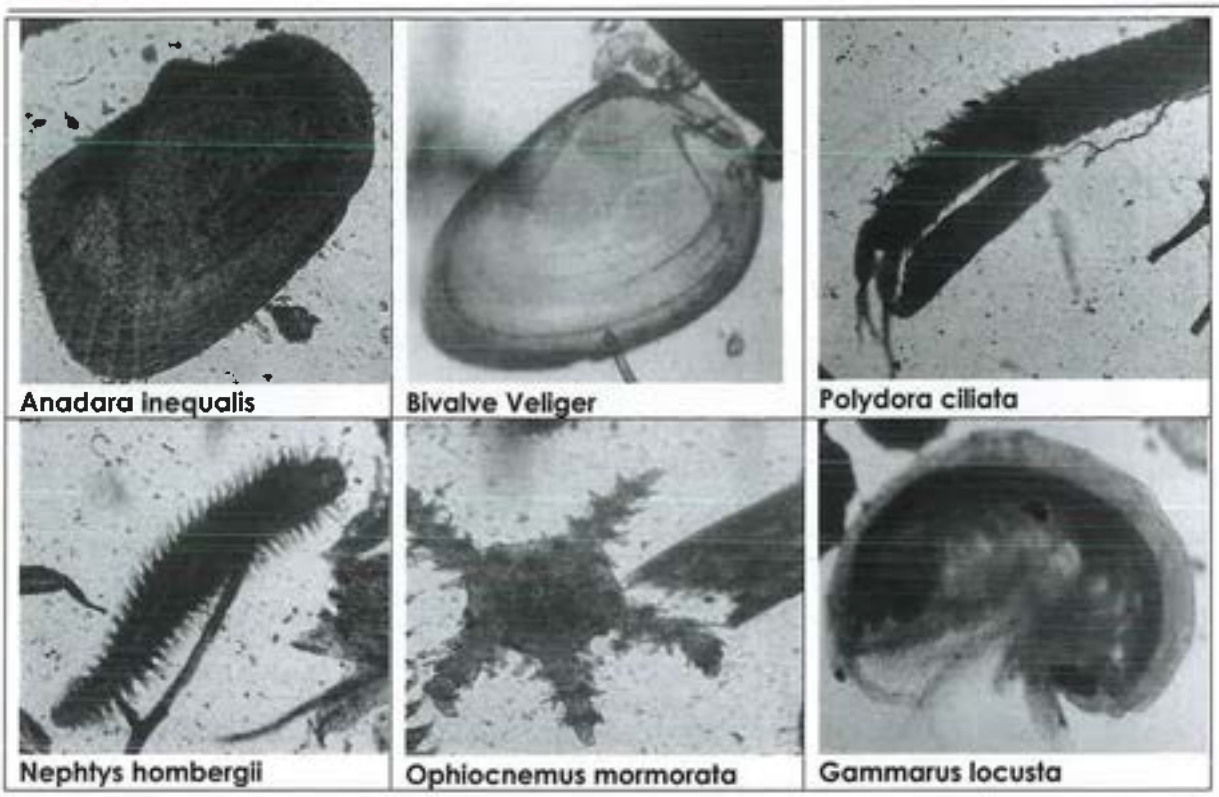


Figure 3-25:Macro Benthos recorded during Dredging

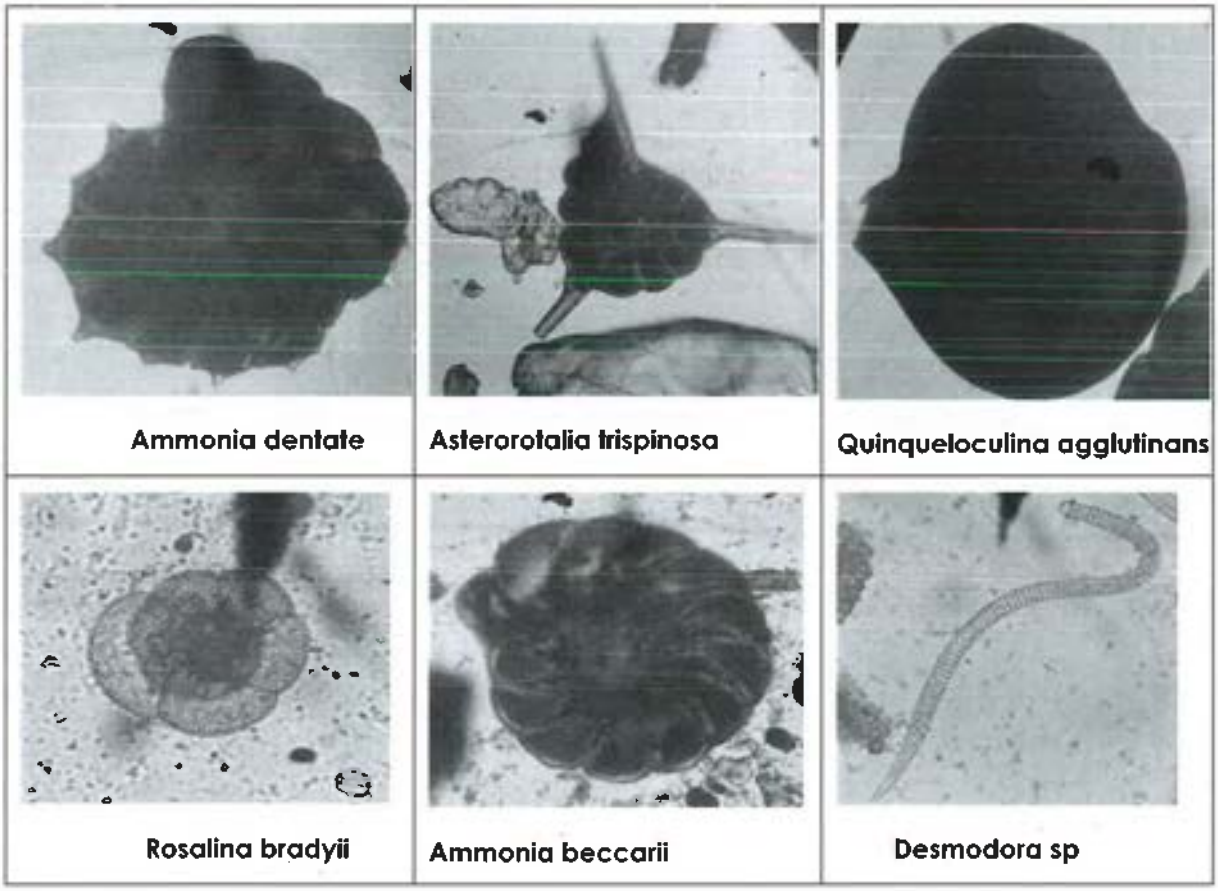


Figure 3-26: Meio Benthos recorded during Dredging

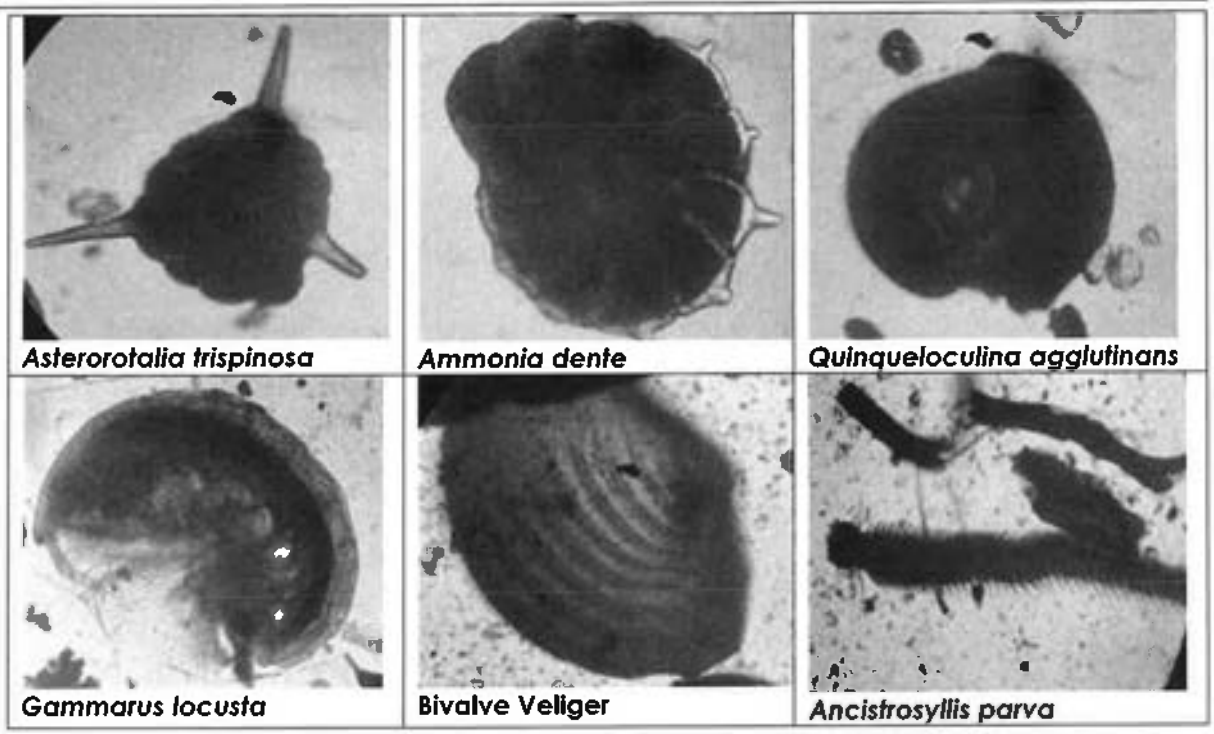


Figure 3-27:Benthos recorded during Post Dredging

Inference:

Macrobenthic Community

- Polychaetes consistently dominated across all dredging phases i.e., 55.17% (pre dredging), 57.22% (during dredging), 58.54% (post dredging), reflecting adaptability to both disturbance and recovery.
- Amphipods were second most dominant during predredging (17.24%) and post-dredging (notably Gammarus locusta) but dipped slightly during dredging (13.06%) due to habitat stress.
- Gastropods and bivalves remained stable in presence through all phases, with slight increases in representation post-dredging in stations with sandy, organic-rich substrates.
- Isopods and miscellaneous taxa (barnacles, echinoderms) were consistently the least abundant group across all phases but contributed to habitat complexity.
- Macrobenthic density peaked at Station 5 in pre-dredging (2575 Nos/m²), remained high during dredging at MS5 (1275), and stayed elevated post-dredging at the same station (1426), suggesting resilience in intertidal zones.

Meiobenthic Community

- Foraminiferans increased in dominance: 47.83% (pre), peaked at 64.08% (during), and stabilized at 52% (post), showing strong ecological tolerance and recovery potential.
- Nematodes maintained dominance across all phases: 30.43% (pre), 31% (during and post), indicating consistent bioturbation roles and resilience.
- Ostracods held steady: 10.87% (pre), 10% (during), and showed slight enrichment post-dredging under stable microhabitats.
- Minor taxa (tanaids, fish eggs, polychaete & bivalve larvae) contributed equally (≈2%) across phases, reflecting ongoing spawning and larval settlement.

- Meiofaunal density highest at Station 11 (811 Nos/10 cm²) pre-dredging, shifted to MS2 (660) during, and peaked at MS13 (885) post-dredging, indicating intertidal zones as biodiversity hotspots throughout.

Ecological Trends & Habitat Response

- Intertidal stations (MS2, MS5, MS13) showed consistently high benthic abundance during all phases due to tidal flushing, organic matter, and sediment stability.
- Subtidal creek stations (MS10, MS6, MS9) had lowest densities especially during dredging, highlighting disturbance effects and slow recovery.
- Species distribution patterns showed dominance of tolerant taxa during dredging (Capitella capitata, Polydora ciliata), and reappearance of balanced communities post-dredging (Nephtys hombergii, Euclymene annandalei).
- Overall community structure shifted from diverse (pre), to opportunistic (during), then toward functional recovery and recolo nization (post).

Annexures

ANNAMALAI UNIVERSITY

CAS in Marine Biology,
Faculty of Marine Sciences,
Parangipettai – 608 502, Tamil Nadu, India
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E.mail: fish_lar@yahoo.com
Mobile: 09486456460

Dr. A. SUNDARAMANICKAM,
Associate Professor & PI

30.06.2025

To,
Falcon Resilient Infra Consultants (FRICS)
501 A, Sudheer Tapani Towers, opposite Telugu Academy,
Old MLA quarters road, Himayat Nagar,
500029, Hyderabad,
Telangana

Kind Attention: Mrs. Susruta Mamidanna, Technical Director.

Subject: Submission of Marine Environmental monitoring reports of Pre dredging, dredging and Post dredging phases for Adani Krishnapatnam Port, Nellore District, Andhra Pradesh-Reg.

Ref: Work order 001-C24021-RCP-L-AKPL- Annamalai WO dated October 18, 2024

Dear Madam,

Hereby submitting the Marine Environmental monitoring reports pertaining to Pre-dredging, Dredging and Post-dredging phases for Adani Krishnapatnam Port, Nellore District, Andhra Pradesh.

The following are the details of Marine Environmental monitoring studies conducted at Adani Krishnapatnam Port conducted by CAS in Marine Biology, Annamalai University.

SI. No	Scenario	Date of Monitoring
1	Pre Dredging	December 10, 2024
2	Dredging	January 27, 2025
3	Post Dredging	April 07, 2025

Thanking you.

Yours Faithfully,

(A. SUNDARAMANICKAM)

Pre dredging

Marine Environmental Monitoring for AKPL-Marine Environmental Studies Pre-dredging, Nellore District, Andhra Pradesh

Submitted

by

Dr. A. Sundaramanickam,
Associate Professor

ANNAMALAI UNIVERSITY
CENTRE OF ADVANCED STUDY IN MARINE BIOLOGY
FACULTY OF MARINE SCIENCES
PARANGIPETTAI – 608 502
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INDIA

1. Introduction

The delicate balance of marine ecosystems, spanning vast coastal regions and expansive oceanic environments, stands as a testament to the intricate web of life that thrives beneath the waves. As human activities expand and industries increasingly interface with these fragile environments, the necessity of evaluating their impact becomes paramount. Environmental Impact Assessment (EIA) in the marine realm emerges as a crucial framework aimed at comprehensively understanding and predicting the repercussions of human interventions on these vital ecosystems.

The seas and oceans, constituting a significant portion of our planet, host diverse habitats, ranging from vibrant coral reefs to the mysterious depths of the open ocean. These ecosystems are not only home to an array of marine life but also play an integral role in global climate regulation, oxygen production, and sustaining livelihoods for countless communities worldwide. However, the burgeoning demands of human development, including maritime trade, coastal infrastructure, offshore energy exploration, and fisheries, pose significant challenges to the ecological integrity of these marine systems.

Recognizing the complexity and interconnectedness of marine environments, EIA serves as a crucial tool in navigating the intricate balance between human progress and environmental preservation. Within the realm of EIA for marine environments, a myriad of factors necessitate scrutiny. The exploration of offshore energy resources, establishment of coastal infrastructure, expansion of shipping lanes, and the cumulative effects of various anthropogenic stressors demand thorough examination to gauge their potential environmental ramifications. Moreover, as climate change exerts its influence on sea levels, ocean temperatures, and marine biodiversity, the need to integrate these dynamic shifts into EIA assessments becomes increasingly imperative.

The marine environmental study underscores the critical importance of understanding the environmental implications of human activities on these intricate and irreplaceable

ecosystems. By delving into the core principles, methodologies, challenges, and advancements within this domain, a deeper appreciation of the significance of EIA in safeguarding the oceans and coastal areas can be attained. Ultimately, this process stands as a cornerstone for fostering sustainable coexistence between human endeavors and the preservation of our planet's marine treasures.

Study area

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Krishnapatnam Port, Thamminapatnam, Andhra Pradesh
524344, India
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Google

GPS Map Camera
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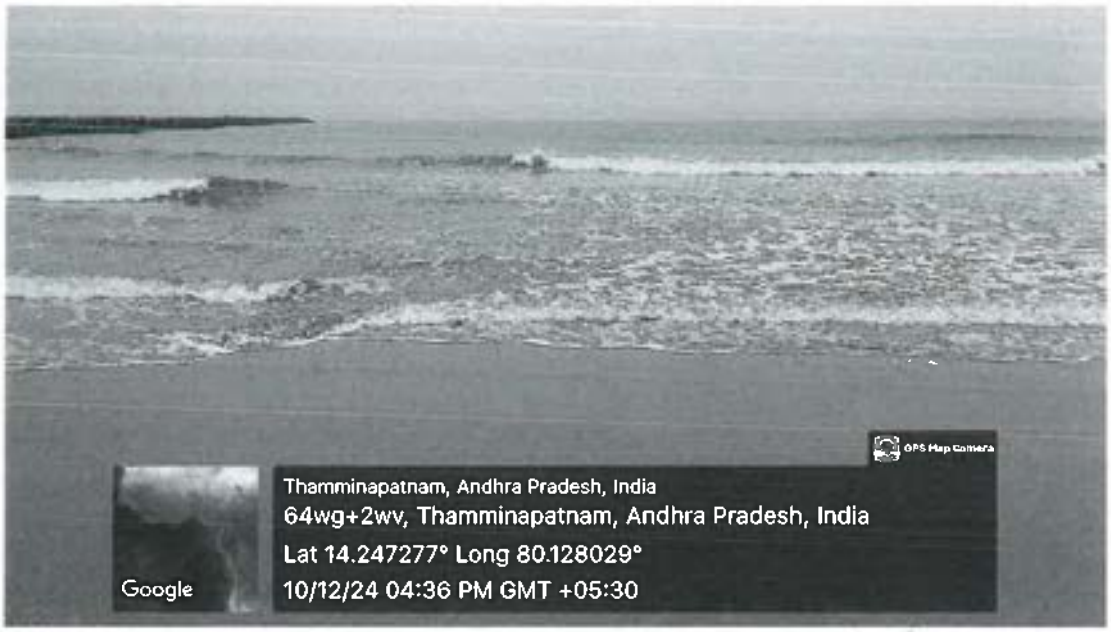
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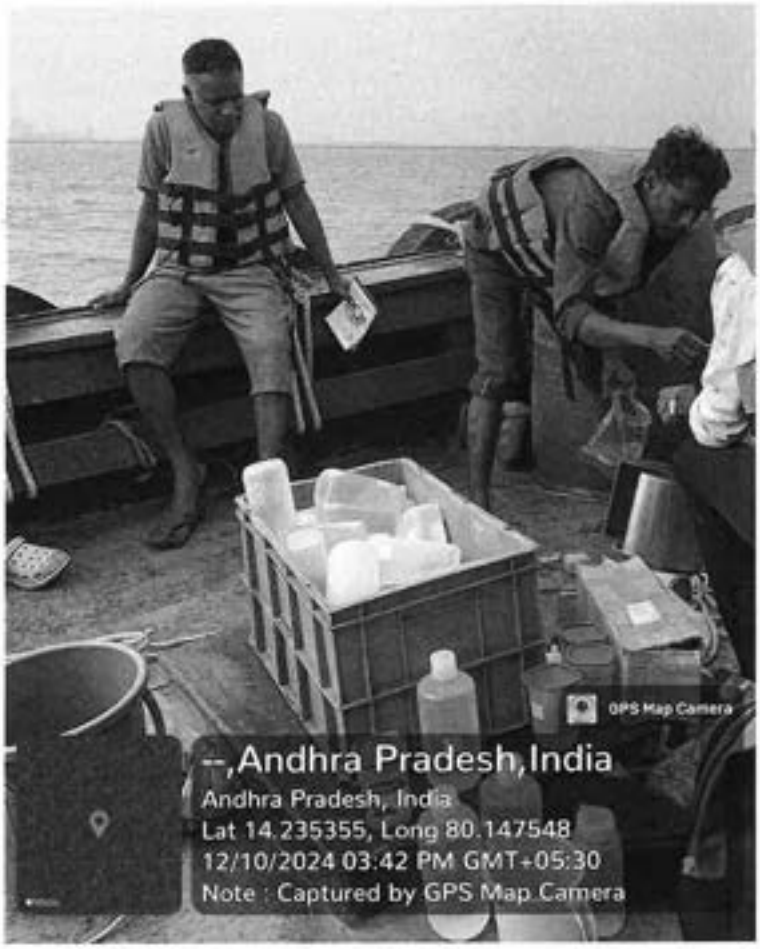
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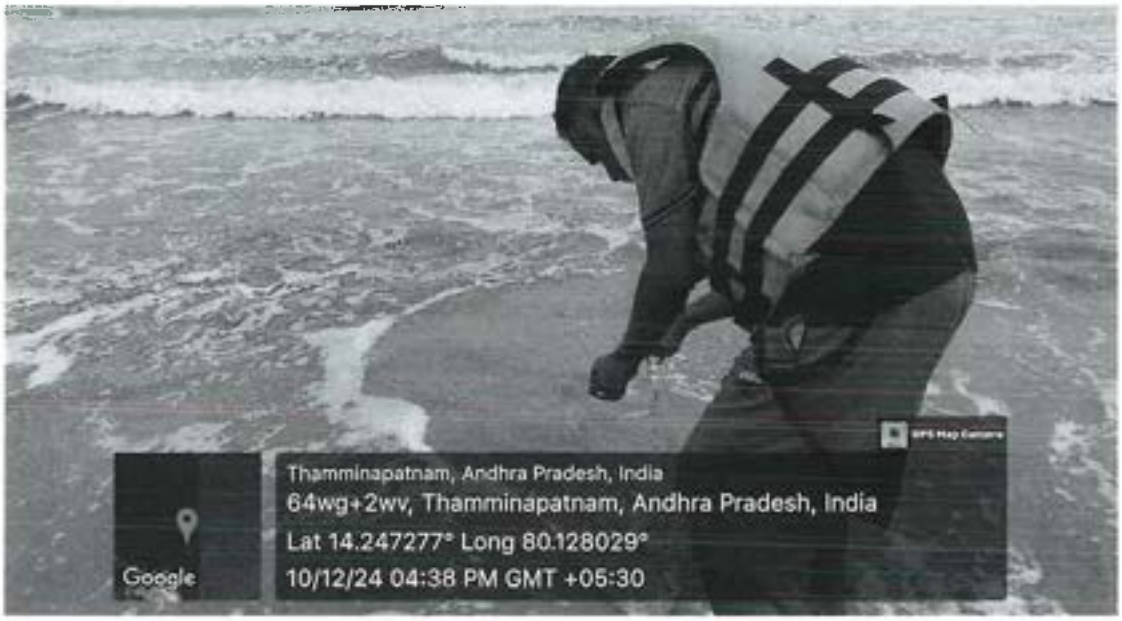
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GPS Map Camera
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10/12/24 11:47 AM GMT +05:30
Google

Photographs captured during the marine environmental sampling process, documenting the various sampling stations, techniques, and conditions at the time of data collection.

1. Marine Water Quality.

Methodologies Adopted For Various Analyses

Water samples were collected at the surface and sub-surface level using Universal water sampler and transferred to the pre-cleaned polypropylene and glass containers. Sediment samples were collected using van Veen Grab, transferred to clean polythene bags and transported to the shore. The samples were air-dried and the plant root and other debris were removed and stored for further analysis.

Temperature, Salinity and pH

The physical parameters such as temperature, salinity and pH were measured *in-situ* in the field. The sub-surface temperature was measured with a mercury thermometer (±0.02°C accuracy) and the pH was measured by a calibrated pH pen (pH ep-3 model). Salinity was estimated using a Hand Refractometer (Atago, Japan). Water samples collected for dissolved oxygen estimation were transferred carefully to DO bottles. The DO was immediately fixed and brought to the shore for further analysis. TSS was measured using Millipore vacuum filtration unit and the values are expressed in ppm. Turbidity was measured using turbidity meter and expressed in NTU.

Preservation and Laboratory Analysis

After collection, the samples were immediately cooled to 4°C and then brought to the Lab, in an insulated thermocool box. On reaching the shore, water samples were filtered through Whattman GF/C filter paper and analysed for organic matter and other nutrients. Unfiltered samples were used for the estimation of total nitrogen and total phosphorus. All the analyses were carried out by adopting Standard procedures for samples of aquatic origin.

Dissolved Oxygen

The modified Winkler's method as described by Strickland and Parsons (1972) was adopted for the estimation of dissolved oxygen. The values are expressed in mg/l.

Sulphate

The sulphates content of samples were analysed by following the method described by APHA (1995).

Nitrate and Nitrite

The nitrate and nitrite content of samples were analysed by following the method described by Grasshoff et al. (1999). The nitrite was estimated from highly coloured azo dye formed by the addition of N (1-Napthyl) ethylene diaminedihydro-chloride and sulphanilamide into the solution which was then measured at 543 nm in a spectrophotometer. Same procedure was followed for the estimation of nitrate. For this, nitrate was reduced to nitrite by passing the sample through copper coated cadmium column. The calculated values were expressed as µmol of Nitrogen/l

Ammonia and Total nitrogen

Ammonia present in water reacts with sodium hypochlorite and phenol in alkaline condition to produce indophenol blue. Sodium nitroprusside is used as a catalyst and colour intensifier. The methodology described in Grasshoff *et al.* (1999) was followed for the determination of Ammonia and Total nitrogen. Organically bound nitrogen is oxidized to nitrate during alkaline persulphate digestion. The nitrate content of the sample is determined after reduction to nitrite. The calculated values are expressed in μmol of Nitrogen/l for both the parameters.

Inorganic Phosphate

The single solution mixed reagent procedure developed by Grasshoff *et al.* (1999) was followed for the estimation of dissolved inorganic phosphate levels in water samples. This involves the conversion of phosphate into phosphomolybdic acid, which was then reduced to molybdenum blue colour complexes and then the intensity of colour was measured at 882 nm in a spectrophotometer. The calculated values are expressed in µmol of Phosphate/L.

Total Phosphorus

The Total Phosphorus in water samples was estimated by adopting the method described by Grasshoff *et al.* (1999). This procedure involves the conversion of organically bound phosphate into inorganic phosphate by wet oxidation of samples with potassium persulphate in an autoclave for 30 min at 15 lbs pressure. The converted inorganic phosphate

was then estimated by using the method described by Murphy and Riley (1962). The subtraction of original dissolved inorganic phosphate from total phosphate yielded the organic phosphate in the water sample. The calculated value is expressed in µmol of Phosphorus/L.

Reactive Silicate

The reactive silicate content of water was estimated by following the method of Grasshoff *et al.* (1999). In this method, the intensity of blue colour formed by silico-molybdate complex was measured at 810 nm in a spectrophotometer and the calculated values are expressed in µmol of Silica/l

Results

Environmental Impact Assessment (EIA) of Water Quality

This study assesses the water quality across multiple monitoring stations (MS) to evaluate the environmental conditions of the water bodies. Various parameters such as temperature, salinity, dissolved oxygen (DO), pH, turbidity, total dissolved solids (TDS), and total suspended solids (TSS) were measured at different depths (surface and bottom).

Table: Water Quality Assessment – Temperature, Salinity, Dissolved Oxygen (DO), pH, Turbidity, Total Dissolved Solids (TDS), and Total Suspended Solids (TSS) at Different Monitoring Stations

	Temp ° C		Salinity PPT/PSU		DO mg/l		pH		Turbidity	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS 1 (creek)	27.8	27.5	12	12	4.5	4.52	7.7	7.8	38	42
MS(ITL) 2	28.6	-	29	-	4.6	-	7.9	-	52	-
MS 3 (creek)	27.9	27.6	20	20	4.35	4.59	7.9	8	40	52
MS 4 (creek)	29	28.8	12.5	12.8	4.5	4.4	7.9	8	51	62
MS (ITL)5	28.2	-	30	-	4.8	-	8	-	58	-
MS 6	28.4	28.1	25	25.3	4.8	4.98	8.1	8.1	35	41
MS 7	27.7	26.5	31	32	5.12	4.85	8.15	8.19	35	40
MS 8	28.3	28.1	28	28.2	4.79	4.98	8.21	8.25	38	42
MS 9	28.3	28	25	25.2	4.87	4.65	8.22	8.26	41	48
MS 10	28.8	28.5	25	25.1	4.5	4.4	8.22	8.23	12	14
MS 11	28.1	27.9	30	30.5	4.92	4.58	8.22	8.24	10	12
MS 12	28.3	28	30	31	5.02	4.86	8.22	8.24	8	11
MS (ITL)13	27.8	-	32	-	4.8	-	7.9	-	52	-

Key Findings

Temperature: The surface temperature ranged from 27.7°C to 29°C, while the bottom temperature showed minimal variation, staying within a close range. The consistency suggests stable thermal conditions in the water bodies.

Salinity: Salinity levels varied significantly, with values ranging from 12 PPT to 32 PPT. Higher salinity levels were observed in ITL stations compared to creek stations, indicating a possible influence of tidal intrusion or seawater mixing.

Dissolved Oxygen (DO): DO levels ranged from 4.35 mg/L to 5.12 mg/L, with slightly lower values at the bottom compared to the surface. The lower DO at certain stations (MS 3 and MS 4) suggests possible organic matter decomposition or limited oxygen exchange.

pH Levels: The pH levels remained relatively stable across all stations, ranging from 7.7 to 8.26, indicating a neutral to slightly alkaline nature, which is typical for coastal and estuarine environments.

Turbidity: Turbidity levels varied from 8 NTU to 62 NTU, with higher values at creek station. Increased turbidity may indicate suspended sediments, runoff, or human activities affecting water clarity.

Table: Water Quality Assessment – Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD) at Different Monitoring Stations

Station Name	TDS mg/L		TSS mg/L		CODmg/L		BODmg/L	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS 1(creek)	11800	12040	29	29	20.5	22.3	3.2	3.4
MS(ITL) 2	28700	-	42	-	13.6	-	2.8	-
MS 3(creek)	12600	12810	20	22	15.4	17.2	3.2	3
MS 4 creek)	12600	12810	26	29	22.80	24.60	2.8	3.1
MS (ITL)5	29050	-	41	-	10.5	-	2.7	-
MS 6	25020	25260	36	39	8.2	10	1.8	2.4
MS 7	23200	23100	42	44	11.8	11.6	2.48	2.94
MS 8	28040	28180	34	32	17.4	18.8	2.5	2.9
MS 9	25120	25180	26	28	7.8	9.2	2.5	2.6
MS 10	25080	25120	25	27	7.2	9	2.3	2.4
MS 11	30020	30480	23	25	6.2	8	2.12	2.24
MS 12	30040	30050	22	28	6.5	8.3	1.95	1.98
MS (ITL)13	30980	-	48	-	14.9	-	2.9	-

key water quality parameters, including Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD) across different monitoring stations. These parameters help evaluate water pollution levels, organic matter decomposition, and overall water quality health in both surface and bottom water samples.

Key Findings

Total Dissolved Solids (TDS) (mg/L): TDS levels varied significantly, ranging from 11800 mg/L (MS 1) to 30980 mg/L (MS ITL 13). Higher TDS concentrations in ITL stations

suggest strong marine influence and higher salinity levels, whereas creek stations exhibited moderate TDS values.

Total Suspended Solids (TSS) (mg/L): TSS concentrations ranged from 20 mg/L to 48 mg/L, with higher values recorded at MS ITL 13.

Chemical Oxygen Demand (COD) (mg/L): COD values varied between 6.2 mg/L and 24.6 mg/L, indicating meager organic pollution.

Biological Oxygen Demand (BOD) (mg/L): BOD values ranged from 1.8 mg/L to 3.2 mg/L, with higher levels in creek stations (MS 1, MS 3).

Table: Water Quality Assessment – Nitrite, Nitrate, Ammonical Nitrogen, Inorganic Phosphate, Chlorides, and Sodium Levels at Different Monitoring Stations

	Nitrite µmol/l		Nitrate µmol/l		Ammonical N µmol/l		Inorganic Posphate µmol/l		Chlorides mg/l		Sodium mg/l	
Station Name	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS 1 (creek)	2.16	2.65	4.33	5.76	0.35	0.37	1.46	1.46	78400	80400	666	680
MS(ITL 2	1.12	-	2.191	-	0.67	-	1.148	-	14500	-	1610	-
MS 3 (creek)	1.19	2.11	2.69	3.74	0.46	0.54	1.85	2.4	12670	12570	910	830
MS 4 (creek)	2.12	2.13	2.04	4.20	0.42	0.46	1.51	1.45	76400	84600	694	710
MS (ITL)5	1.522	-	2.524	-	0.71	-	1.148	-	14500	-	1665	-
MS 6	1.36	1.37	2.049	2.76	0.46	0.48	1.554	1.897	12745	12982	3388	3400
MS 7	1.27	1.31	2.14	2.13	0.49	0.51	1.35	1.41	12480	12640	3665	3670
MS 8	1.843	1.93	2.346	2.07	0.45	0.49	1.42	1.461	12860	12480	3550	3565
MS 9	1.56	1.61	2.479	3.04	0.41	0.47	1.86	1.78	13,750	13,860	2400	3400
MS 10	1.468	1.618	2.153	2.48	0.48	0.51	1.417	1.26	13,750	13,805	1390	1390
MS 11	1.656	1.725	1.98	2.29	0.44	0.48	0.99	1.647	12050	12840	1670	1690
MS 12	1.54	1.79	1.82	2.184	0.48	0.49	1.571	1.452	12140	12450	1665	1720
MS (ITL)13	1.168	-	3.665	-	0.61	-	1.547	-	14600	-	1675	-

The nutrient and ionic composition of water samples from multiple monitoring stations (MS). Key parameters analyzed include nitrite, nitrate, ammonical nitrogen, inorganic phosphate, chlorides, and sodium levels at both surface and bottom depths. These parameters provide insight into nutrient loading, potential pollution sources, and water chemistry variations.

Table: Water Quality Assessment – Silica, Reactive Silicate, Total Phosphorus (TP), Total Nitrogen (TN), Oil & Grease, and Sulphates at Different Monitoring Stations

Station Name	Silica µmol/l		Reactive Silicate µmol/l		TP µmol/l		TN µmol/l		Oil & Grease µg/l		Sulphates mg/l	
	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS 1 (creek)	9.93	10.19	5.38	6.64	3.20	3.45	12.35	13.89	0.40	0.48	620	620
MS(ITL) 2	9.383	-	6.001	-	2.513	-	6.89	-	0.393	-	1500	-
MS 3 (creek)	6.01	6.54	6.87	8.13	2.15	2.39	7.33	8.87	0.23	0.30	935	1040
MS 4 (creek)	6.87	7.64	5.29	6.55	2.33	2.54	5.45	5.46	0.28	0.35	645	660
MS (ITL)5	6.674	-	5.419	-	3.244	-	6.108	-	0.234	-	1550	-
MS 6	5.856	6.199	4.364	5.621	2.102	2.312	3.642	4.182	0.233	0.304	1290	1305
MS 7	7.94	7.64	2.272	2.262	1.873	2.32	4.538	5.078	0.272	0.262	2388	2460
MS 8	5.129	5.382	3.274	4.531	2.559	2.769	5.189	5.729	0.218	0.289	1450	1460
MS 9	5.486	5.743	3.328	4.585	2.736	2.946	4.642	5.182	0.16	0.231	1290	1303
MS 10	5.746	6.001	4.965	5.222	2.239	2.449	7.573	8.113	0.136	0.208	1295	1297
MS 11	3.437	3.692	2.020	3.277	2.056	2.266	3.827	4.367	0.108	0.179	1550	1577
MS 12	3.020	3.274	2.783	4.04	2.184	2.394	4.723	5.263	0.127	0.1989	1555	1603
MS (ITL)13	6.91	-	4.729	-	2.878	-	4.65	-	0.367	-	1650	-

The water quality parameters, including silica, reactive silicate, total phosphorus (TP), total nitrogen (TN), oil & grease, and sulphates across different monitoring stations.

Key Findings

Silica and Reactive Silicate (µmol/L): Silica concentrations ranged from 3.020 µmol/L (MS 12) to 9.93 µmol/L (MS 1) in surface waters, with slightly higher values at the bottom. Reactive silicate levels followed a similar trend, ranging from 2.020 µmol/L to 6.87 µmol/L in surface waters. Higher silica levels in creek station (MS 1) suggest increased sediment interactions or natural silicate weathering.

Total Phosphorus (TP) (µmol/L): TP values varied between 1.873 µmol/L (MS 7) and 3.244 µmol/L (MS ITL 5).

Total Nitrogen (TN) (µmol/L): TN values showed higher concentrations in creek stations, with maximum levels of 13.89 µmol/L (MS 1).

Oil & Grease (µg/L): Concentrations ranged from 0.108 µg/L to 0.40 µg/L, with higher values in creek stations (MS 1, MS 2, and MS ITL 13).

Sulphates (mg/L): Sulphate concentrations ranged from 620 mg/L (MS 1) to 1650 mg/L (MS ITL 13), with higher values recorded in ITL stations. Higher sulphate levels suggest marine influences.

1.2. Heavy metals

Table: Lead (Pb), Cadmium (Cd), and Copper (Cu) Concentrations in Surface and Bottom Waters at Different Monitoring Stations

	Lead µg/l		Cadmium µg/l		Copper µg/l	
Stations	surface	Bottom	surface	Bottom	surface	Bottom
MS 1 (creek)	2.45	2.48	1.29	1.31	4.58	4.63
MS(ITL) 2	1.86	-	0.45	-	3.18	-
MS 3 (creek)	2.64	2.67	0.96	0.50	4.98	5.15
MS 4 (creek)	1.48	1.59	0.78	1.06	3.84	4.39
MS (ITL)5	1.42	-	0.65	-	4.08	-
MS 6	1.39	1.51	0.51	0.52	2.86	4.50
MS 7	1.42	1.47	0.54	0.52	2.77	3.51
MS 8	1.41	1.36	0.46	0.46	2.51	2.72
MS 9	1.53	1.55	0.33	0.41	2.36	2.77
MS 10	0.82	0.83	0.28	0.36	2.17	2.60
MS 11	0.56	0.57	0.26	0.22	1.97	2.39
MS 12	0.49	0.50	0.21	0.29	1.68	2.17
MS (ITL)13	2.07	-	1.04	-	4.02	-

Key findings

Lead (Pb): Concentrations ranged from 0.49 µg/L (MS 12) to 2.67 µg/L (MS 3), with slightly higher values at creek stations (MS 1, MS 3, MS ITL 13). Minimal differences between surface and bottom layers suggest a stable distribution.

Cadmium (Cd): Levels varied between 0.21 µg/L (MS 12) and 1.29 µg/L (MS 1), with some stations showing higher concentrations at the bottom, indicating possible accumulation in sediments.

Copper (Cu): Measured between 1.68 µg/L (MS 12) and 4.98 µg/L (MS 3), with higher concentrations in bottom waters, suggesting settling and sediment interactions.

The study indicates no critical heavy metal contamination, as most values remain below or within international safety thresholds. Continuous assessment of metal sources is necessary to ensure water quality stability.

Table: Zinc (Zn), Iron (Fe), and Mercury (Hg) Concentrations in Surface and Bottom Waters at Different Monitoring Stations

	Zinc		Iron		Mercury	
Stations	surface	Bottom	surface	Bottom	surface	Bottom
MS 1 (creek)	18.56	18.76	21.67	21.95	BDL	BDL
MS(ITL) 2	16.94	-	25.41	-	BDL	BDL
MS 3 (creek)	15.46	15.67	21.42	22.02	BDL	BDL
MS 4 (creek)	10.87	11.04	24.14	24.81	BDL	BDL
MS (ITL)5	13.31	-	26.71	-	BDL	BDL
MS 6	10.44	10.17	20.58	22.57	BDL	BDL
MS 7	5.72	7.05	16.82	20.58	BDL	BDL
MS 8	5.97	5.61	14.75	18.47	BDL	BDL
MS 9	5.41	6.44	15.32	16.76	BDL	BDL
MS 10	5.72	6.05	13.75	16.05	BDL	BDL
MS 11	4.17	4.26	13.74	15.01	BDL	BDL
MS 12	4.71	4.83	11.91	12.75	BDL	BDL
MS (ITL)13	13.12	-	20.13	-	BDL	BDL

Key Findings

Zinc (Zn): Concentrations ranged from 4.17 µg/L (MS 11, surface) to 18.76 µg/L (MS 1, bottom). Higher levels were observed in creek stations (MS 1 and MS 3), indicating possible contributions from natural sources.

Iron (Fe): Levels varied between 12.97 µg/L (MS 12, surface) and 29.02 µg/L (MS 3, bottom). Bottom layers generally showed higher concentrations, suggesting settling and sediment interactions.

Mercury (Hg): Levels were below detection limits (<0.01 µg/L) at all stations, indicating no significant mercury contamination in the studied area.

1.3 Biological analysis

Table: Primary productivity, Chlorophyll concentrations along the observed lactations

Station Name	Primary Productivity (g C/m²/day)	Chlorophyll-a (µg/L)	Chlorophyll-b (µg/L)	Chlorophyll-c (µg/L)
MS 1 (creek)	0.65	1.43	0.59	0.33
MS(ITL) 2	0.73	1.83	0.75	0.42
MS 3 (creek)	0.75	1.65	0.68	0.38
MS 4 (creek)	0.69	1.52	0.62	0.35
MS (ITL)5	0.82	1.74	0.71	0.41
MS 6	0.93	2.05	0.84	0.47
MS 7	0.82	1.85	0.74	0.41
MS 8	0.93	2.05	0.84	0.47
MS 9	0.99	2.18	0.89	0.52
MS 10	0.87	1.91	0.78	0.44
MS 11	0.85	1.87	0.77	0.43
MS 12	0.83	1.83	0.75	0.42
MS (ITL)13	0.75	1.69	0.68	0.38

Key Findings:

The relationship between primary productivity and chlorophyll-a, b, and c concentrations at different sampling stations, including creek and intertidal locations. The estimated values of chlorophyll pigments provide insights into the phytoplankton biomass and productivity of the water body.

Primary productivity: Primary productivity values ranged from 0.65 to 0.99 g C/m²/day, indicating moderate to high productivity across different stations. ITL stations (MS 2, MS 5, MS 13) showed moderate productivity levels (0.73–0.82 g C/m²/day), indicating balanced nutrient conditions. MS 6 and MS 8 (0.93 g C/m²/day) demonstrated high productivity, suggesting favorable environmental conditions, possibly influenced by nutrient influx or stable water column conditions.

Chlorophyll-a Concentration: Chlorophyll-a values ranged from 1.43 µg/L (MS 1) to 2.18 µg/L (MS 9), indicating variations in phytoplankton abundance across different stations. MS 9 showed the highest chlorophyll-a (2.18 µg/L), correlating with its highest primary productivity (0.99 g C/m²/day). Creek stations (MS 1, MS 3, MS 4) exhibited relatively lower chlorophyll-a levels, suggesting lower phytoplankton abundance compared to intertidal stations.

Chlorophyll-b and Chlorophyll-c Trends: Chlorophyll-b ranged from 0.59 µg/L (MS 1) to 0.89 µg/L (MS 9), showing a similar pattern to chlorophyll-a. Chlorophyll-c, which represents certain phytoplankton groups (e.g., diatoms), was highest in MS 9 (0.52 µg/L) and lowest in MS 1 (0.33 µg/L). Higher chlorophyll-c values indicate a diverse phytoplankton community, including diatoms and dinoflagellates. Intertidal (ITL) stations like MS(ITL) 2, MS(ITL) 5, and MS(ITL) 13 generally had higher productivity and chlorophyll concentrations.

Creek stations (MS 1, MS 3, MS 4) showed moderate to low chlorophyll values, indicating either lower nutrient availability or higher flushing rates that prevent phytoplankton accumulation. The variations in chlorophyll concentrations reflect differences in nutrient availability, light penetration, and hydrodynamic conditions at different stations.

Higher productivity and chlorophyll levels in some stations suggest higher phytoplankton biomass, which could support a more productive aquatic ecosystem. Lower values at certain locations could indicate limited nutrient input or higher water movement, reducing phytoplankton retention.

Plankton

Phytoplankton

Phytoplankton Diversity and Abundance Analysis

The phytoplankton composition across different stations, focusing on Bacillariophyceae (diatoms), Dinophyceae (dinoflagellates), and Cyanophyceae (blue-green algae).

Key findings:

Phytoplankton Abundance:

The highest total cell count was recorded at ST-9 (6857 cells/L), followed by ST-10 (6755 cells/L) and MS-8 (6672 cells/L). Creek stations (MS-1, MS-3, MS-4) exhibited lower phytoplankton counts, suggesting potential nutrient limitations or hydrodynamic influences.

Table: Phytoplankton numerical abundance observed along the different locations except intertidal regions

Phytoplankton (Cells/L) Bacillariophyceae	MS-1 Creek	MS-3 Creek	MS-4 Creek	MS - 6	MS - 7	MS - 8	ST-9	ST-10	MS-11	MS-12
Asterionella glacialis	0	0	0	305	0	353	391	324	447	0
Bacillaria sp	230	161	127	168	222	340	239	0	291	298

Phytoplankton (Cells/L)	MS-1 Creek	MS-3 Creek	MS-4 Creek	MS - 6	MS - 7	MS - 8	ST-9	ST-10	MS-11	MS-12
Bacillariophyceae										
Bacteriastrum comosum	0	0	0	0	152	227	133	147	185	0
Bellerochea malleus	248	0	176	193	683	233	119	231	289	226
Chaetoceros coarctatus	0	189	207	163	558	313	289	263	198	293
Coscinodiscus radiatus	0	0	0	83	187	319	219	233	271	140
Cyclotella sp	126	107	73	83	102	139	140	154	192	179
Ditylum brightwelli	0	0	0	0	0	98	129	143	181	0
Eucampia zodiacus	0	0	0	128	180	142	0	227	265	252
Gyrosigma sp.	0	85	206	59	123	110	93	107	145	132
Leptocylindrus danicus	0	214	241	243	113	200	150	164	202	189
Lithodesmium undulatum	362	0	0	358	223	142	253	267	305	292
Melosira	0	0	99	155	128	218	164	178	100	203
Navicula directa	135	373	121	173	206	194	237	251	288	276
Nitzschia closterium	0	0	0	140	348	85	204	191	126	409
Pleurosigma directum	0	0	0	0	218	64	248	262	116	287
Pleurosigma normanii	0	0	0	90	133	77	169	183	93	208
Rhizosolenia alata	147	0	168	278	125	257	161	175	91	201
Skeletonema costatum	0	0	0	0	170	302	203	217	255	243
Stephanopyxis sp	0	0	0	0	0	0	134	148	0	0
Streptotheca thamensis	0	0	0	0	0	0	365	105	0	0
Thalassionema nitzschioides	405	437	329	308	313	445	337	351	389	376
Thalassiosira sp.	0	248	246	518	298	430	323	337	375	362
Thalassiothrix frauenfeldii	245	363	374	618	221	323	251	265	302	290
Triceratium favus	0	0	0	94	58	103	99	113	151	138
Dianophyseae										
Ceratium furca	106	103	97	142	133	78	169	183	221	208
Ceratium longipes	0	0	0	0	38	103	0	94	132	119
Ceratium macroceros	89	97	82	164	58	137	98	112	95	138
Dinophysis caudata	117	0	78	110	51	130	92	106	121	116
Gymnodinium sp	0	0	0	0	70	108	110	124	45	112
Noctiluca sp.	0	0	0	0	171	105	204	218	117	99
Peridinium claudicans	0	83	0	0	134	114	170	184	91	209
Protoperidinium sp.	89	62	43	140	0	100		283	86	101
Cynophyceae										
Oscillatoria sp	443	323	256	553	418	0	0	0	0	0
Trichodesmium erytheaum	0	0	0	0	0	240	146	160	197	185
Phormidium sp	0	0	0	0	0	450	342	356	393	381
TOTAL	**2737**	**2843**	**2920**	**5258**	**5831**	**6672**	**6383**	**6857**	**6755**	**6663**

Dominant Groups:

Diatoms (Bacillariophyceae) were the most abundant, with *Thalassiosira* sp., *Thalassionema nitzschioides*, and *Thalassiothrix frauenfeldii* being the dominant species.

Dinoflagellates (Dinophyceae) such as *Ceratium furca* and *Noctiluca* sp. were found in moderate numbers, with higher concentrations in intertidal and offshore stations.

Cyanophyceae (blue-green algae), represented by *Oscillatoria* sp. and *Phormidium* sp., showed higher concentrations at MS-6, MS-7, and MS-8, indicating possible eutrophic conditions. Higher phytoplankton diversity and abundance were observed at offshore and intertidal stations (MS-6 to ST-10).

Data for intertidal regions (MS-ITL stations) is unavailable as no sampling was carried out in these areas due to the inability to conduct plankton sampling in these regions.

ssPhytoplankton Percentage Composition

Phytoplankton play a vital role in aquatic ecosystems. Bacillariophyceae (diatoms) dominate at 77% in the given dataset, indicating a stable primary production system. Dianophyceae (dinoflagellates) make up 14%, contributing to marine food webs and sometimes causing algal blooms. Cyanophyceae (blue-green algae) account for 9%, playing a role in nitrogen fixation but also posing risks of harmful blooms. The overall composition reflects a diverse phytoplankton community, essential for maintaining ecosystem balance.

Zooplankton

Zooplankton Community Structure

Zooplankton abundance varied across different stations, with the highest recorded at MS-10 (10,563 Nos/m^3) and MS-9 (8,870 Nos/m^3), while the lowest was observed at MS-1 (2,665 Nos/m^3). Calanoid copepods dominated the community, particularly *Paracalanus parvus*, which showed peak abundance at MS-10 (2,025 Nos/m^3) and MS-9 (1,458 Nos/m^3). Other notable copepod species included *Oithona similis* and *Euterpina acutifrons*, which were widespread across the stations.

Among decapods, *Lucifer hanseni* was prominent, particularly at MS-6 (313 Nos/m^3) and MS-10 (278 Nos/m^3). Hydrozoans and oligotrich ciliates, such as *Diphyes sp.* and *Tintinnopsis mortenseni*, were recorded in moderate numbers. Additionally, bivalve veligers

were most abundant at MS-6 (365 Nos/m³), while polychaete larvae were distributed across most stations.

Rotifers (*Brachionus* sp.) and foraminifers (*Globigernia* sp.) were present in some regions, though their numbers were relatively low. The absence of sampling data in intertidal regions (MS-ITL stations) is due to the infeasibility of plankton collection in these areas. Overall, zooplankton diversity and abundance were highest at offshore stations, indicating favourable conditions for their proliferation, while creek stations showed lower densities.

Data for intertidal regions (MS-ITL stations) is unavailable as no sampling was carried out in these areas due to the inability to conduct plankton sampling in these regions.

Table: Zooplankton numerical abundance observed along the different locations except intertidal regions

Zooplankton (Nos/m3)	MS-1 Creek	MS-3 Creek	MS-4 Creek	MS - 6	MS - 7	MS - 8	ST-9	ST-10	MS-11	MS-12
Calanoid Copepods										
Acartia danae	0	0	0	226	208	170	220	225	247	200
A. spinicauda	0	0	0	182	191		203	208	253	183
Acrocalanus gibber	0		0	174	156	178	228	233	207	208
A. gracilis	0	0	0	0	182	145	195	200	245	175
Labidocera pavo	0	0	0	122	252	0	0	267	223	242
Nannocalanus minor	252	191	208	356	443	325	475	558	583	550
Paracalanus parvus	356	252	330	547	1380	1925	1458	2025	1683	1458
Pseudodiaptomus aurivilli	0	0	0	0	156	0	187	192	237	167
Temora stylifera	0	0	0	217	217	0	228	233	208	208
Cyclopoid copepods										0
Corycaeus danae	165	0	200	174	191	153	203	208	253	183
C. catus	130	217	0	252	217	120	170	175	220	150
Oithona brevicornis	0	182	0	226	182	145	195	200	245	175
O. rigida	0	0	0	200	252	173	262	267	282	242
O. similis	226	130	339	252	477	258	478	483	283	217
Oncaea sp.	148	0	226	373	191	153	203	208	253	183
Harpacticoid copepods										0
Euterpina acutifrons	286	156	156	269	191	270	320	325	242	275
Longipedia sp.	0	252	0	252	200	0	0	233	225	192
Microsetella rosea	0	260	217	339	182	145	195	200	245	175
Macrosetella sp.	87	0	200	252	252	212	262	267	312	242
Decapoda										0
Lucifer hanseni	0	0	0	313	295	178	228	233	278	208
Hydrozoa										0

Zooplankton (Nos/m3)	MS-1 Creek	MS-3 Creek	MS-4 Creek	MS - 6	MS - 7	MS - 8	ST-9	ST-10	MS-11	MS-12
Calanoid Copepods										
Diphyes sp.	0	0	0	234	165	0	178	183	228	158
Oligotrichea										0
Favella brevis	0	0	0	0	191	153	203	208	253	183
Tintinnopsis mortenseni	0	165	174	217	182	145	195	200	245	175
Other Crustacean forms										0
Crab Zoea	95	113	130	95	191	138	188	200	238	167
Copepod nauplii	304	234	313	286	191	153	203	208	253	183
Molluscs										0
Bivalve veliger	122	191	234	365	217	178	228	233	278	208
Gastropod veliger	139	252	208	304	165	128	178	183	228	158
Rotifera										0
Brachionus sp.	148	200	0	0	191	153	203	208	253	183
B. rubens	165	113	0	0	217	178	228	233	175	183
Foraminifera										0
Globigernia sp.	0	0	0	252	252	0	170	175	220	150
G. bulloides	0	0	0	165	191	153	203	208	253	183
G. opima	0	0	0	252	191	115	165	175	198	150
Annelids										0
Polychaete larvae	43	78	78	130	217	178	228	233	278	208
Branchiopoda										0
Evadne spinifera	0	113	200	208	191	153	203	208	253	183
Chaetognatha										0
Sagitta sp	0	0	0	0	165	128	178	183	228	158
Appendicularia										0
Oikopleura dioica	0	0	0	0	191	153	203	208	253	183
TOTAL	**2665**	**3099**	**3212**	**7231**	**8924**	**6662**	**8870**	**10192**	**10563**	**8450**

Zooplankton are crucial components of aquatic ecosystems, serving as primary consumers and linking primary producers to higher trophic levels. The given data highlights the percentage composition of various zooplankton groups.

Copepods are the most dominant group, with Calanoid copepods (34%) forming the largest fraction, followed by Cyclopoid copepods (17%) and Harpacticoid copepods (11%). Their abundance indicates a healthy food web, as they are key prey for many fish species. Other notable groups include Molluscs (6%), Foraminifera (5%), and Other Crustacean forms (6%), which contribute to biodiversity and ecosystem functioning. Rotifera (4%),

Oligotrichea (4%), and Decapoda (2%) also play significant roles in nutrient cycling and food web dynamics. Smaller fractions include Hydrozoa (2%), Annelids (2%), Branchiopoda (2%), Chaetognatha (1%), and Appendicularia (2%), all of which contribute to ecosystem stability and energy transfer.

The diverse composition of zooplankton groups suggests a balanced aquatic environment, supporting a wide range of marine and freshwater organisms. Their population dynamics can serve as bioindicators of water quality and environmental changes. Percentage Composition of Macrobenthos.

The zooplankton biomass varied across the stations, with the highest values observed in coastal stations (22.18–25.92), indicating higher productivity. Creek stations exhibited a wider range (14.76–24.34), suggesting variable environmental conditions. ITL stations had moderate biomass levels (12.7–21.34), reflecting their transitional nature between creek and open coastal environments.

Bacterial Abundance in Water Samples

Table: The pathogenic load in water (Fecal coliforms; *E. coli*; Total coliform, *vibrio*)

	Total coliforms	**Fecal coliforms**	***E. coli***	***Vibrio***
Stations	**Water CFU/ml**			
MS 1 (creek)	2600	980	51	7
MS(ITL) 2	4100	830	42	11
MS 3 (creek)	4200	107	73	17
MS 4 (creek)	4240	210	69	8
MS (ITL)5	1950	950	58	10
MS 6	2600	980	51	7
MS 7	2010	800	43	7
MS 8	3100	980	28	6
MS 9	3300	450	24	4
MS 10	1400	550	20	0
MS 11	1600	850	12	0
MS 12	800	450	16	0
MS (ITL)13	2500	790	52	9

The analysis of pathogens in water samples revealed that total coliform levels ranged from 800 to 4240 CFU/ml, indicating varying degrees of microbial presence across the stations. Fecal coliform levels were observed between 107 and 980 CFU/ml, reflecting potential

contamination from fecal sources. The presence of E. coli was recorded within a range of 12 to 73 CFU/ml, suggesting different levels of bacterial activity in the sampled areas. Additionally, Vibrio levels varied between 0 and 17 CFU/ml, with some stations showing no detectable presence, while others exhibited minimal to moderate concentrations of the bacteria.

2. Marine Sediments

2.1. Physical parameters

Soil texture

The soil texture analysis showed clay content ranging from 0% to 98%, silt from 2% to 99%, and sand from 0% to 31%. MS 10 had the highest clay (98%), while MS (ITL) 13 had the most sand (31%). Silt was dominant in most stations, peaking at 99% (MS 1, MS 11). Several stations had no clay or sand, highlighting varying sediment deposition patterns.

Table: Total Organic Carbon (TOC), nitrogen, phosphorus, potassium, and sodium levels in marine sediments of different sampling locations

Stations	TOC mg/g	Nitrogen mg/g	Phosphorus mg/g	Potassium mg/g	Sodium mg/g
MS 1 (creek)	17.45	0.92	0.43	3.36	4.54
MS(ITL) 2	13.45	1.75	0.59	15.56	26.96
MS 3 (creek)	23.43	0.87	0.49	12.76	7.65
MS 4 (creek)	21.34	0.71	0.42	3.69	15.96
MS (ITL)5	15.49	1.65	0.46	17.67	23.87
MS 6	11.32	1.58	0.41	14.98	34.54
MS 7	11.12	1.23	0.47	18.95	39.95
MS 8	12.35	1.05	0.41	16.64	37.76
MS 9	11.27	0.59	0.48	13.19	35.09
MS 10	11.39	0.51	0.33	14.07	36.43
MS 11	10.26	0.48	0.35	18.9	40.32
MS 12	9.45	0.41	0.28	17.76	41.49
MS (ITL)13	15.35	1.83	0.52	17.05	18.93

The comparison of Total Organic Carbon (TOC), nitrogen, phosphorus, potassium, and sodium levels among creek, coastal, and intertidal (ITL) stations reveals distinct differences in sediment composition.

TOC Levels: Creek stations exhibited the highest TOC values, with a range of 9.45–23.43 mg/g, indicating higher organic matter deposition. Coastal stations had relatively lower TOC levels (9.45–12.35 mg/g), while ITL stations showed moderate values (13.45–15.49 mg/g). Nitrogen Content: Creek sediments contained slightly higher nitrogen levels (0.71–0.92 mg/g) compared to coastal stations (0.41–1.58 mg/g). ITL stations had moderate nitrogen concentrations (1.65–1.83 mg/g). Phosphorus: Phosphorus levels were low across all stations, with creek values ranging from 0.42–0.49 mg/g, coastal stations from 0.28–0.48 mg/g, and ITL stations from 0.46–0.59 mg/g. Potassium: Coastal stations had the highest potassium content (13.19–18.95 mg/g), while creek stations showed lower values (3.36–12.76 mg/g). ITL stations recorded the widest range (15.56–17.67 mg/g). Sodium: Sodium levels in ITL stations (18.93–26.96 mg/g), followed by coastal stations (34.54–41.49 mg/g), while creek stations had the lowest levels (4.54–15.96 mg/g).

Overall, creek stations showed higher TOC and nitrogen levels, suggesting higher organic matter accumulation, while coastal and ITL stations exhibited greater mineral content, particularly in sodium and potassium.

Sediment Biological parameters

Table: The pathogenic load in sediments (Fecal coliforms; *E.coli*; Total coliform, *vibrio)*

Stations	Total coliforms	Fecal coliforms	*E. coli*	*Vibrio*
MS 1 (creek)	14000	1530	138	260
MS(ITL) 2	11000	1940	124	130
MS 3 (creek)	15000	1620	129	240
MS 4 (creek)	17000	1340	116	250
MS (ITL)5	7100	1400	110	110
MS 6	5800	1100	120	110
MS 7	3500	1200	110	150
MS 8	3100	980	120	130
MS 9	2900	1100	110	120
MS 10	2200	1300	100	110
MS 11	1900	970	110	100

Stations	Total coliforms	Fecal coliforms	*E. coli*	*Vibrio*
MS 12	10000	1000	130	210
MS (ITL)13	14000	1530	138	260

The total coliform levels in sediments ranged from 1900 to 17000 CFU/g, with the highest at MS 4 (creek) and the lowest at MS 11. Fecal coliforms varied between 970 and 1940 CFU/g, with the highest recorded at MS (ITL) 2. *E. coli* concentrations ranged from 110 to 138 CFU/g, while *Vibrio* levels were between 100 and 260 CFU/g, with MS 1 (creek) showing the highest presence. These variations highlight potential pollution sources and environmental influences across different sediment sampling stations.

Benthic organisms

Table: Distribution and Abundance of Macrobenthos in Sediment Samples of different locations

S. No	Species Name	MACRO BENTHOS (Nos/m²)						
	Polychaetes	**MS-1 Creek**	**MS-2 ITL2**	**MS-3 Creek**	**MS-4 Creek**	**MS-5 ITL 5**	**MS-6**	**MS-7**
1	*Capitella capitata*	0	50	0	0	50	0	0
2	*Euclymene annandalei*	75	0	50	0	0	0	0
3	*Eunice tubifex*	50	0	50	0	25	0	0
4	*Glycera alba*	75	50	50	50	0	25	75
5	*Goniada emerita*	75	0	0	50	0	0	75
6	*Lumbriconereis heteropoda*	50	0	50	0	0	0	50
7	*Nephtys polybranchia*	50	50	25	75	0	50	0
8	*Nereis capensis*	0	0	0	50	0	0	0
9	*Nereis diversicolor*	75	0	0	25	0	0	75
10	*Onuphis erumita*	0	25	0	0	50	0	0
11	*Paraprionospio pinnata*	75	0	75	0	50	0	0
12	*Pereneries cultrifera*	0	50	0	50	0	0	75
13	*Phyllodoce malmgreni*	0	75	75	0	0	0	50
14	*Platynereis* sp.	50	0	50	0	0	50	0
15	*Pista* sp.	0	0	0	0	50	0	0
16	*Scololepis squamata*	75	0	50	0	75	0	25
	Gastropods	0	0	0	0	0	0	0
17	*Turitella duplicata*	0	0	0	0	0	0	0
18	*Babylonia spirata*	0	0	0	0	0	0	0
	Bivalves	0	0	0	0	0	0	0
19	*Anadara inequalis*	0	50	0	0	0	50	0
20	*Meretrix meretrix*	75	0	75	0	75	0	0
	Amphipods	0	0	0	0	0	0	0
21	*Gammarus locusta*	150	200	200	150	950	0	0
22	*Urothoe* sp.	50	0	0	150	275	0	75
23	*Pontharoinia* sp.	0	100	200	100	0	300	100

24	*Caprella mutica*	300	200	50	0	325	0	75
25	*Phoxocephalus holbolli*	100	100	0	200	450	0	100
26	**Isopods**	0	0	0	0	0	0	0
27	*Anthura gracilis*	0	50	0	50	50	0	50
	Others	0	0	0	0	0	0	0
28	*Balanus amphitrite*	0	0	50	0	0	0	0
29	*Lepas* sp.	0	0	25	0	0	0	0
30	Mysis Larva	0	25	0	0	150	0	0
		1325	**1025**	**1075**	**950**	**2575**	**475**	**825**

S.No	Polychaetes	MS-8	MS-9	MS-10	MS-11	MS-12	MS-13 ITL13
1	*Capitella capitata*	75	0	0	0	0	0
2	*Euclymene annandalei*	0	0	0	25	50	0
3	*Eunice tubifex*	0	25	50	50	0	50
4	*Glycera alba*	0	0	0	0	0	0
5	*Goniada emerita*	0	0	0	50	0	0
6	*Lumbriconereis heteropoda*	50	0	50	25	50	0
7	*Nephtys polybranchia*	0	75	0	50	50	75
8	*Nereis capensis*	0	0	75	0	0	75
9	*Nereis diversicolor*	75	75	0	0	0	0
10	*Onuphis erumita*	0	50	0	0	0	0
11	*Paraprionospio pinnata*	100	0	50	50	0	25
12	*Pereneries cultrifera*	0	0	75	0	0	0
13	*Phyllodoce malmgreni*	0	0	0	0	0	0
14	*Platynereis* sp.	0	0	0	0	0	0
15	*Pista* sp.	0	0	0	0	0	0
16	*Scololepis squamata*	75	25	0	25	50	0
	Gastropods	0	0	0	0	0	0
17	*Turitella duplicata*	0	0	0	0	0	50
18	*Babylonia spirata*	0	25	0	0	0	0
	Bivalves	0	0	0	0	0	0
19	*Anadara inequalis*	0	50	0	0	0	50
20	*Meretrix meretrix*	100	0	0	50	50	0
	Amphipods	0	0	0	0	0	0
21	*Gammarus locusta*	75	50	50	100	75	100
22	*Urothoe* sp.	0	0	0	0	0	0
23	*Pontharoinia* sp.	0	150	125	0	50	50
24	*Caprella mutica*	0	50	50	50	0	50
25	*Phoxocephalus holbolli*	0	0	0	0	50	75
26	**Isopods**	0	0	0	0	0	0
27	*Anthura gracilis*	0	0	0	0	0	0
	Others	0	0	0	0	0	0
28	*Balanus amphitrite*	0	0	0	0	0	0
29	*Lepas* sp.	0	0	0	0	0	0
30	Mysis Larva	0	0	0	0	0	0
		550	**575**	**525**	**475**	**425**	**600**

Macro-Benthos

Quantitative and qualitative analysis of macrobenthos in this study reveals that whole among the 13 stations the maximum density showed at station 5 with 2575 Nos/m^2 while the

minimum density showed at station 12 with 425Nos/m^2. Amphipods occupied the dominant group followed by Polychaetes. *Gammarus locusta* the dominant species among the Amphipod group.

Table: Distribution and Abundance of Miobenthos in Sediment Samples of different locations

S.No	Species Name	MEIOBENTHOS Nos/10 cm2						
		MS-1 Creek	MS-2 ITL2	MS-3 Creek	MS-4 Creek	MS-5 ITL 5	MS-6	MS-7
	Nematodes	0	0	0	0	0	0	1
1	*Astomonema* sp.	2	4	5	0	2	2	2
2	*Daptonema conicum*	12	18	22	8	14	12	8
3	*Desmodora* sp.	2	3	6	1	3	0	4
4	*Desmoscolex falcatus*	0	1	1	0	4	2	0
5	*Dracoma* sp.	2	2	3	0	3	0	2
6	*Greeffiella* sp.	0	2	0	0		2	3
7	*Halalaimus film*	10	6	5	10	12	6	8
8	*Oncholaimus* sp.	8	5	7	3	0	0	6
9	*Oxystomina* sp.	1	2	0	1	0	2	0
10	*Pandolaimus* sp.	10	13	18	12	18	12	12
11	*Polygastrophora septembulba*	6	10	12	3	22	6	10
12	*Theristus* sp.	8	15	13	5	24	14	8
13	*Tricoma* sp.	3	0	1	0	2	0	2
14	*Viscosia* sp.	5	2	0	6	20	8	4
	Foraminiferans							
15	*Adelosina laevigata*	0	2	3	0	1	0	2
16	*Ammobaculites exiguous*	11	6	3	0	3	2	2
17	*Ammonia beccarii*	52	64	58	12	22	14	12
18	*Amphisorus* sp.	3	5	2	5	20	6	8
19	*Ammonia dentata*	4	8	6	0	2	0	2
20	*Asterorotalia trispinosa*	68	56	62	24	32	12	12
21	*Cibicides lobatulus*	6	13	14	16	12	6	14
22	*Globigerinoides glutinata*	6	12	8	8	26	4	8
23	*Elphidium advena*	32	30	41	12	36	0	4
24	*Elphidium macellum*	12	8	22		13	2	3
25	*Elphidium norvangi*	8	12	18	3	0	2	2
26	*Lagena striata*	4	8	11	0	6	4	12
27	*Planorbulinella larvata*	42	36	32	22	24	12	16
28	*Nonionella labradorica*	36	42	44	20	16	8	12
29	*Quinqueloculina agglutinans*	48	58	53	10	18	6	8
30	*Rosalina bradyi*	16	8	7	0	4	2	2
31	*Spiroloculina communis*	8	3	7	0	3	0	4
32	*Spirillina limbata.*	5	2	0	2	0	2	
33	*Textularia agglutinans*	13	11	8	18	12	2	6
34	*Triloculina striatitrigonula*	5	0	3	14	3	0	2
35	*Triloculina trigonula*	0	1	0	1	0	2	0
36	*Trochammina globige riniformis*	2	0	1	1	0	2	3
	Ostrocodes							
37	*Keijella oertlii*	6	5	2	2	4	2	4
38	*Leptocythere* sp.	3	1	0	0	0	1	0

39	*Tanella estuarii*	0	3	4	0	6	0	4
40	*Tanella kingmaii*	5	5	2	4	0	1	2
41	*Cyprideis* sp.	2	6	2	2	6	0	2
	Tanaidacea							
42	*Pogurapseudes largoensis*	0	1	1	0	2	1	1
43	*Apseudes setosus*	2	0	0	0	0	2	2
44	**Fish Eggs**	64	82	88	36	22	18	12
45	**Polychaete Larvae**	0	0	2	0	0	2	2
46	**Bivalve Veliger**	3	0	0	4	0	6	4
	Total	**535**	**571**	**597**	**265**	**417**	**187**	**237**

	Species name	**MEIOBENTHOS Nos/10 cm2**					
S.No		**MS-8**	**MS-9**	**MS-10**	**MS-11**	**MS-12**	**MS-13 ITL13**
	Nematodes	0	3	1	2	0	0
1	*Astomonema* sp.	6	0	0	2	1	2
2	*Daptonema conicum*	23	18	16	34	12	0
3	*Desmodora* sp.	12	3	0	14	6	0
4	*Desmoscolex falcatus*	5	4	2	6	2	0
5	*Dracoma* sp.	2	0	2	2	0	0
6	*Greeffiella* sp.	1	2	0	0	2	0
7	*Halalaimus film*	14	22	20	32	13	6
8	*Oncholaimus* sp.	4	20	18	12	11	3
9	*Oxystomina* sp.	0	2	1	5	4	0
10	*Pandolaimus* sp.	16	18	14	18	12	12
11	*Polygastrophora septembulba*	12	6	3	12	8	6
12	*Theristus* sp.	8	12	10	24	6	12
13	*Tricoma* sp.	0	4	0	8	2	0
14	*Viscosia* sp.	8	14	12	14	12	6
	Foraminiferans						
15	*Adelosina laevigata*	0	2	1	3	0	0
16	*Ammobaculites exiguous*	3	1	3	6	2	
17	*Ammonia beccarii*	16	24	28	62	16	10
18	*Amphisorus* sp.	10	16	18	34	12	2
19	*Ammonia dentata*	6	8	4	26	6	3
20	*Asterorotalia trispinosa*	24	26	20	72	22	8
21	*Cibicides lobatulus*	12	20	28	34	12	12
22	*Globigerinoides glutinata*	10	24	16	24	8	3
23	*Elphidium advena*	16	6	3	28	4	0
24	*Elphidium macellum*	4	4	2	20	0	0
25	*Elphidium norvangi*	0	2	0	12	0	0
26	*Lagena striata*	6	2	1	12	2	0
27	*Planorbulinella larvata*	14	11	16	34	8	6
28	*Nonionella labradorica*	18	14	12	36	4	8
29	*Quinqueloculina agglutinans*	12	8	8	42	8	4
30	*Rosalina bradyi*	4	0	1	13	2	6
31	*Spiroloculina communis*	0	0	2	0	1	0
32	*Spirillina limbata.*	3	0	1	0	1	4
33	*Textularia agglutinans*	8	6	8	16	6	6
34	*Triloculina striatitrigonula*	0	4	0	6	0	0
35	*Triloculina trigonula*	3	0	1	4	0	5
36	*Trochammina globigeriniformis*	0	3	2	2	1	0

	Ostrocodes						
37	*Keijella oertlii*	6	4	3	16	2	6
38	*Leptocythere* sp.	3	6	4	12	0	4
39	*Tanella estuarii*	7	0	2	22	4	2
40	*Tanella kingmaii*	5	2	1	16	2	3
41	*Cyprideis* sp.	6	4	6	12	2	2
	Tanaidacea						
42	*Pogurapseudes largoensis*	0	0	0	2	0	1
43	*Apseudes setosus*	1	1	2	4	0	0
44	**Fish Eggs**	26	46	28	56	12	16
45	**Polychaete Larvae**	3	0	2	0	1	0
46	**Bivalve Veliger**	6	0	3	0	0	0
	Total	**343**	**372**	**325**	**811**	**229**	**158**

Meio-Benthos

In the meiobenthos, the population density maximum was showed at station 11 with 811 Nos/10 cm^2 and the minimum density was showed at station 12 with 158 Nos/10 cm^2. Fish eggs, Nematodes, Foraminiferans and Ostracods were highly diversified all the samples. Among these Fish eggs was occupied most dominant in all the stations followed by the Foraminiferans species such as *Ammonia beccarii, Asterorotalia trispinosa* were showed the dominant species.

Macrobenthic organisms play a crucial role in maintaining sediment structure, nutrient cycling, and overall ecosystem health. The given data presents the percentage composition of various macrobenthic groups.

Polychaetes dominate the macrobenthic community, accounting for 55.17%, indicating their significance in benthic ecosystems as sediment dwellers and detritus feeders. Amphipods contribute 17.24%, playing a key role in decomposition and serving as prey for higher trophic levels. Gastropods (6.90%) and Bivalves (6.90%) represent molluscan groups that influence sediment stability and nutrient cycling. Isopods (3.45%) are less abundant but contribute to organic matter breakdown. Other groups (10.34%) add to the overall diversity and resilience of the benthic community. The dominance of polychaetes suggests a well-oxygenated and productive benthic environment, while the presence of diverse taxa reflects a balanced and functional ecosystem.

Percentage Composition of Meiobenthic Organisms

Meiobenthic organisms are small, sediment-dwelling fauna that play a vital role in nutrient cycling, sediment stability, and the aquatic food web. The given data highlights the percentage composition of different meiobenthic groups.

Foraminiferans dominate the community at 47.83%, indicating their importance in organic matter decomposition and as bioindicators of environmental conditions. Nematodes (30.43%) are also highly abundant, contributing to sediment bioturbation and nutrient recycling.

Ostracods (10.87%) are crustaceans that influence sediment structure, while Tanaidacea (4.35%) play a role in detritus processing. The presence of fish eggs (2.17%), polychaete larvae (2.17%), and bivalve veligers (2.17%) suggests an active reproductive ecosystem, supporting biodiversity and larval dispersal.

Overall, the composition of meiobenthic organisms reflects a dynamic and functional benthic habitat, essential for maintaining ecosystem stability and productivity.

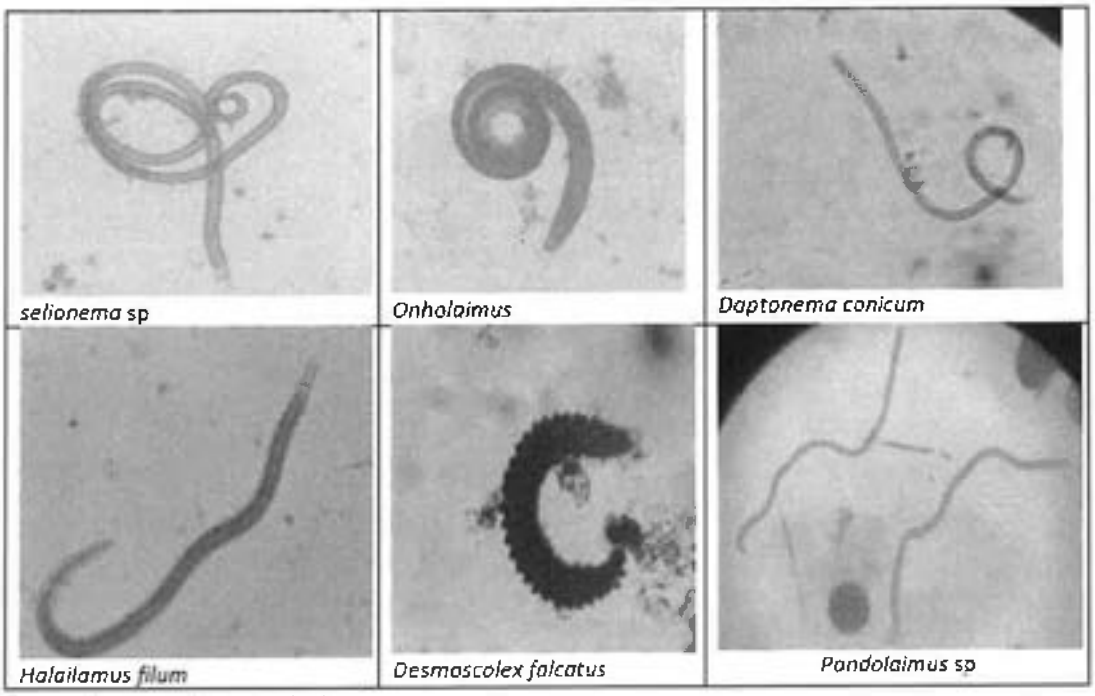

Figure: Benthos(Nematodes)

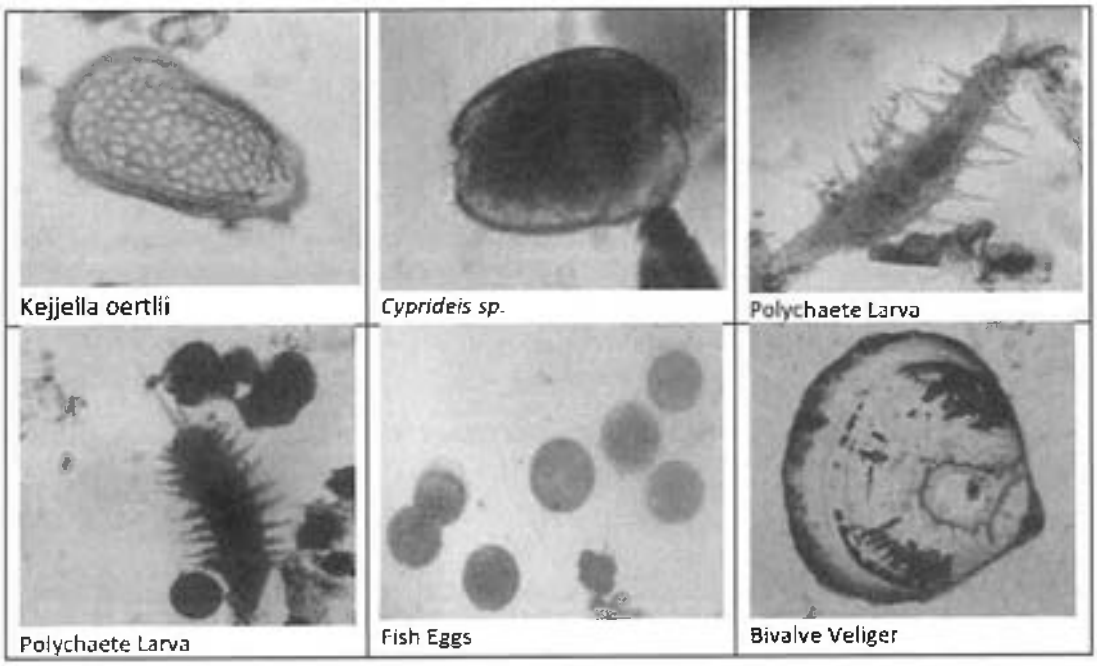

Figure: Meio Benthos (Ostracods and others)

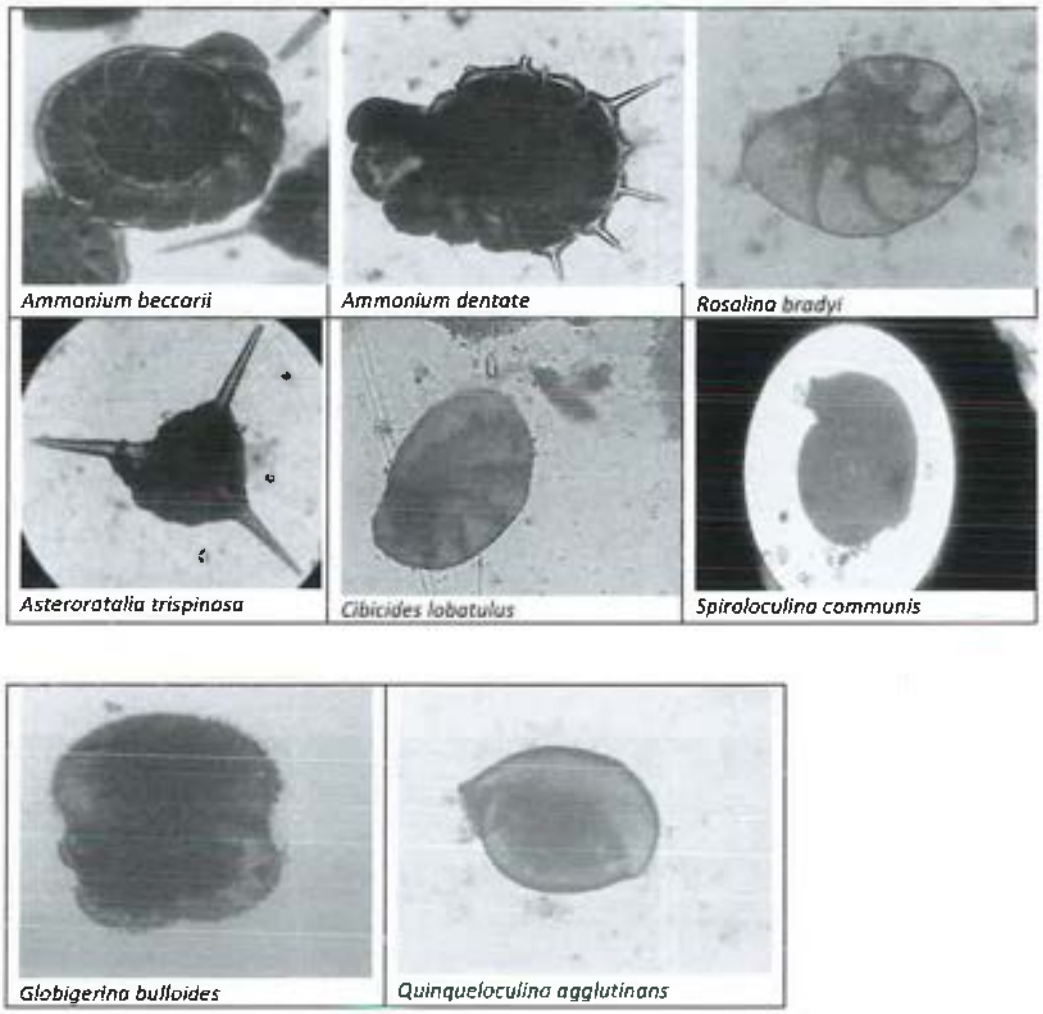

Figure: Meio Benthos (Foraminiferans)

Title: Heavy Metal Concentrations in Sediment Samples Across Different Stations

Stations	Lead	Cadmium	Copper	Zinc	Iron	Mercury
	Concentrations (µg/g)					
MS 1 (creek)	12.46	1.98	12.94	40.92	7991	<0.01
MS(ITL) 2	18.09	0.53	10.38	37.08	10428.4	<0.01
MS 3 (creek)	18.12	1.01	11.84	31.67	7066	<0.01
MS 4 (creek)	10.82	0.98	11.72	22.54	8222	<0.01
MS (ITL)5	12.36	0.79	12.94	30.36	8552.4	<0.01
MS 6	18.12	0.65	9.88	23.68	5370.37	<0.01
MS 7	11.84	0.56	8.06	18.04	5817.06	<0.01
MS 8	10.32	0.67	8.15	13.63	5120.21	<0.01
MS 9	10.14	0.52	8.19	14.54	5124.64	<0.01
MS 10	8.56	0.48	6.78	10.24	4014.23	<0.01

Stations	Lead	Cadmium	Copper	Zinc	Iron	Mercury
	Concentrations (µg/g)					
MS 11	5.81	0.42	6.05	10.21	3281.07	<0.01
MS 12	5.22	0.45	5.01	11.11	3189.11	<0.01
MS (ITL)13	20.51	1.21	12.91	35.52	7423.2	<0.01

The concentrations of heavy metals in sediment samples varied across different stations. Lead levels ranged from 5.22 µg/g at MS 11 to 20.51 µg/g at MS (ITL)13, while cadmium concentrations were lowest at MS 12 (0.42 µg/g) and highest at MS 1 (creek) (1.98 µg/g). Copper content fluctuated between 5.01 µg/g (MS 12) and 12.94 µg/g (MS 1). Zinc concentrations were found to be highest at MS 1 (40.92 µg/g) and lowest at MS 11 (10.21 µg/g). Iron, the most abundant metal, ranged from 3189.11 µg/g at MS 12 to 10428.4 µg/g at MS(ITL) 2. Mercury levels remained consistently below detection limits (<0.01 µg/g) across all stations.

Dredging

Marine Environmental Monitoring for AKPL-Marine Environmental Studies during-dredging, Nellore District, Andhra Pradesh

Submitted

by

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1. Introduction

The delicate balance of marine ecosystems, spanning vast coastal regions and expansive oceanic environments, stands as a testament to the intricate web of life that thrives beneath the waves. As human activities expand and industries increasingly interface with these fragile environments, the necessity of evaluating their impact becomes paramount. Environmental Impact Assessment (EIA) in the marine realm emerges as a crucial framework aimed at comprehensively understanding and predicting the repercussions of human interventions on these vital ecosystems.

The seas and oceans, constituting a significant portion of our planet, host diverse habitats, ranging from vibrant coral reefs to the mysterious depths of the open ocean. These ecosystems are not only home to an array of marine life but also play an integral role in global climate regulation, oxygen production, and sustaining livelihoods for countless communities worldwide. However, the burgeoning demands of human development, including maritime trade, coastal infrastructure, offshore energy exploration, and fisheries, pose significant challenges to the ecological integrity of these marine systems.

Recognizing the complexity and interconnectedness of marine environments, EIA serves as a crucial tool in navigating the intricate balance between human progress and environmental preservation. Within the realm of EIA for marine environments, a myriad of factors necessitate scrutiny. The exploration of offshore energy resources, establishment of coastal infrastructure, expansion of shipping lanes, and the cumulative effects of various anthropogenic stressors demand thorough examination to gauge their potential environmental ramifications. Moreover, as climate change exerts its influence on sea levels, ocean temperatures, and marine biodiversity, the need to integrate these dynamic shifts into EIA assessments becomes increasingly imperative.

The marine environmental study underscores the critical importance of understanding the environmental implications of human activities on these intricate and irreplaceable ecosystems. By delving into the core principles, methodologies, challenges, and advancements within this domain, a deeper appreciation of the significance of EIA in safeguarding the oceans and coastal areas can be attained. Ultimately, this process stands as a cornerstone for fostering sustainable coexistence between human endeavors and the preservation of our planet's marine treasures.

Study area

MSL 1

MSL 3

GPS Map Camera
Sri Potti Sriramulu Nellore, Andhra Pradesh, India
Google
GPS Map Camera
Sri Potti Sriramulu Nellore, Andhra Pradesh, India
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MSL 7

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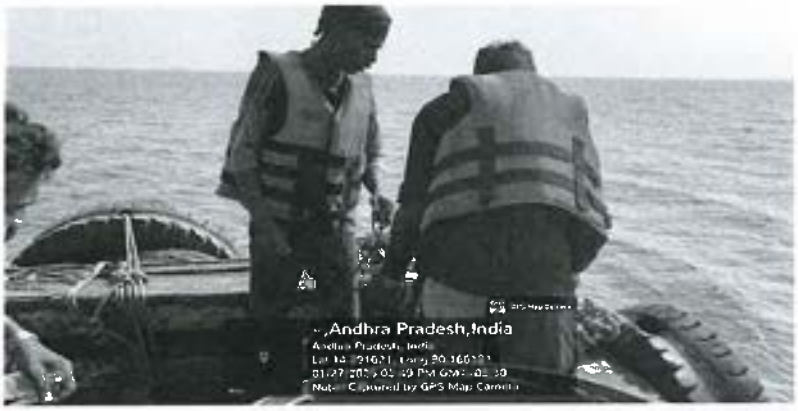
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MSL 9

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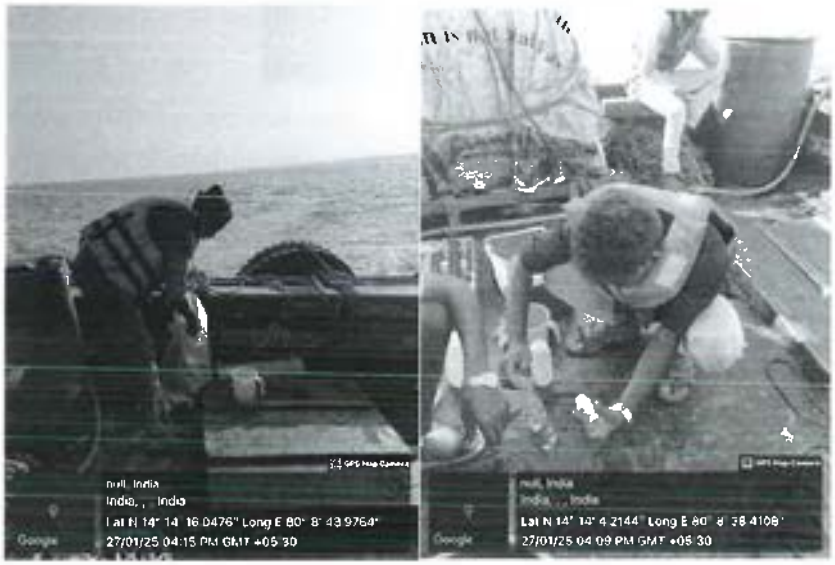
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MSL 8

GPS Map Camera
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Google
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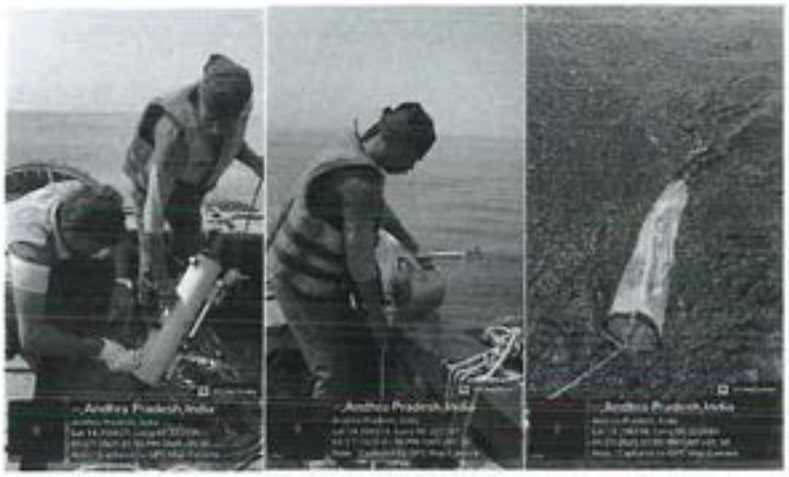
MSL 10



MSL 11

MSL 12

ITL 13

Photographs captured during the marine environmental sampling process, documenting the various sampling stations, techniques, and conditions at the time of data collection.

1. Marine Water Quality.

Methodologies Adopted For Various Analyses

Water samples were collected at the surface and sub-surface level using Universal water sampler and transferred to the pre-cleaned polypropylene and glass containers. Sediment samples were collected using van Veen Grab, transferred to clean polythene bags and transported to the shore. The samples were air-dried and the plant root and other debris were removed and stored for further analysis.

Temperature, Salinity and pH

The physical parameters such as temperature, salinity and pH were measured *in-situ* in the field. The sub-surface temperature was measured with a mercury thermometer (±0.02°C accuracy) and the pH was measured by a calibrated pH pen (pH ep-3 model). Salinity was estimated using a Hand Refractometer (Atago, Japan). Water samples collected for dissolved oxygen estimation were transferred carefully to DO bottles. The DO was immediately fixed and brought to the shore for further analysis. TSS was measured using Millipore vacuum filtration unit and the values are expressed in ppm. Turbidity was measured using turbidity meter and expressed in NTU.

Preservation and Laboratory Analysis

After collection, the samples were immediately cooled to 4°C and then brought to the Lab, in an insulated thermocool box. On reaching the shore, water samples were filtered through Whattman GF/C filter paper and analysed for organic matter and other nutrients. Unfiltered samples were used for the estimation of total nitrogen and total phosphorus. All the analyses were carried out by adopting Standard procedures for samples of aquatic origin.

Dissolved Oxygen

The modified Winkler's method as described by Strickland and Parsons (1972) was adopted for the estimation of dissolved oxygen. The values are expressed in mg/l.

Sulphate

The sulphates content of samples were analysed by following the method described by APHA (1995).

Nitrate and Nitrite

The nitrate and nitrite content of samples were analysed by following the method described by Grasshoff et al. (1999). The nitrite was estimated from highly coloured azo dye formed by the addition of N (1-Napthyl) ethylene diaminedihydro-chloride and sulphanilamide into the solution which was then measured at 543 nm in a spectrophotometer. Same procedure was followed for the estimation of nitrate. For this, nitrate was reduced to nitrite by passing the sample through copper coated cadmium column. The calculated values were expressed as µmol of Nitrogen/l

Ammonia and Total nitrogen

Ammonia present in water reacts with sodium hypochlorite and phenol in alkaline condition to produce indophenol blue. Sodium nitroprusside is used as a catalyst and colour intensifier. The methodology described in Grasshoff *et al.* (1999) was followed for the determination of Ammonia and Total nitrogen. Organically bound nitrogen is oxidized to nitrate during alkaline persulphate digestion. The nitrate content of the sample is determined after reduction to nitrite. The calculated values are expressed in μmol of Nitrogen/l for both the parameters.

Inorganic Phosphate

The single solution mixed reagent procedure developed by Grasshoff *et al.* (1999) was followed for the estimation of dissolved inorganic phosphate levels in water samples. This involves the conversion of phosphate into phosphomolybdic acid, which was then reduced to molybdenum blue colour complexes and then the intensity of colour was measured at 882 nm in a spectrophotometer. The calculated values are expressed in µmol of Phosphate/L.

Total Phosphorus

The Total Phosphorus in water samples was estimated by adopting the method described by Grasshoff *et al.* (1999). This procedure involves the conversion of organically bound phosphate into inorganic phosphate by wet oxidation of samples with potassium persulphate in an autoclave for 30 min at 15 lbs pressure. The converted inorganic phosphate was then estimated by using the method described by Murphy and Riley (1962). The subtraction of original dissolved inorganic phosphate from total phosphate yielded the organic phosphate in the water sample. The calculated value is expressed in µmol of Phosphorus/L.

Reactive Silicate

The reactive silicate content of water was estimated by following the method of Grasshoff *et al.* (1999). In this method, the intensity of blue colour formed by silico-molybdate complex was measured at 810 nm in a spectrophotometer and the calculated values are expressed in µmol of Silica/l

Results

Environmental Impact Assessment (EIA) of Water Quality

This study assesses the water quality across multiple monitoring stations (MS) to evaluate the environmental conditions of the water bodies. Various parameters such as temperature, salinity, dissolved oxygen (DO), pH, turbidity, total dissolved solids (TDS), and total suspended solids (TSS) were measured at different depths (surface and bottom).

Table: Water Quality Assessment – Temperature, Salinity, Dissolved Oxygen (DO), pH, Turbidity, Total Dissolved Solids (TDS), and Total Suspended Solids (TSS) at Different Monitoring Stations

	Temp ° C		Salinity PPT/PSU		DO mg/l		pH		Turbidity	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS 1 (creek)	28.50	28.3	22	23	3.41	3.23	8.1	8.15	47	51
MS(ITL) 2	28.5	-	30	-	3.8	-	8.12	-	38	-
MS 3 (creek)	28.4	28.2	25	24	3.42	3.28	8.12	8.15	55	58
MS 4 (creek)	28	27.8	22	23	3.6	3.24	8.14	8.16	65	67
MS (ITL)5	28.2	-	31	-	3.52	-	8.23	-	62	-
MS 6	28.3	28.1	24.1	25.6	4.21	4.12	8.29	8.21	51	53
MS 7	27.7	26.5	32.5	32.1	3.81	3.68	8.25	8.27	48	50
MS 8	27.8	27.2	31	32	4.12	4.09	8.31	8.28	48	50
MS 9	27.7	27.1	31	33	4.03	3.89	8.29	8.31	49	51
MS 10	27.8	27.2	32	32	3.84	3.57	8.27	8.29	15	18
MS 11	28.4	28	32	33	3.9	3.38	8.28	8.31	12	14
MS 12	28.4	28	33	33	4.25	4.15	8.27	8.29	10	13
MS (ITL)13	28.2	-	31	-	3.7	-	8.1	-	52	-

Key Findings

Temperature: The surface temperature ranged from 27.7°C to 28.5°C, while the bottom temperature showed minimal variation, staying within a close range. The consistency suggests stable thermal conditions in the water bodies.

Salinity: Salinity levels varied significantly, with values ranging from 12 PPT to 32 PPT. Higher salinity levels were observed in ITL stations compared to creek stations, indicating a possible influence of tidal intrusion or seawater mixing.

Dissolved Oxygen (DO): DO levels ranged from 4.3 mg/L to 6.8 mg/L, with slightly lower values at the bottom compared to the surface. The lower DO at certain stations (MS 4 and MS 6) suggests possible organic matter decomposition or limited oxygen exchange.

pH Levels: The pH levels remained relatively stable across all stations, ranging from 7.7 to 8.2, indicating a neutral to slightly alkaline nature, which is typical for coastal and estuarine environments.

Turbidity: Turbidity levels varied from 8 NTU to 65 NTU, with higher values at creek stations (MS 1 and MS 4). Increased turbidity may indicate suspended sediments, runoff, or human activities affecting water clarity.

Table: Water Quality Assessment – Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD) at Different Monitoring Stations

Station Name	TDS mg/L		TSS mg/L		CODmg/L		BODmg/L	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS 1(creek)	17900	20500	55	62	30.20	32.5	3.9	3.60
MS(ITL) 2	31700	-	62	-	18.6	-	3.15	-
MS 3(creek)	30100	31500	34	37	28.90	29.30	3.37	3.56
MS 4 creek)	22200	23000	70	79	33.4	34.7	2.95	3.18
MS (ITL)5	31000	-	73	-	22.5	-	3.84	-
MS 6	31400	29200	45	48	21.8	22.1	2.95	3.07
MS 7	29200	29100	52	58	15.8	16.6	3.05	3.15
MS 8	29700	29800	43	40	23.4	24.8	2.63	2.86
MS 9	31700	31900	32.8	41	12.5	13.7	2.63	2.74
MS 10	30500	30100	62	69	11.5	11.8	2.42	2.59
MS 11	31500	31100	45	52	8.5	9.7	2.47	2.84
MS 12	31500	31800	57	63	8.4	9.3	1.75	2.21
MS (ITL)13	32100	-	66	-	19.3	-	3.11	-

key water quality parameters, including Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD) across different monitoring stations. These parameters help evaluate water pollution levels, organic matter decomposition, and overall water quality health in both surface and bottom water samples.

Key Findings

Total Dissolved Solids (TDS) (mg/L): TDS levels varied significantly, ranging from 17900 mg/L (MS 9) to 31,900 mg/L (MS ITL 13). Higher TDS concentrations in ITL stations suggest strong marine influence and higher salinity levels, whereas creek stations exhibited moderate TDS values.

Total Suspended Solids (TSS) (mg/L): TSS concentrations ranged from 32.8 mg/L to 79 mg/L, with higher values recorded in creek areas (MS 1, MS 4, and MS ITL 13).

Chemical Oxygen Demand (COD) (mg/L): COD values varied between 8.40 mg/L and 34.70 mg/L, indicating meager organic pollution.

Biological Oxygen Demand (BOD) (mg/L): BOD values ranged from 1.75 mg/L to 3.60 mg/L, with higher levels in creek stations (MS 1, MS ITL 13).

Table: Water Quality Assessment – Nitrite, Nitrate, Ammonical Nitrogen, Inorganic Phosphate, Chlorides, and Sodium Levels at Different Monitoring Stations

Station Name	Nitrite µmol/l		Nitrate µmol/l		Ammonical N µmol/l		Inorganic Posphate µmol/l		Chlorides mg/l		Sodium mg/l	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS 1 (creek	3.01	3.11	6.1	6.3	0.82	0.97	1.51	1.55	117600	124600	5500	6100
MS(ITL) 2	1.98	-	3.01	-	0.83	-	2.19	-	16500	-	9200	-
MS 3 (creek	2.41	2.65	4.92	5.01	0.72	0.98	2.15	2.41	16500	17050	9200	9400
MS 4 (creek	2.39	2.63	3.9	2.75	0.52	0.57	2.06	1.97	17050	17330	9500	9650
MS (ITL)5	2.05	-	2.62	-	0.94	-	2.190	-	17050	-	9400	-
MS 6	1.93	1.92	2.32	2.45	0.74	0.79	1.59	1.87	13,582	15254	4800	5100
MS 7	1.68	1.61	2.24	2.38	0.58	0.61	1.53	1.61	14020	14560	4500	4780
MS 8	1.53	1.78	3.8	3.94	0.51	0.53	1.46	1.53	13450	13950	4480	4790
MS 9	1.8	1.78	2.52	2.68	0.51	0.57	1.81	1.85	15020	15400	9450	10100
MS 10	1.82	1.84	2.37	2.47	0.56	0.43	1.45	1.28	15020	15240	9800	9800
MS 11	1.81	1.99	1.93	2.02	0.51	0.52	1.05	1.69	13080	13480	9080	9140
MS 12	1.89	1.91	2.3	2.41	0.52	0.58	1.58	1.49	13470	13600	9420	9850
MS (ITL)13	2.168	-	3.665	-	0.87	-	2.6	-	17050	-	9470	-

The nutrient and ionic composition of water samples from multiple monitoring stations (MS). Key parameters analyzed include nitrite, nitrate, ammonical nitrogen, inorganic phosphate, chlorides, and sodium levels at both surface and bottom depths. These parameters provide insight into nutrient loading, potential pollution sources, and water chemistry variations.

Table: Water Quality Assessment – Silica, Reactive Silicate, Total Phosphorus (TP), Total Nitrogen (TN), Oil & Grease, and Sulphates at Different Monitoring Stations

Station Name	Silica µmol/l		Reactive Silicate µmol/l		TP µmol/l		TN µmol/l		Oil & Grease µg/l		Sulphates mg/l	
	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS 1 (creek)	14.49	15.27	10.83	10.65	4.25	4.58	17.34	18.46	0.83	0.65	1380	1540
MS(ITL) 2	10.51	-	7.476	-	3.78	-	10.5	-	0.476	-	2340	-
MS 3 (creek)	7.84	8.54	10.41	10.39	3.35	3.86	11.58	11.43	0.41	0.39	2310	2380
MS 4 (creek)	8.76	9.67	10.33	10.34	3.46	3.67	7.4	7.35	0.33	0.34	1690	1770
MS (ITL)5	7.51	-	6.349	-	3.84	-	15.5	-	0.349	-	2388	-

Station Name	Silica µmol/l		Reactive Silicate µmol/l		TP µmol/l		TN µmol/l		Oil & Grease µg/l		Sulphates mg/l	
	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS 6	6.43	6.95	5.294	5.248	2.35	2.57	4.78	6.84	0.494	0.348	2405	2480
MS 7	8.94	9.64	3.272	3.262	2.2	2.49	5.67	7.56	0.372	0.362	2288	2260
MS 8	5.73	6.49	4.284	4.297	2.27	2.45	6.48	7.25	0.384	0.297	2290	2265
MS 9	6.27	6.52	5.246	5.224	2.85	2.27	4.83	6.43	0.246	0.224	2392	2540
MS 10	6.52	6.81	5.251	5.218	2.3	2.62	8.64	10.47	0.251	0.218	2465	2460
MS 11	3.89	4.28	2.204	2.196	2.18	2.43	4.28	5.28	0.204	0.196	2460	2540
MS 12	3.25	3.62	3.13	4.38	2.28	2.51	4.8	5.263	0.195	0.186	2530	2530
MS (ITL)13	7.75	-	7.422	-	2.95	-	9.56	-	0.422	-	2385	-

The water quality parameters, including silica, reactive silicate, total phosphorus (TP), total nitrogen (TN), oil & grease, and sulphates across different monitoring stations.

Key Findings

Silica and Reactive Silicate (µmol/L): Silica concentrations ranged from 3.250 µmol/L (MS 12) to 15.270 µmol/L (MS 1) in surface waters, with slightly higher values at the bottom. Reactive silicate levels followed a similar trend, ranging from 2.196 µmol/L to 10.830 µmol/L in surface waters. Higher silica levels in creek stations (MS 1, MS ITL 13) suggest increased sediment interactions or natural silicate weathering.

Total Phosphorus (TP) (µmol/L): TP values varied between 2.180 µmol/L (MS 11) and 4.580 µmol/L (MS 1).

Total Nitrogen (TN) (µmol/L): TN values showed higher concentrations in creek stations, with maximum levels of 18.46 µmol/L (MS 1).

Oil & Grease (µg/L): Concentrations ranged from 0.186 µg/L to 0.476 µg/L, with higher values in creek stations.

Sulphates (mg/L): Sulphate concentrations ranged from 1380 mg/L (MS 1) to 2540 mg/L (MS 12), with higher values recorded in ITL stations. Higher sulphate levels suggest marine influences.

1.2. Heavy metals

Table: Lead (Pb), Cadmium (Cd), and Copper (Cu) Concentrations in Surface and Bottom Waters at Different Monitoring Stations

	Lead µg/l		Cadmium µg/l		Copper µg/l	
Stations	surface	Bottom	surface	Bottom	surface	Bottom
MS 1 (creek)	2.58	2.77	1.95	2.19	5.13	5.74
MS(ITL) 2	2.58	-	0.52	-	3.56	-
MS 3 (creek)	2.47	2.17	1.08	1.21	3.46	3.35
MS 4 (creek)	1.99	1.87	0.96	1.08	4.98	5.44
MS (ITL)5	1.49	-	0.83	-	4.57	-
MS 6	1.99	1.57	0.68	0.65	5.2	5.58
MS 7	1.82	1.47	0.64	0.62	3.77	3.91
MS 8	1.62	1.52	0.62	0.65	2.81	3.38
MS 9	1.61	1.37	0.35	0.39	2.64	3.43
MS 10	0.86	0.31	0.3	0.34	2.43	3.22
MS 11	0.59	0.49	0.28	0.31	2.21	2.97
MS 12	0.52	0.54	0.28	0.2	1.88	2.69
MS (ITL)13	2.18	-	1.24	-	4.5	-

Key findings

Lead (Pb): Concentrations ranged from 0.31 µg/L (MS 10) to 2.77 µg/L (MS 1), with slightly higher values at creek stations (MS 1, MS 3, MS ITL 13). Minimal differences between surface and bottom layers suggest a stable distribution.

Cadmium (Cd): Levels varied between 0.20 µg/L (MS 12) and 2.19 µg/L (MS 1), with some stations showing higher concentrations at the bottom, indicating possible accumulation in sediments.

Copper (Cu): Measured between 1.88 µg/L (MS 12) and 5.74 µg/L (MS 1), with higher concentrations in bottom waters, suggesting settling and sediment interactions.

The study indicates no critical heavy metal contamination, as most values remain below or within international safety thresholds. Continuous assessment of metal sources is necessary to ensure water quality stability.

Table: Zinc (Zn), Iron (Fe), and Mercury (Hg) Concentrations in Surface and Bottom Waters at Different Monitoring Stations

Stations	Zinc		Iron		Mercury	
	surface	Bottom	surface	Bottom	surface	Bottom
MS 1 (creek)	20.56	20.76	25.67	25.95	BDL	BDL
MS(ITL) 2	16.94	-	35.41	-	BDL	-
MS 3 (creek)	18.02	17.21	23.42	29.02	BDL	BDL
MS 4 (creek)	13.87	13.04	27.14	28.81	BDL	BDL
MS (ITL)5	15.23	-	32.67	-	BDL	-
MS 6	11.84	12.78	22.58	26.00	BDL	BDL
MS 7	8.72	10.05	18.92	23.78	BDL	BDL
MS 8	6.97	7.61	16.75	20.85	BDL	BDL
MS 9	6.49	7.68	16.29	18.46	BDL	BDL
MS 10	5.74	7.15	15.71	17.95	BDL	BDL
MS 11	5.28	5.66	13.22	15.31	BDL	BDL
MS 12	5.67	5.82	12.97	14.57	BDL	BDL
MS (ITL)13	16.11	-	24.53	-	BDL	-

Key Findings

Zinc (Zn): Concentrations ranged from 5.14 µg/L (MS 10, surface) to 20.76 µg/L (MS 1, bottom). Higher levels were observed in creek stations (MS 1 and MS 3), indicating possible contributions from natural sources.

Iron (Fe): Levels varied between 12.97 µg/L (MS 12, surface) and 29.02 µg/L (MS 3, bottom). Bottom layers generally showed higher concentrations, suggesting settling and sediment interactions.

Mercury (Hg): Levels were below detection limits (<0.01 µg/L) at all stations, indicating no significant mercury contamination in the studied area.

1.3 Biological analysis

Table: Primary productivity, Chlorophyll concentrations along the observed lactations

Station Name	Primary Productivity (g C/m²/day)	Chlorophyll-a (µg/L)	Chlorophyll-b (µg/L)	Chlorophyll-c (µg/L)
MS 1 (creek)	0.58	1.25	0.52	0.29
MS(ITL) 2	0.67	1.68	0.64	0.36
MS 3 (creek)	0.69	1.56	0.64	0.34
MS 4 (creek)	0.63	1.43	0.59	0.32
MS (ITL)5	0.68	1.58	0.65	0.33
MS 6	0.86	1.89	0.78	0.36
MS 7	0.79	1.71	0.74	0.38
MS 8	0.89	1.89	0.72	0.42

Station Name	Primary Productivity (g C/m²/day)	Chlorophyll-a (µg/L)	Chlorophyll-b (µg/L)	Chlorophyll-c (µg/L)
MS 9	0.88	2.08	0.79	0.48
MS 10	0.81	1.68	0.73	0.41
MS 11	0.78	1.65	0.72	0.38
MS 12	0.79	1.68	0.71	0.41
MS (ITL)13	0.67	1.45	0.61	0.32

Key Findings:

The relationship between primary productivity and chlorophyll-a, b, and c concentrations at different sampling stations, including creek and intertidal locations. The estimated values of chlorophyll pigments provide insights into the phytoplankton biomass and productivity of the water body.

Primary productivity: Primary productivity values ranged from 0.58 to 0.99 g C/m²/day, indicating moderate to high productivity across different stations. ITL stations (MS 2, MS 5, MS 13) showed moderate productivity levels (0.75–0.83 g C/m²/day), indicating balanced nutrient conditions. MS 6 and MS 8 (0.93 g C/m²/day) demonstrated high productivity, suggesting favorable environmental conditions, possibly influenced by nutrient influx or stable water column conditions.

Chlorophyll-a Concentration: Chlorophyll-a values ranged from 1.43 µg/L (MS 1) to 2.18 µg/L (MS 9), indicating variations in phytoplankton abundance across different stations. MS 9 showed the highest chlorophyll-a (2.18 µg/L), correlating with its highest primary productivity (0.99 g C/m²/day). Creek stations (MS 1, MS 3, MS 4) exhibited relatively lower chlorophyll-a levels, suggesting lower phytoplankton abundance compared to intertidal stations.

Chlorophyll-b and Chlorophyll-c Trends: Chlorophyll-b ranged from 0.59 µg/L (MS 1) to 0.89 µg/L (MS 9), showing a similar pattern to chlorophyll-a. Chlorophyll-c, which represents certain phytoplankton groups (e.g., diatoms), was highest in MS 9 (0.50 µg/L) and lowest in MS 1 (0.33 µg/L). Higher chlorophyll-c values indicate a diverse phytoplankton community, including diatoms and dinoflagellates. Intertidal (ITL) stations like MS(ITL) 2, MS(ITL) 5, and MS(ITL) 13 generally had higher productivity and chlorophyll concentrations.

Creek stations (MS 1, MS 3, MS 4) showed moderate to low chlorophyll values, indicating either lower nutrient availability or higher flushing rates that prevent phytoplankton accumulation. The variations in chlorophyll concentrations reflect differences in nutrient availability, light penetration, and hydrodynamic conditions at different stations.

Higher productivity and chlorophyll levels in some stations suggest higher phytoplankton biomass, which could support a more productive aquatic ecosystem. Lower values at certain locations could indicate limited nutrient input or higher water movement, reducing phytoplankton retention.

Plankton

Phytoplankton

Phytoplankton Diversity and Abundance Analysis

The phytoplankton composition across different stations, focusing on Bacillariophyceae (diatoms), Dinophyceae (dinoflagellates), and Cyanophyceae (blue-green algae).

Key findings:

Phytoplankton Abundance:

The highest total cell count was recorded at ST-9 (6857 cells/L), followed by ST-10 (6755 cells/L) and MS-8 (6672 cells/L). Creek stations (MS-1, MS-3, MS-4) exhibited lower phytoplankton counts, suggesting potential nutrient limitations or hydrodynamic influences.

Table: Phytoplankton numerical abundance observed along the different locations except intertidal regions

Phytoplankton (Cells/L)	MS-1 Creek	MS-3 Creek	MS-4 Creek	MS - 6	MS - 7	MS - 8	ST-9	ST-10	MS-11	MS-12
Bacillariophyceae										
Asterionella glacialis	0	0	0	305	0	353	391	324	447	0
Bacillaria sp	230	161	127	168	222	340	239	0	291	298
Bacteriastrum comosum	0	0	0	0	152	227	133	147	185	0
Bellerochea malleus	248	0	176	193	683	233	119	231	289	226
Chaetoceros coarctatus	0	189	207	163	558	313	289	263	198	293
Coscinodiscus radiatus	0	0	0	83	187	319	219	233	271	140
Cyclotella sp	126	107	73	83	102	139	140	154	192	179
Ditylum brightwelli	0	0	0	0	0	98	129	143	181	0
Eucampia zodiacus	0	0	0	128	180	142	0	227	265	252
Gyrosigma sp.	0	85	206	59	123	110	93	107	145	132
Leptocylindrus danicus	0	214	241	243	113	200	150	164	202	189

Lithodesmium undulatum	362	0	0	358	223	142	253	267	305	292
Melosira	0	0	99	155	128	218	164	178	100	203
Navicula directa	135	373	121	173	206	194	237	251	288	276
Nitzschia closterium	0	0	0	140	348	85	204	191	126	409
Pleurosigma directum	0	0	0	0	218	64	248	262	116	287
Pleurosigma normanii	0	0	0	90	133	77	169	183	93	208
Rhizosolenia alata	147	0	168	278	125	257	161	175	91	201
Skeletonema costatum	0	0	0	0	170	302	203	217	255	243
Stephanopyxis sp	0	0	0	0	0	0	134	148	0	0
Streptotheca thamensis	0	0	0	0	0	0	365	105	0	0
Thalassionema nitzschioides	405	437	329	308	313	445	337	351	389	376
Thalassiosira sp.	0	248	246	518	298	430	323	337	375	362
Thalassiothrix frauenfeldii	245	363	374	618	221	323	251	265	302	290
Triceratium favus	0	0	0	94	58	103	99	113	151	138
Dianophyseae										
Ceratium furca	106	103	97	142	133	78	169	183	221	208
Ceratium longipes	0	0	0	0	38	103	0	94	132	119
Ceratium macroceros	89	97	82	164	58	137	98	112	95	138
Dinophysis caudata	117	0	78	110	51	130	92	106	121	116
Gymnodinium sp	0	0	0	0	70	108	110	124	45	112
Noctiluca sp.	0	0	0	0	171	105	204	218	117	99
Peridinium claudicans	0	83	0	0	134	114	170	184	91	209
Protoperidinium sp.	89	62	43	140	0	100		283	86	101
Cynophyceae										
Oscillatoria sp	443	323	256	553	418	0	0	0	0	0
Trichodesmium erytheaum	0	0	0	0	0	240	146	160	197	185
Phormidium sp	0	0	0	0	0	450	342	356	393	381
TOTAL	**2737**	**2843**	**2920**	**5258**	**5831**	**6672**	**6383**	**6857**	**6755**	**6663**

Dominant Groups:

Diatoms (Bacillariophyceae) were the most abundant, with *Thalassiosira* sp., *Thalassionema nitzschioides*, and *Thalassiothrix frauenfeldii* being the dominant species.

Dinoflagellates (Dinophyceae) such as *Ceratium furca* and *Noctiluca* sp. were found in moderate numbers, with higher concentrations in intertidal and offshore stations.

Cyanophyceae (blue-green algae), represented by *Oscillatoria* sp. and *Phormidium* sp., showed higher concentrations at MS-6, MS-7, and MS-8, indicating possible eutrophic

conditions. Higher phytoplankton diversity and abundance were observed at offshore and intertidal stations (MS-6 to ST-10).

Data for intertidal regions (MS-ITL stations) is unavailable as no sampling was carried out in these areas due to the inability to conduct plankton sampling in these regions.

Phytoplankton play a vital role in aquatic ecosystems. Bacillariophyceae (diatoms) dominate at 77% in the given dataset, indicating a stable primary production system. Dianophyceae (dinoflagellates) make up 14%, contributing to marine food webs and sometimes causing algal blooms. Cyanophyceae (blue-green algae) account for 9%, playing a role in nitrogen fixation but also posing risks of harmful blooms. The overall composition reflects a diverse phytoplankton community, essential for maintaining ecosystem balance.

Zooplankton

Zooplankton Community Structure

Zooplankton abundance varied across different stations, with the highest recorded at MS-10 (10,563 Nos/m^3) and MS-9 (8,870 Nos/m^3), while the lowest was observed **at** MS-1 (2,665 Nos/m^3). Calanoid copepods dominated the community, particularly *Paracalanus parvus*, which showed peak abundance at MS-10 (2,025 Nos/m^3) and MS-9 (1,458 Nos/m^3). Other notable copepod species included *Oithona similis* and *Euterpina acutifrons*, which were widespread across the stations.

Among decapods, *Lucifer hanseni* was prominent, particularly at MS-6 (313 Nos/m^3) and MS-10 (278 Nos/m^3). Hydrozoans and oligotrich ciliates, such as *Diphyes sp.* and *Tintinnopsis mortenseni*, were recorded in moderate numbers. Additionally, bivalve veligers were most abundant at MS-6 (365 Nos/m^3), while polychaete larvae were distributed across most stations.

Rotifers (*Brachionus* sp.) and foraminifers (*Globigernia* sp.) were present in some regions, though their numbers were relatively low. The absence of sampling data in intertidal regions (MS-ITL stations) is due to the infeasibility of plankton collection in these areas. Overall, zooplankton diversity and abundance were highest at offshore stations, indicating favourable conditions for their proliferation, while creek stations showed lower densities.

Data for intertidal regions (MS-ITL stations) is unavailable as no sampling was carried out in these areas due to the inability to conduct plankton sampling in these regions.

Table: Zooplankton numerical abundance observed along the different locations except intertidal regions

Zooplankton (Nos/m3)	MS-1 Creek	MS-3 Creek	MS-4 Creek	MS-6	MS-7	MS-8	ST-9	ST-10	MS-11	MS-12
Calanoid Copepods										
Acartia danae	0	0	0	226	208	170	220	225	247	200
A. spinicauda	0	0	0	182	191		203	208	253	183
Acrocalanus gibber	0		0	174	156	178	228	233	207	208
A. gracilis	0	0	0	0	182	145	195	200	245	175
Labidocera pavo	0	0	0	122	252	0	0	267	223	242
Nannocalanus minor	252	191	208	356	443	325	475	558	583	550
Paracalanus parvus	356	252	330	547	1380	1925	1458	2025	1683	1458
Pseudodiaptomus aurivilli	0	0	0	0	156	0	187	192	237	167
Temora stylifera	0	0	0	217	217	0	228	233	208	208
Cyclopoid copepods										0
Corycaeus danae	165	0	200	174	191	153	203	208	253	183
C. catus	130	217	0	252	217	120	170	175	220	150
Oithona brevicornis	0	182	0	226	182	145	195	200	245	175
O. rigida	0	0	0	200	252	173	262	267	282	242
O. similis	226	130	339	252	477	258	478	483	283	217
Oncaea sp.	148	0	226	373	191	153	203	208	253	183
Harpacticoid copepods										0
Euterpina acutifrons	286	156	156	269	191	270	320	325	242	275
Longipedia sp.	0	252	0	252	200	0	0	233	225	192
Microsetella rosea	0	260	217	339	182	145	195	200	245	175
Macrosetella sp.	87	0	200	252	252	212	262	267	312	242
Decapoda										0
Lucifer hanseni	0	0	0	313	295	178	228	233	278	208
Hydrozoa										0
Diphyes sp.	0	0	0	234	165	0	178	183	228	158
Oligotrichea										0
Favella brevis	0	0	0	0	191	153	203	208	253	183
Tintinnopsis mortenseni	0	165	174	217	182	145	195	200	245	175
Other Crustacean forms										0
Crab Zoea	95	113	130	95	191	138	188	200	238	167
Copepod nauplii	304	234	313	286	191	153	203	208	253	183
Molluscs										0
Bivalve veliger	122	191	234	365	217	178	228	233	278	208
Gastropod veliger	139	252	208	304	165	128	178	183	228	158
Rotifera										0
Brachionus sp.	148	200	0	0	191	153	203	208	253	183
B. rubens	165	113	0	0	217	178	228	233	175	183
Foraminifera										0
Globigernia sp.	0	0	0	252	252	0	170	175	220	150
G. bulloides	0	0	0	165	191	153	203	208	253	183
G. opima	0	0	0	252	191	115	165	175	198	150
Annelids										0
Polychaete larvae	43	78	78	130	217	178	228	233	278	208

Branchiopoda										0
Evadne spinifera	0	113	200	208	191	153	203	208	253	183
Chaetognatha										0
Sagitta sp	0	0	0	0	165	128	178	183	228	158
Appendicularia										0
Oikopleura dioica	0	0	0	0	191	153	203	208	253	183
TOTAL	**2665**	**3099**	**3212**	**7231**	**8924**	**6662**	**8870**	**10192**	**10563**	**8450**

Zooplankton are crucial components of aquatic ecosystems, serving as primary consumers and linking primary producers to higher trophic levels. The given data highlights the percentage composition of various zooplankton groups.

Copepods are the most dominant group, with Calanoid copepods (34%) forming the largest fraction, followed by Cyclopoid copepods (17%) and Harpacticoid copepods (11%). Their abundance indicates a healthy food web, as they are key prey for many fish species. Other notable groups include Molluscs (6%), Foraminifera (5%), and Other Crustacean forms (6%), which contribute to biodiversity and ecosystem functioning. Rotifera (4%), Oligotrichea (4%), and Decapoda (2%) also play significant roles in nutrient cycling and food web dynamics. Smaller fractions include Hydrozoa (2%), Annelids (2%), Branchiopoda (2%), Chaetognatha (1%), and Appendicularia (2%), all of which contribute to ecosystem stability and energy transfer.

The diverse composition of zooplankton groups suggests a balanced aquatic environment, supporting a wide range of marine and freshwater organisms. Their population dynamics can serve as bioindicators of water quality and environmental changes. Percentage Composition of Macrobenthos.

The zooplankton biomass varied across the stations, with the highest values observed in coastal stations (22.18–25.92), indicating higher productivity. Creek stations exhibited a wider range (14.76–24.34), suggesting variable environmental conditions. ITL stations had moderate biomass levels (12.7–21.34), reflecting their transitional nature between creek and open coastal environments.

Bacterial Abundance in Water Samples

Table: The pathogenic load in water (Fecal coliforms; *E. coli*; Total coliform, *vibrio*)

Stations	Total coliforms	Fecal coliforms	*E. coli*	*Vibrio*
	Water CFU/ml			
MS 1 (creek)	4560	350	90	18
MS(ITL) 2	5820	1500	75	15
MS 3 (creek)	4840	130	85	20
MS 4 (creek)	4950	240	80	80
MS (ITL)5	2800	1700	102	13
MS 6	3440	1200	60	11
MS 7	2880	1500	50	9
MS 8	5840	1600	35	9
MS 9	4080	800	28	5
MS 10	2280	830	25	1
MS 11	2240	960	15	2
MS 12	1120	680	20	0
MS (ITL)13	3360	1100	95	12

The analysis of pathogens in water samples revealed that total coliform levels ranged from 1120 to 5820 CFU/ml, indicating varying degrees of microbial presence across the stations. Fecal coliform levels were observed between 130 and 1,700 CFU/ml, reflecting potential contamination from fecal sources. The presence of E. coli was recorded within a range of 15 to 102 CFU/ml, suggesting different levels of bacterial activity in the sampled areas. Additionally, Vibrio levels varied between 0 and 80 CFU/ml, with some stations showing no detectable presence, while others exhibited minimal to moderate concentrations of the bacteria.

2. Marine Sediments

2.1. Physical parameters

Soil texture

Soil Texture Composition (Clay, Silt, and Sand) Across Sampling Stations

The soil texture analysis showed clay content ranging from 0% to 98%, silt from 2% to 99%, and sand from 0% to 31%. MS 10 had the highest clay (98%), while MS (ITL) 13 had the most sand (31%). Silt was dominant in most stations, peaking at 99% (MS 1, MS 11). Several stations had no clay or sand, highlighting varying sediment deposition patterns.

Table: Total Organic Carbon (TOC), nitrogen, phosphorus, potassium, and sodium levels in marine sediments of different sampling locations

Stations	TOC mg/g	Nitrogen mg/g	Phosphorus mg/g	Potassium mg/g	Sodium mg/g
MS 1 (creek)	21.81	2.65	1.22	7.2	10.25
MS(ITL) 2	17.52	3.65	0.95	19.14	32.54
MS 3 (creek)	29.45	3.05	1.15	15.95	13.94
MS 4 (creek)	25.78	2.6	0.88	4.61	28.64
MS (ITL)5	19.24	2.85	0.84	22.11	35.42
MS 6	14.8	3.65	0.82	18.85	38.83
MS 7	15.53	1.74	0.75	23.75	40.52
MS 8	17.25	1.53	0.68	20.14	39.72
MS 9	13.54	1.14	0.78	16.48	40.25
MS 10	13.75	8.1	1.26	0.72	42.85
MS 11	12.42	1.14	0.54	23.54	43.64
MS 12	11.48	0.75	0.51	15.45	45.87
MS (ITL)13	18.56	2.4	0.98	18.68	30.78

The comparison of Total Organic Carbon (TOC), nitrogen, phosphorus, potassium, and sodium levels among creek, coastal, and intertidal (ITL) stations reveals distinct differences in sediment composition.

TOC Levels: Creek stations exhibited the highest TOC values, with a range of 21.81–29.45 mg/g, indicating higher organic matter deposition. Coastal stations had relatively lower TOC levels (11.48–17.25 mg/g), while ITL stations showed moderate values (17.52–19.24 mg/g). Nitrogen Content: Creek sediments contained slightly higher nitrogen levels (2.6–3.05 mg/g) compared to coastal stations (0.75–0.59 mg/g). ITL stations had moderate nitrogen concentrations (0.65–0.83 mg/g). Phosphorus: Phosphorus levels were low across all stations, with creek values ranging from 0.00042–0.0043 mg/g, coastal stations from 0.00028–0.00041 mg/g, and ITL stations from 0.00025–0.00059 mg/g. Potassium: Coastal stations had the highest potassium content (14.07–18.95 mg/g), while creek stations showed lower values (3.36–3.65 mg/g). ITL stations recorded the widest range (2.4–3.65 mg/g). Sodium: Sodium levels were highest in ITL stations (30.78–35.42 mg/g), followed by coastal stations (38.83–45.87 mg/g), while creek stations had the lowest levels (10.25–28.64 mg/g).

Overall, creek stations showed higher TOC and nitrogen levels, suggesting higher organic matter accumulation, while coastal and ITL stations exhibited greater mineral content, particularly in sodium and potassium.

Sediment Biological parameters

THB in marine sediments

The highest value was recorded at MS (ITL) 13 (195,000), while the lowest was at MS 12 (87,000). Creek stations showed moderate variability (106,000–152,000), while ITL stations exhibited a broader range (120,000–195,000). Coastal stations had relatively lower counts (87,000–124,000), indicating possible environmental influences on microbial abundance.

Table: The pathogenic load in sediments (Fecal coliforms; *E.coli*; Total coliform, *vibrio)*

Stations	THB	Total coliforms	Fecal coliforms	*E. coli*	*Vibrio*
MS 1 (creek)	57000	21000	1700	145	480
MS(ITL) 2	16000	14000	8000	140	190
MS 3 (creek)	88000	12000	1900	135	460
MS 4 (creek)	78000	19000	1550	139	380
MS (ITL)5	35000	10000	2500	138	250
MS 6	43000	9000	2500	160	140
MS 7	36000	7700	1400	150	180
MS 8	73000	4200	3600	160	190
MS 9	51000	3700	1200	150	180
MS 10	16000	3500	1400	140	160
MS 11	28000	2600	1500	140	180
MS 12	14000	2200	1100	130	140
MS (ITL)13	42000	12300	3500	180	350

The total coliform levels in sediments ranged from 2200 to 21000 CFU/g, with the highest at MS 1 (creek) and the lowest at MS 12. Fecal coliforms varied between 1,100 and 8,000 CFU/g, with the highest recorded at MS (ITL) 2. *E. coli* concentrations ranged from 130 to 180 CFU/g, while *Vibrio* levels were between 140 and 480 CFU/g, with MS 1 (creek) showing the highest presence. These variations highlight potential pollution sources and environmental influences across different sediment sampling stations.

Benthic organisms

Table: Distribution and Abundance of Macrobenthos in Sediment Samples of different locations

S. No	Species Name	MACRO BENTHOS (Nos/m^2)						
	Polychaetes	**MS-1 Creek**	**MS-2 ITL 2**	**MS-3 Creek**	**MS-4 Creek**	**MS-5 ITL 5**	**MS-6**	**MS-7**
1	*Capitella capitata*	0	50	0	0	50	0	0
2	*Euclymene annandalei*	75	0	50	0	0	0	0
3	*Eunice tubifex*	50	0	50	0	25	0	0
4	*Glycera alba*	75	50	50	50	0	25	75
5	*Goniada emerita*	75	0	0	50	0	0	75
6	*Lumbriconereis heteropoda*	50	0	50	0	0	0	50
7	*Nephtys polybranchia*	50	50	25	75	0	50	0
8	*Nereis capensis*	0	0	0	50	0	0	0
9	*Nereis diversicolor*	75	0	0	25	0	0	75
10	*Onuphis erumita*	0	25	0	0	50	0	0
11	*Paraprionospio pinnata*	75	0	75	0	50	0	0
12	*Pereneries cultrifera*	0	50	0	50	0	0	75
13	*Phyllodoce malmgreni*	0	75	75	0	0	0	50
14	*Platynereis* sp.	50	0	50	0	0	50	0
15	*Pista* sp.	0	0	0	0	50	0	0
16	*Scololepis squamata*	75	0	50	0	75	0	25
	Gastropods	0	0	0	0	0	0	0
17	*Turitella duplicata*	0	0	0	0	0	0	0
18	*Babylonia spirata*	0	0	0	0	0	0	0
	Bivalves	0	0	0	0	0	0	0
19	*Anadara inequalis*	0	50	0	0	0	50	0
20	*Meretrix meretrix*	75	0	75	0	75	0	0
	Amphipods	0	0	0	0	0	0	0
21	*Gammarus locusta*	150	200	200	150	950	0	0
22	*Urothoe* sp.	50	0	0	150	275	0	75
23	*Pontharoinia* sp.	0	100	200	100	0	300	100
24	*Caprella mutica*	300	200	50	0	325	0	75
25	*Phoxocephalus holbolli*	100	100	0	200	450	0	100
26	**Isopods**	0	0	0	0	0	0	0
27	*Anthura gracilis*	0	50	0	50	50	0	50
	Others	0	0	0	0	0	0	0
28	*Balanus amphitrite*	0	0	50	0	0	0	0

29	*Lepas* sp.	0	0	25	0	0	0	0
30	Mysis Larva	0	25	0	0	150	0	0
		1325	**1025**	**1075**	**950**	**2575**	**475**	**825**

S.No	Polychaetes	MS-8	MS-9	MS-10	MS-11	MS-12	MS-13 ITL13
1	*Capitella capitata*	75	0	0	0	0	0
2	*Euclymene annandalei*	0	0	0	25	50	0
3	*Eunice tubifex*	0	25	50	50	0	50
4	*Glycera alba*	0	0	0	0	0	0
5	*Goniada emerita*	0	0	0	50	0	0
6	*Lumbriconereis heteropoda*	50	0	50	25	50	0
7	*Nephtys polybranchia*	0	75	0	50	50	75
8	*Nereis capensis*	0	0	75	0	0	75
9	*Nereis diversicolor*	75	75	0	0	0	0
10	*Onuphis erumita*	0	50	0	0	0	0
11	*Paraprionospio pinnata*	100	0	50	50	0	25
12	*Pereneries cultrifera*	0	0	75	0	0	0
13	*Phyllodoce malmgreni*	0	0	0	0	0	0
14	*Platynereis* sp.	0	0	0	0	0	0
15	*Pista* sp.	0	0	0	0	0	0
16	*Scololepis squamata*	75	25	0	25	50	0
	Gastropods	0	0	0	0	0	0
17	*Turitella duplicata*	0	0	0	0	0	50
18	*Babylonia spirata*	0	25	0	0	0	0
	Bivalves	0	0	0	0	0	0
19	*Anadara inequalis*	0	50	0	0	0	50
20	*Meretrix meretrix*	100	0	0	50	50	0
	Amphipods	0	0	0	0	0	0
21	*Gammarus locusta*	75	50	50	100	75	100
22	*Urothoe* sp.	0	0	0	0	0	0
23	*Pontharoinia* sp.	0	150	125	0	50	50
24	*Caprella mutica*	0	50	50	50	0	50
25	*Phoxocephalus holbolli*	0	0	0	0	50	75
26	**Isopods**	0	0	0	0	0	0
27	*Anthura gracilis*	0	0	0	0	0	0
	Others	0	0	0	0	0	0
28	*Balanus amphitrite*	0	0	0	0	0	0
29	*Lepas* sp.	0	0	0	0	0	0
30	Mysis Larva	0	0	0	0	0	0
		550	**575**	**525**	**475**	**425**	**600**

Macro-Benthos

Quantitative and qualitative analysis of macrobenthos in this study reveals that whole among the 13 stations the maximum density showed at station 5 with 2575 Nos/m^2 while the minimum density showed at station 12 with 425Nos/m^2. Amphipods occupied the dominant group followed by Polychaetes. *Gammarus locusta* the dominant species among the Amphipod group.

Table: Distribution and Abundance of Miobenthos in Sediment Samples of different locations

S.No	Species Name	MEIOBENTHOS Nos/10 cm2						
		MS-1 Creek	MS-2 ITL 2	MS-3 Creek	MS-4 Creek	MS-5 ITL 5	MS-6	MS-7
	Nematodes	0	0	0	0	0	0	1
1	*Astomonema* sp.	2	4	5	0	2	2	2
2	*Daptonema conicum*	12	18	22	8	14	12	8
3	*Desmodora* sp.	2	3	6	1	3	0	4
4	*Desmoscolex falcatus*	0	1	1	0	4	2	0
5	*Dracoma* sp.	2	2	3	0	3	0	2
6	*Greeffiella* sp.	0	2	0	0		2	3
7	*Halalaimus film*	10	6	5	10	12	6	8
8	*Oncholaimus* sp.	8	5	7	3	0	0	6
9	*Oxystomina* sp.	1	2	0	1	0	2	0
10	*Pandolaimus* sp.	10	13	18	12	18	12	12
11	*Polygastrophora septembulba*	6	10	12	3	22	6	10
12	*Theristus* sp.	8	15	13	5	24	14	8
13	*Tricoma* sp.	3	0	1	0	2	0	2
14	*Viscosia* sp.	5	2	0	6	20	8	4
	Foraminiferans							
15	*Adelosina laevigata*	0	2	3	0	1	0	2
16	*Ammobaculites exiguous*	11	6	3	0	3	2	2
17	*Ammonia beccarii*	52	64	58	12	22	14	12
18	*Amphisorus* sp.	3	5	2	5	20	6	8
19	*Ammonia dentata*	4	8	6	0	2	0	2
20	*Asterorotalia trispinosa*	68	56	62	24	32	12	12
21	*Cibicides lobatulus*	6	13	14	16	12	6	14
22	*Globigerinoides glutinata*	6	12	8	8	26	4	8
23	*Elphidium advena*	32	30	41	12	36	0	4
24	*Elphidium macellum*	12	8	22		13	2	3
25	*Elphidium norvangi*	8	12	18	3	0	2	2

26	*Lagena striata*	4	8	11	0	6	4	12
27	*Planorbulinella larvata*	42	36	32	22	24	12	16
28	*Nonionella labradorica*	36	42	44	20	16	8	12
29	*Quinqueloculina agglutinans*	48	58	53	10	18	6	8
30	*Rosalina bradyi*	16	8	7	0	4	2	2
31	*Spiroloculina communis*	8	3	7	0	3	0	4
32	*Spirillina limbata.*	5	2	0	2	0	2	
33	*Textularia agglutinans*	13	11	8	18	12	2	6
34	*Triloculina striatitrigonula*	5	0	3	14	3	0	2
35	*Triloculina trigonula*	0	1	0	1	0	2	0
36	*Trochammina globige riniformis*	2	0	1	1	0	2	3
	Ostrocodes							
37	*Keijella oertlii*	6	5	2	2	4	2	4
38	*Leptocythere* sp.	3	1	0	0	0	1	0
39	*Tanella estuarii*	0	3	4	0	6	0	4
40	*Tanella kingmaii*	5	5	2	4	0	1	2
41	*Cyprideis* sp.	2	6	2	2	6	0	2
	Tanaidacea							
42	*Pogurapseudes largoensis*	0	1	1	0	2	1	1
43	*Apseudes setosus*	2	0	0	0	0	2	2
44	**Fish Eggs**	64	82	88	36	22	18	12
45	**Polychaete Larvae**	0	0	2	0	0	2	2
46	**Bivalve Veliger**	3	0	0	4	0	6	4
	Total	**535**	**571**	**597**	**265**	**417**	**187**	**237**

	Species name	**MEIOBENTHOS Nos/10 cm2**					
S.No		**MS-8**	**MS-9**	**MS-10**	**MS-11**	**MS-12**	**MS-13 ITL13**
	Nematodes	0	3	1	2	0	0
1	*Astomonema* sp.	6	0	0	2	1	2
2	*Daptonema conicum*	23	18	16	34	12	0
3	*Desmodora* sp.	12	3	0	14	6	0
4	*Desmoscolex falcatus*	5	4	2	6	2	0
5	*Dracoma* sp.	2	0	2	2	0	0
6	*Greeffiella* sp.	1	2	0	0	2	0
7	*Halalaimus film*	14	22	20	32	13	6
8	*Oncholaimus* sp.	4	20	18	12	11	3
9	*Oxystomina* sp.	0	2	1	5	4	0
10	*Pandolaimus* sp.	16	18	14	18	12	12

11	*Polygastrophora septembulba*	12	6	3	12	8	6
12	*Theristus* sp.	8	12	10	24	6	12
13	*Tricoma* sp.	0	4	0	8	2	0
14	*Viscosia* sp.	8	14	12	14	12	6
	Foraminiferans						
15	*Adelosina laevigata*	0	2	1	3	0	0
16	*Ammobaculites exiguous*	3	1	3	6	2	
17	*Ammonia beccarii*	16	24	28	62	16	10
18	*Amphisorus* sp.	10	16	18	34	12	2
19	*Ammonia dentata*	6	8	4	26	6	3
20	*Asterorotalia trispinosa*	24	26	20	72	22	8
21	*Cibicides lobatulus*	12	20	28	34	12	12
22	*Globigerinoides glutinata*	10	24	16	24	8	3
23	*Elphidium advena*	16	6	3	28	4	0
24	*Elphidium macellum*	4	4	2	20	0	0
25	*Elphidium norvangi*	0	2	0	12	0	0
26	*Lagena striata*	6	2	1	12	2	0
27	*Planorbulinella larvata*	14	11	16	34	8	6
28	*Nonionella labradorica*	18	14	12	36	4	8
29	*Quinqueloculina agglutinans*	12	8	8	42	8	4
30	*Rosalina bradyi*	4	0	1	13	2	6
31	*Spiroloculina communis*	0	0	2	0	1	0
32	*Spirillina limbata.*	3	0	1	0	1	4
33	*Textularia agglutinans*	8	6	8	16	6	6
34	*Triloculina striatitrigonula*	0	4	0	6	0	0
35	*Triloculina trigonula*	3	0	1	4	0	5
36	*Trochammina globigeriniformis*	0	3	2	2	1	0
	Ostrocodes						
37	*Keijella oertlii*	6	4	3	16	2	6
38	*Leptocythere* sp.	3	6	4	12	0	4
39	*Tanella estuarii*	7	0	2	22	4	2
40	*Tanella kingmaii*	5	2	1	16	2	3
41	*Cyprideis* sp.	6	4	6	12	2	2
	Tanaidacea						
42	*Pogurapseudes largoensis*	0	0	0	2	0	1
43	*Apseudes setosus*	1	1	2	4	0	0
44	**Fish Eggs**	26	46	28	56	12	16

45	**Polychaete Larvae**	3	0	2	0	1	0
46	**Bivalve Veliger**	6	0	3	0	0	0
	Total	**343**	**372**	**325**	**811**	**229**	**158**

Meio-Benthos

In the meiobenthos, the population density maximum was showed at station 11 with 811 Nos/10 cm^2 and the minimum density was showed at station 12 with 158 Nos/10 cm^2. Fish eggs, Nematodes, Foraminiferans and Ostracods were highly diversified all the samples. Among these Fish eggs was occupied most dominant in all the stations followed by the Foraminiferans species such as *Ammonia beccarii, Asterorotalia trispinosa* were showed the dominant species.

Macrobenthic organisms play a crucial role in maintaining sediment structure, nutrient cycling, and overall ecosystem health. The given data presents the percentage composition of various macrobenthic groups.

Polychaetes dominate the macrobenthic community, accounting for 55.17%, indicating their significance in benthic ecosystems as sediment dwellers and detritus feeders. Amphipods contribute 17.24%, playing a key role in decomposition and serving as prey for higher trophic levels. Gastropods (6.90%) and Bivalves (6.90%) represent molluscan groups that influence sediment stability and nutrient cycling. Isopods (3.45%) are less abundant but contribute to organic matter breakdown. Other groups (10.34%) add to the overall diversity and resilience of the benthic community. The dominance of polychaetes suggests a well-oxygenated and productive benthic environment, while the presence of diverse taxa reflects a balanced and functional ecosystem.

Meiobenthic organisms are small, sediment-dwelling fauna that play a vital role in nutrient cycling, sediment stability, and the aquatic food web. The given data highlights the percentage composition of different meiobenthic groups.

Foraminiferans dominate the community at 47.83%, indicating their importance in organic matter decomposition and as bioindicators of environmental conditions. Nematodes (30.43%) are also highly abundant, contributing to sediment bioturbation and nutrient recycling.

Ostracods (10.87%) are crustaceans that influence sediment structure, while Tanaidacea (4.35%) play a role in detritus processing. The presence of fish eggs (2.17%), polychaete larvae (2.17%), and bivalve veligers (2.17%) suggests an active reproductive ecosystem, supporting biodiversity and larval dispersal.

Overall, the composition of meiobenthic organisms reflects a dynamic and functional benthic habitat, essential for maintaining ecosystem stability and productivity.

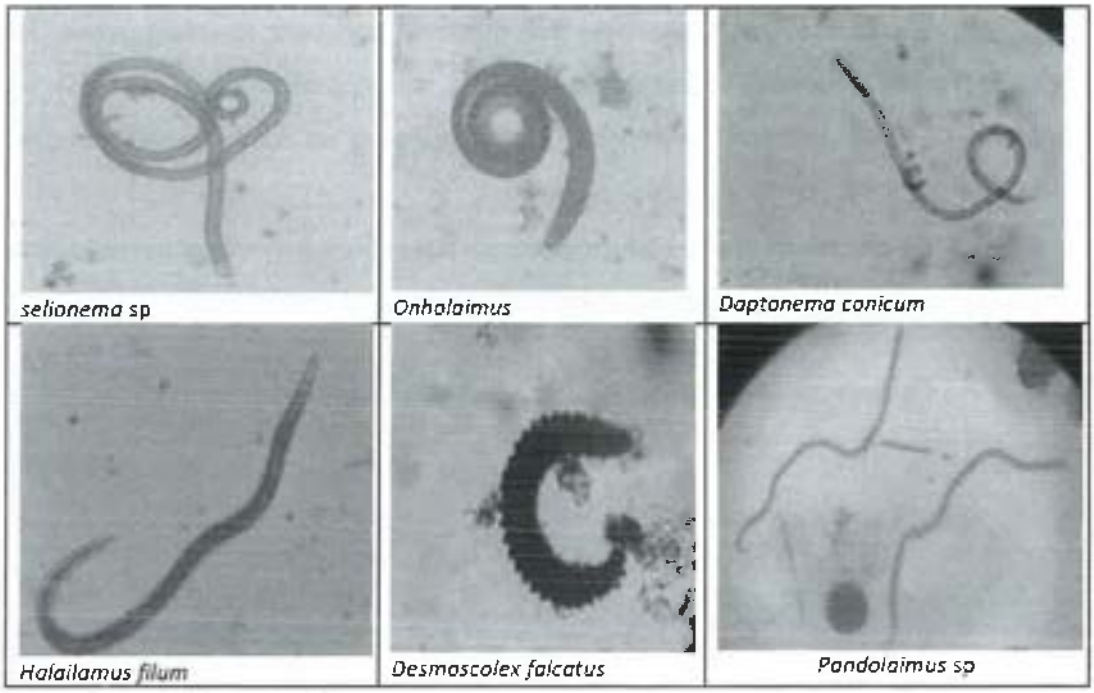


Figure: Benthos(Nematodes)

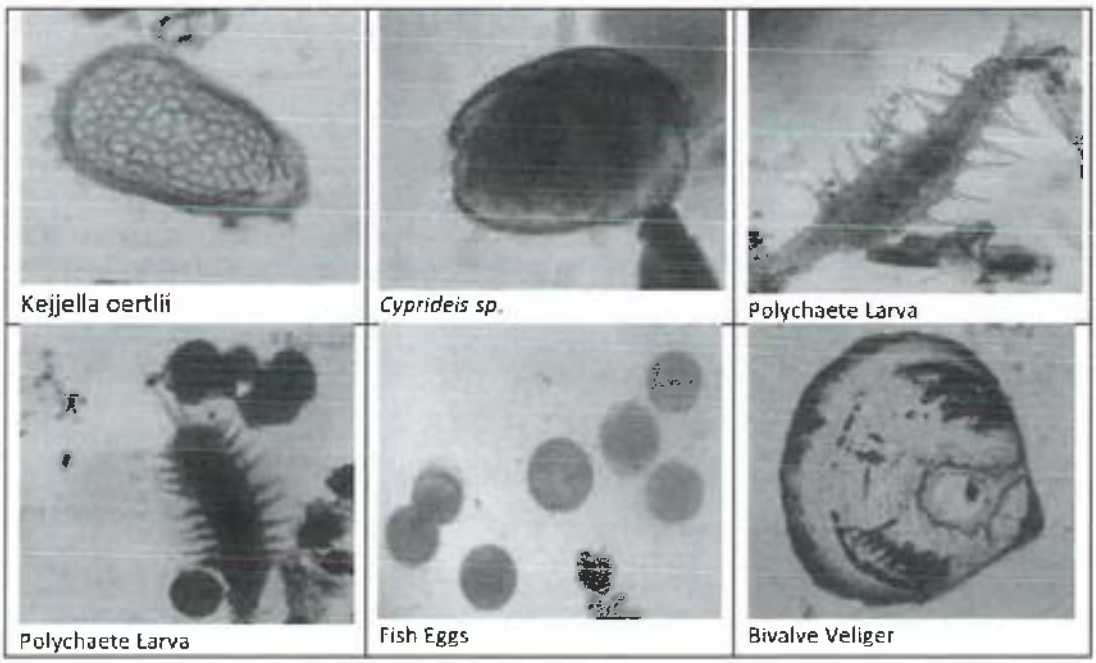


Figure: Meio Benthos (Ostracods and others)

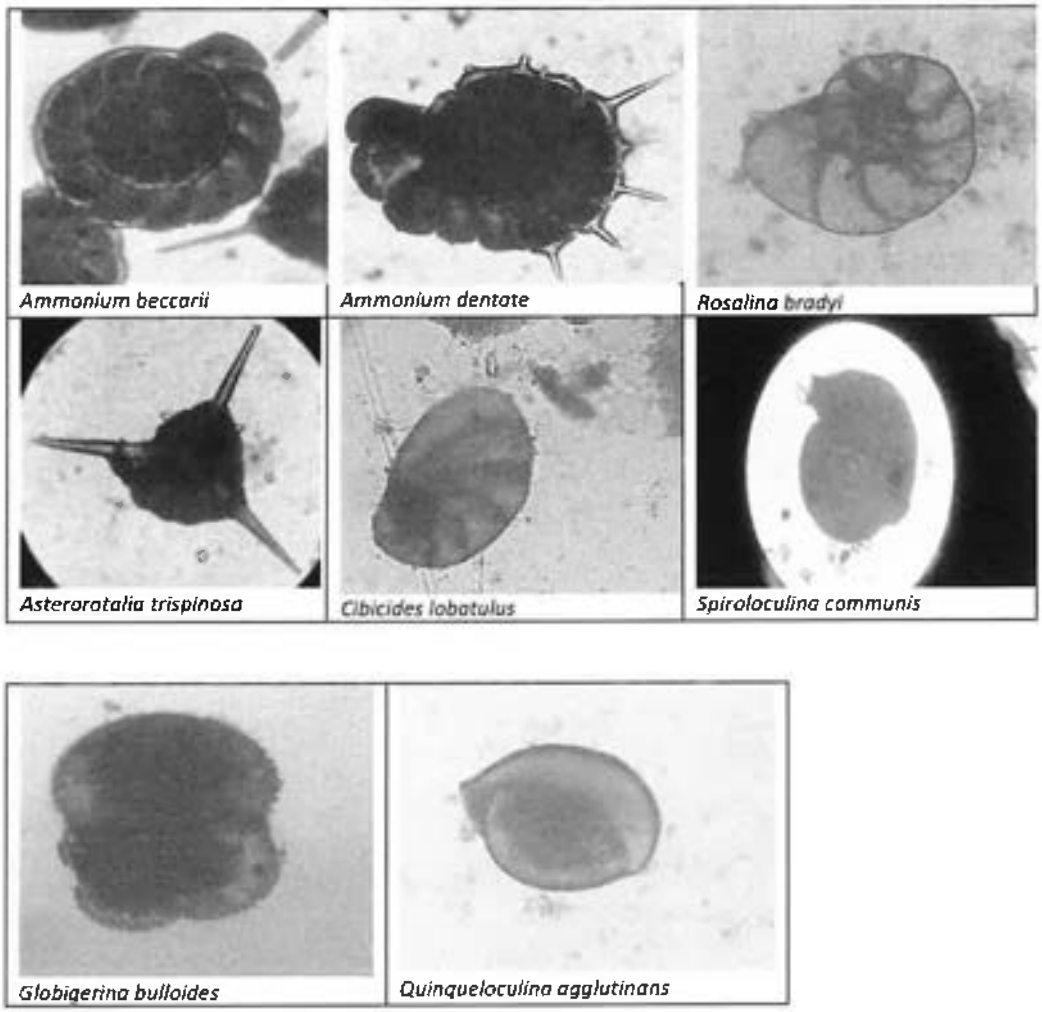


Figure: Meio Benthos (Foraminiferans)

Title: Heavy Metal Concentrations in Sediment Samples Across Different Stations

Stations	Lead	Cadmium	Copper	Zinc	Iron	Mercury
	Concentrations (µg/g)					
MS 1 (creek)	21.81	2.13	16.40	43.59	8291	BDL
MS(ITL) 2	20.09	0.69	11.34	39.3008	11437.43	BDL
MS 3 (creek)	28.512	1.21	14.2484	35.8672	7564.66	BDL
MS 4 (creek)	20.412	1.02	13.7472	29.8584	8766.22	BDL
MS (ITL)5	15.336	0.89	14.6064	35.3336	10552.41	BDL
MS 6	20.412	0.75	10.2388	27.4688	6970.34	BDL
MS 7	12.684	0.66	8.8426	20.2304	6111.16	BDL
MS 8	11.632	0.7	8.9858	16.1704	5410.25	BDL
MS 9	10.524	0.57	8.4488	15.0568	5261.67	BDL
MS 10	8.856	0.52	7.7686	11.9248	5074.33	BDL
MS 11	6.048	0.5	7.0526	12.2496	4270.06	BDL
MS 12	5.292	0.45	6.0144	13.1544	4189.31	BDL

Stations	Lead	Cadmium	Copper	Zinc	Iron	Mercury
	Concentrations (µg/g)					
MS (ITL)13	22.356	1.28	14.3916	37.3752	7923.19	BDL

The concentrations of heavy metals in sediment samples varied across different stations. Lead levels ranged from 5.29 µg/g at MS 12 to 28.51 µg/g at MS 3 (creek), while cadmium concentrations were lowest at MS 12 (0.45 µg/g) and highest at MS 1 (creek) (2.13 µg/g). Copper content fluctuated between 6.01 µg/g (MS 12) and 16.39 µg/g (MS 1). Zinc concentrations were found to be highest at MS 1 (43.05 µg/g) and lowest at MS 10 (11.92 µg/g). Iron, the most abundant metal, ranged from 4,189.31 µg/g at MS 12 to 11,437.43 µg/g at MS(ITL) 2. Mercury levels remained consistently below detection limits (<0.01 µg/g) across all stations.

Post dredging

Marine Environmental Monitoring for AKPL- Marine Environmental Studies Post-dredging, Nellore District, Andhra Pradesh

Submitted

by

Dr. A. Sundaramanickam,
Associate Professor

ANNAMALAI UNIVERSITY
CENTRE OF ADVANCED STUDY IN MARINE BIOLOGY
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Post-Dredging Assessment

Introduction

In coastal and estuarine environments, dredging is a crucial engineering operation that supports land reclamation and other infrastructure projects, preserves or deepens navigation channels, and eases port development. Dredging can, however, result in significant short-term and long-term environmental disruptions despite its advantages for the economy and navigation. Increased turbidity, altered sediment properties, disturbed benthic habitats, discharge of pollutants trapped in sediments, and modifications to hydrodynamic regimes are a few of these. Therefore, to assess the degree of ecological disturbance and ascertain the potential for recovery of impacted ecosystems, a post-dredging Environmental Impact Assessment (EIA) is essential. With an emphasis on sensitive indicators like primary producers and benthic meiofauna, this assessment seeks to detect and measure changes in biological communities, sediment composition, and water quality. It also considers the mobilization of pollutants that could endanger human health and the environment, like hydrocarbons or heavy metals. The EIA identifies any residual impacts and long-term environmental monitoring, and assesses the efficacy of mitigation measures put in place during dredging by comparing baseline (pre-dredging) data with post-dredging observations. This thorough assessment offers crucial information for planning future dredging operations, sustainable coastal management, and regulatory compliance.

Study area

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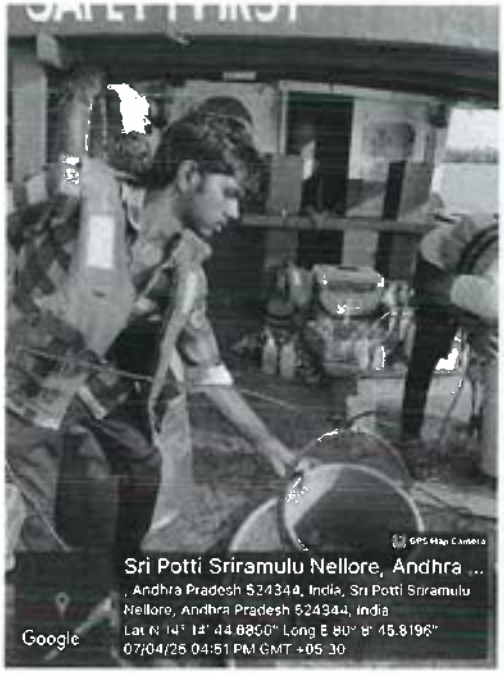
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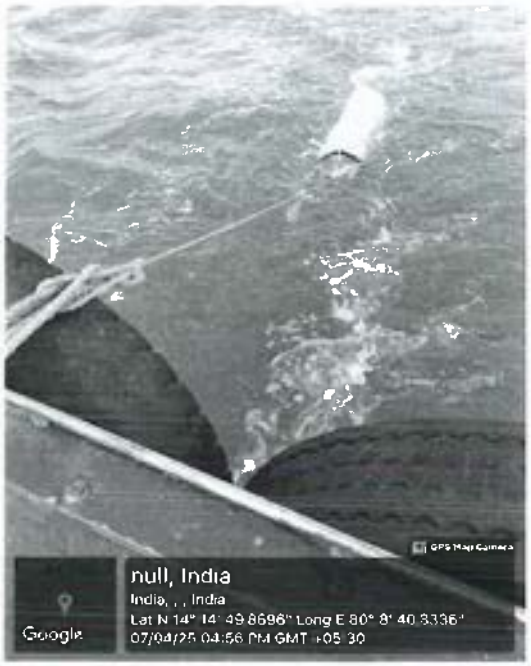
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Methods adopted for various analyses

The environmental monitoring was carried out concurrently during active dredging at specific sites within the harbor and adjacent stream areas in order to precisely evaluate the environmental impact of dredging activities. This survey allowed for the real-time tracking of changes in key metrics, such as physico-chemical parameters and biological organisms, which are immediately impacted by sediment resuspension and water column disruption during dredging operations.

Water and Sediment Samples

Water Analysis

Temperature, Salinity and pH

The physical parameters such as temperature, salinity and pH were measured *in-situ* in the field. The sub-surface temperature was measured with a mercury thermometer (±0.02°C accuracy) and the pH was measured by a calibrated pH pen (pH ep-3 model). Salinity was estimated using a Hand Refractometer (Atago, Japan). Water samples collected for dissolved oxygen estimation were transferred carefully to DO bottles. The DO was immediately fixed and brought to the shore for further analysis. TSS was measured using Millipore vacuum filtration unit and the values are expressed in ppm. Turbidity was measured using turbidity meter and expressed in NTU.

Preservation and Laboratory Analysis

After collection, the samples were immediately cooled to 4°C and then brought to the Lab, in an insulated thermocool box. On reaching the shore, water samples were filtered through Whattman GF/C filter paper and analysed for organic matter and other nutrients. Unfiltered samples were used for the estimation of total nitrogen and total phosphorus. All the analyses were carried out by adopting Standard procedures for samples of aquatic origin. The methodology for each analysis is briefly given below:

Dissolved Oxygen

The modified Winkler's method as described by Strickland and Parsons (1972) was adopted for the estimation of dissolved oxygen. The values are expressed in mg/l.

Sulphate

The sulphates content of samples were analysed by following the method described by APHA (1995).

Nitrate and Nitrite

The nitrate and nitrite content of samples were analysed by following the method described by Grasshoff et al. (1999). The nitrite was estimated from highly coloured azo dye formed by the addition of N (1-Napthyl) ethylene diaminedihydro-chloride and sulphanilamide into the solution which was then measured at 543 nm in a spectrophotometer. Same procedure was followed for the estimation of nitrate. For this, nitrate was reduced to nitrite by passing the sample through copper coated cadmium column. The calculated values were expressed as µmol of Nitrogen/l

Ammonia and Total nitrogen

Ammonia present in water reacts with sodium hypochlorite and phenol in alkaline condition to produce indophenol blue. Sodium nitroprusside is used as a catalyst and colour intensifier. The methodology described in Grasshoff *et al.* (1999) was followed for the determination of Ammonia and Total nitrogen. Organically bound nitrogen is oxidized to nitrate during alkaline persulphate digestion. The nitrate content of the sample is determined after reduction to nitrite. The calculated values are expressed in μmol of Nitrogen/l for both the parameters.

Inorganic Phosphate

The single solution mixed reagent procedure developed by Grasshoff *et al.* (1999) was followed for the estimation of dissolved inorganic phosphate levels in water samples. This involves the conversion of phosphate into phosphomolybdic acid, which was then reduced to molybdenum blue colour complexes and then the intensity of colour was measured at 882 nm in a spectrophotometer. The calculated values are expressed in µmol of Phosphate/L.

Total Phosphorus

The Total Phosphorus in water samples was estimated by adopting the method described by Grasshoff *et al.* (1999). This procedure involves the conversion of organically bound phosphate into inorganic phosphate by wet oxidation of samples with potassium persulphate in an autoclave for 30 min at 15 lbs pressure. The converted inorganic phosphate was then estimated by using the method described by Murphy and Riley (1962). The subtraction of original dissolved inorganic phosphate from total phosphate yielded the organic phosphate in the water sample. The calculated value is expressed in µmol of Phosphorus/L.

Reactive Silicate

The reactive silicate content of water was estimated by following the method of Grasshoff *et al.* (1999). In this method, the intensity of blue colour formed by silico-molybdate

complex was measured at 810 nm in a spectrophotometer and the calculated values are expressed in µmol of Silica/l.

Sediment Analysis

For the analysis of soil textural composition and pH, the air-dried sediment samples were used as such. For all other analyses, sediment samples were ground to fine powder and dried in an oven at 110°C to constant weight for an hour and the parameters such as soil texture, Toc, PHC, Heavy metals were analysed using the sediment samples.

Total Organic Carbon:

The estimation of total organic carbon in sediment was performed by adopting the method of El Wakeel and Riley (1956). The procedure involves chromic acid digestion and subsequent titration against ferrous ammonium sulphate solution in the presence of 1-10 ferrous phenonthroline indicator. The values calculated are expressed in mgC/g of sediment.

Chlorophyll `a' & Phaeo-pigments

The detailed methodology as described in APHA manual (1989) was followed for estimating Chlorophyll'a' and phaeo-pigments content. The samples were filtered through Whattman GF/C filter papers and the chlorophyll was extracted into 90% acetone. The resulting coloured acetone extract was measured in a spectrophotometer at different wave lengths and the same acetone extracts were acidified and measured for the Phaeo-pigments.

Phytoplankton

Phytoplankton samples were collected from the surface waters of the study area by towing a plankton net (mouth diameter 0.35 m) made of bolting silk [No.30 mesh size 48 µm) for half an hour. These samples were preserved in 5% neutralized formalin and used for qualitative analysis. For the quantitative analysis of phytoplankton, the settling method as described by Sukhanovo (1978) was adopted. Numerical plankton analysis was carried out using Utermohl's inverted plankton microscope.

Phytoplankton species was identified using the standard works of Hustedt (1930-1966), Venkataraman (1939), Cupp (1943), Subramanian (1946), Prescott (1954), Desikachary (1959 and 1987), Hendey (1964), Steidinger and Williams (1970) and Taylor (1976) and Anand *et al.* (1986).

Zooplankton:

Zooplankton samples were collected from the surface waters of the study area by horizontal towing of plankton net with mouth diameter of 0.35 m, made of bolting silk (No. 70 mesh size 200 µm) for half an hour. After collection, the samples were preserved in 5%

neutralized formalin and used for quantitative analysis. The zooplankton collected were identified to the species level using the classical works of Dakin and Colefax (1940), Davis (1955), Kasthurirangan (1963) and Wickstead (1965) and Damodara Naidu (1981). For the quantitative analysis of zooplankton, a known quantity of water (100 L) was filtered through a bag net (0.33 mm mesh size) and filtrate was made up to 1 litre in a wide mouthed bottle and then enumerated using Utermohl's inverted plankton microscope. The plankton density is expressed as number of organisms/m^3.

Benthic Community:

For studying the benthic organisms, sediment samples were collected using Van veen grab which covered an area of 0.1m^2. The wet sediment was sieved with varying mesh sizes (0.5mm -macrofauna and 0.062mm-meiofauna) for segregating the organisms. The organisms retained in the sieve were fixed in 5-7% formalin and stained further with Rose Bengal solution for easy spotting at the time of sorting. The number of organisms in each grab sample was expressed as number per meter square. All the species were sorted, enumerated and identified to the advanced taxonomic level possible with the consultation of available literature. The works of Fauvel (1953), Day (1967) were referred for polychaetes; Barnes (1980) and Lyla *et al.* (1999) for crustaceans; Subba Rao *et al.* (1991) and Ramakrishna (2003) for molluscs.

Results

1. Marine water quality

1.1. Physico-chemical parameters

The physico-chemical characteristics of the water column were assessed across multiple stations to understand the immediate environmental conditions following dredging activities. Key parameters such as salinity, temperature, and pH were measured at both surface and bottom layers where applicable. The observations provide insight into water column stability, mixing patterns, and potential ecological shifts in the dredged and adjacent areas. Variations across creek and intertidal stations reflect localized hydrodynamic responses and help evaluate the extent of physical disturbance and recovery trends in the study area.

Table: Water Quality Assessment – Temperature, Salinity, Dissolved Oxygen (DO), pH, Turbidity, Total Dissolved Solids (TDS), and Total Suspended Solids (TSS) at Different Monitoring Stations after dredging

Stations	Salinity PSU		Temp ° C		pH		Turbidity (NTU)	
	Surface	Bottom	Surface	Bottom	Surface	Bottom	Surface	Bottom
MS1(creek)	18.30	17.50	29.50	28.90	7.90	8	35	39
MS(ITL)2	32	-	31.2	-	8.22	-	39	-
MS3(Creek)	23	22	29.50	29.10	8.10	7.90	39	41
MS4(creek)	25	24	31.1	31	8.13	8.14	52	58
MS(ITL)5	32	-	31.2	-	8.21	-	44	-
MS6	32	32.5	32.2	31.9	8.22	8.25	26	36
MS7	31	31.5	30	29.8	8.26	8.25	30	34
MS8	30.5	31.5	32	31.8	8.27	8.29	29	31
MS9	32	32.5	32	31.8	8.25	8.28	31	24
MS10	31	31.5	31.5	31.2	8.23	8.25	9	14
MS11	32	32.5	32	31.8	8.24	8.27	8	15
MS12	30	31	32	31.7	8.21	8.25	6	12
MS(ITL)13	32	-	31.5	-	8.24	-	39	-

Salinity (PSU)

Post-dredging salinity across the stations ranged from 18.30 to 32.5 PSU, indicating typical estuarine and nearshore salinity gradients. Slightly higher salinity values were observed at

intertidal (ITL) stations and deeper bottom layers (e.g., MS6, MS9, and MS11), suggesting enhanced tidal exchange or saline water intrusion after dredging.

Creek stations such as MS1, MS3, and MS4 showed relatively stable salinity values, reflecting minimal freshwater input or dilution during the sampling period.

Temperature (°C):

The surface water temperature varied between 29.50°C and 32.2°C, while bottom temperatures were slightly lower, ranging from 28.90°C to 31.9°C, showing a minor thermal stratification. Creek stations (MS3 and MS7) displayed slightly cooler bottom waters, possibly due to sediment resuspension or deeper water mixing post-dredging. The overall thermal regime suggests moderate warming, likely influenced by shallow depths and seasonal climate conditions.

pH:

The pH values ranged from 7.90 to 8.29, indicating slightly alkaline conditions across all stations. Higher pH values (e.g., 8.25–8.29 at MS8 and MS9) may reflect good buffering capacity and possible primary productivity enhancement post-dredging. Slightly lower pH values were recorded in creek stations such as MS1 and MS3, which could be associated with localized organic matter breakdown or reduced flushing. No signs of acidification were evident, indicating stable chemical conditions despite recent disturbances.

Turbidity

The turbidity levels across the study stations varied considerably between surface and bottom waters, indicating localized sediment disturbances and hydrodynamic conditions. Surface turbidity ranged from 6 NTU (MS 12) to 52 NTU (MS4), while bottom turbidity peaked at 58 NTU (MS 4), suggesting significant resuspension of sediments in some creek stations. Intertidal locations (ITL 2, 5, 13) generally exhibited elevated surface turbidity, potentially due to wave action and tidal flushing. A marked turbidity gradient was observed from upstream (e.g., MS 1–6) to downstream stations (e.g., MSL 10–12), reflecting varying degrees of sediment input and water column stability post-dredging.

Table: Water Quality Assessment – TDS, TSS, DO, COD and BOD at Different Monitoring Stations during post- dredging

Stations	TDS mg/L		TSS		DO mg/l		COD mg/L		BOD	
	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS1	11900	12110	24	29	4.51	4.56	19.24	20.56	3.32	3.49
MS(ITL)2	29360	-	46.4	-	4.7	-	14.30	-	2.72	-
MS3(Creek)	12840	12960	22.5	28.6	4.66	5.1	17.28	21.56	3.67	3.7
MS4(creek)	14260	14580	23.6	29.6	4.8	4.40	23.21	24.56	3.16	3.37
MS(ITL)5	30500	-	42.6	-	4.9	-	12.6	-	2.28	-
MS6	23080	23100	31.5	34.5	5.02	4.58	13.45	14.57	2.2	2.38
MS7	24020	23300	38	39	5.1	5.02	12.68	12.93	2.8	2.94
MS8	29400	29600	27.5	29.5	5.04	4.82	15.42	16.17	2.48	2.7
MS9	30600	30800	25.5	26.8	5.04	4.98	10.14	11.82	2.56	2.54
MS10	31480	31050	36.8	38.9	4.68	4.87	10.52	10.51	3.04	2.41
MS11	30600	30800	21	23.5	4.7	4.28	8.41	8.24	2.18	2.14
MS12	30200	30600	22.6	24.9	4.8	4.68	7.44	7.4	1.56	1.89
MS(ITL)13	31280	-	42.8	-	5.6	-	16.52	-	2.24	-

Total Dissolved Solids (TDS)

The TDS concentrations across surface and bottom waters of the monitored stations range from 11,900 mg/L to 31,480 mg/L, indicating a high salinity environment typical of estuarine and coastal systems. Notably, MS10 exhibited the highest bottom TDS (31,050 mg/L), suggesting localized saltwater intrusion or reduced flushing. Stations like MS(ITL)5, MS9, MS10 and MS(ITL)13 also showed elevated TDS levels above 30,000 mg/L, particularly at the bottom layers, indicating salt stratification post-dredging. The slight increase in bottom TDS compared to surface values at most creek stations suggests vertical mixing was limited, and dredging may have caused resuspension of saline sediments or altered the hydrodynamic flow patterns. Continuous monitoring is recommended to observe long-term salinity trends and potential ecological impacts.

Total Suspended Solids (TSS)

The TSS concentrations across surface and bottom waters of the monitored stations range from 21 mg/L to 46.40 mg/L, indicating a high salinity environment typical of estuarine and coastal systems. Notably, MS10 exhibited the highest bottom TSS (38.90 mg/L), suggesting localized saltwater intrusion or reduced flushing. Stations like MS(ITL)5, MS6, MS7, MS10 and MS(ITL)13 also showed elevated TSS levels above 25 mg/L, particularly at the bottom layers, indicating salt stratification post-dredging. The slight increase in bottom TSS compared to surface values at most creek stations suggests vertical mixing was limited, and dredging may have caused resuspension of saline sediments or altered the hydrodynamic

flow patterns. Continuous monitoring is recommended to observe long-term salinity trends and potential ecological impacts.

Dissolved Oxygen (DO)

The dissolved Oxygen (DO) levels across the sampling stations ranged from 4.28 to 5.6 mg/L, indicating moderate to good oxygenation in the estuarine and ITL waters. Surface waters generally showed slightly higher DO than bottom waters, with stations MS6, MS7 and MS8 recording a noticeable drop at the bottom (~5.02 mg/L), possibly due to limited vertical mixing and organic matter decomposition post-dredging. MS3 and MS4 had the highest DO levels at both depths, suggesting better water circulation and aeration. In contrast, lower DO at ITL stations like MS(ITL)13 (5.6 mg/L surface) could indicate stagnant conditions or pollution influence. Overall, the DO levels remain within acceptable limits for aquatic life, but close monitoring is recommended, especially in bottom layers where oxygen depletion may occur.

Chemical Oxygen Demand (COD)

The COD values across the stations ranged from 7.44 to 24.56 mg/L, indicating varying levels of organic pollution in the estuarine and ITL waters. Elevated COD levels were observed at MS4 (23.21–24.56 mg/L) and MS1 (19.24–20.56 mg/L), suggesting high organic matter content, likely due to sediment disturbance or urban runoff following dredging. Creek stations such as MS4 and MS1 also showed moderately high COD values, indicating possible organic load accumulation in bottom layers. In contrast, stations MS10, MS11 and MS12 exhibited the lowest COD values (~10.51–7.40 mg/L), reflecting relatively cleaner conditions. The overall trend shows higher COD at the bottom compared to surface waters at most sites, pointing to settling of organic matter and reduced mixing. Continuous assessment is essential to monitor pollution levels and protect water quality.

Biological Oxygen Demand (BOD)

The BOD levels across surface and bottom waters ranged from 1.56 to 3.70 mg/L, reflecting moderate organic pollution in the estuarine and ITL systems. The highest BOD was recorded at MS(Creek)3 (3.70 mg/L surface) and MS1 (3.32–3.49 mg/L), indicating high biodegradable organic load, possibly due to anthropogenic discharges or disturbed sediments post-dredging. Stations like MS4 and MS10 also showed elevated BOD, supporting the possibility of increased microbial activity and oxygen demand. In contrast, MS11 and MS12

showed the lowest BOD values (~1.56–2.18 mg/L), suggesting better water quality and lower organic content. BOD was generally slightly higher at the bottom layers, highlighting the accumulation of organic matter and reduced oxygen availability. These findings underscore the need for ongoing monitoring and pollution control in areas with higher BOD.

Table: Water Quality Assessment –Ammonical Nitrogen, Nitrite, Nitrate, Total Nitrogen, Inorganic Phosphate, Total Phosphorus Levels at Different Monitoring Stations during Post-dredging

Stations	Ammonical N µmol/l		NITRITE µmol/l		NITRATE µmol/l		TN µmol/l		IP µmol/l		TP µmol/l	
	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS1(creek)	0.35	0.37	2.05	2.06	81000	86740	12.45	12.92	1.23	1.24	2.34	2.63
MS(ITL)2	0.51	-	1.3	-	14600	-	9.75	-	2.04	-	3.53	-
MS3(Creek)	0.41	0.47	2.22	2.24	87400	90400	7.54	7.81	1.15	1.18	1.41	1.59
MS4(creek)	0.36	0.37	2.10	2.20	84300	86400	4.96	4.96	1.48	1.97	0.93	1.04
MS(ITL)5	0.65	-	1.18	-	14700	-	5.82	-	1.11	-	1.1	-
MS6	0.39	0.44	1.24	1.25	14280	14350	6.15	4.56	1.42	1.74	3.97	4.46
MS7	0.33	0.36	1.22	1.32	13540	13800	4.58	5.4	1.38	1.48	3.66	4.15
MS8	0.39	0.42	1.24	1.26	12840	12970	5.62	6.68	1.4	1.34	3.22	3.62
MS9	0.3	0.33	1.42	1.53	14020	14084	4.28	4.6	1.86	1.89	1.41	1.59
MS10	0.4	0.45	1.34	1.31	14005	14070	7.24	8.23	1.37	1.41	1.19	1.34
MS11	0.4	0.44	1.26	1.28	14300	14520	4.08	4.08	0.98	1.52	2.12	2.38
MS12	0.38	0.42	1.48	1.59	12600	12700	3.62	4.57	1.51	1.34	1.94	2.18
MS(ITL)13	0.72	-	1.16	-	14700	-	10.52	-	1.53	-	1.5	-

Ammonical Nitrogen

Ammonical nitrogen concentrations across the study area ranged from 0.3 to 0.72 µmol/L, indicating low to moderate levels of nitrogenous pollution. The lowest values were observed at MS1 (0.35–0.37 µmol/L), suggesting minimal organic contamination and relatively unpolluted conditions. In contrast, MS3 (ITL) recorded the highest concentrations (0.41 µmol/L surface and 0.47 µmol/L bottom), likely due to sediment disturbance or organic matter decomposition post-dredging. Other stations such as MS10, MS11, and MS12 also exhibited relatively elevated ammonical nitrogen values, especially at the bottom, pointing to possible nutrient enrichment or localized anthropogenic input.

Nitrite

Nitrite concentrations ranged from 1.18 to 2.24 µmol/L, indicating low to moderate nitrogen cycling activity in the water column. The highest surface nitrite level was recorded at MS(creek)3 (2.22 µmol/L), which may suggest localized organic decomposition or incomplete nitrification, possibly triggered by dredging disturbances. MS1 (creek) also showed elevated nitrite levels at both depths (2.05–2.06 µmol/L), pointing to active microbial processing of nitrogen compounds.

Conversely, stations such as MS6, MS9 and MS7 recorded the lowest nitrite concentrations (1.22–1.32 µmol/L), indicating relatively less organic input or better nitrification efficiency. A general pattern of slightly higher nitrite levels at the bottom was observed, possibly due to settling of organic matter and microbial transformation in low-oxygen conditions.

Nitrate

The nitrate levels ranged from 1.52 to 3.97 µmol/L, reflecting moderate nutrient presence in the estuarine and ITL systems. The highest concentration was observed at MS1 (3.25 µmol/L surface, 3.97 µmol/L bottom), indicating potential nitrogen enrichment likely due to organic matter decomposition or agricultural runoff, intensified by dredging activity. Stations MS6 and MS8 also exhibited relatively high nitrate levels, particularly at the bottom, suggesting vertical accumulation of nutrients. In contrast, MS11 recorded the lowest values (1.52–1.86 µmol/L), indicating comparatively less nutrient loading in that area.

Across most stations, nitrate concentrations were higher at the bottom, pointing to sediment-associated nutrient release or reduced nitrification efficiency near the benthic layer. These findings highlight the need for ongoing nutrient monitoring to prevent eutrophication and ensure aquatic ecosystem balance post-dredging.

Total Nitrogen (TN)

The Total Nitrogen (TN) concentrations ranged from 3.62 to 12.92 µmol/L, indicating moderate nutrient presence across the estuarine and ITL regions. The highest TN level was recorded at MS1 (12.45 µmol/L surface, 12.92 µmol/L bottom), likely due to organic matter input or sediment disturbance caused by dredging. Other stations with relatively high TN values include MS(ITL)13 (10.52 µmol/L) and MS(ITL)2 (9.75 µmol/L), suggesting elevated

nutrient loading in ITL zones, potentially from urban or agricultural runoff. In contrast, stations MS11 and MS12 showed lowest TN levels (~4 µmol/L), indicating less nutrient influence. Most stations demonstrated slightly higher TN in the bottom layers, reflecting possible nutrient regeneration from sediments. However, MS6 showed an unusual drop at the bottom, possibly due to localized flushing or dilution effects. Overall, TN values suggest moderate nitrogen enrichment, and continued monitoring is advised to prevent potential eutrophication or algal bloom risks in susceptible zones.

Inorganic Phosphate (IP)

The Inorganic Phosphate ranged from 0.98 to 2.04 µmol/L, reflecting moderate nutrient presence in the estuarine and ITL systems. The highest concentration was observed at MS(ITL)2 (2.04 µmol/L), indicating potential Phosphate enrichment likely due to organic matter decomposition or agricultural runoff, intensified by dredging activity. Stations MS4 and MS9 and MS12 also exhibited relatively high Phosphate levels.

Total Phosphorus (TP)

The Total Phosphorus ranged from 0.93 to 4.46 µmol/L, reflecting moderate nutrient presence in the estuarine and ITL systems. The highest concentration was observed at MS6 (3.97 µmol/L surface, 4.46 µmol/L bottom), indicating potential total Phosphorus enrichment likely due to organic matter decomposition or agricultural runoff, intensified by dredging activity. Stations MS6 and MS8 also exhibited relatively high Phosphorus levels.

Table: Water Quality Assessment – Chlorides, Sodium, Silica, Reactive Silicate, Oil & Grease, and Sulphates Levels at Different Monitoring Stations during Post -dredging

Stations	Chlorides mg/l		Sodium mg/l		Silica		Reactive silicate µmol/l		Oil & Grease µg/l		Sulphate mg/l	
	Sur	Bot	Sur	Bot	Su	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS1(cre	810	867	810	867	9.1	9.3	5.8	6.35	0.954	0.784	231	235
MS(ITL	146	-	146	-	9.2	9.3	6.8	-	0.744	-	246	–
MS3(Cr	874	904	874	904	9.8	9.9	4.02	4.4	0.582	0.438	231	239
MS4(cre	843	864	843	864	9.7	9.9	4.7	5.15	0.648	0.372	239	243
MS(ITL	147	-	147	-	9.4	9.6	6.48	-	0.475	-	247	–
MS6	142	143	142	143	9.4	9.7	2.71	2.96	0.439	0.355	247	250
MS7	135	138	135	138	9.7	9.9	3.24	3.54	0.372	0.327	239	243

MS8	128	129	128	129	9.5	9.6	4.55	5.97	0.326	0.306	239	246
MS9	140	140	140	140	9.6	9.9	3.97	4.35	0.324	0.298	247	250
MS10	140	140	140	140	9.2	9.3	1.78	1.94	0.281	0.234	239	243
MS11	143	145	143	145	9.8	9.8	2.93	3.2	0.247	0.219	246	250
MS12	126	127	126	127	9.6	9.4	4.91	6.37	0.228	0.202	231	239
MS(ITL	147	-	147	-	9.2	-	8.52	-	0.754	-	246	–

Chlorides

The Chloride concentrations measured at surface and bottom waters across various stations show relatively high and consistent levels, ranging from 12,600 mg/l to 90,400 mg/l. The bottom water samples generally exhibit slightly higher chloride concentrations compared to surface samples, indicating minimal vertical variation but a tendency for chloride to be more concentrated near the bottom. Stations in both creek and ITL areas show similar chloride levels, reflecting the saline nature of the waterbody, typical of estuarine or coastal environments. These chloride concentrations are important indicators of salinity and influence the aquatic ecosystem's health and species composition.

Sodium

The Sodium Concentration in Water Samples (mg/l). Sodium levels in surface and bottom water samples from various stations range between 3,750 mg/l and 9,800 mg/l. Bottom waters generally show slightly higher sodium concentrations compared to surface samples, indicating a subtle vertical gradient. The concentrations are relatively consistent across creek and ITL stations, reflecting a stable saline environment typical of estuarine or coastal waters. Sodium is a major contributor to salinity and plays an important role in maintaining the ionic balance of the aquatic ecosystem.

Reactive silicate

The measured reactive silicate concentrations at surface and bottom water samples from various stations show variability across the sampling locations. Surface values range from 1.78 µmol/l (MS10) to 8.52 µmol/l (MS ITL13), while bottom concentrations, where available, vary from 1.94 µmol/l (MS10) to 6.37 µmol/l (MS12).

Generally, bottom water samples exhibit slightly higher reactive silicate levels compared to surface samples, indicating possible silicate accumulation or reduced biological uptake near the bottom sediments. These variations in reactive silicate are important as silicate is a key nutrient for diatoms and other siliceous organisms, influencing primary productivity and ecosystem dynamics.

Oil & Grease

The concentration of oil and grease in surface and bottom water samples shows a decreasing trend from the creek (MS1) towards other stations. Surface values range from 0.954 µg/l at MS1 to 0.754 µg/l at MS13, while bottom values are generally lower, indicating some settling or degradation. Higher concentrations near creek stations suggest localized contamination sources, likely from runoff or human activities. Overall, the oil and grease levels are relatively low but should be monitored to prevent potential impacts on water quality and aquatic life.

Silica

The silica concentrations measured in surface and bottom water samples across the stations range from approximately 9.18 µmol/l to 9.95 µmol/l. Bottom waters generally exhibit slightly higher silica levels compared to surface samples, suggesting minor accumulation or reduced uptake near the bottom sediments. The concentrations remain consistent across creek and ITL stations, indicating stable silica availability in the aquatic environment. Silica is a vital nutrient for diatoms and other siliceous organisms, playing a crucial role in supporting primary productivity and maintaining ecosystem balance.

Sulphate Concentration After Dredging

Post-dredging monitoring of sulphate concentrations across surface and bottom waters revealed values ranging from 2,310 mg/L to 2,505 mg/L. Surface water sulphate levels were generally high, with the highest concentration recorded at MS-6 and MS-9 (2,472–2,500 mg/L), indicating enhanced marine influence and salinity intrusion. Bottom water concentrations were slightly higher than surface values at most stations, with peaks up to 2,505 mg/L at MS-11, suggesting stratification and limited vertical mixing in some locations. Creek and intertidal stations showed consistent sulphate profiles, reflecting stable chemical conditions following dredging. Overall, the distribution pattern aligns with salinity gradients and suggests that the dredging activity did not lead to significant sulphate disruption but may have facilitated better water exchange and slight increases in bottom-layer sulphate due to sediment reworking and tidal flushing.

1.2 Heavy metals in water

Table: Concentration of Heavy Metals in Surface and Bottom Waters during Post-Dredging at Krishnapatnam Port, Nellore.

Stations	Lead		Cadmium		Copper		Zinc		Iron		Mercury	
	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot	Sur	Bot
MS 1 (creek)	2.3	2.79	1.77	1.61	3.90	3.21	15.63	17.3	23	22.42	BDL	BDL
MS(ITL) 2	1.74	-	0.47	-	3.4	-	14.26	-	31.73	-	BDL	-
MS 3 (creek)	2.41	1.17	0.98	1.19	3.26	3.95	15.46	15.67	20.98	21.07	BDL	BDL
MS 4 (creek)	1.47	1.41	0.87	0.69	4.11	4.94	10.84	10.02	24.32	24.89	BDL	BDL
MS (ITL)5	1.33	-	0.76	-	4.37	-	12.82	-	29.27	-	BDL	-
MS 6	1.77	1.53	0.53	0.64	3.06	5.07	9.97	9.78	19.34	22.46	BDL	BDL
MS 7	1.52	1.43	0.58	0.51	2.65	3.55	7.34	8.27	16.95	20.55	BDL	BDL
MS 8	1.44	1.48	0.56	0.69	2.69	3.07	5.87	7.02	15.01	18.01	BDL	BDL
MS 9	1.43	1.34	0.32	0.38	2.52	3.11	5.46	5.08	14.6	15.95	BDL	BDL
MS 10	0.77	0.31	0.27	0.33	2.32	2.92	4.33	6.59	14.08	15.51	BDL	BDL
MS 11	0.53	0.3	0.25	0.21	2.11	2.17	4.45	5.22	11.85	13.23	BDL	BDL
MS 12	0.46	0.24	0.16	0.2	1.8	2.44	4.77	5.37	11.62	12.59	BDL	BDL
MS (ITL)13	1.94	-	1.13	-	4.3	-	13.56	-	21.98	-	BDL	BDL

Heavy Metal Distribution in Surface and Bottom Waters

The concentrations of heavy metals (Lead, Cadmium, Copper, Zinc, Iron, and Mercury) in surface and bottom waters showed notable spatial and vertical variability across stations. **Lead (Pb)** concentrations ranged from 0.46 to 2.41 µg/L in surface waters and 0.24 to 2.79 µg/L in bottom waters. The highest values were recorded at MS1 (bottom: 2.79 µg/L) and MS3 (surface: 2.41 µg/L), indicating creek-associated metal loading. **Cadmium (Cd)** levels were relatively low, ranging from 0.16 to 1.77 µg/L (surface) and 0.2 to 1.61 µg/L (bottom). The maximum was noted at MS1 bottom, suggesting minor anthropogenic influence. **Copper (Cu)** values were higher in bottom waters at most stations, peaking at MS4 (4.94 µg/L bottom) and MS6 (5.07 µg/L bottom), indicating potential remobilization from sediments during dredging.

Zinc (Zn) showed elevated levels, especially in bottom waters (up to 17.3 µg/L at MS1), reflecting both natural sources and possible enrichment through dredging activities.

Iron (Fe) concentrations were the highest among all metals, particularly at MS2 (31.73 µg/L surface) and MS4 bottom (24.89 µg/L), likely due to high terrestrial input and sediment disturbance. Mercury (Hg) was consistently below detection limits (BDL) at all stations in both surface and bottom waters, suggesting negligible contamination from this toxic metal. But the levels were lesser than the dredging period.

1.3. Biological analysis

Table: Primary Productivity and Chlorophyll Pigment Concentrations during Dredging at Krishnapatnam Port, Nellore

Station Name	P. Productivity (g C/m²/day)	Chlorophyll-a (µg/L)	Chlorophyll-b (µg/L)	Chlorophyll-c (µg/L)
MS 1 (creek)	0.65	1.43	0.58	0.32
MS(ITL) 2	0.71	1.72	0.71	0.39
MS 3 (creek)	0.77	1.79	0.72	0.38
MS 4 (creek)	0.71	1.86	0.66	0.36
MS (ITL)5	0.71	1.72	0.71	0.39
MS 6	0.96	2.12	0.87	0.51
MS 7	0.88	1.92	0.83	0.42
MS 8	0.96	2.12	0.92	0.47
MS 9	1.1	2.33	0.88	0.54
MS 10	0.91	1.88	0.82	0.47
MS 11	0.87	1.85	0.84	0.45
MS 12	0.87	1.88	0.8	0.46
MS (ITL)13	0.71	1.59	0.63	0.34

Primary productivity (g C/m²/day)

The primary productivity across the stations ranged from 0.65 to 1.10 g C/m²/day, with the highest productivity recorded at MS9 (1.10 g C/m²/day), indicating favorable light and nutrient conditions. The lowest productivity was observed at MS1 (0.65 g C/m²/day), a creek station, possibly due to turbidity or reduced photosynthetic activity.

Overall, the intertidal and mid-port stations (MS6–MS9) exhibited relatively higher productivity and pigment concentrations, suggesting enhanced primary production possibly influenced by nutrient influx, stable salinity, and light penetration post-dredging.

Chlorophyll-a

Chlorophyll-a, the key indicator of phytoplankton biomass, varied between 1.43 µg/L (MS1) and 2.33 µg/L (MS9), closely aligning with productivity trends. Stations MS6 and MS8 also showed elevated values (2.12 µg/L), indicating productive zones with active phytoplankton growth.

Chlorophyll-b

Chlorophyll-b ranged from 0.58 µg/L (MS1) to 0.92 µg/L (MS8), while Chlorophyll-c showed values between 0.32 µg/L and 0.54 µg/L, supporting the presence of diverse phytoplankton groups including green algae and diatoms.

Chlorophyll-c

Chlorophyll-c concentrations ranged from 0.32 µg/L (MS1) to 0.54 µg/L (MS9) across the sampled stations. Higher values were recorded at MS9 (0.54 µg/L), MS6 (0.51 µg/L), and MS8 (0.47 µg/L), indicating the presence of diatom-rich phytoplankton communities, which typically contain this pigment. Creek station MS1 showed the lowest concentration, suggesting lower phytoplankton diversity or biomass. Overall, elevated Chlorophyll-c levels in central and intertidal stations reflect productive waters with a dominance of mixed algal populations, particularly diatoms and dinoflagellates.

Table: Total heterotopic bacterial Levels in water samples at Different Monitoring Stations post-dredging

Stations	Water CFU/ml
MS 1 (creek)	104160
MS(ITL) 2	75600
MS 3 (creek)	74760
MS 4 (creek)	78120
MS (ITL)5	92400
MS 6	64500
MS 7	59942
MS 8	55470
MS 9	47730
MS 10	42140
MS 11	41280
MS 12	41600
MS (ITL)13	98400

Plankton

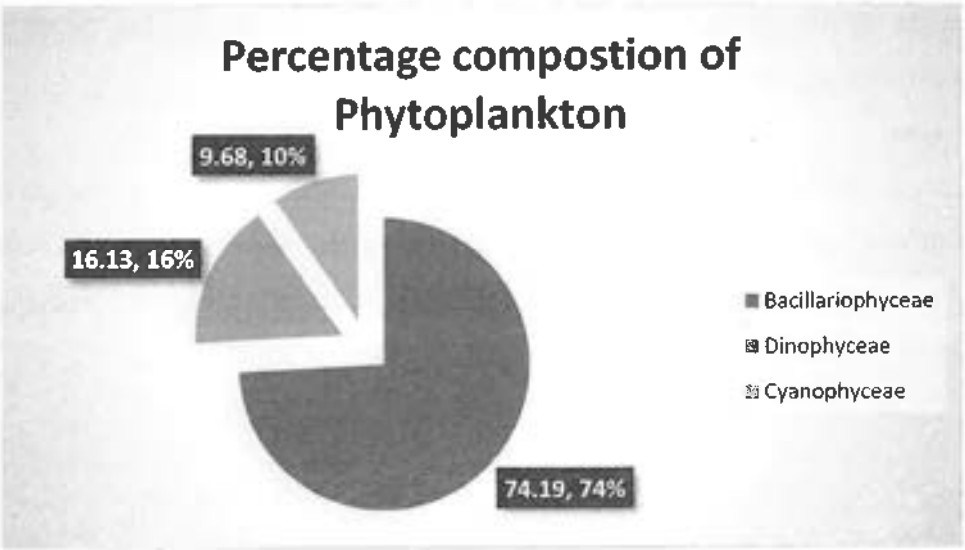
Phytoplankton Density and Species Diversity Across Stations

The post-dredging survey of phytoplankton communities across multiple sampling stations (MS-1 to MS-12) revealed notable variations in species abundance and distribution among different algal classes, primarily Bacillariophyceae (diatoms), Dinophyceae (dinoflagellates), and Cyanophyceae (cyanobacteria)

Total Density

The post-dredging analysis of phytoplankton density across the sampling stations revealed moderate to high concentrations, indicating a stable to recovering primary productivity regime. The densities ranged from 6,649 to 9,814 cells/L, with the highest values observed at ST-9 (9,814 cells/L) and MS-7 (9,771 cells/L), suggesting favorable nutrient and light conditions in these regions. Creek stations such as MS-3 (9,440 cells/L) and MS-4 (9,093 cells/L) also exhibited elevated phytoplankton abundance, reflecting minimal disturbance or rapid biological response post-dredging. In contrast, relatively lower densities were recorded at MS-11 (6,649 cells/L) and MS-12 (7,159 cells/L), which may indicate localized sediment resuspension, reduced water clarity, or delayed ecological recovery in these zones. Overall, the results suggest that phytoplankton communities are re-establishing across most stations, with signs of resilience and productivity rebound following the dredging operations.

Species Composition and Diversity



Phytoplankton Diversity during dredging at Krishnapatnam port, Nellore

The post-dredging phytoplankton community exhibited notable class-wise diversity, with Bacillariophyceae (diatoms) being the most dominant group, comprising 23 species. This group included ecologically significant genera such as Asterionella, Bacillaria, Chaetoceros,

Coscinodiscus, Skeletonema and others, reflecting the resilience and adaptability of diatoms in coastal and estuarine environments following dredging activities. Dinophyceae (dinoflagellates) contributed 6 species, including Ceratium, Dinophysis, Gymnodinium, Noctiluca and Peridinium, which are known for their mixotrophic behavior and potential bloom-forming capabilities. Cyanophyceae (blue-green algae) were represented by 3 species such as Oscillatoria, Trichodesmium and Phormidium, indicating the presence of nitrogen-fixing and filamentous forms, particularly in nutrient-rich or disturbed zones. Overall, the class-wise distribution highlights a diverse and balanced phytoplankton assemblage, with diatoms dominating both in species richness and ecological significance during the post-dredging phase.

Bacillariophyceae:

Diatoms dominated the assemblage, with species such as *Asterionella glacialis, Bacillaria* sp., and *Skeletonema costatum* showing substantial presence across stations. Highest cell counts were observed at open ocean stations (ST-9 to MS-12), indicating potential recolonization or favorable conditions post-dredging. Notably, *Pleurosigma directum* and *Rhizosolenia alata* recorded elevated counts at certain creek and open ocean sites, suggesting spatial variability influenced by local hydrodynamics and nutrient availability.

Dinophyceae:

Dinoflagellates such as *Ceratium furca, Dinophysis caudata,* and *Peridinium claudicans* exhibited moderate abundances, with peaks at stations MS-7, MS-11, and MS-12. These species are important indicators of ecosystem health and may respond rapidly to environmental changes induced by dredging activities.

Cyanophyceae:

Cyanobacteria including *Oscillatoria sp.* and *Trichodesmium erythraeum* showed variable densities, with notable counts at mid to outer stations (MS-6 to MS-12). Their presence highlights potential shifts in nutrient dynamics, possibly influenced by dredging-induced sediment resuspension.

Table: Distribution and Abundance of Phytoplankton during post dredging at Krishnapatnam port, Nellore

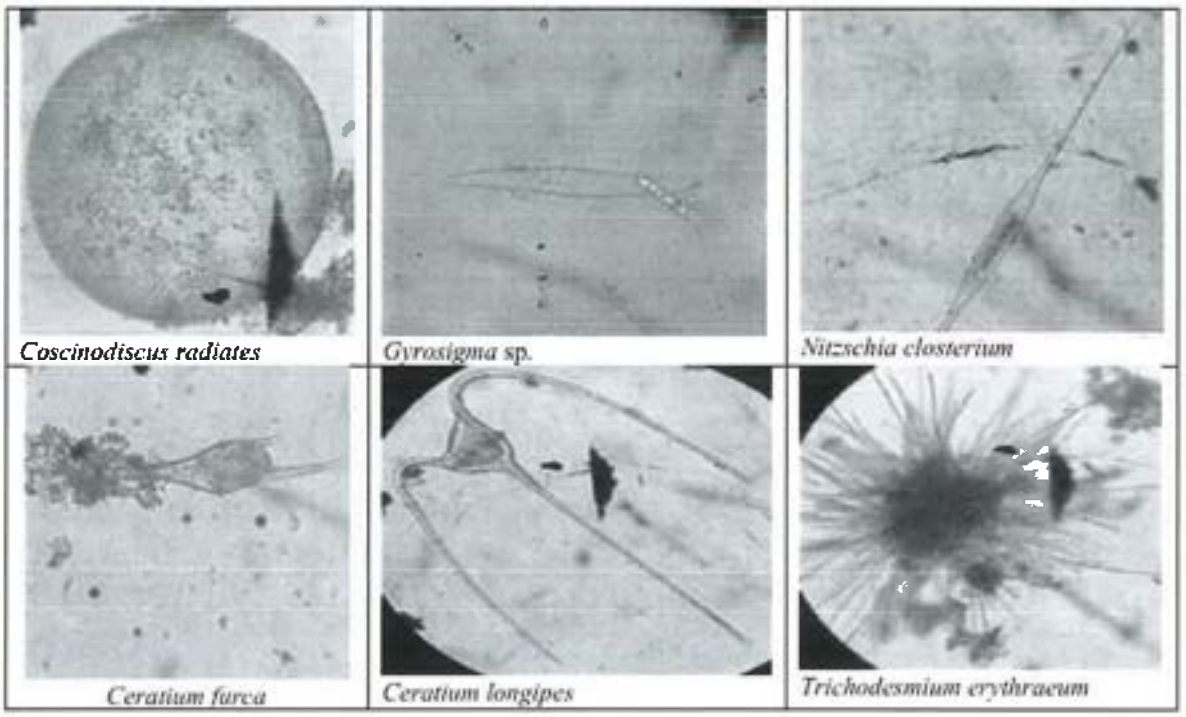
S. No	Species name	MS-1	MS-3	MS-4	MS -6	MS -7	MS -8	ST-9	MS -10	MS -11	ST-12
	Bacillariophyceae	**Creek**									
1	*Asterionella glacialis*	298	304	302	194	345	272	433	347	146	317
2	*Bacillaria* sp.	284	351	370	304	290	291	279	371	109	165
3	*Bacteriastrum comosum*	356	150	291	334	484	465	127	262	249	275
4	*Bellerochea malleus*	190	237	360	276	337	426	140	422	269	149
5	*Chaetoceros coarctatus*	249	189	297	290	178	373	397	349	277	197
6	*Coscinodiscus radiatus*	310	313	293	274	263	305	316	282	295	265
7	*Cyclotella* sp.	288	255	268	188	274	180	310	300	213	299
8	*Ditylum brightwelli*	66	445	238	247	326	241	314	275	325	262
9	*Eucampia zodiacus*	131	164	283	222	524	195	278	237	274	116
10	*Gyrosigma* sp.	147	316	237	368	438	333	412	186	143	195
11	*Leptocylindrus danicus*	284	235	311	389	431	300	165	225	146	113
12	*Lithodesmium undulatum*	202	221	268	205	239	347	346	368	100	68
13	*Melosira* sp.	395	384	316	85	146	291	222	283	222	213
14	*Navicula directa*	304	396	224	404	509	213	331	126	331	222
15	*Nitzschia closterium*	178	325	309	158	309	97	442	121	243	108
16	*Pleurosigma directum*	270	539	240	114	200	377	194	261	188	114
17	*Rhizosolenia alata*	434	384	145	177	147	552	484	248	158	233
18	*Skeletonema costatum*	478	346	336	250	376	325	320	331	187	266
19	*Stephanopyxis* sp.	375	241	320	298	267	348	314	364	173	215
20	*Thalassionema nitzschioides*	159	240	257	219	313	469	354	399	194	404
21	*Thalassiosira* sp.	141	285	82	497	189	329	415	223	217	198
22	*Thalassiothrix frauenfeldii*	359	158	257	240	343	206	228	317	151	397
23	*Triceratium favus*	370	288	380	216	146	296	292	285	134	216
	Dinophyceae										
24	*Ceratium furca*	50	194	298	335	460	373	240	296	192	216
25	*Ceratium longipes*	357	310	220	328	57	105	259	342	208	153
26	*Dinophysis caudata*	316	317	445	279	290	66	319	260	220	268
27	*Gymnodinium* sp.	199	253	262	115	291	375	488	229	217	351

S. No	Species name	MS-1	MS-3	MS-4	MS -6	MS -7	MS -8	ST-9	MS -10	MS -11	ST-12
	Bacillariophyceae	**Creek**									
28	*Noctiluca* sp.	117	320	304	525	342	268	362	334	150	262
29	*Peridinium claudicans*	361	267	287	176	293	277	199	330	298	239
	Cyanophyceae										
30	*Oscillatoria* sp.	277	297	275	365	386	161	413	242	178	223
31	*Trichodesmium erythraeum*	267	333	260	213	316	410	115	230	161	188
32	*Phormidium* sp.	317	383	358	269	262	122	306	125	281	252
	Total	**8529**	**9440**	**9093**	**8554**	**9771**	**9388**	**9814**	**8970**	**6649**	**7159**

Overall Trends:

Total phytoplankton abundance ranged from 8,529 to 10,559 cells/L across stations, with the highest counts recorded at MS-12, suggesting recovery or enrichment in this zone. The spatial variability indicates that dredging impacts were site-specific, likely governed by sediment characteristics, water flow, and nutrient fluxes.

These findings provide a crucial baseline for monitoring ecological recovery and guiding management actions to mitigate dredging impacts on phytoplankton communities and overall estuarine health.



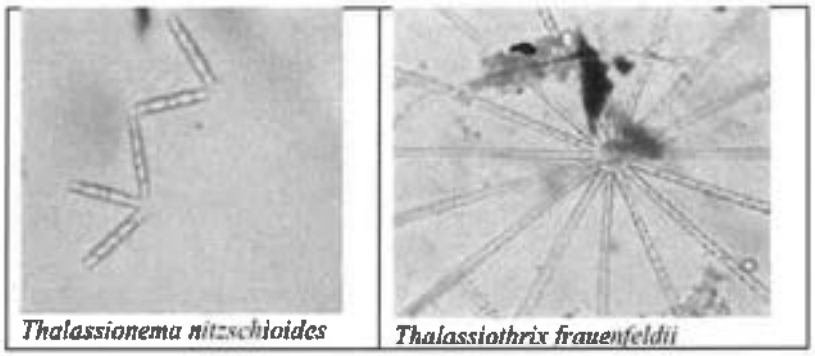


Figure: Some of the commonly observed Phytoplankton species

Zooplankton

The post-dredging zooplankton community structure across the sampling stations revealed substantial diversity, abundance, and spatial variability, indicating an active recovery phase and environmental heterogeneity in the estuarine and creek environments.

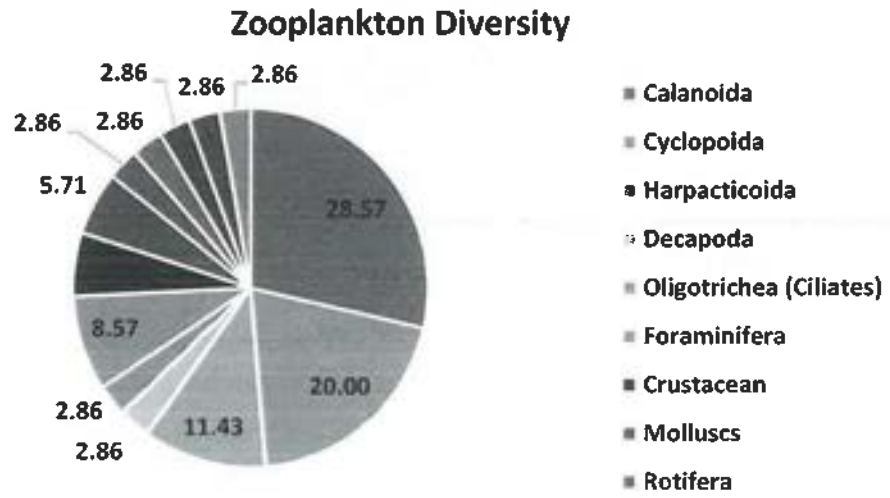
Zooplankton Abundance and Diversity Across Stations

The post-dredging zooplankton community exhibited notable classwise diversity, dominated primarily by copepods, which included Calanoids, Cyclopoids, and Harpacticoids, contributing the highest number of species and abundance across stations.

Zooplankton density during post dredging at Krishnapatnam port, Nellore

The zooplankton density varied markedly across sampling stations in the post-dredging phase, with the highest total abundance recorded at ST-8 (10,830 individuals) followed by MS-7 (8,786) and MS-6 (8,436), indicating zones of high productivity and possible nutrient enrichment. In contrast, relatively lower densities were observed at MS-4 (5,194), MS-3 (5,226), and MS-1 (5,433), suggesting less favorable conditions or slower recovery. The distribution trend reflects spatial heterogeneity in environmental parameters such as salinity, turbidity, and organic content. The elevated densities at ST-8 and MS-6 may be attributed to increased copepod populations, particularly cyclopoids and calanoids, demonstrating their role as key indicators of ecological shifts post-dredging.

Zooplankton diversity



Zooplankton diversity during the post dredging at Krishnapatnam port, Nellore

A total of 35 species were recorded post-dredging, distributed among 13 major taxonomic groups. The copepod group Calanoida was the most dominant, comprising 10 species (28.57%), followed by Cyclopoida with 7 species (20.00%), and Harpacticoida with 4 species (11.43%), highlighting their ecological dominance and adaptability. Other notable groups included Foraminifera (3 species, 8.57%), and Molluscs and Crustaceans with 2 species each (5.71%). Several groups were represented by a single species (2.86% each), including Decapoda, Oligotrichea, Rotifera, Annelids, Branchiopoda, Chaetognatha, and Appendicularia, suggesting low diversity or early-stage recolonization in these taxa. The community structure reflects a moderately diverse zooplankton/meiofaunal assemblage with a clear dominance of copepods, which are typically the first responders in recovering ecosystems following dredging disturbances.

Table: Distribution and Abundance of zooplankton during the post dredging at Krishnapatnam port, Nellore

S.NO		MS-1	MS-3	MS-4	MS-6	MS-7	ST-8	ST-9	MS-8	MS-11	MS-12
	Copepods Calanoid	**Creek**									
1	*Acartia danae*	207	230	167	110	294	253	118	47	143	176
2	*Acartia erythraea*	178	299	114	196	93	181	260	137	243	71
3	*Agetus limbatus*	198	88	185	217	141	267	213	161	179	77
4	*Bestiolina similis*	185	140	219	156	189	55	107	125	188	146
5	*Centropages* sp.	83	94	131	141	101	116	147	235	92	183
6	*Paracalanus parvus*	163	97	73	155	117	260	197	196	189	137
7	*Nannocalanus minor*	80	52	86	142	204	250	189	122	310	173
	Paracalanus parvus	215	142	210	154	274	294	304	228	315	280
8	*Pseudodiaptomus aurivilli*	110	208	114	128	38	249	68	190	165	31

9	*Temora stylifera*	187	173	142	193	165	106	157	165	134	209
	Cyclopoid										
10	*Corycaeus limbatus*	169	143	185	508	508	565	486	384	390	387
11	*C. catus*	98	135	89	792	792	540	178	306	612	402
12	*Corycaeus danae*	188	174	124	288	288	750	424	633	399	714
13	*Oithona similis*	223	232	38	632	632	1310	274	483	432	480
14	*Oithona brevicornis*	191	167	99	720	720	665	228	144	543	450
15	*Oncaea* sp.	181	94	147	280	280	870	200	315	129	75
16	*Farranula orbisa*	192	191	167	744	744	875	454	183	657	414
	Harpacticoid										
17	*Euterpina acutifrons*	166	77	154	175	118	245	152	128	50	176
18	*Longipedia* sp.	56	199	42	192	174	199	61	89	202	179
19	*Microsetella rosea*	175	128	126	187	256	205	79	289	215	172
20	*Macrosetella* sp.	105	87	225	264	298	299	305	261	345	290
	Decapoda										
21	*Lucifer hanseni*	260	83	182	129	143	93	64	93	216	189
	Oligotrichea (Ciliates)										
22	*Favella brevis*	137	131	150	87	50	142	110	119	27	94
23	*Tintinnopsis mortenseni*	206	161	59	87	173	97	210	167	123	231
	Crustacean										
24	Crab Zoea	187	146	235	103	240	167	263	119	148	147
25	Copepod nauplii	100	80	199	162	184	100	337	189	47	180
	Molluscs										
26	Bivalve veliger	199	266	166	167	114	135	80	137	114	277
27	Gastropod veliger	147	156	314	65	129	182	169	160	170	215
	Rotifera										
28	*Brachionus rubens*	236	221	128	169	129	147	96	69	193	82
	Foraminifera										
29	*Globigerina bulloides*	84	215	125	91	192	224	96	62	82	131
30	*G. bulloides*	0	0	41	202	178	192	178	154	228	174
31	*G. opima*	45	14	23	261	194	180	157	120	192	154
	Annelids										
32	Polychaete larvae	130	150	202	114	255	194	171	158	109	198
	Branchiopoda										
33	*Evadne spinifera*	182	112	190	50	123	86	91	138	86	164
	Chaetognatha										
34	*Sagitta* sp.	83	138	99	202	95	56	121	119	112	116
	Appendicularia										
35	*Oikopleura dioica*	87	203	244	173	161	281	320	198	107	168
	Total	**5433**	**5226**	**5194**	**8436**	**8786**	**10830**	**7064**	**6823**	**7886**	**7742**

Key Taxonomic Groups and Dominant Species

Copepods were the most dominant group across all stations, categorized into three suborders: Calanoids, Cyclopoids, and Harpacticoids. Among Calanoid copepods, *Acartia danae, Paracalanus parvus, Temora stylifera,* and *Pseudodiaptomus aurivilli* were frequently encountered in significant densities, particularly at ST-8, ST-9, and MS-11, suggesting favorable hydrographic conditions post-dredging. *Paracalanus parvus* showed consistently high densities across nearly all stations, marking its ecological dominance.

Cyclopoid copepods showed explosive abundance at midstream and outer creek stations, especially *Oithona similis, Corycaeus danae,* and *Farranula orbisa*, which peaked at ST-9 and ST-8. These species are known for their tolerance to fluctuating salinity and high suspended particulate matter, common after dredging.

Harpacticoid copepods, typically benthic-associated or epibenthic, such as *Euterpina acutifrons, Microsetella rosea,* and *Macrosetella* sp., were relatively evenly distributed, with MS-11 and MS-12 exhibiting higher values. Their presence suggests resuspension from sediments and good organic matter availability in post-dredging conditions.

Decapoda larvae, represented by *Lucifer hanseni*, were more abundant in MS-1 and MS-11, suggesting a recovering recruitment pathway for benthic crustaceans.

Oligotrich ciliates, including *Favella brevis* and *Tintinnopsis mortenseni*, were moderately represented across stations, acting as indicators of microbial loop activity and nutrient cycling. They reached peak numbers at ST-9 and MS-12.

Larval forms of crustaceans and mollusks, such as crab zoea, copepod nauplii, bivalve veliger, and gastropod veliger, were commonly found throughout all sites, with higher densities observed in ST-9 and MS-8, pointing to active spawning and larval dispersal zones. These are essential links in the trophic network and bioindicators of ecosystem resilience.

Rotifers, represented by *Brachionus rubens*, were found in relatively high numbers in MS-1 and MS-3. Their abundance usually indicates eutrophic or nutrient-rich waters, possibly due to sediment resuspension.

Foraminifera, particularly *Globigerina bulloides* and *G. opima*, were observed predominantly in MS-6 through MS-12, with *G. opima* showing higher densities in MS-6 and MS-8. These organisms, while planktonic, also reflect benthic interactions and are useful in paleoenvironmental reconstruction.

Annelid larvae (Polychaete larvae) and Branchiopods (Evadne spinifera) occurred moderately across most stations, further supporting the idea of larval dispersion and benthic-pelagic coupling post-dredging.

Chaetognaths (*Sagitta* sp.) and Appendicularians (*Oikopleura dioica*) were sparsely distributed but present in notable numbers at MS-6, ST-8, and MS-12. Their occurrence marks higher trophic level activity and ongoing food web structuring.

Overall, station ST-8 recorded the highest total zooplankton density (10,830 ind/m³), followed by ST-9 and MS-7, likely due to enhanced water exchange, nutrient flux, and habitat complexity following dredging. Conversely, MS-4 and MS-3 recorded lower zooplankton densities, potentially reflecting less favorable hydrodynamic conditions or ongoing recovery. The observed diversity and relative abundance across trophic levels suggest a gradually stabilizing ecosystem with a shift toward recolonization and trophic rebuilding in the post-dredging scenario.

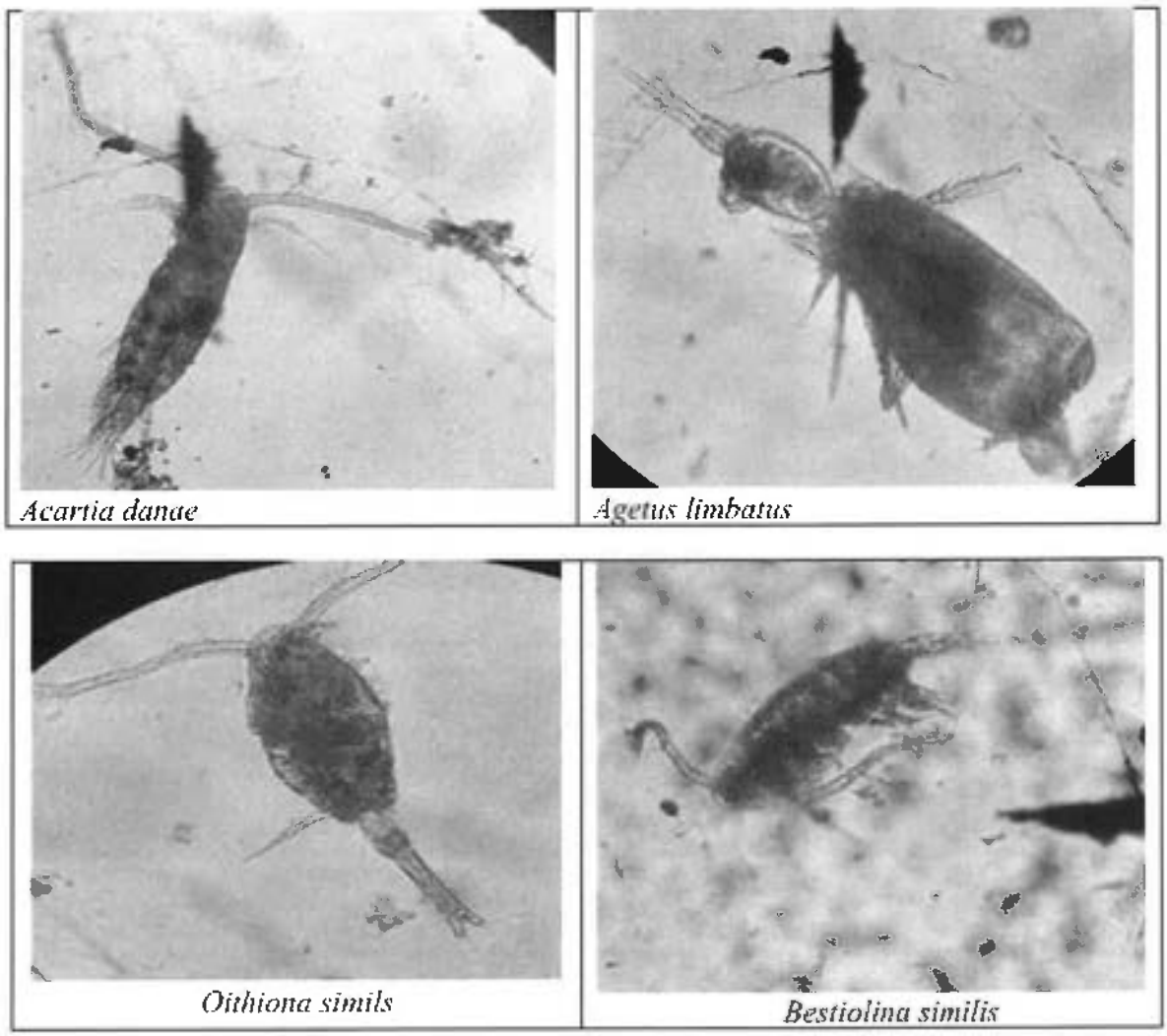


Figure: Some of the commonly observed zootoplankton species.

Microbial load

The Total Heterotrophic Bacterial Count in Surface Water Samples

The bacterial load in surface waters ranged from 41,280 CFU/ml (MS11) to 104,160 CFU/ml (MS1). The highest colony-forming units were observed in creek station MS1, indicating elevated organic matter or nutrient input, likely from upstream or port activities. Intertidal stations such as MS(ITL)13 (98,400 CFU/ml) and MS(ITL)5 (92,400 CFU/ml) also exhibited high bacterial counts, pointing to localized enrichment. In contrast, offshore and mid-creek stations like MS9 to MS12 showed lower bacterial densities, reflecting relatively oligotrophic or stable conditions. Overall, the spatial variation suggests that creek and intertidal zones are microbiologically more active, likely due to higher productivity and anthropogenic influences.

Pathogenic load in surface Water Samples.

The microbial quality of water was assessed after dredging by quantifying the presence of total coliforms, fecal coliforms, *Escherichia coli*, and *Vibrio* species across various sampling stations.

Table: Pathogenic load in surface Water Samples during Post-Dredging at Krishnapatnam Port, Nellore

Stations	Total coliforms	Fecal coliforms	*E-coli*	*Vibrio*
	Water CFU/ml			
MS 1 (creek)	2530	194	56	10
MS(ITL) 2	4366	600	65	12
MS 3 (creek)	3940	125	47	11
MS 4 (creek)	3950	160	44	6
MS (ITL)5	2155	980	84	11
MS 6	1900	650	33	6
MS 7	1600	830	28	5
MS 8	3240	750	19	5
MS 9	2260	600	16	3
MS 10	1710	700	14	1
MS 11	1244	610	8	1
MS 12	620	500	11	0
MS (ITL)13	2860	150	64	10

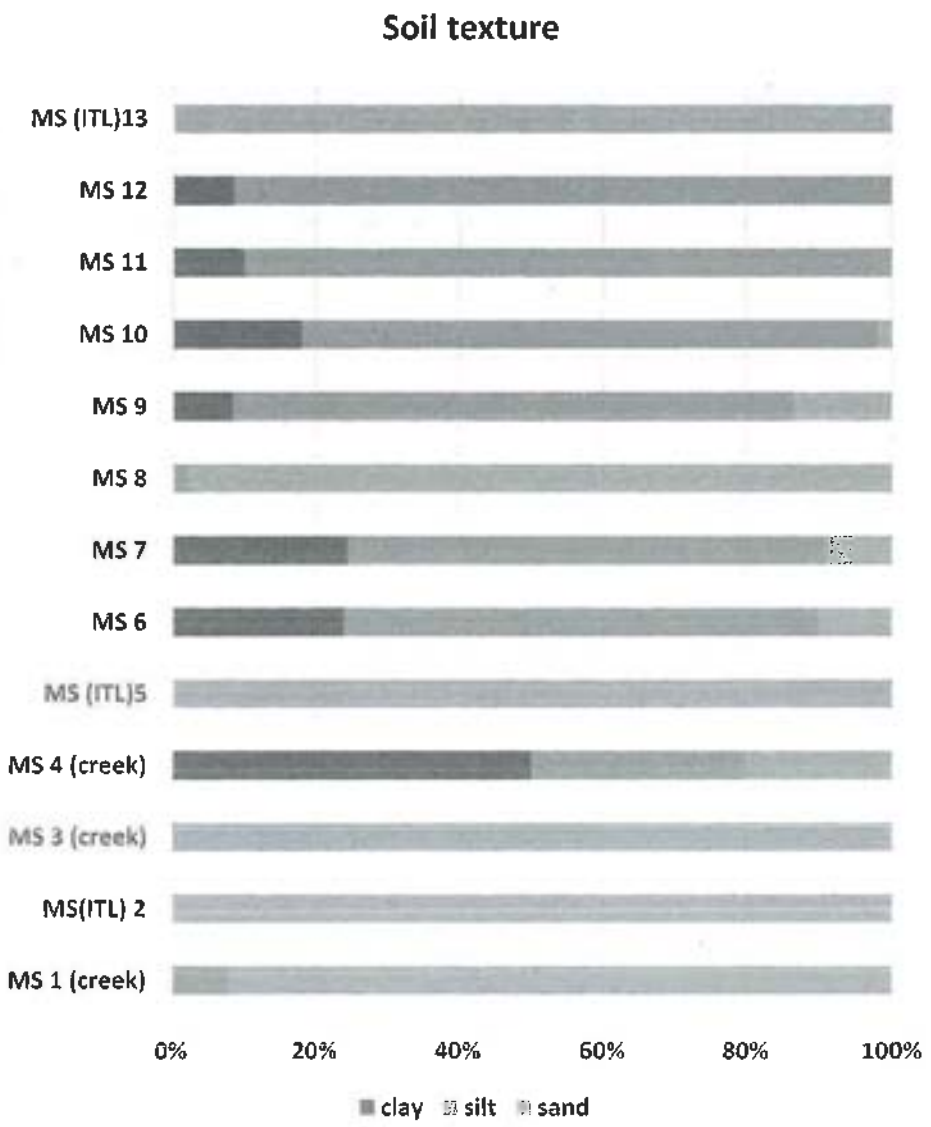
Post-dredging observations indicate a notable decline in bacterial indicators compared to the dredging phase. Total coliform counts, though still elevated in some creek stations (e.g., MS4: 3,950 CFU/ml), show a general decrease across all stations. Fecal coliforms and E. coli levels also declined, with fecal coliforms peaking at 980 CFU/ml (MS ITL 5), compared to higher values previously recorded during dredging. The *E. coli* and *Vibrio* counts remained low at all stations, with maximum *E. coli* at 84 CFU/ml (MS(ITL)5) and *Vibrio* at 12 CFU/ml (MS3). These reductions suggest an improvement in microbial water quality, likely due to the settling of disturbed sediments, dilution, and reduced organic input following cessation of dredging activity.

This decline highlights a positive recovery trend in water quality parameters in the port environment during the post-dredging period.

2. Marine Sediment

2.1. Physical parameters

Soil Texture



Soil Texture Composition (Clay, Silt, and Sand) (%) during Post-Dredging at Krishnapatnam Port, Nellore

Sediment texture across the stations showed marked spatial variability. Sand-dominated sediments were prominent at most stations, particularly at MS(ITL)2, MS(ITL)5, MS3, and MS(ITL)13, where sand content exceeded 99%, indicating highly energetic conditions or continuous flushing. Creek stations like MS4 showed a contrasting profile with 50% clay and 30% silt, suggesting low-energy depositional settings with higher organic matter retention potential. MS6 and MS7 exhibited moderate clay (24%) and high silt content (66–65%), reflecting finer particle deposition. Stations such as MS10 to MS12 also showed elevated silt and clay fractions, indicative of sediment settling in calmer waters. These variations in sediment composition are crucial in influencing benthic community structure and contaminant retention post-dredging.

Table: Macronutrient Concentrations (Nitrogen, Phosphorus, Potassium, Sodium) in Sediments at Different Stations during the post Dredging at Krishnapatnam Port, Nellore

Stations	PH	Toc	Nitrogen	Phosphorus	Potassium	Sodium
			Concentrations mg/g			
MS 1 (creek)	7.9	16.18	2.38	0.98	7.1	10.11
MS(ITL) 2	8.2	12.68	2.54	0.69	13.86	27.15
MS 3 (creek)	8.2	21.62	2.08	0.81	11.18	12.81
MS 4 (creek)	8.2	18.42	1.82	0.62	3.23	20.09
MS (ITL)5	8.1	13.97	2.02	0.67	15.5	24.84
MS 6	8.2	10.86	1.79	0.57	13.22	37.24
MS 7	8.2	11.4	1.22	0.53	17.45	38.42
MS 8	8.2	12.66	1.08	0.52	14.12	38.97
MS 9	8.1	9.94	0.8	0.55	11.56	28.23
MS 10	8.2	11.15	0.88	0.5	12.32	34.84
MS 11	8.2	9.12	0.85	0.38	16.51	35.48
MS 12	8.2	11.33	0.53	0.36	10.83	38.47
MS (ITL)13	7.9	19.45	1.72	0.71	6.09	20.71

The Total Organic Carbon (TOC)

The Total Organic Carbon (TOC) content in surface sediments ranged from 9.12 to 21.62 mg/g, reflecting moderate to high organic matter accumulation across the stations. The highest TOC value was recorded at MS 3 (creek) with 21.62 mg/g, followed by MS (ITL)13 (19.45 mg/g) and MS 4 (18.42 mg/g), all indicating areas with reduced hydrodynamic activity and potential for organic enrichment. Conversely, the lowest TOC was observed at MS 11 (9.12 mg/g), suggesting relatively cleaner or well-flushed conditions. Creek stations generally exhibited higher TOC compared to intertidal and open water stations, likely due to localized inputs from runoff and lower mixing. These values suggest that post-dredging sediment conditions still retain moderate organic loading, potentially influencing benthic productivity and contaminant binding.

Soil pH

The soil pH levels recorded post-dredging across the sampling stations ranged from 7.9 to 8.2, indicating slightly alkaline conditions. Most stations, including both creek and intertidal locations, exhibited a consistent pH of 8.2, suggesting uniform buffering capacity and stable sediment chemistry in the post-dredging environment. Stations MS-1 and MS(ITL)-13 recorded a slightly lower pH of 7.9, potentially reflecting localized organic matter input or freshwater influence. Overall, the alkaline nature of the sediments supports the favorable conditions for benthic recolonization and microbial activity during ecosystem recovery.

The sediment Nutrient Composition Post-dredging analysis revealed spatial variability in sediment nutrient concentrations across stations. Nitrogen levels ranged from 0.53 to 2.54

mg/g, with higher values observed at MS(ITL)2 and MS 1, suggesting moderate organic matter inputs. Phosphorus concentrations were generally low, between 0.36 and 1.2 mg/g, with the highest level at MS 1 (creek). Potassium content varied widely, from 3.23 to 17.45 mg/g, peaking at MS 7, indicating differential mineral composition and potential terrestrial input. Sodium showed a clear increasing trend toward the offshore stations, reaching a maximum of 38.47 mg/g at MS 12, reflective of saline influence and sediment exchange with marine waters. Overall, nutrient enrichment in sediments appears moderate, with localized peaks likely influenced by hydrography and anthropogenic inputs.

Sediment Nutrient Composition

pH of Surface Sediments

The pH of surface sediments across the study area during the post-dredging phase remained generally alkaline, ranging from 7.9 to 8.2. Most stations exhibited a stable pH of 8.2, indicating well-buffered conditions. Slightly lower pH values were recorded at MS 1 (creek) and MS (ITL)13, both at 7.9, possibly influenced by localized organic inputs or reduced flushing. Overall, the sediment pH suggests a favorable environment for benthic organisms with minimal signs of acidification or disturbance post-dredging.

Heavy Metal Distribution in Sediments

Table: Concentration of Heavy Metals in sediment sample during Post- Dredging at Krishnapatnam Port, Nellore.

Stations	Lead	Cadmium	Copper	Zinc	Iron	Mercury
	Concentrations (µg/g)					
MS 1 (creek)	12.67	2.07	15.9	41.77	8043	BDL
MS(ITL) 2	19.49	0.61	10.94	38.12	11094	BDL
MS 3 (creek)	14.95	1.09	12.97	34.79	7138	BDL
MS 4 (creek)	15.57	0.93	12.51	26.96	8503	BDL
MS (ITL)5	13.96	0.81	13.29	30.03	8570	BDL
MS 6	18.57	0.68	9.32	23.35	5425	BDL
MS 7	11.54	0.6	8.05	17.2	5194	BDL
MS 8	10.59	0.64	8.18	13.74	4529	BDL
MS 9	10.21	0.55	8.2	14.61	5104	BDL
MS 10	8.59	0.41	6.06	9.3	3908	BDL

MS 11	5.87	0.39	5.5	9.55	3371	BDL
MS 12	5.13	0.35	4.69	10.26	3248	BDL
MS (ITL)13	21.69	1.24	13.96	36.25	7695	BDL

The post-dredging analysis of sediment samples across various stations revealed spatial variations in heavy metal concentrations: Lead (Pb) levels were highest at MS 2 (19.49 µg/g) and MS13 (21.69 µg/g), indicating significant accumulation in both creek and intertidal zones. Lower values were observed at MS12 (5.13 µg/g) and MS11 (5.87 µg/g). Cadmium (Cd) showed moderate concentrations ranging from 0.35 to 2.07 µg/g, with the maximum at MS1, suggesting localized enrichment possibly from upstream sources or legacy contamination. Copper (Cu) concentrations ranged from 4.69 µg/g (MS12) to 15.9 µg/g (MS1). Elevated levels were mainly associated with creek stations, pointing to anthropogenic input. Zinc (Zn) levels were relatively high across stations, with a peak of 41.77 µg/g at MS1 and consistently above 10 µg/g at all locations, indicating widespread presence likely from multiple sources. Iron (Fe) concentrations were considerably high, ranging from 3248 µg/g (MS12) to 11094 µg/g (MS2), reflecting the natural geochemical background and terrestrial runoff. Mercury (Hg) was consistently below detection limits (BDL) across all stations, indicating no significant contamination from this highly toxic metal.

Overall, higher concentrations of most metals were recorded at creek stations (MS1–MS4) and intertidal locations such as MS13, pointing toward sediment-bound pollutant retention and possible remobilization due to dredging activities.

Benthic organisms

Table: Distribution and Abundance of Macrobenthos in Sediment Samples during post-dredging for the stations MSL-1, ITL=2, MSL=3, MSL4, MSL5 and MSL 7 at Krishnapatnam port, Nellore

	Taxon	**MACROBENTHOS Nos/m²**						
S.No	**Polychaetes**	**MSL-1**	**ITL-2**	**MSL-3**	**MSL-4**	**ITL-5**	**MSL-6**	**MSL-7**
1	*Ancistrosyllis parva*	0	50	0	0	25	0	0
2	*Armandia longicaudata*	25	0	50	0	0	0	25
3	*Boccardia polybranchia*	0	25	50	50	75	0	25
4	*Capitella capitata*	50	75	25	0	0	0	0
5	*Cirratulus concinnus*	75	0	0	0	75	50	25
6	*Drilonereis monroi*	0	50	0	0	50	0	0
7	*Dorvillea* sp.	0	0	50	25	0	25	0
8	*Euclymene annandalei*	25	75	75	0	50	0	0

9	*Eulalia macroceros*	0	0	0	25	0	0	50
10	*Exogone clavator*	25	25	25	50	25	0	25
11	*Glycera alba*	0	0	0	25	0	0	0
12	*Goniada emerita*	0	0	0	0	25	50	50
13	*Lumbriconereis heteropoda*	50	0	0	25	0	0	0
14	*Nephtys hombergii*	0	75	50	0	75	50	25
15	*Nereis capensis*	25	50	25	50	50	0	0
16	*Nereis diversicolor*	0	25	50	0	0	0	25
17	*Onuphis erumita*	25	25	0	50	50	25	25
18	*Paraprionospio pinnata*	50	50	0	50	50	0	0
19	*Pereneries cultrifera*	0	25	25	0	0	0	25
20	*Phyllodoce malmgreni*	0	25	50	25	75	50	50
21	*Pista* sp	50	25	0	50	25	0	50
22	*Polydora ciliata*	0	0	25	25	0	0	0
23	*Platynereis* sp.	25	50	75	0	75	50	25
24	*Scololepis squamata*	25	50	0	50	50	0	0
	Gastropods							
25	*Turritella attenuata*	25	25	25	0	50	25	0
26	*Turitella duplicata*	0	0	25	50	50	0	0
27	*Babylonia spirata*	0	25	0	0	25	50	25
	Bivalves							
28	*Donax scortum*	50	25	25	25	25	0	25
29	*Anadara inequalis*	25	50	0	0	50	0	50
30	*Cardium setosum*	25	50	25	50	0	0	0
31	*Meretrix meretrix*	50	75	0	0	25	0	0
	Amphipods							
32	*Gammarus locusta*	100	75	100	50	75	25	50
33	*Urothoe* sp	0	0	25	25	50	0	25
34	*Pontharoinia* sp.	25	50	0	0	75	50	25
35	*Phoxocephalus holbolli*	25	25	50	25	25	0	0
	Isopods							
36	*Anthura gracilis*	25	50	0	0	26	25	0
37	*Microjaera anisopoda*	25	50	25	50	25	0	0
	Others							
38	*Ophiocnemus mormorata*	25	0	25	25	0	25	0
39	*Meretrix Veliger*	25	50	25	75	50	50	25
40	*Balanus amphitrite*	0	0	0	0	75	25	25
41	Penaeus larva	0	25	25	25	25	0	0
	Total	**875**	**1275**	**950**	**900**	**1426**	**575**	**675**

Table: Distribution and Abundance of Macrobenthos in Sediment Samples during post-dredging for the stations MSL-8, MSL=9, MSL=10, MSL11, MSL12 and ITL 13 at Krishnapatnam port, Nellore

S.No	Taxon	MACROBENTHOS Nos/m2					
	Polychaetes	**MSL-8**	**MSL-9**	**MSL-10**	**MSL-11**	**MSL-12**	**ITL-13**
1	*Ancistrosyllis parva*	0	50	0	0	0	25
2	*Armandia longicaudata*	25	0	50	50	0	0
3	*Boccardia polybranchia*	0	0	50	0	0	75
4	*Capitella capitata*	0	0	25	0	0	50
5	*Cirratulus concinnus*	0	0	0	0	0	25
6	*Drilonereis monroi*	0	0	0	0	0	0
7	*Dorvillea* sp.	75	25	0	25	50	25
8	*Euclymene annandalei*	25	0	0	0	0	0
9	*Eulalia macroceros*	25	0	0	0	0	25
10	*Exogone clavator*	0	25	25	25	0	50
11	*Glycera alba*	25	0	0	0	25	0
12	*Goniada emerita*	0	50	0	25	0	25
13	*Lumbriconereis heteropoda*	25	0	0	50	50	0
14	*Nephtys hombergii*	25	0	0	0	0	50
15	*Nereis capensis*	0	0	0	0	0	0
16	*Nereis diversicolor*	75	25	0	25	50	25
17	*Onuphis erumita*	0	0	0	0	0	75
18	*Paraprionospio pinnata*	0	0	0	50	0	0
19	*Pereneries cultrifera*	50	0	50	25	50	50
20	*Phyllodoce malmgreni*	0	50	0	50	50	0
21	*Pista* sp	0	0	75	0	0	50
22	*Polydora ciliata*	25	50	0	0	0	0
23	*Platynereis* sp.	25	0	0	0	0	50
24	*Scololepis squamata*	0	0	0	0	0	0
	Gastropods						
25	*Turritella attenuata*	25	50	50	25	25	50
26	*Turitella duplicata*	0	25	25	0	0	25
27	*Babylonia spirata*	0	0	0	0	25	0
	Bivalves						
28	*Donax scortum*	0	25	0	25	0	25
29	*Anadara inequalis*	0	0	50	0	50	25
30	*Cardium setosum*	25	0	0	25	0	25
31	*Meretrix meretrix*	0	25	25	25	0	0
	Amphipods						
32	*Gammarus locusta*	25	50	50	0	50	75
33	*Urothoe* sp	0	25	0	25	0	25
34	*Pontharoinia* sp.	0	0	0	0	0	0
35	*Phoxocephalus holbolli*	50	25	0	25	50	0
	Isopods						
36	*Anthura gracilis*	25	75	25	25	0	50

S.No	Taxon Polychaetes	MACROBENTHOS Nos/m2 MSL-8	MSL-9	MSL-10	MSL-11	MSL-12	ITL-13
37	*Microjaera anisopoda*	25	25	0	0	25	50
	Others						
38	*Ophiocnemus mormorata*	0	0	0	0	25	0
39	*Meretrix Veliger*	25	25	0	25	0	25
40	*Balanus amphitrite*	0	0	25	0	25	25
41	Penaeus larva	75	25	0	25	75	0
	Total	**675**	**650**	**525**	**550**	**625**	**1000**

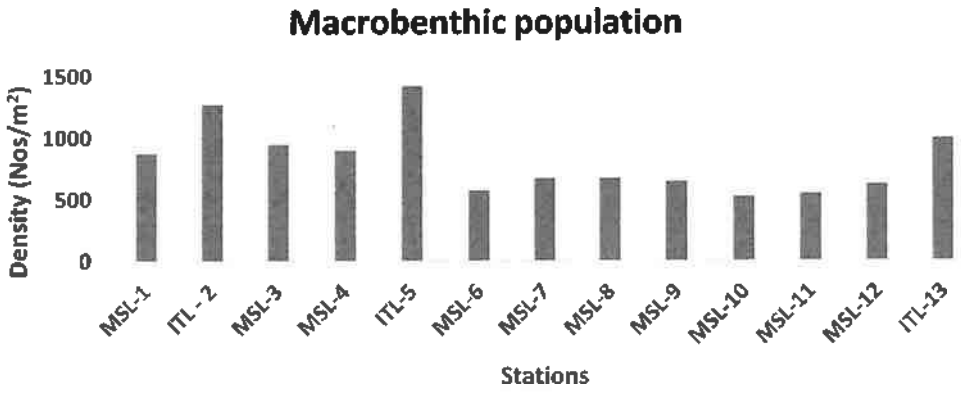
Macrobenthic Diversity

Polychaetes formed the dominant group across all stations, both in diversity and abundance, with species like *Cirratulus concinnus, Capitella capitata,* and *Paraprionospio pinnata* frequently recorded.

Amphipods were the second most abundant group, particularly Gammarus locusta, showing high densities at MSL-1, ITL-2, and MSL-3. Bivalves (e.g., *Donax scortum, Meretrix meretrix*) and gastropods (*Turritella attenuata, Babylonia spirata*) were moderately represented across stations, showing a preference for sandy and mixed substrates. Isopods and other organisms, such as Balanus amphitrite, Penaeus larvae, and *Ophiocnemus mormorata,* were found in localised patches, indicating niche-specific adaptation.

Dominant Species

ITL-5 was dominated by *Boccardia polybranchia, Platynereis* sp., *and Pontharoinia* sp., contributing to the high overall abundance. ITL-2 showed a strong presence of *Nephtys hombergii, Euclymene annandalei, and Meretrix meretrix. Capitella capitata* and *Cirratulus concinnus* were notably dominant at MSL-1, indicating organic enrichment. MSL-3 featured a rich mix of polychaetes, especially *Boccardia polybranchia, Dorvillea* sp., and *Euclymene annandalei.* Stations MSL-10 to MSL-12 had moderate to low densities but consistently included the presence of amphipods and selected polychaetes, suggesting recovering benthic conditions post-dredging.

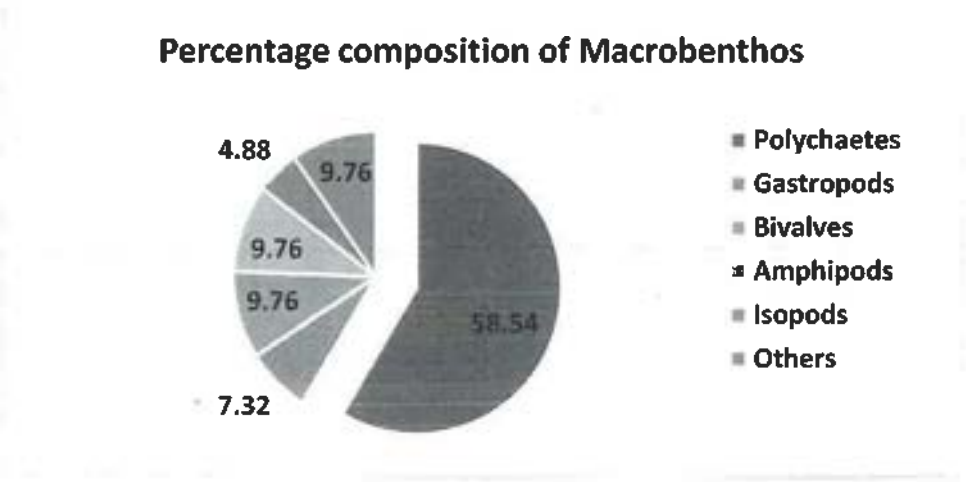


Macrobenthic population density in during post dredging at Krishnapatnam port, Nellore.

Macrobenthic population density

The total macrobenthic density ranged from 525 Nos/m² at MSL-10 to 1426 Nos/m² at ITL-5. Intertidal stations such as ITL-5 (1426 Nos/m²) and ITL-2 (1275 Nos/m²) exhibited the highest macrofaunal abundance, likely due to tidal influx and organic matter enrichment. Among creek stations, MSL-3 (950 Nos/m²) and MSL-1 (875 Nos/m²) showed comparatively high densities, whereas MSL-6 (575 Nos/m²) and MSL-10 (525 Nos/m²) showed lower faunal abundance, possibly due to altered sediment characteristics post-dredging.

Species Composition of Macrobenthos



The macrobenthic community was predominantly composed of polychaetes, contributing 58.54% to the total faunal abundance, indicating their ecological dominance and adaptability to varying sediment conditions. Bivalves, amphipods, and miscellaneous groups (each ~9.76%) formed the next major components, reflecting a balanced benthic structure with trophic and functional diversity. Gastropods contributed 7.32%, while isopods were the least represented group at 4.88%, occurring sporadically across stations. The overall composition highlights a polychaete-dominated assemblage typical of estuarine and moderately disturbed environments.

Table: Distribution and Abundance of Meiobenthos in Sediment Samples during post-dredging for the stations MSL-1, ITL=2, MSL=3, MSL4, MSL5 and MSL 7 at Krishnapatnam port, Nellore

S.No	Taxon	MEIOBENTHOS Nos/10 cm2						
		MSL-1	ITL-2	MSL-3	MSL-4	ITL-5	MSL-6	MSL-7
	Nematodes							
1	*Astomonema* sp.	22	28	21	14	32	16	12
2	*Daptonema conicum*	18	52	14	22	46	38	24
3	*Desmodora* sp	12	16	12	14	24	16	16
4	*Desmoscolex falcatus*	18	12	8	26	22	20	32
5	*Enoploides* sp.	12	24	16	22	14	12	18
6	*Greeffiella* sp	16	12	10	18	4	0	4
7	*Halalaimus film*	12	14	12	4	22	12	14
8	*Oncholaimus* sp	2	2	0	4	2	0	4
9	*Oxystomina* sp.	4	6	4	8	2	0	2
10	*Pandolaimus* sp	8	12	3	12	0	0	16
11	*Polygastrophora septembulba*	18	24	32	22	28	24	22
12	*Theristus* sp	14	16	18	26	26	16	8
13	*Viscosia* sp	32	12	38	34	38	32	26
	Foraminiferans							

14	*Adelosina laevigata .*	26	12	42	14	12	10	14
15	*Ammobaculites exiguous*	28	26	26	22	38	36	42
16	*Ammonia beccarii*	44	53	28	26	42	28	26
17	*Amphisorus* sp.	14	0	20	4	0	2	4
18	*Ammonia dentata*	52	68	46	36	22	42	38
19	*Asterorotalia trispinosa*	46	72	48	32	58	56	38
20	*Cibicides lobatulus*	12	14	30	26	26	13	18
21	*Globigerina bulloides*	38	46	42	24	18	18	14
22	*Elphidium advena*	42	38	42	32	64	22	24
23	*Elphidium macellum*	0	14	0	12	22	14	0
24	*Elphidium norvangi*	12	14	12	10	12	10	12
25	*Lagena qudrata*	14	18	16	10	12	10	12
26	*Planorbulinella larvata*	28	32	28	40	42	26	26
27	*Nonionella labradorica*	18	32	16	22	18	14	12
28	*Quinqueloculina agglutinans*	26	22	28	20	26	24	20
29	*Rosalina bradyi*	24	28	22	23	16	14	10
30	*Spiroloculina communis*	10	12	20	10	12	14	12
31	*Spirillina limbata.*	8	12	0	2	0	2	4
32	*Textularia agglutinans*	4	8	11	0	6	4	12
33	*Triloculina striatitrigonula*	16	32	22	28	20	10	18
34	*Triloculina trigonula*	18	23	12	22	26	22	32
35	*Trochammina globigeriniformis*	12	10	4	0	14	3	5
	Ostrocodes							
36	*Keijella oertlii*	10	14	12	4	16	12	14
37	*Tanella estuarii*	2	6	2	2	12	0	12
38	*Tanella kingmaii*	4	8	0	4	8	2	2
39	*Cyprideis* sp	8	10	12	10	16	10	12
	Tanaidacea							
40	*Apseudes setosus*	0	4	2	2	2	2	0
41	**Polychaete Larvae**	4	3	2	0	4	2	0
42	**Bivalve Veliger**	2	2	4	2	2	0	6
	Total	**710**	**863**	**737**	**665**	**826**	**608**	**637**

Table: Distribution and Abundance of Meiobenthos in Sediment Samples during post-dredging for the stations MSL-8, MSL=9, MSL=10, MSL11, MSL12 and ITL 13 at Krishnapatnam port, Nellore

S.No	Taxon	MEIOBENTHOS Nos/10 cm2					
		MSL-8	MSL-9	MSL-10	MSL-11	MSL-12	ITL-13
	Nematodes						
1	*Astomonema* sp.	14	8	16	18	20	24
2	*Daptonema conicum*	26	42	20	16	32	38
3	*Desmodora* sp	22	16	12	10	18	32

4	*Desmoscolex falcatus*	42	22	12	8	4	26
5	*Enoploides* sp.	10	14	6	0	4	8
6	*Greeffiella* sp	2	2	0	0	0	2
7	*Halalaimus film*	5	0	8	6	0	10
8	*Oncholaimus* sp	2	2	2	2	0	2
9	*Oxystomina* sp.	0	2	0	2	0	2
10	*Pandolaimus* sp	3	6	3	6	2	8
11	*Polygastrophora septembulba*	26	20	18	12	24	32
12	*Theristus* sp	2	12	22	16	22	28
13	*Viscosia* sp	24	18	14	32	34	38
	Foraminiferans						
14	*Adelosina laevigata*	10	16	18	1	14	32
15	*Ammobaculites exiguous*	52	22	14	21	26	36
16	*Ammonia beccarii*	28	24	32	22	32	48
17	*Amphisorus* sp.	6	2	0	0	0	10
18	*Ammonia dentata*	32	20	24	26	58	62
19	*Asterorotalia trispinosa*	42	54	62	58	64	70
20	*Cibicides lobatulus*	16	9	14	31	6	8
21	*Globigerina bulloides*	20	12	10	32	36	42
22	*Elphidium advena*	32	28	22	20	24	22
23	*Elphidium macellum*	2	12	12	0	16	24
24	*Elphidium norvangi*	12	14	14	16	10	18
25	*Lagena qudrata*	18	10	12	14	12	16
26	*Planorbulinella larvata*	20	22	20	12	10	14
27	*Nonionella labradorica*	10	20	26	0	24	28
28	*Quinqueloculina agglutinans*	22	24	26	20	24	28
29	*Rosalina bradyi*	8	8	4	0	2	18
30	*Spiroloculina communis*	14	14	12	20	14	24
31	*Spirillina limbata.*	0	2	0	6	0	0
32	*Textularia agglutinans*	6	2	1	12	2	0
33	*Triloculina striatitrigonula*	10	8	22	18	18	26
34	*Triloculina trigonula*	12	36	26	42	18	42
35	*Trochammina globigeriniformis*	3	2	2	0	8	12
	Ostrocodes						
36	*Keijella oertlii*	4	4	8	2	10	22
37	*Tanella estuarii*	8	12	2	3	4	2
38	*Tanella kingmaii*	5	2	2	0	2	3
39	*Cyprideis* sp	6	14	6	4	12	16
	Tanaidacea						
40	*Apseudes setosus*	2	2	2	0	2	4

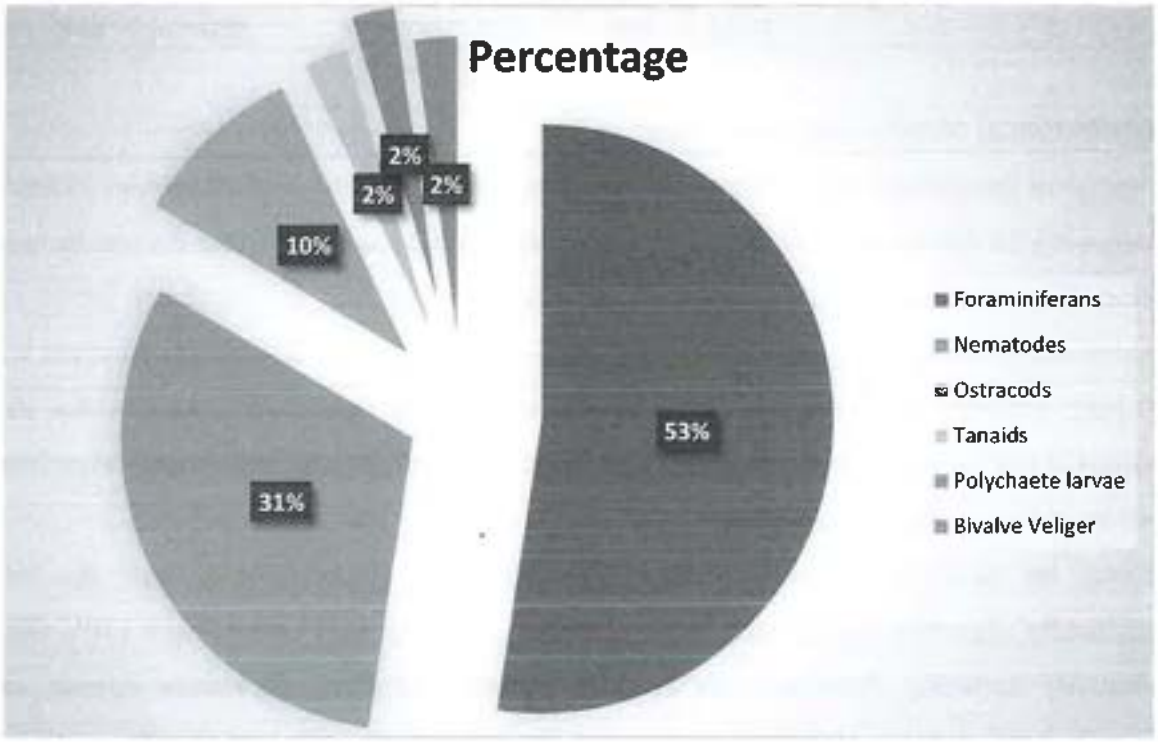
41	**Polychaete Larvae**	0	0	4	0	0	4
42	**Bivalve Veliger**	2	4	0	2	0	4
	Total	**580**	**563**	**530**	**510**	**608**	**885**

Distribution of Meiobenthic community

In terms of group-wise composition, foraminiferans exhibited the highest species richness, comprising 22 distinct taxa, followed by nematodes with 13 species. Other groups included ostracods (4 species), tanaids (1 species), and larval forms such as polychaete larvae and bivalve veligers. The dominance of foraminiferans suggests a stable benthic environment with adequate calcium carbonate and microhabitat complexity. Nematodes, known for their ecological resilience and wide adaptability, were present in all stations and formed a significant portion of the meiofaunal community.

Among the dominant species, *Asterorotalia trispinosa* (foraminiferan) was the most consistently abundant taxon, with peak densities at ITL-2 (72) and ITL-13 (70). Other commonly occurring foraminiferans included *Ammonia dentata, Elphidium advena,* and *Planorbulinella larvata,* each showing wide distribution and relatively high abundance. Within the nematodes, *Viscosia* sp., *Polygastrophora septembulba, Daptonema conicum,* and *Theristus* sp. were frequently encountered and numerically dominant, highlighting their ecological significance in sedimentary habitats. The ostracod *Cyprideis* sp. and tanaid *Apseudes setosus* occurred in moderate densities, while polychaete and bivalve larvae were sporadically present, indicating recent spawning events or larval settlement patterns. Overall, the meiofaunal assemblage reflects a diverse and productive benthic system, with group-specific patterns driven by sediment type, salinity, and anthropogenic pressures such as dredging.

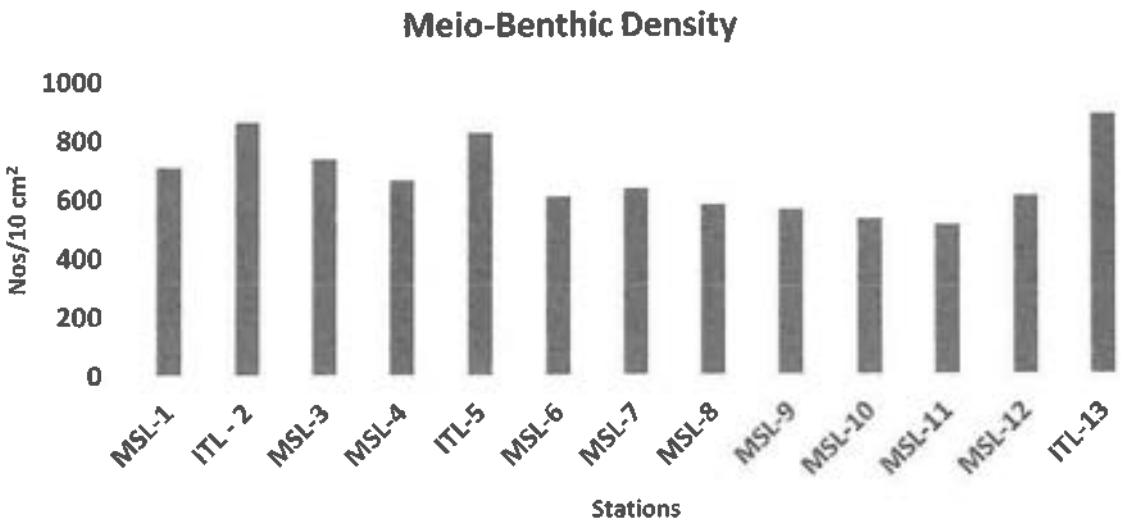
Percentage composition of Meiobenthic organisms



Meio-benthic population diversity in during post dredging at Krishnapatnam port, Nellore.

The meiofaunal community was dominated by foraminiferans (52%), followed by nematodes (31%), indicating their ecological significance and adaptability. Ostracods (10%) showed moderate presence, reflecting stable microhabitats. Minor groups like tanaids, polychaete larvae, and bivalve veligers (each 2%) contributed to overall diversity, suggesting active reproduction and ecological complexity in the benthic environment.

Mio-benthic population density



Meio-benthic population density in during post dredging at Krishnapatnam port, Nellore.

The meiofaunal abundance across the surveyed stations varied notably, with densities ranging from 510 to 885 individuals per 10 cm². The highest meiofaunal density was recorded at ITL-13 (885), followed closely by ITL-2 (863) and ITL-5 (826), indicating favourable ecological conditions in these intertidal locations. Conversely, MSL-11 (510) and MSL-10 (530) exhibited the lowest densities, reflecting either poor habitat quality or higher environmental stress in these subtidal creek zones. Generally, intertidal stations showed higher meiofaunal abundance compared to mid-stream subtidal locations, likely due to better oxygenation, sediment texture, and organic matter availability in the upper layers.

Overall Assessment of Post-Dredging Environmental Conditions

Post-dredging evaluation of the Krishnapatnam Port region revealed a multifaceted picture of the ecosystem's physical, chemical, and biological responses. Physico-chemical parameters, including soil pH, remained relatively stable, with values ranging from 7.9 to 8.2, indicating slightly alkaline sediment conditions across both creek and intertidal stations. This stability suggests that the dredging activity did not cause significant acidification or disruption in the sediment buffering capacity.

Nutrient analysis showed moderate concentrations of nitrogen, phosphorus, potassium, and sodium, with notable spatial variation. These nutrients, essential for primary productivity,

remained within ecologically acceptable ranges, indicating a resilient nutrient balance post-disturbance.

Total Organic Carbon (TOC) concentrations reflected organic matter distribution in the sediment, with slightly elevated levels in certain stations, possibly due to resuspension and redistribution during dredging. Such organic enrichment can facilitate microbial and benthic recovery in the sediment environment.

Phytoplankton diversity and density indicated a healthy post-dredging response. Bacillariophyceae (diatoms) were the most dominant group, with species such as *Skeletonema costatum, Thalassiosira sp.,* and *Navicula directa* showing high densities across stations. Moderate contributions from Dinophyceae and Cyanophyceae were also recorded, highlighting a balanced phytoplankton composition and sustained primary productivity following sediment disturbance.

Zooplankton composition was rich and varied, with dominance of copepods—especially Calanoids (*Acartia danae, Paracalanus parvus, Temora stylifera*) and Cyclopoids (*Oithona similis, Corycaeus danae*). Harpacticoids, decapod larvae, molluscan veligers, rotifers, foraminiferans, polychaete larvae, and other taxa *like Sagitta* and *Oikopleura* contributed to a diverse trophic base, suggesting a strong secondary productivity and rapid ecological recovery in the water column.

Station-wise density analysis showed spatial heterogeneity, with highest zooplankton densities at ST-8, indicating localized productivity hotspots, possibly due to favorable hydrodynamic conditions or nutrient availability.

In summary, the post-dredging ecosystem of the study area demonstrated signs of rapid recovery and ecological resilience, characterized by stable sediment chemistry, sustained primary and secondary productivity, and diverse biotic communities. The results collectively indicate that the dredging activity, although temporarily disturbing, did not lead to prolonged negative impacts on sediment or water quality, and the system is in a phase of functional recovery.

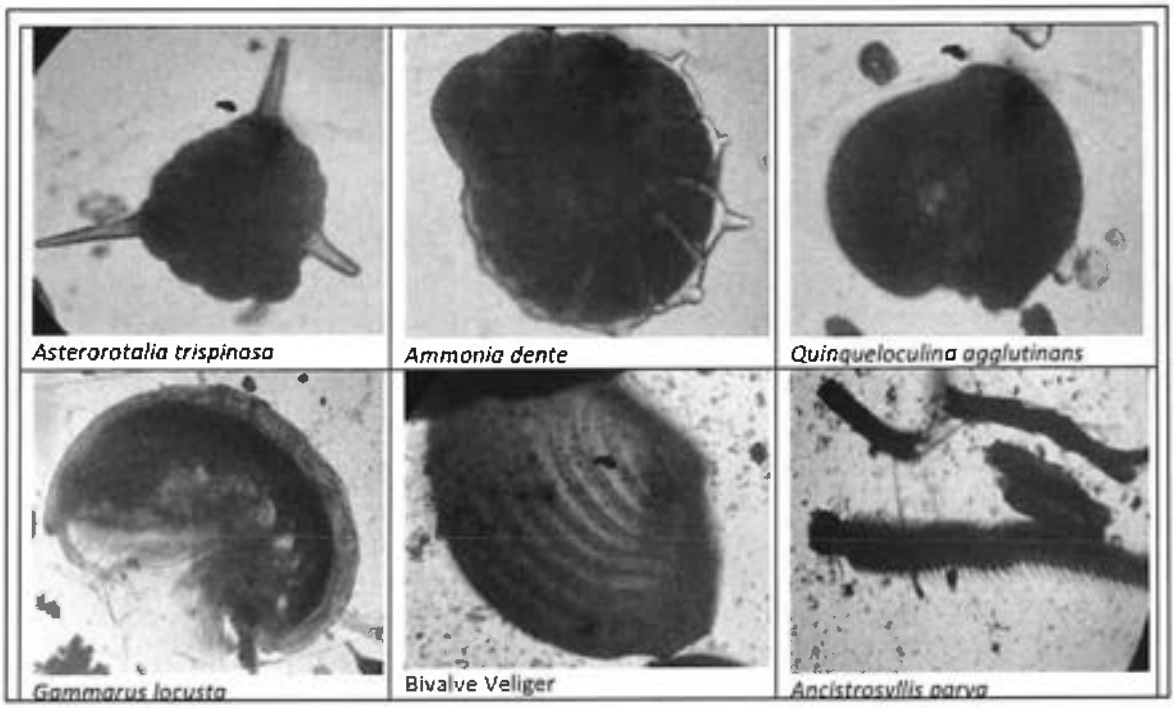


Figure: Benthos

Table: THB, Total coliforms, Fecal coliforms, *E. coli* and *Vibrio* sp. Levels in sediment samples at Different Monitoring Stations during dredging

Stations	THB	Total coliforms	Fecal coliforms	*E. coli*	*Vibrio* sp.
	CFU/g of Sediment				
MS 1	945840	45030	8630	130	32
MS(ITL) 2	615000	54510	9945	150	21
MS 3	565800	69520	8040	142	25
MS 4	606800	69520	7350	120	15
MS (ITL)5	656000	27650	8015	110	13
MS 6	475600	33970	5040	72	19
MS 7	451000	28440	4503	70	10
MS 8	492800	57670	3310	85	9
MS 9	387200	40290	2910	64	3
MS 10	343200	12640	2750	60	4
MS 11	334400	22120	2050	40	2
MS 12	378400	11060	1730	30	0
MS (ITL)13	1012000	33180	10190	82	18

Microbial Load in Sediment After Dredging

Post-dredging microbiological analysis of sediment samples revealed substantial variation in total heterotrophic bacteria (THB) and indicator pathogens across the stations. THB counts

ranged from 334,400 CFU/g (MS-11) to a peak of 1,012,000 CFU/g (MS-13, intertidal), indicating high microbial activity likely supported by organic matter availability. Creek stations such as MS-1 (945,840 CFU/g) and MS-3 (565,800 CFU/g) showed elevated bacterial loads, possibly due to sediment disturbance and organic enrichment from nearby runoff or tidal inputs.

Total coliforms were relatively high at most stations, with maximum levels of 69,520 CFU/g at MS-3 and MS-4, suggesting persistent fecal contamination sources. Fecal coliforms and *E. coli* were also detected in all stations, with the highest fecal coliform count at MS-13 (10,190 CFU/g) and *E. coli* concentrations peaking at MS-2 (150 CFU/g), reflecting recent fecal contamination, especially in intertidal zones.

Vibrio species, potential indicators of marine pathogenicity, were generally low, ranging from 0 to 32 CFU/g, with the highest detected at MS-1, suggesting minor health risk under current conditions. Notably, microbial loads were higher in creek and intertidal regions compared to offshore or inner basin stations, indicating localized contamination and sediment reworking due to dredging activities.

Overall, the data suggest that while bacterial communities remain active and diverse post-dredging, elevated coliforms and *E. coli* in certain stations warrant regular monitoring to assess ecological and public health risks.

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Annexure – X

adani
Ports and
Logistics

Environmental Policy

Adani Ports and Special Economic Zone Limited's (APSEZ) environmental responsibilities are driven by its commitment to preserve the environment and are integral to the way we do business. We shall strive to integrate best environmental practices across APSEZ's management and governance systems to minimize environmental impacts and attain a leadership position in environmental stewardship.

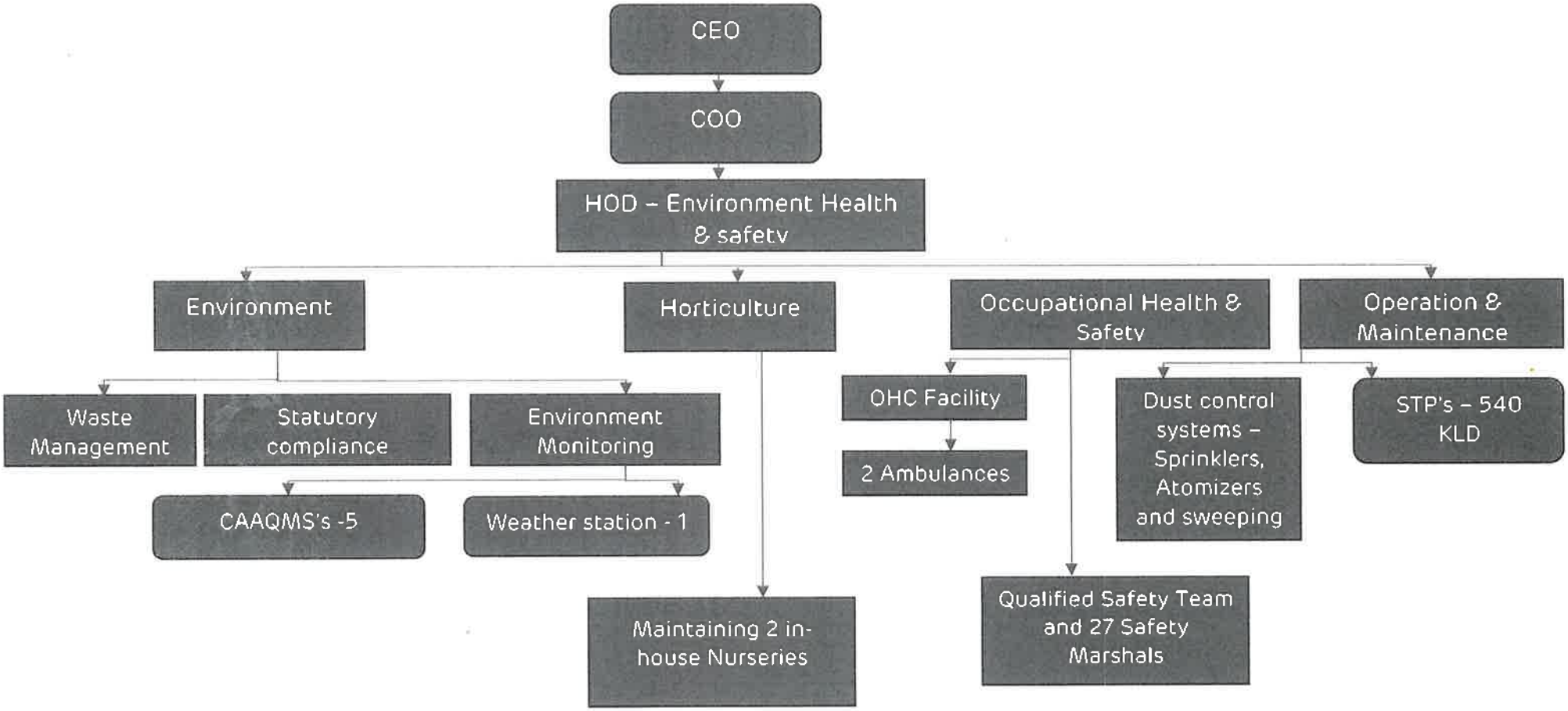
APSEZ, its subsidiaries, joint ventures, suppliers, service providers and contractors shall keep its commitment to:

- Build and operate the facilities in compliance with all applicable environmental laws, regulations, obligations and endeavor to go beyond compliances.
- Identify and evaluate environmental and climate impacts and their associated risks for all activities including distribution & logistics and formulate a mitigation strategy.
- Define roles and responsibilities for implementing environmental management policy.
- Conduct training for employees to understand the impacts of business activities on the environment.
- Continually improve the environmental performance by setting objectives, targets and processes for efficient use of natural resources, waste management and minimization, emission reduction, noise level control and pollution prevention.
- Conserve and protect environment in and around of our operational sites in consultation with stakeholders.
- Conduct environmental due diligence for new and expansion of existing projects, mergers and acquisitions by set procedures.
- Create environmental awareness through continuous engagement and training with stakeholders including employees, customers, suppliers, service providers, contractors and local communities.
- Measure, monitor, review and report the environmental performance and issues of the organization in accordance with this policy at regular intervals and audit (internal/ external) before communicating to relevant stakeholders.

Date: August 09, 2023

Karan Adani
Whole-Time Director & CEO

Environment Cell



Annexure - 11

ANNEXURE-2

EMP matrix during Construction Phase

S. No	Project Activity	Potential Risks and Impacts	Recommended Mitigation Measures	Frequency of Measurement/ Monitoring	Responsibility of Mitigation Measures	Mitigation Measures Implementation Period	Any other
Land Environment							
1	Excavation for civil structures such as operational buildings and storage areas	Disposal of excavated soil	Excavated soil will be used for back- filling the excavated pits after completion of concreting and the balance quantity will be used for filling low lying areas within Port Premises	After construction works complete	Main/ Sub-Contractor	During Soil Excavation Period	Physical Supervision
Air Environment							
2	Excavation and Civil Foundation Works	Dust emission and Air Pollution	Ambient Air Quality Monitoring near project site	Once in a month and random sampling will be done- 3 locations	AKPL/Main Contractor	Construction Period	Ambient Air Quality Monitoring conducted through NABL Accredited Laboratory

S. No	Project Activity	Potential Risks and Impacts	Recommended Mitigation Measures	Frequency of Measurement/ Monitoring	Responsibility of Mitigation Measures	Mitigation Measures Implementation Period	Any other

Annexure - 12

3	Vehicle Exhaust	Gaseous Emission and Air Pollution	BS IV/VI Emission Norms complied Vehicle to be deployed. Pollution Under Control (PUC) Certificate shall be furnished to Main Contractor for vehicles deployed for project related works	Once in a year- Parking areas	Main Contractor/Sub Contractor	Construction Period	PUC certificate shall be obtained from Agency authorized by State Transport Authority, Government of Andhra Pradesh
Noise Environment							
4	Vehicle Movement	Nuisance and Noise Pollution	Proper maintained vehicles will be deployed for project related activities	Once in a month- 3 locations- Junctions of Port road and public roads	Main Contractor	Construction Period	Noise Monitoring shall be monitored by Contractor using hand held noise meter
5	DG Set, Compressor, Construction Equipment Operation	Noise Pollution and Affects Hearing Loss to Workers	Acoustic Enclosure for DG Sets, Barriers for Compressor, Construction Equipment Isolation during works	Continuous 24 hrs monitoring - Once in a month- 3 locations. Instantaneous monitoring daily at the construction site.	Main/Sub Contractor	Construction Period	Contractor shall procure and train the person to monitor the noise level during construction period on daily basis.
Groundwater Quality							

S. No	Project Activity	Potential Risks and Impacts	Recommended Mitigation Measures	Frequency of Measurement/ Monitoring	Responsibility of Mitigation Measures	Mitigation Measures Implementation Period	Any other
6	Dredging/excavation for construction of berths	Salinity ingress in the groundwater	Envisaged berth construction with diaphragm wall structures shall prevent saturation of soil to incoming seawater	Half-Yearly - 4 locations	AKPL/Main Contractor	Construction Period	Groundwater quality in the surrounding land environment to be measured.
Soil Environment							
7	Dredging/excavation for construction of berths, Reclamation	Salinity ingress in the soil	Soil used for reclamation shall be tested. Envisaged berth construction with diaphragm wall structures shall prevent saturation of soil	Dredge/excavated soil shall be tested for contamination before using it for reclamation. HalfYearly- 2 locations adjacent to the reclaimed land	AKPL/Main Contractor	Construction Period	Soil quality in the surrounding land environment to be measured.
Waste Management							
8	Civil and Mechanical Works	Concrete Waste, Metal Scrap Waste and Waste Management	Concrete Waste shall be recycled or disposed to Landfill. Recyclable Scrap Waste shall be disposed to recyclers	Daily	Main Contractor	Construction Period	Log Book to be maintained for Waste Disposal
Marine Environment							

9	Drilling of piles for construction of berths	Increase of turbidity, TSS and heavy metal concentration	Sheet Piling around the drilling locations	Turbidity, Marine water quality and sediment quality - Weekly-4 locations	Main Contractor	Entire Construction Period	NABL accredited Lab shall be engaged for Monitoring

S. No	Project Activity	Potential Risks and Impacts	Recommended Mitigation Measures	Frequency of Measurement/ Monitoring	Responsibility of Mitigation Measures	Mitigation Measures Implementation Period	Any other
							Sea water quality
10	Capital Dredging of 60 Million m^3	TSS and Turbidity of Marine Water Quality	Silt Curtain and Boom shall be deployed	Pre Dredging, Capital Dredging Period and Post dredging - 4 locations	AKPL	At the time of Dredging Schedule	NABL accredited Lab shall be engaged for Monitoring Sea water quality
11	Oil Spill from Construction Equipment during Construction activities in marine environment	Oil spill on the shore and seawater	Spill absorbing material shall be made available at project site. Oil spill collection tray shall be provided at potential oil leak source if any Oil storage area shall be provided away from the marine waters.	Daily	Main Contractor	Entire Construction Period	Log Book maintained for Oil Spill if any

Marine Ecological Environment							
12	Capital Dredging of 60 Million m^3	Migration of marine species and loss of Benthic species	Silt Curtains/containment bunds for reclamation areas and Boom Dispersion Equipment		AKPL	Construction Period	NABL accredited Lab shall be engaged for Monitoring Sea water quality
S. No	**Project Activity**	**Potential Risks and Impacts**	**Recommended Mitigation Measures**	**Frequency of Measurement/ Monitoring**	**Responsibility of Mitigation Measures**	**Mitigation Measures Implementation Period**	**Any other**
13	Offshore disposal of dredge spoil	Increase in turbidity, change in bed contour and shoreline	Adequate interval shall be maintained for one cycle of disposal to other.	Pre dredging and Post dredging monitoring at the disposal site for 3 locations and 1 location at clear water for comparison.	AKPL	Construction Period	NABL accredited Lab shall be engaged

EMP matrix during Operation Phase

S. No	Project Activity	Potential Risks and Impacts	Recommended Mitigation Measures	Frequency of Measurement/ Monitoring	Responsibility of Mitigation Measures	Mitigation Measures Implementation Period	Any other
Air Environment							
1	Cargo Handling	Fugitive Dust Emissions – Affects Air Quality	Mechanization of Material Handling System from Berths to Coal Stock Piles. Dust Suppression and Dust Containment Systems shall be installed at critical locations such as Unloading and Coal Stock Piles area and Truck loading points	Twice a Week as per NAAQ Standards of CPCB- 7 locations	AKPL	Operation Period	NABL Accredited Lab shall be engaged
2	Vehicular Movement within Port Premises	Gaseous Emission – Affect Air Quality	Emission norms prescribed by Transport Authority of State Government	Twice a Week as per NAAQ Standards of CPCB- 7 locations	AKPL	Operation Period	NABL Accredited Lab shall be engaged

Noise Environment							
3	Vehicular Movement KMPH within Port Premises	Ambient Nuisance	Speed Speed Limit Noise Monthly- 7 shall be locations Vehicle prescribed	of 30 Governor on AKPL Operation shall	Period		be installed
Waste Management							

S. No	Project Activity	Potential Risks and Impacts	Recommended Mitigation Measures	Frequency of Measurement/ Monitoring	Responsibility of Mitigation Measures	Mitigation Measures Implementation Period	Any other
4	Operational buildings, Administrative Offices, Canteens	Solid Waste Generation	Biodegradable and Non-biodegradable wastes are collected, segregated and composted. Compost will be used as manure for Greenbelt	Once in a Year	AKPL	Maintenance	As per SWM Rules, 2016 all records shall be maintained.
5	Hazardous Waste – Used/Waste Oil	Hazardous Waste	Authorized Recyclers shall be identified for Reuse/Recycle	Once in a Year	AKPL	Maintenance	As per HWM Rules, 2016 all records shall be maintained.
Storm Water Management							

6	Storm Water Run-off from Coal Stock Piles	Affect Seawater Quality	Catch Pit, OilWater Separator and primary settling treatment facility shall be installed. Treated water will be reused for dust suppression system and greenbelt development	Once in Year	AKPL	Monsoon Period	Catch Pit, Oil Water Separator shall be cleaned before Monsoon. Discharge of wastewater in to storm water drain is not allowed
Green Belt Development							
S. No	**Project Activity**	**Potential Risks and Impacts**	**Recommended Mitigation Measures**	**Frequency of Measurement/ Monitoring**	**Responsibility of Mitigation Measures**	**Mitigation Measures Implementation Period**	**Any other**
7	Green Belt Development	Positive Impact to control Dust and Noise Pollution	Greenbelt of width 20 m is proposed around coal stockpiles and 50 m width along the port boundary		AKPL	Operation Period	Forests and Environment officers shall be consulted
Mangrove Management							
8	Monitoring/conservation of Existing mangroves	Positive impact on surrounding ecology	The mangroves shall be monitored for growth and survival	Bi-yearly- Random sampling by quadrat survey	AKPL	Operation Period	Forests and MSSRF shall be consulted.
Marine Ecological Monitoring							

9	Cargo Handling at Berth – Dust Deposition of Seawater Surface	Affects the primary productivity (Plantain and Algae)	Closed Conveyor and Hopper at Feeding point	Weekly- 3 locations within the port and 1 location in the approach channel	AKPL	Operation Period	NABL accredited Lab shall be engaged
Marine Water Environment							
10	Cargo Handling at Berth – Dust Deposition of Seawater Surface	Affect the water quality	Closed Conveyor and Hopper at Feeding point	Weekly- 3 locations within the port and 1 location in the approach channel	AKPL	Operation Period	NABL accredited Lab shall be engaged
11	Maintenance Dredging	Affect the water quality and sediment quality	Disposal of dredged material at the identified location in an even spread.	Monthly - at the disposal site for 4 locations and 1 location at clear water for comparison.	AKPL	Operation Period	NABL accredited Lab shall be engaged

M/s Krishnapatnam Port Company Ltd.

Regarding Environmental and CRZ Clearance of Phase-III Expansion

PUBLIC NOTICE

This is to bring to the public notice that M/s Krishnapatnam Port Company Ltd. has been accorded Environmental Clearance (EC) for Development of Phase-III Expansion with supporting utilities and infrastructure facilities by the Ministry of Environment Forest and Climate Change (MoEF&CC), Indira Paryavaran Bhavan, Jor Bagh Road, New Delhi 110003, vide File No.: 10-18/2016-IA.III, dated 11.01.2021. A copy of the above mentioned clearance letter along with the Environmental Conditions and safeguard is published here and is available with Andhra Pradesh Pollution Control Board. This may also be seen on the website of Ministry of Environment, Forest and Climate Change at https://www.moef.nic.in and on website of http://krishnapatnamport.com in Environmental Information section.

File No.: 10-18/2016-IA.III

Proposal No.: IA/AP/MIS/966/2009

Government of India, Ministry of Environment, Forest and Climate Change (Impact Assessment Division), Indira Paryavaran Bhawan, Jor Bagh Road, Ali Ganj, New Delhi - 110 003.

Dated: 11th January, 2021

To: The Director and Chief Executive Officer, M/s Krishnapatnam Port Company Ltd. 1st Floor, 48-9-17, Dwarakanagar, Visakhapatnam - 530 016, Andhra Pradesh.

Subject: Expansion of Krishnapatnam Port (Phase-III) at SPSR Nellore District, Andhra Pradesh by M/s Krishnapatnam Port Company Ltd - Environmental and CRZ Clearance.

Sir,

This has reference to your online proposal to this Ministry on 05th June 2020 regarding Environmental and CRZ Clearance for Expansion of Krishnapatnam Port (Phase-III) at SPSR Nellore District, Andhra Pradesh by M/s Krishnapatnam Port Company Ltd.

2. Krishnapatnam Port located at 14°15'10" N Latitude and 80°08' 05" E Longitude in Sri Potti Sri Ramulu (SPSR) Nellore District, AP is developed by Krishnapatnam Port Company Ltd (KPCL) as an all-weather, deep water, multi-purpose port. The Phase I & II developments of Krishnapatnam Port comprising of 12 berths out of 17 approved berths with required marine infrastructure were developed in a designated land area of Ha.1240 (Ac. 3064) to cater to 68 MTPA of various types of cargo plus 2.0 MTEUsPA of container traffic. To cater to future traffic needs, KPCL has proposed to take up Phase III expansion of the port.

3. The proposed phase-III project comprising of 16 Berths including 3 jetties for liquid cargo and 3 SBM's in deep waters within Port Limits to cater 150.2 MTPA of various types of cargo plus 1.1 MTEUsPA of container cargo. The proposed expansion entail 60 million cu m of dredging in soft soil, utilize 26 million cum of dredged sand for reclamation of low lying areas of port, stock pile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT and disposal of balance 32 million cu m of dredged spoil in the identified dredge disposal area of 56 Km2 beyond (-) 20 m contour. In view of the severe floods that have occurred in the Nellore region during 2015, in order to improve the discharge through Kandaleru Creek the GoAP also suggested cutting through the islands in the Creek. The Masterplan development as well as the proposed Phase-III expansion of Krishnapatnam Port envisaged training the meanders of the Kandaleru Creek by forming a straight cut across the sand bar existing in the Kandaleru Creek within the port limits and develop the west dock with berths on both sides of the straight cut and reclaim the erstwhile meanders of the creek.

4. The proposed proposal fall under 7(e), Category A as per EIA notification 2006. The overall cost of the project is Rs. 907000 Lakhs. The Term of Reference (ToR) was issued vide letter No. 10-18/2016-IA.III dated 4th May 2016. Amendment in TOR was done vide Letter No. of even number dated 24th November 2017. Further amendment in TOR was done vide Letter No. of even number dated 27th August 2018. Public hearing was exempted as per the ToR amendment vide Letter No.10-18/2016-IA-III dated 24th November 2017. However, it was recommended that the Project Proponent shall address the compliance of there commendations made in the Public Hearing 2009 and submit the same as separate document attached to EIA report.

5. As per the commitments made during the public hearing 100 m green belt has been developed along the boundary of the port. Further as desired by APPCB, 191.5 Ha of green belt has been developed. Dedicated 4 lane port road connectivity has been developed to NH-16 by GoAP. Further, as requested by local public, Krishnapatnam Port is undertaking environmental protection measures to combat air pollution. Total no of village population working directly and indirectly in the port and port based industries are 10,500. Further KPCL has adopted 33 surrounding villages and is carrying out necessary developmental activities.

6. Total area of the proposed project is 1094 Ha (Ac.2703). The project does not involve any land acquisition and R&R as the proposed project activities will be developed within the exiting designated Krishnapatnam port facility. There is no diversion of forest land. The patches of mangroves around 7,128 Ha of area is falling in proposed Phase-III development area will be protected. There is no Eco-Sensitive Zone (ESZ) / Protected Areas such as National Parks, Sanctuaries and Tiger Reserves etc., within the 10 km radius of the project area.

7. The proposed project site is located in the coastal area and attracts CRZ Notification, 2011. The CRZ Area details of the proposed project activities as per the revised layout of the Phase-III expansion of KPCL has been provided by Institute of Remote Sensing, Anna University, which is an authorized agency for CRZ map preparation. The layout superimposed on CRZ map was done at 1:4000 scales. The proposed project was appraised by the Andhra Pradesh Coastal Zone Management Authority (APCZMA) and the recommendation was obtained vide Letter No. 202/CRZ/IND/201930 dated 21.05.2020.

8. The project site is located on the east coast alongside Bay of Bengal. The Kandaleru Creek and Upputeru creeks, Buckingham canal passes through the project site. The other surface water bodies in the study area include irrigation drains from agricultural fields, Sarvepalli reservoir and Govindapalli reservoir. The ephemeral drains inside the project site will not be disturbed and culverts CED 1 and CED 2 are proposed to be provided for the road and rail bridges over the drains without affecting their flow. The mangroves inside the Phase III developmental area will be conserved and pipelines from the nearby drain are provided for tidal exchange. The Kandaleru Creek will be straightened to develop the west dock. NIOT has studied the impacts of creek rerouting and it was found that there is only slight change in the water level and no impact on flushing and tidal exchange due to the proposed development.

9. The existing port facility has a water supply of 5 MLD which includes 1 MLD of water from Muthukur Reservoir provided by Government of Andhra Pradesh and 4 MLD of water from NakkalaKalava irrigation drain provided by Irrigation Department of Andhra Pradesh. The present Port facility (Phase-I and Phase-II developments) utilizes 2.5 MLD of water and the water requirement for the proposed Phase-III development is estimated to be 2.5 MLD. No groundwater will be extracted/utilized for the proposed project.

10. The port is proposed to install a Sewage Treatment Plant (STP) of capacity 700 KLD to treat the sewage and an Effluent Treatment Plant (ETP) of 300 KLD capacities to treat the wastewater from the Port. The treated wastewater will be utilized for greenbelt and dust suppression systems. Greenbelt is proposed in an area of 120 Ha along the Port boundary and around the coal storage areas with native species.

11. Benefits of the project: The proposed development would generate large scale direct and indirect employment for the local people in both the skilled and unskilled worker class. Further there would be an improvement to the local infrastructures in the vicinity of the port through CSR. About 6200 people will get employment during construction and operation phase. The proposed development will help in handling the increased cargo demand due to industrialization. This will contribute towards the growth in economy of the region and the nation. The increased revenue due to proposed development would contribute to the exchequer i.e., Central Government departments like Customs & Excise, Railways, Commercial Taxes and Income Tax. This will eventually contribute towards the State Government of Andhra Pradesh by way of share of revenue and lease rentals.

12. The project proponent along with the EIA consultant M/s Cholamandalam MS Risk Services Limited, Chennai made a presentation through Video Conferencing during 249th EAC meeting held on 14th December 2020. The EAC based on the information submitted and

(vi) Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.

(vii) Total fresh water use shall not exceed the proposed requirement as provided in the project details. Prior permission from competent authority shall be obtained for use of fresh water.

(viii) Sewage Treatment Plant shall be provided to treat the wastewater generated from the project. Treated water shall be reused for horticulture, flushing, backwash, HVAC purposes and dust suppression.

(ix) A certificate from the competent authority for discharging treated effluent / untreated effluents into the Public sewer / disposal / drainage systems along with the final disposal point should be obtained.

(x) No diversion of the natural course of the river shall be made without prior permission from the Ministry of Water resources.

(xi) All the erosion control measures shall be taken at water front facilities. Earth protection work shall be carried out to avoid erosion of soil from the shoreline / boundary line from the land area into the marine water body.

IV. Noise monitoring and prevention:

(i) Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.

(ii) Noise from vehicles, power machinery and equipment on-site should not exceed the prescribed limit. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.

(iii) Acoustic enclosures for DG sets, noise barriers for ground-run bays, ear plugs for operating personnel shall be implemented as mitigation measures for noise impact due to ground sources.

(iv) The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.

V. Energy Conservation measures:

(i) Provide solar power generation on roof tops of buildings, for solar light system for all common areas, street lights, parking around project area and maintain the same regularly.

(ii) Provide LED lights in their offices and port areas.

VI. Waste management:

(i) Dredged material shall be disposed safely in the designated areas.

(ii) Shoreline should not be disturbed due to dumping. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring reports.

(iii) 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 or State Pollution Control Board and under the Environment (Protection) Act, 1986.

(iv) The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.

(v) Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016.

(vi) A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.

(vii) Used CFLs and TFLs should be properly collected and disposed off / sent for recycling as per the prevailing guidelines / rules of the regulatory authority to avoid mercury contamination.

(viii) Oil spill contingency plan shall be prepared and part of DMP to tackle emergencies. The equipment and recovery of oil from a spill would be assessed. Guidelines given in MARPOL and Shipping Acts for oil spill management would be followed. Mechanism for integration of terminals oil contingency plan with the overall area contingency plan under the co-ordination of Coast should be covered.

VII. Green Belt:

(i) Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCB guidelines.

(ii) Top soil shall be separately stored and used in the development of green belt.

VIII. Marine Ecology:

(i) The dredging schedule shall be so planned that the turbidity developed is dispersed soon enough to prevent any stress on the fish population.

(ii) While carrying out dredging, an independent monitoring shall be carried out through a Government Agency / Institute to assess the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.

(iii) A detailed marine biodiversity management plan shall be prepared through the NIO or any other Institute of repute on marine, brackish water and fresh water ecology and biodiversity and submitted to and implemented to the satisfaction of the State Biodiversity Board and the CRZ authority. The report shall be based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, sub-tidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography.

(iv) Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps,

Annexure - 13

[illegible] dated 4th January, 2019 for the said project / activity.

13. The Ministry of Environment, Forest and Climate Change has considered the proposal based on the recommendations of the Expert Appraisal Committee (Infrastructure, CRZ and other Miscellaneous projects) and hereby decided to grant Environmental and CRZ Clearance for the "Expansion of Krishnapatnam Port (Phase-III) at SPSR Nellore District, Andhra Pradesh by M/s Krishnapatnam Port Company Ltd." under the EIA Notification, 2006 as amended and CRZ Notification 2011, subject to strict compliance of the following specific conditions, in addition to all standard conditions applicable for such projects.

(i) The Environmental and CRZ Clearance to the project is primarily under provisions of EIA Notification, 2006 and CRZ Notification, 2011. It does not tantamount to approvals / consent / permissions etc required to be obtained under any other Act / Rule / regulation. The Project Proponent is under obligation to obtain approvals / clearances under any other Acts / Regulations or Statutes as applicable to the project.

(ii) The project proponent shall abide by all the commitments and recommendations made in the Form-II, EIA and EMP report, submissions made during Public Hearing and also that have been made during their presentation to EAC.

(iii) Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction works other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.

(iv) All the recommendations and conditions specified by the Andhra Pradesh Coastal Zone Management Authority (APCZMA) vide letter 202/CRZ/IND/201930 dated 21.05.2020 shall be complied with.

(v) 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. Creek water monitoring program shall be implemented during the construction phase.

(vi) Development of green belt by native species with consultation with state forest department shall be ensured.

(vii) The proposed expansion entails 60 million cum of dredging in soft soil. As proposed, the PP shall utilize 26 million cu m of dredged sand for reclamation of low lying areas of port, stock pile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT and disposal of balance 32 million cu m of dredged spoil in the identified dredge disposal area of 56 Km2 beyond (-) 20 m contour. The impact of dredging on the marine environment should be monitored and necessary measures shall be taken on priority basis if any adverse impact is observed. NIOT will oversee the work as scientific body and continue to monitor its impact / benefits for at least 5 years post project completion. Necessary financial assistance to be provided by project proponent to NIOT. The report of the same to be submitted to regional office of MoEFCC by project proponent.

(viii) Marine ecological monitoring and its mitigation measures for protection of phytoplankton, zooplanktons, macrobenthos, estuaries, sea-grass, algae, sea weeds, Crustaceans, Fishes, coral reefs and mangroves etc. as given in the EIA-EMP Report shall be complied with in letter and spirit with the help of reputed organization or individuals of national repute having knowledge in the said subject. Necessary financial assistance to be provided by project proponent.

(ix) Continuous online monitoring of air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance reports to the regional office of MoEFCC.

(x) The actions shall be in accordance with proposed landscape planning concepts to minimize major landscape changes. The change in land use pattern shall be limited to the proposed port limits and be carried out in such a way as to ensure proper drainage by providing surface drainage systems including storm water network.

(xi) Suitable preventive measures be taken to trap spillage of fuel / engine oil and lubricants from the construction site. Measures should be taken to contain, control and recover the accidental spills of fuel during cargo handling.

(xii) 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.

(xiii) The company shall draw up and implement Corporate Social Responsibility Plan as per the Company's Act of 2013.

(xiv) As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30th September, 2020, the project proponent shall abide by all the commitments made by them to address the concerns raised during the public consultation. The project proponent shall initiate the activities proposed by them, based on the commitment made in the public hearing, and incorporate in the Environmental Management Plan and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R&R, wildlife and forest conservation/protection measures including the NPV, Compensatory Afforestation etc, either proposed by the project proponent based on the social impact assessment and R&R action plan carried out during the preparation of EIA report or prescribed by EAC, shall also be implemented and become part of EMP.

B. STANDARD CONDITIONS:

I. Statutory compliance:

(i) Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011 and the State Coastal Zone Management Plan as drawn up by the State Government. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.

(ii) A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained.

(iii) All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Coast Guard, Civil Aviation Department shall be obtained, as applicable by project proponents from the respective competent authorities.

II. Air quality monitoring and preservation:

(i) The project proponent shall install system to carryout Ambient Air Quality monitoring for common / criterion parameters relevant to the main pollutants released (e.g. PM_{10} and $PM_{2.5}$ in reference to PM emission, and SO_2 and Nox in reference to SO_2 and Nox emissions) within and outside the project area at least at four locations covering upwind and downwind directions.

(ii) Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed emission standards.

(iii) Shrouding shall be carried out in the work site enclosing the dock / proposed facility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.

(iv) Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.

(v) The Vessels shall comply the emission norms prescribed from time to time.

(vi) Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low Sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board.

(vii) A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D. / competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments.

III. Water quality monitoring and preservation:

(i) 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.

(ii) Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality. Silt curtains shall be used to contain the spreading of suspended sediment during dredging within the dredging area.

(iii) No ships docking at the proposed project site will discharge its on-board waste water untreated in to the estuary / channel. All such wastewater load will be diverted to the proposed Effluent Treatment Plant of the project site.

(iv) Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.

(v) The project proponents will draw up and implement a plan for the management of temperature differences between intake waters and discharge waters.

(vi) The project proponent shall ensure that water traffic does not impact the aquatic wildlife sanctuaries that fall along the stretch of the river.

IX. Public hearing and human health issues:

(i) The work space shall be maintained as per international standards for occupational health and safety with provision of fresh air respirators, blowers, and fans to prevent any accumulation and inhalation of undesirable levels of pollutants including VOCs.

(ii) Workers shall be strictly enforced to wear personal protective equipments like dust mask, ear muffs or ear plugs, whenever and wherever necessary / required. Special visco-elastic gloves will be used by labour exposed to hazards from vibration.

(iii) Safety training shall be given to all workers specific to their work area and every worker and employee will be engaged in fire hazard awareness training and mock drills which will be conducted regularly. All standard safety and occupational hazard measures shall be implemented and monitored by the concerned officials to prevent the occurrence of untoward incidents / accidents.

(iv) Emergency preparedness plan based on the Hazard Identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.

(v) Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.

(vi) Occupational health surveillance of the workers shall be done on a regular basis.

X. Environment Responsibility:

(i) The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements / deviation / violation of the environmental / forest / wildlife norms / conditions. The company shall have defined system of reporting infringements / deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders / stake holders. The copy of the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.

(ii) A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.

(iii) Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry / Regional Office along with the Six Monthly Compliance Report.

(iv) Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.

XI. Miscellaneous:

(i) The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.

(ii) The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.

(iii) The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.

(iv) The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.

(v) The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.

(vi) The criteria pollutant levels namely; $PM_{2.5}$, PM_{10}, SO_2, NOx (ambient levels) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.

(vii) The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land development work and start of production operation by the project.

(viii) The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.

(ix) The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.

(x) No further expansion or modifications in the port area shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).

(xi) Concealing factual data or submission of false / fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.

(xii) The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

(xiii) The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

(xiv) The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information / monitoring reports.

(xv) The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.

(xvi) Any appeal against this EC 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.

19. This issues with the approval of the Competent Authority.

(Amardeep Raju)
Scientist-E

Copy to:

1. The Principal Secretary, Department of Forests & Environment and Chairman, APCZMA, Govt. of Andhra Pradesh, A.P. Secretariat, Velagapudi, Amaravathi, A.P.
2. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32.
3. The Member Secretary, AP Pollution Control Board, Chalamalavari Street, Kasturibaipet, Vijayewada - 520 010.
4. The APCCF (C), Tulja Guda Complex, building, M.J. Market, Hyderabad, (Andhra Pradesh) - 500001.
5. Monitoring Cell, MoEF&CC, Indira Paryavaran Bhavan, New Delhi.
6. Guard File / Record File.
7. Notice Board.

(Amardeep Raju)
Scientist-E

This is a copy of Environment Clearance issued in English and the original copy of the same is available on MoEF&CC website. This is in line with directive issued therein and is for information purposes only. In case of a discrepancy, the original Environment Clearance in English will prevail and KPCL shall not be liable for any ambiguity arises

M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్

3వ దశ విస్తరణకు పర్యావరణ మరియు సీఆర్‌జడ్ అనుమతి గురించి

బహిరంగ ప్రకటన

ఇందుమూలంగా ప్రజలకు తెలియజేయునది ఏమనగా ముడుపులు వినియోగ/సహాయక ఉపయోగం మరియు మౌలిక సదుపాయాల కల్పనతో 3వ దశ విస్తరణ అభివృద్ధి పనులకు M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్‌కి పర్యావరణ అనుమతి (ఈసీ & సీఆర్‌జడ్‌ఎమ్‌పీ) లభించింది. పర్యావరణ, అటవీ మరియు వాతావరణ మార్పు మంత్రిత్వ శాఖ, ఇంటిగ్రేటెడ్ పర్యావరణ భవన్, సీజీవో కాంప్లెక్స్, లోధీ రోడ్, న్యూ ఢిల్లీ-110003 ఎండ్ టు ఎండ్ ప్రాసెస్ ద్వారా 10-18/2016-IA.III ద్వారా, తేదీ 11.01.2021న ఈ అనుమతి ఇచ్చింది. పర్యావరణ విస్తీర్ణతలతో పాటు పైన పేర్కొనబడిన అనుమతి ఆఫీస్ ఆర్డర్ ప్రతులను https://www.moef.nic.in లో మరియు http://krishnapatnamport.com వెబ్‌సైట్‌లోని పర్యావరణ సమాచార విభాగంలో కూడా దీనిని చూడవచ్చు

ప్రాజెక్ట్ ఉదాహరణ: 10-18/2016-IA.III

ప్రతిపాదన ఉదాహరణ: IA/AP/MIS/566/2009

భారత ప్రభుత్వం పర్యావరణం, అటవీ మరియు వాతావరణ మార్పు మంత్రిత్వ శాఖ (ప్రభావ అంచనా విభాగం) ఇందిరా పర్యావరణ్ భవన్, జోర్ బాగ్ రోడ్, అలీ గంజ్, న్యూ ఢిల్లీ-110003

తేదీ: 11 జనవరి, 2021

టు, ద డైరెక్టర్ ఇంక్ చీఫ్ ఎగ్జిక్యూటివ్ ఆఫీసర్ M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్, 1వ అంతస్తు, 48-9-17, ద్వారకానగర్, విశాఖపట్టణం-530 016, ఆంధ్రప్రదేశ్.

విషయం: M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్ ఎక్సిమ్‌ఓర్ వెంకటేష ఉత్తర, ఆంధ్రప్రదేశ్‌లో కృష్ణపట్నం పోర్ట్ (3వ దశ) విస్తరణ- పర్యావరణ మరియు సీఆర్‌జడ్ అనుమతి.

సార్,

M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్‌కి ఎస్‌ఐఏఏ సెలక్షన్ తేదీ, ఆంధ్రప్రదేశ్‌లో కృష్ణపట్నం పోర్ట్ (3వ దశ) విస్తరణ తొలగు పర్యావరణ మరియు సీఆర్‌జడ్ క్లియరెన్స్ గురించి 09 జూన్ 2020న ఈ మంత్రిత్వ శాఖకు మీరు ఇచ్చినదానిలో చేసిన ప్రతిపాదనకు సంబంధించి దీనిని ఇస్తున్నాము.

2. శ్రీ పొట్ట శ్రీనాథుడు (ఎస్‌ఐఏఏ) సెక్షన్ తేదీ, ఎత్తు 14°15'17" N ఉష్ణాంశం మరియు 80°08' 09" E రేఖాంశం వద్ద ఉన్న కృష్ణపట్నం పోర్టును M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్ అన్ని వాణిజ్యవరణాలను తప్పుకోగలం. దీని బాటర్, బహుళ ఉపయోగపర పోర్టుగా అభివృద్ధి చేస్తుంది. కృష్ణపట్నం పోర్ట్ యొక్క దశ 1 మరియు 2 అభివృద్ధిలో ఆమోదించిన 17 బెర్తులలో 12 బెర్తులకు ఇంటర్నల్ సమ్మతి మౌలిక సదుపాయంతో 66 ఎంటీపీఎం వివిధ రకాల కార్గో ఫ్లైస్ 2.0 ఎంటీపీఏ/ఎ కంటెయినర్ ట్రాఫిక్ ఆపరేషన్లను తీర్చేందుకు 1240 హెక్టార్లలో (3064 ఎకరాలు) కేటాయించిన భూమిలో అభివృద్ధి చేయబడింది. భవిష్యత్తులో ఉన్నే ట్రాఫిక్ ఆపరేషన్లను తీర్చేందుకు, పోర్టు యొక్క 3వ దశ విస్తరణను చేపట్టాలని తెలియచేసింది.

3. ప్రతిపాదిత దశ 3లో 150.2 ఎంఎమ్‌టీపీఏ వివిధ రకాల కార్గో వివిధ 1.1 ఎంటీపీఏ/ఎ కమర్షియల్ కార్గో అనుబంధాలను తీర్చేందుకు పోర్టు బలమ్‌తుల లోపల దీప్ వాటర్‌లో 3 ఎస్‌బీఎంలు మరియు వివిక్ష కార్గో కోసం 3 జెట్టీలతో సహా 16 బెర్తులు ఉన్నాయి. ప్రతిపాదిత విస్తరణకు మెత్తం సేలంతో 60 మిలియన్ క్యూబిక్ మీటర్ల డ్రెడ్జింగ్‌తో, పోర్టులోని లోతుల్ని ప్రాంతాలను పూర్తించేందుకు 26 మిలియన్‌ల మ్యూబిక్ మీటర్ల డ్రెడ్జింగ్ చేసిన ఖనుజను ఉపయోగించుకోవడానికి, ఎగుమతి నిమిత్తను చేసినట్లుగా దీర్ఘకాలం తీర ప్రాంతాన్ని రక్షించేందుకు ఉత్తర బ్రేక్‌వాటర్‌ని ఉత్తర తీరంలో 2 మిలియన్ క్యూబిక్ టీంట్లుగల స్థితి చేయడానికి మరియు (-) 20 మీ లంబోదిక మించి 56 చదరపు కిలోమీటర్ల గుర్తించిన స్థిర డిస్పోజల్ ఏరియాలో మించిన 32 మిలియన్ క్యూబిక్ మీటర్ల డ్రెడ్జింగ్ చేసిన మట్టిని పర్యావరణంకి పాల్పడం. 2015 సంవత్సరంలో నెల్లూరు ప్రాంతంలో తీవ్ర వరదలు సంభవించిన దృష్ట్యా, కండలేరు క్రీక్ గుండా నీటి రిజర్వాయర్ పెంపొందించుకు, క్రీక్‌లోని దీవులను తక్షణం చేయించి చూపు ఆంధ్రప్రదేశ్ ప్రభుత్వం ప్రతిపాదించింది. పోర్టు బాట్లుల లోపల కండలేరు క్రీక్‌లో ఇప్పటిన్న ఇసుక బార్ గుండా స్లైయిస్ గేట్ వేర్లను చేయడం ద్వారా మరియు స్లైయిస్ గేటు రెండు వైపులా ఎత్తిన బెర్తులో అభివృద్ధి చేయడం ద్వారా క్రీక్ యొక్క అలాంటి సులువులను తరగతిచేయడం ద్వారా కండలేరు క్రీక్ యొక్క మంచుదనం పెరుగు చేయాలని వాప్కోస్/క్రిస్ రెజనల్‌మెంట్ మరియు ప్రతిపాదిత కృష్ణపట్నం పోర్టు దశ 3 విస్తరణలో ప్రతిపాదించింది.

4. ప్రతిపాదిత ప్రతిపాదన EIA నోటిఫికేషన్ 2006 ప్రకారం 7 (e), కేటగిరి A కిందకు వస్తుంది. ప్రాజెక్టు మొత్తం పెట్టుబడి రూ. 6070.00 లక్షలు బడ్జెట్ ఉన్న పర్యావరణ (పరిరక్షణ) చర్యలు చేపట్టడానికి రూ. 191.5 కోట్లు కేటాయించారు. ప్రాజెక్టు మొత్తం ప్రాంతం 10,500 ఇందా, కొనసాగుతున్న 33 పరిధిలో గ్రామాలకు దక్షకుకు తీరుపని అనుబంధిత అభివృద్ధి కార్యకలాపాలను చేర్చినది.

5. ప్రతిపాదిత ప్రాజెక్టు యొక్క మొత్తం బర్త్‌లు 1094 హెక్టార్లు (2703 ఎకరాలు), ఈ ప్రాజెక్టులో భూ సేకరణలు మరియు అర్‌అండ్‌ఆర్ లేదు. ఎందుకంటే ప్రతిపాదిత ప్రాజెక్టు పనులు కృష్ణపట్నం పోర్టులు కేటాయించిన ప్రాంతం లోపల మాత్రమే చేయవలసినవి. అటవీ భూమి ప్రమేయం లేదు. ప్రతిపాదిత దశ 3 అభివృద్ధి ప్రాంతంలో ఉన్న దాదాపుగా 7,120 హెక్టార్లలో మ్యాంగ్రోవ్స్ వృద్ధిచేసిన ప్రాంతం లోపల మాత్రమే చేయవలసినవి. ఆకలిగా పొలిక్కు, ఆహారయోక్కాలు మరియు పులుల సంరక్షణ కేంద్రాలు తదుపరి లాంటి పర్యావరణ సున్నితమైన జోన్‌కి/చుట్టూ ప్రాంతాలు ఈ ప్రాజెక్టుకు 10 కిలోమీటర్ల రేడియస్‌లో లేవు.

7. ఈ ప్రతిపాదిత ప్రాజెక్టు సైట్ తీర ప్రాంతంలో ఉంది మరియు సిఆర్‌జడ్ నోటిఫికేషన్, 2011 కిందకు వస్తుంది. సవరించిన కెటగిరి దశ-3 విస్తరణ లేఅవుట్ ప్రణాళిక. ప్రతిపాదిత ప్రాజెక్టు పనుల యొక్క సిఆర్‌జడ్ వివరణ పరిధిలోని ఇన్‌స్టిట్యూట్ ఆఫ్ ఓషనో స్టెడీస్, అన్నా యూనివర్సిటీ ఆధ్వరం. సిఆర్‌జడ్ మ్యాప్ తయారీకి ఈ యూనివర్సిటీ అధికృత ఏజెన్సీగా ఉంది. సిఆర్‌జడ్ మ్యాప్‌ను సూచిస్తూ 1:4000 స్కేల్‌లో చేయబడింది. 1:4000 స్కేల్‌లో చేయబడింది. ప్రతిపాదిత ప్రాజెక్టును ఆంధ్రప్రదేశ్ కోస్టల్ జోన్ మేనేజ్‌మెంట్ అథారిటీ (ఎపిసిజెడ్‌ఎంఎ) అంచనా వేయడంలోని మరియు లేఖ నం. 202/CRZ/IND/201930 కేటీ 21.05.2020న సిఫారసు పొందడంలోని.

8. ప్రతిపాదిత ప్రాజెక్టు యొక్క బంగాళాఖాతం తీరం పెంబకి ఉంది. ఈ ప్రాజెక్టు సుంకా కండలేరు క్రీక్, ఉప్పలేరు క్రీక్‌లు, ఉకిరిగొట్టేమ్ వాగు వెలుతున్నాయి. తృతీయాయి విశాలమైన మాగుపీటి ప్రాంతంలు, బర్త్‌ల్లు ఏకాభ్యాసంగా తెలుగింపుల్లో ఉకిరిగొట్టేమ్ వాగు మరియు పైపు బ్రిడ్జిలు బిల్డించేందుకు కమ్యూనిటీ రెండు 1 మిలియన్ సెషన్ 2 ప్రతిపాదించాయి. దశ 3 అభివృద్ధి ప్రాంతం లోపల ఉన్న మ్యాన్‌గ్రూవ్‌లను పరిరక్షించాలి మరియు ట్రైబల్ ఎక్స్‌టెన్షన్ కొరకు సమీపంలోని ట్రైబల్ గుంపు సైట్‌ఫైలింగ్‌లు వేయాలి. చిన్నపు జాతిని అభివృద్ధి చేసినందు కండలేరు క్రీక్‌ని తిన్నగా చేయాలి. క్రీక్‌లు దాని మ్యాన్‌గ్రూవ్‌లను పరిరక్షించాలి మరియు ఇలా చేయడం వల్ల సీటి మట్టంలో కొన్నిగా మార్పులు మారకు ఉంటుందని మరియు ప్రతిపాదిత అభివృద్ధి వల్ల ట్రాఫిక్‌లో సంభవించే ట్రాఫిక్ ఎక్కిపోయేట్లు ప్రభావం ఉంటుందని పొందినది.

9. ప్రస్తుత పోర్టుకు 5 ఎంఎంటీపీ సీటి సరఫరా ఉంది, వీటిలో ఆంధ్రప్రదేశ్ ప్రభుత్వం ముఖ్యమైన రిజర్వాయర్ నుంచి 1 ఎంఎంటీపీ సరఫరా చేస్తుండగా ఆంధ్రప్రదేశ్ రాష్ట్ర ఇంగ్లీషు శాఖ దక్షతలను నుంచి 4 ఎంఎంటీపీ సీటిని సరఫరా చేసినది. ఈ ప్రస్తుత పోర్టు (దశ-1 మరియు దశ-2 అభివృద్ధి) 2.5 ఎంఎంటీపీ సీటిని వినియోగించుకుంటుంది. ప్రతిపాదిత దశ 3 అభివృద్ధికి సీటి అవసరం 2.5 ఎంఎంటీపీ ఉంటుందని అంచనావేయడమైనది. ఈ ప్రతిపాదిత ప్రాజెక్టు కోసం భూగర్భ జలాల కోసం/వినియోగించుకోవడం ఉండదు.

10. మురుగు సీటిని శుద్ధి చేసిందుకు 700 కెఎల్‌డీ సామర్థ్యంతో సీబీటీ ట్రీట్‌మెంట్ ప్లాంట్ (ఎస్‌టీపీ) మరియు పార్కులోని వృక్ష సీటిని శుద్ధి చేసిందుకు 300 కెఎల్‌డీ సామర్థ్యంతో ఎస్టీపీలో ట్రీట్‌మెంట్ ప్లాంట్ (ఆర్‌టీపీ) నెలకొల్పాలని పోర్టు ప్రతిపాదించింది. శుద్ధి చేసిన వృక్ష సీటిని గ్రీన్‌బెల్ట్‌ని మరియు దుమ్ము అణచివేత వృక్షపుటకు ఉపయోగించడం జరుగుతుంది. పోర్టు సరఫరాచ్చు నేలంటి మరియు బొగ్గు బల్కునులే ప్రాంతాల్లో 120 హెక్టార్ల బఫర్‌జోన్ స్థానిక తెగకు చుంచని మొక్కలతో గ్రీన్‌బెల్టును అభివృద్ధి చేయబడ్డాయి.

11. ప్రాజెక్టు వల్ల ఇంటి ప్రయోజనాలను ప్రతిపాదిత అభివృద్ధి పనులు నైపుణ్యం గల మరియు నైపుణ్యం లేని కార్మిక ప్రత్యేకంగా స్థానిక ప్రజలకు ప్రాధ్యమం మరియు పరోక్షంగా భారీ స్థియంలో ఉపాధి అవకాశాలు కల్పిస్తుంది. సిసిఎస్‌ద్వారా పోర్టు పరిధిలో ప్రాంతాల్లో స్థానిక బోగాకుదుపాయాల్లో పురోగతి ఉంటుంది. విద్యుత్ మరియు నిర్వహణ దశలో దాదాపు 6200 మంది ప్రజలకు ఉపాధి లభిస్తుంది. పిలాభ్రాయిడ్‌లకు వల్ల పెరుగుతున్న ఆర్థిక డిమాండ్‌ని తీర్చడానికి ప్రతిపాదిత అభివృద్ధి సమీపంలోనుండి, ఇది ఈ ప్రాంతంలో పాటు చేశ ఆర్థికాభివృద్ధికి దోహదపడుతుంది. ప్రతిపాదిత అభివృద్ధి వల్ల పెరిగిన అదాయం కస్టమ్స్ ఆండ్ ఎక్సైజ్, ఫైట్‌టాక్స్, వాణిజ్య పన్నుల మరియు ఆదాయపు పన్ను రూపంలో కేంద్ర ప్రభుత్వ శాఖల ఖజానాకు దోహదపడుతుంది. ఇది అంతిమంగా ఆదాయం పాటు మరియు దీని ఆర్థిక రూపంలో ఆంధ్రప్రదేశ్‌కి మాటా దోహదపడుతుంది.

12. ఇదాం వ్యక్తిగులో M/s చోళమండలం ఎండాస్ లిమ్ సర్వీసెస్ లిమిటెడ్, చిన్నికి భూమి ప్రాజెక్టు ప్రతిపాదనలు 14 రిసెంబరు 2020న ఆరిగేర 2498 ఇంపు పరామర్శలలో మీడియా కాన్ఫరెన్స్‌లో డ్యూం సమర్పణ చేశాయి. ప్రాజెక్టు ప్రతిపాదనలు సమర్పించిన మరియు అభ్యర్థనలపై మరియు ఆన్ లైన్ విచారణలపై చేసిన వివరమైన చర్చలపై ఆధారపడినది ఇంపు, సదరు ప్రాజెక్టు/యాక్టివిటీకి 4 జనవరి, 2019 తేదీన ఇంం ద్వారా మంత్రిత్వ శాఖ తెలియజేసినట్లుగా ఖరార్ ప్రాజెక్టుకి ఇది సరఫరాలతో పాటు పర్యావరణ పరిశీలనలకి సిఫార్సు చేయబడినట్లుగా.

(v) తీసుకునే మరియు విడుదల చేసే నీటికి మధ్యలో గల ఉష్ణోగ్రత వ్యత్యాసాలను నిర్వహించేందుకు ప్రాజెక్టు ప్రతిపాదనలకు డిజైన్ రూపొందించి ఆమోదం చేయాలి.

(vi) నిర్వహణ ప్రైజింగ్ ఇంధనం/ఇంధనే ఆయిల్ మరియు ఉత్పత్తిచెయ్యి చుట్టడం వల్ల వేంబ్రియ్ కాలుష్యం ఏర్పడి. ఇది సమస్యల ప్రాజెక్టులకు ప్రభావితం చేస్తుంది. తగిన మొండుజాగ్రత్తలు తీసుకోవడం ద్వారా మరియు చిందినవారిని పట్టుకునేందుకు ఉపయుక్తమైన యత్నాలాచరణం అందించడం ద్వారా భూతా వీటిని విరోధించాలి.

(vii) తుయుయోగించే ముఖ్యం ఇంధనంపు నీరు ప్రాజెక్టు పరిధిలో ఇప్పటిదిన ప్రజలకు అవసరాలకు సంబంధిత అధికారుల నుంచి అనుమతి తీసుకోవాలి. ఇంధనంపు నీటిని ఉపయోగించేందుకు సంబంధిత అధికారుల నుంచి అనుమతి తీసుకోవాలి.

(viii) ప్రాజెక్టు నుంచి ఉత్పత్తి అయ్యే శుద్ధ నీటిని శుద్ధి చేసిందుకి సీబీటీ ట్రీట్‌మెంట్ ప్లాంటుని నెలకొల్పాలి. శుద్ధిచేసిన నీటిని రక్షణట్టి, ప్లషింగ్, బ్యాక్‌వాష్, హౌస్‌కీపింగ్ ఆక్టివిటీలకు, గులయ దుమ్ము నివారణకి ఉపయోగించాలి.

(ix) శుద్ధిచేసిన ఎఫ్లుయెంట్/శుద్ధిచేయని వ్యర్థాయింటిలను చుపల మిశ్రికిజల్ పాయింట్‌తో పాటు ప్రజా సీవరేజ్/డిసిపిత్రుల్/ట్రైనేజీ మిక్సుకోలోకి డిశ్చార్జ్ చేసేందుకు సంబంధిత అధికారం నుంచి సర్టిఫికేట్ తీసుకోవాలి.

(x) టీటీ భవరాల మంత్రిత్వ శాఖ నుంచి చుంచుగా అనుమతి తీసుకోకుండా గని యొక్క సమగ్రతపైన గమనాన్ని మత్స్యాకుంటుంది.

(xi) టీటీ ముఖ్య ద్వారా సదుపాయాల్లో కోత మరియుంచిన దర్యాప్తులలిని తీసుకోవాలి. భూమి నుంచి తీరభాగంలో/సంభాషణ వాటర్‌లో తోసుకుపోయిన్నా నిబంధించేందుకు భారం ద్వారా పని నిర్వహించాలి.

IV. ధ్వని పర్యవేక్షణ మరియు బరోధనలు:

(i) ధ్వని స్థితిని సర్వేని నిర్దేశిత మార్గదర్శకాల ప్రకారం నిర్వహించాలి మరియు దీని వివరాలను ఆరు-వారాలకి ఫ్రీక్వెన్సీ మరియు ఇతర ప్రాంతాల్లో భాగంగా మంత్రిత్వ శాఖ లేఖలకి ఆఫీసర్‌కి సమర్పించాలి.

(ii) బాహ్యాలు, భవన్ యంత్రాలు మరియు ప్రైటోలోని వివరాలు నుంచి వెలువడే ధ్వని నిర్దిష్ట పరిధులకు మించిపోకుండా, వరణాలకు క్రమంతప్పకుండా నిర్వహణ చేయాలి. మఫ్లర్ పెయింటింగ్‌స్టిక్ మరియు ధ్వని వెర్వే పరిధులకాలను ఎనర్జీస్ట్ ఫ్యూయల్‌కాలిని భూమి ఫ్రీక్వ చూడాలి.

(iii) చీట్ సెపరేటర్ ధ్వని ఎనర్జీలతోను, సేలర్లు నుంచే టీలాకి ధ్వని బ్యారియర్‌లు, ఇయర్‌ప్లగ్స్ నిర్వహించి ఉయారే ధ్వనులను గ్రౌండ్ పొర్షన్ దిర్ల ఆదరే ధ్వని ప్రభావాన్ని తగ్గించే చర్యలు అమలు చేయాలి.

(iv) జరిగినదాని ధ్వని స్థితులు E(P)A rule, 1986లో ప్రిస్క్రిప్షన్‌లో చేసిన ప్రమాణాల ప్రకారం పగలి పూట 75 dB(A) మరియు రాత్రి వేళల్లో 70 dB(A) ఉండాలి.

V. ఎయిర్ పొల్యూషన్ పర్యవేక్షణ:

(i) భవనాల రూఫ్‌టాప్‌లపై సోలార్ పవర్ ఉత్పత్తి, అన్ని కాటన్ వెలుపాలకు సోలార్ లైట్ సిస్టమ్, మీధి దీపాలు, ప్రాజెక్టు పరిధిలోని చలనాల్లోల్లో పొల్యూషన్ పర్వాలు చేయాలి మరియు బిటిని రెన్యూవర్‌గా మెయింటెయిన్ చేయాలి.

(ii) బాక్ట్ ఆఫ్యాలయాల్లో మరియు పోర్టు పరిధిలాల్లో ఎలీక్ట్రిక్ వైహికల్స్ వినియోగం చేయాలి.

VI. శక్తిపరిరక్షణ చర్యలు:

(i) శక్తిపొదుపు మెకానిజంతో కేటాయించిన భవనాల్లో సురక్షితంగా విద్యుత్‌ంచాలి.

(ii) లంచింగ్ వల్ల తీరప్రాంతానికి విఘాతం ఉంగాకుండడం, తీర ప్రాంతంలో మాడ్యూల్‌ని అభ్యర్థనాల్ని ఎప్పటికప్పుడు చేయాలి మరియు అవసరాలకి తీరుగ ఆర్థించి చర్యలు నిర్వహించాలి. వివరాలను అరు-నెలలకొకటి పర్యవేక్షక బోర్డులంతో పాటు సమర్పించాలి.

(iii) ఎక్సకేవేషన్ మరియు కుంటిని మేట్టడాను శుద్ధి చేసిందుకు అవసరమైన సౌర్యాల్ని తప్పకుండా చేయాలి మరియు కేంద్ర లేదా రాష్ట్ర కాలుష్య నియంత్రణ మండలితో సమన్వయంతో అవసరాలు పాంయించడాని ప్రమాణాలను మరియు పర్యావరణ (రక్షణ) చట్టం, 1986లోని అమలులు పాటించాలి.

(iv) ఘన వ్యర్థ పదార్థాలను పాటిక వేస్ట్ చేసేటేమెంట్ నిబంధనలు, 2016 నిబంధనలు ప్రకారం వర్తిస్తాయించాలి మరియు అమలు చేయాలి.

(v) నిర్వహణ సులయ దిశికి సంబంధించిన బాధ్యతిక ధనుల నుంచి వెలువడే ధనుల వ్యర్థ పదార్థాలు వివిధ రకాన్నిక్షేప మరియు మేటాబిలిసి మేర్ మేనేజ్‌మెంట్ నిబంధనలు, 2016 నిబంధనల ప్రకారం ఉన్నులుగా నిర్వహించాలి.

(vi) ముగ్గురులో ధనుల వ్యర్థ పదార్థాలను సంబంధించే సంబంధిత అధికారం నుంచి సర్టిఫికెట్ తీసుకోవాలి. సంబంధించిందంలో ధ్రువీకృత సంస్థకి తీయడాన్నాలు మరియు ప్రాజెక్టు నుంచి తిలాన్నాలను ఎం.ఎస్.యుల్లుని తీర్మానానికి జాబితాచేసిన ఉత్పాయనే ఐయాలం సూచించాలి.

(vii) ఉపయోగించిన సింథటిక్‌లను మరియు చేతిపుచ్చులిని నిబంధన రెసిక్లింగ్‌కి అధికారం యొక్క అధికృత అధికారులో ఉన్న మార్గదర్శకాలు/సూచనల ప్రకారం పంపాలి/రిసైక్లింగ్ చేయాలి.

(viii) ఐయిల్ స్లిల్ కంటిసేజర్స్ స్లిలని తయారు చేయాలి మరియు అత్యవసరాలను ఎదుర్కొనేందుకు డీజిల్‌లో భాగంగా ఉంచాలి. వరణాలను మరియు చందన ఆయిల్ లవరల్ చేయబడ్డ మరలను ఉపయోగించడం జరుగుతుంది. ఇంటర్నల్ మరియు MARPOL మరియు Shipping రూల్‌తో ఇజ్జకుదిగల మార్గదర్శకాలను అనుసరించాలి. వీరు యొక్క సమగ్రతను బట్టి సమాధి వివరాలు తంటీనేజర్స్ స్లిలనీతో బిల్డుగల్లో ఆయిల్ కంటెయినర్స్ స్లిలని వినియోగం యాత్రాలాంగాన్ని ఆపరే చేయాలి.

VII. గ్రీన్ బెల్ట్:

(i) గ్రీన్ బెల్టుని సిమ్యులేషన్ మార్గదర్శకాల ప్రకారం స్థానిక చెట్ల జాతులతో ప్రాజెక్టు పరిధుల్లో ఉన్నదానిపట్టుగా వివయాలో అభివృద్ధి చేయాలి.

(ii) ఫ్లై బుల్లెట్ వీరోగా నిల్వ చేయాలి మరియు గ్రీన్ బెల్ట్ అభివృద్ధిలో ఉపయోగించాలి.

VIII. వివిధ కార్యాచరణలు:

(i) నిర్వహిత ఇజాతులు చేపల పింజాల్లు ఒక్కటుకు నిరోధించేందుకి శ్రద్ధగా తిరుచరయ్యేలా ట్రెడ్డింగ్ పెట్టుబడులను ప్రణాళిక చేయాలి.

(ii) ట్రెడ్డింగ్‌ని నిర్వహించేటప్పుడు, ప్రభావాన్ని మరింత చేసేందుకు ప్రభావిత్ మీతిక్/వివిధ రంగాల నిపుణుల ద్వారా సుతంత్ర పర్యవేక్షణ చేయాలి మరియు వివిధ ప్రాజెక్టుల ప్రభావం గురుంచిదానికి ప్రాచుర్యక్ర ప్రతిపాదనలు అవసరమైన చర్యలు తీసుకోవాలి.

(iii) బయలుపడ్డ మెరైన్ బయోడైవర్సిటీ మేనేజ్‌మెంట్ ప్లానును ఎస్‌ఓపీ ద్వారా లేదా మెరైన్, ఫ్రాక్టీ బాటర్ మరియు బయోడైవర్సిటీపు పేరు ప్రభావితం గల పర్యటన బాధ సంస్థతో తయారు చేయాలి మరియు రాష్ట్ర బయోడైవర్సిటీ బోర్డుతో మరియు కేంద్రంతో అధికారి సమన్వయాలతో మరియు బాధ్యతి సంబంధిత అధికారులతో చర్చించి అమలు చేయాలి. ఇంటర్‌టైడల్ బయోలాజిక్ పరామర్శ, మొలస్కులు, సముద్రపు గుర్రి, సముద్రపు తులుతులు, కచ్-బ్రైజల్ మ్యాంగ్రూవ్స్ వేలులు, తిమింగిల్, డ్యూంకిసిన్, ఉద్యుక్త పక్షుల అధికార బాటిలో బయో ఆధార సమాధుల మరియు ఆక్వాటిక్ స్పెషల్, బ్యూటీలో మరియు సెంగా పక్షి జాతులపై ప్రాజెక్టు పరుగు ప్రభావంపై అధ్యయనం అధారంగా వివరిస్తు ఉంటాయి. దేశం సేజీవ మరియు ప్రభావం పుడించి ప్రాంతాల్లో ప్రాంతాలకి పక్షి పద్ధతుల ప్రకారం ఉంటాయి మరియు అంతర్జాతీయ ఫోటోగ్రాఫ్‌లు ఉండాలి.

(iv) సముద్ర కలుపులు, సముద్ర గడ్డి, ముత్యపు సేలలు, ఇరుగు ఉన్నిలుచేపలు, ఎతినోడెర్మ్స్, రొయ్యలు, ఉభయ్య, పగడాలు, తీరభూములతో పక్షులు, మ్యాన్‌గ్రోవ్స్ మరియు సముద్ర తీవ్రమిదిలంలో ఒకాయిల్ బన్ను తులయం పిడ పుష్ట ఇంతు ఆతులలో సవే ఇతర బహుళ ప్రయోజన తీవ్రమిదిపట్టం ఇంటి సముద్ర పర్యావరణాన్ని కూడా ప్రయంతర్భుతంగా పర్యవేక్షించాలి.

వీడియో అస్యూరెన్స్ ద్వారా సమర్థంగా చేశారు. ప్రాజెక్టు ప్రతిపాదనలు సమర్థంచిన మరియు ఇచ్చిన విషయాలపై తెలిసి వివరణలు చర్చలపై ఆధారపడి ఉంది, సవరణ ప్రాజెక్టు/యాక్టివిటీకి 4 ఇయర్లు, 2019 జేడీసీ ఒం20 ద్వారా మంత్రిత్వ శాఖ తెలియజేసినట్లుగా ఇతర ప్రాజెక్టులకే ఇవ్వబడింది మొదటి పొందు స్టబ్బంగా నర్వేచించిన సర్వత్ర పరిశీలనలతో ఈ ప్రాజెక్టుకు బల్కాయరు మరియు సిఇసీఇసీ స్టీయరింగ్ కమిటీ చేయబడినట్లుగా నిర్ణయించడం జరిగింది.

13. సవరణల అప్రూవల్ ఆఫర్ (వర్కింగ్‌ఆర్‌డబ్ల్యూలు, సిఇసీఇసీ మరియు ఇతర ప్రాజెక్టులు) వేసిన ప్రతిపాదనల ఆధారంగా ప్రతిపాదనలు ఇవ్వబడ్డాయి. ఆఫర్ మరియు బాణాయిల మార్పు మంత్రిత్వ శాఖ పరిశీలించిన మరియు ఇతరాలతో ప్రాజెక్టులకు వర్తించే ప్రాజెక్టుల భద్రతాప్రమాణాలకు అనుగుణంగా వర్తిస్తుంది. ఇవ్వబడిన కర్తవ్యంగా అనుబంధ చేయబడిన తేదీ, ఇవ్వబడిన సోర్టేబిలిటీ, 2005ని సవరించడంకొరకు మరియు సిఇసీఇసీ సోర్టేబిలిటీ 2011 పింద, "ఎమిషన్‌ఫుల్ సిబ్బంది: మధ్య, ఆంధ్రప్రదేశ్‌లో MW పుష్టిగల్గిన తేదీ తెలిసి ఐదవది చేయబడిన పుష్టిగల్గిన వాల్ (దశ-II) విస్తరణ" కోసం పర్యావరణ మరియు సిఇసీఇసీ స్టీయరింగ్ కమిటీ చేయబడినట్లుగా నిర్ణయించడం జరిగింది.

(i) ప్రాజెక్టు పర్యావరణ భద్రతా సిఇసీఇసీ స్టీయరింగ్ కమిటీ(ఎస్‌ఎస్‌సీ), 2006 మరియు సిఇసీఇసీ పోలికేషన్, 2011లోని నిబంధనల కింద ఉంది. పవిత్రా ఇతర చట్టం/నిబంధన/రెగ్యులేషన్ కింద పేర్కొనబడిన అనేకమైన/చట్టం/అనుమతులను ఆది సమ్మతం అయి ప్రాజెక్టులు వర్తించబడినట్లుగా ఏర్పాటు ఇతర చట్టాల/నిబంధనల లేదా తగినంత కింద ఆమోదాలు/స్టేటస్ పొందవలసిన బాధ్యత ప్రాజెక్టు ప్రమోటర్‌లకు ఉంది.

(ii) ఫీజు -2, ఇటువ మరియు ఇంగ్లీ చలికాలంలో వేసిన పొగ్గాకాలు మరియు సిఫారసులు, భద్రతాప్రణాళి సిఫారసులో యొక్క సమర్థంగా ముఖ్యం ఉంటుంది ప్రాజెక్టు ప్రతిపాదనలు ఇవ్వబడ్డాయి.

(iii) విస్తరణ పనులను ఉద్దేశించి కర్తవ్యంగా సిఇసీఇసీ పోలికేషన్, 2011లోని నిబంధనల భాగంగా చేపట్టిన. కొన్నటి రాగ్యులేషన్ తోటి నోటిఫికేషన్‌లో అనుమతించినట్లుగా మించిన కొన్నటి రెగ్యులేషన్ తోని ఇతరులు ఎలాంటి నిర్ణయ పనులు చేయబడలేదు.

(iv) ఆంధ్రప్రదేశ్ (స్పెషల్ తోటి మేనేజ్‌మెంట్ ఆఫ్ ఇండస్ట్రీస్ (ఎస్‌ఇసీఎం)) లేఖ 202/CRZ/IND/2019/30 తేదీ 21.05.2020 ద్వారా తెలియజేసిన సిఫారసులు మరియు షరతులు ఉన్నటికి కట్టుబడి పూర్తిచేయాలి.

(v) ప్రాజెక్టు సైటులో వేలర్లకు ఏవైనా వరుస లేదా నదులు ప్రభావితమైనట్లుగా చూడాలి మరియు వీరు మైళ్ళుగా ప్రయోగించేలా చూడాలి. తీత్ తీవ్ర వర్షపాత్ర ప్రోగ్రామ్‌ను నిర్ణయ చేసి అమలుచేయాలి.

(vi) రాష్ట్ర అటవీ శాఖలకు సంప్రతించి స్థానిక వెదుకు చెందిన మొక్కలతో గ్రీన్ బెల్టును అభివృద్ధి చేయాలి.

(vii) ప్రతిపాదిత విస్తరణకు పిట్టల నేలతో 60 మిటియస్ కింద మిశ్రమ ప్రత్యేకంగా మిశ్రమ ప్రత్యేకంగా భస్మ ఉంది. ప్రతిపాదించిన విధంగా, పర్యావరణ రోజున్ ప్రాంతాలను పూర్తిచేయాలని 20 మరియు50 ఇంగ్లీష్ మిశ్రమ ప్రత్యేకంగా చేసిన ఇవ్వబడిన మిశ్రమ ప్రత్యేకంగా వివరాల ప్రకారం ఉన్నట్లుగా ఉన్నట్లుగా ఉన్నట్లుగా

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Annexure - 14

Lr.No.AKPL/2021, dt. 03.02.2021.

To
The Collector & District Magistrate,
SPS Nellore Dist.,

Respected Sir,

Sub: Development of Krishnapatnam Port – Expansion of KP Port (Phase – III) at SPSR Nellore District., Andhra Pradesh by M/s Adani Krishnapatnam Port Ltd., - Environmental and CRZ Clearance – Reg..

Ref: File No. 10-18/2016 – IA.III proposal No. IA/AP/MIS/566/2009, dt. 11.01.2021 from the Ministry of Environment, Forest and Climate Change (Impact Assessment Division), New Delhi.

* * *

With reference to the subject cited, we bring to your kind notice that we have received Environmental and CRZ Clearance vide reference cited for expansion of Krishnapatnam Port (Phase – III) at SPSR Nellore Dist., Andhra Pradesh, from the Ministry of Environment, Forest and Climate Change (Impact Assessment Division), New Delhi.

This is submitted for favour of kind information, please.

Encl: Above reference.

With kind regards,

Yours sincerely,
for ***Adani Krishnapatnam Port Ltd.,***

Dy. General Manager,
Corporate Affairs.

తేది: 03/02/2021.

Adani Krishnapatnam Port Ltd
(Formerly Krishnapatnam Port Company Ltd)
PO Bag No 1
Muthukur Mandal
SPSR Nellore 524 344
Andhra Pradesh, India
CIN: U45203AP1996PLC023529

Tel +91 861 237 7999
Fax +91 861 237 7046
info@adani.com
www.adaniports.com

Registered Office: 1st Floor, 48-9-17, Dwarakanagar, Visakhapatnam 530 016, Andhra Pradesh, India

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Ports and Logistics

లేఖ నెం. కే.పి.పి.ఎల్/2021, తే.01.02.2021.ది

To

1. ది పంచాయితి సెక్రటరీ, గ్రామ పంచాయితి కార్యాలయము, ముత్తుకూరు.
2. ది పంచాయితి సెక్రటరీ, గ్రామ పంచాయితి కార్యాలయము, కృష్ణపట్నం.
3. ది పంచాయితి సెక్రటరీ, గ్రామ పంచాయితి కార్యాలయము, నాలికేళ్ళపల్లి.
4. ది పంచాయితి సెక్రటరీ, గ్రామ పంచాయితి కార్యాలయము, పంటపాళెం.
5. ది పంచాయితి సెక్రటరీ, గ్రామ పంచాయితి కార్యాలయము, తమ్మినపట్నం.

అయ్యా!

విషయము : కృష్ణపట్నం పోర్టు, ఫేజ్-III, శ్రీ పొట్టి శ్రీరాములు నెల్లూరు జిల్లా, ఆంధ్రప్రదేశ్ - పర్యావరణ మరియు సి.ఆర్.జెడ్ క్లియరెన్స్ గురించి తెలియజేయుట.

సూచిక : నెం.10-15/2016 – I A. 3, ప్రపోజల్ నెం.1ఎ/ఏ.పి/ఎం.వి.ఎస్/566/2009, తే.11.01.2021.ది మినిస్ట్రీ ఆఫ్ పర్యావరణ మార్పు, (ఇంపాక్ట్ అసెస్మెంట్ డివిజను), న్యూఢిల్లీ.

ఇందుమూలముగా తెలియజేయడమేమనగా, పై సూచిక ద్వారా, కృష్ణపట్నం పోర్టు, ఫేజ్-III, శ్రీ పొట్టి శ్రీరాములు నెల్లూరు జిల్లా, ఆంధ్రప్రదేశ్ వారికి పర్యావరణ మరియు సి.ఆర్.జెడ్ క్లియరెన్స్ వచ్చినదని తెలియజేయడమైనది. ఇందువెంట పై సూచిక జతపరచడమైనది.

ఇట్లు

భవదీయులు

Panchayati Secretary
Gramapanchayati
Pentapalem, Muthukur Mandal,
SPSR Nellore Dist

Panchayath Secretary
Thaminapatnam Gram Panchayath
Chillakur Mandal, SPSR Nellore Dist

Panchayat Secretary
GRAMAPANCHAYAT
Narikellapalli, Muthukur Mandal
SPSR Nellore Dt.

Panchayat Secretary
KRISHNAPATNAM GP
Muthukur Mandal,
SPSR Nellore Dist

Panchayat Secretary
Grampancnayat, Muthukur
Muthukur Md., SPSR Nellore Dist

Adani Krishnapatnam Port Ltd.
(Formerly Krishnapatnam Port Company Ltd.)
PO Bag No 1
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Registered Office: 1st Floor, 48-9-17, Dwarakanagar, Visakhapatnam 530 016, Andhra Pradesh, India

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Annexure - 15

Lr. No. AKPL/ENVIRONMENT/APPCB/51/2025-26 **Date: 16.07.2025**

To

The Environmental Engineer,
A.P. Pollution Control Board,
Regional Office,
SPSR Nellore.

Sir,

Sub:- Adani Krishnapatnam Port Limited – Submission of Environment Statement Form – V for the FY 2024-25 – Reg.

Ref:- 1. CTO & HWA Order No. APPCB/VJA/NLR/11344/CFO/HO/2019 dated 11.11.2022 valid up to 31.08.2027.

@@@

In compliance with the CTO & HWA condition No.6 stipulated in schedule – A of CTO & HWA Order vide reference cited, and as per Rule No. 14 of E(P) Rules, 1986 & amendments thereof, submitting herewith the Environment Statement in FORM V for the year of 2024-25.

Kindly acknowledge receipt of the same.

Yours sincerely,
Adani Krishnapatnam Port Limited.

(Authorized Signatory)

Encl: a/a

Adani Krishnapatnam Port Ltd
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
Andhra Pradesh, India
CIN: U45203AP1996PLC023529

Tel +91 861 237 7999
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info@adani.com
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Annexure – 16

~~Annexure 14~~

Mangrove Conservation In AKPL:

- Protecting and conserving the existing mangrove areas with suitable barricading, erection of display boards and ensuring the tidal flow. As a part of Phase I EC compliance, and area of 9 acres (3.64 ha) of mangroves are being conserved in the port areas since its inception.
- Mangrove restoration is to be considered as a viable option for enhancing the green belt cover.
- Mangrove's development in 50 Ha. has been undertaken within the port as part of Phase II development. The patches of mangroves are around 7.128 Ha. of area has been protected as part of Phase III development.
- AKPL has conserves more than 200 Acres mangrove area in port premises by significant conservation efforts.
- AKPL is conducting awareness campaign in the local community about the importance of mangroves and their importance.
- Ensuring desilting the creeks for easy tidal water flow which will enhance the natural flushing leading to healthy growth of mangroves.
- AKPL has continued to restore mangroves in the suggested sites with species like Avicennia marina, a resilient and common species along the creek.
- Afforestation of mangrove cover along the creeks will be continued and intensified.

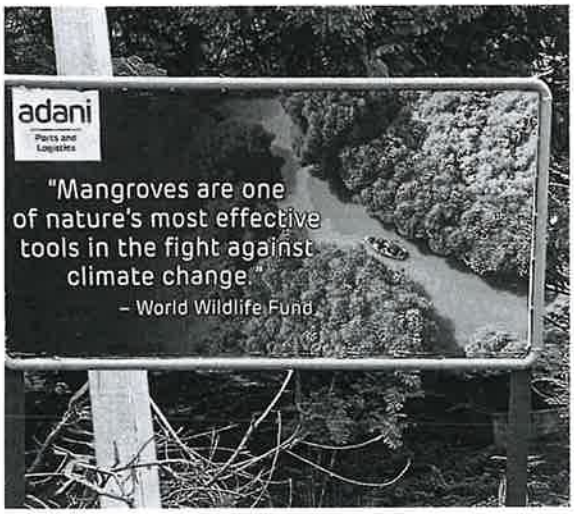
ONE MANGROVE TREE CAN
SAVE A THOUSAND OF LIVES

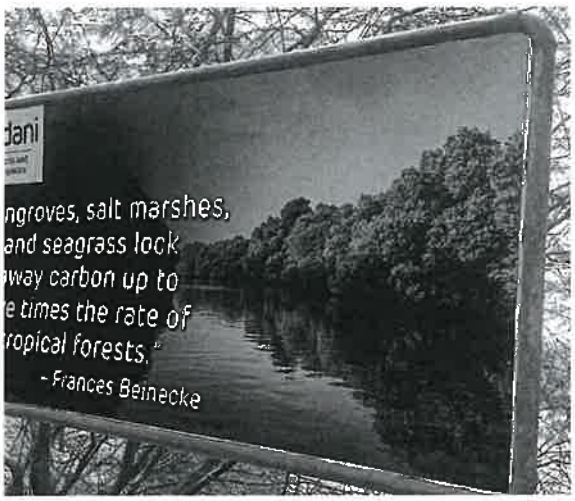
ONE MANGROVE TREE CAN
SAVE A THOUSAND OF LIVES
AKPL IS CONSERVING 200 HA. OF MANGROVES

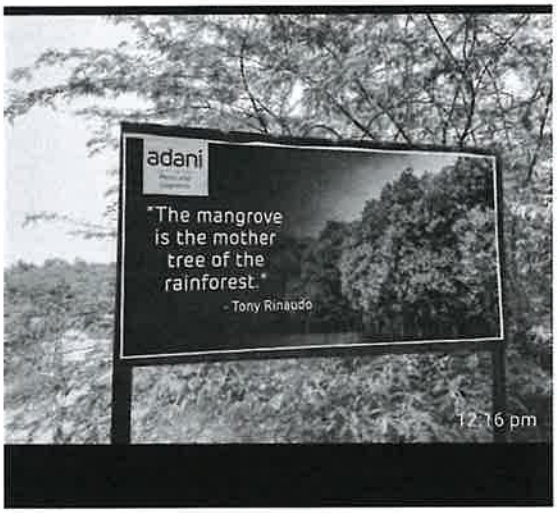
SAVE MANGROVES
SAVE OUR COASTLINES

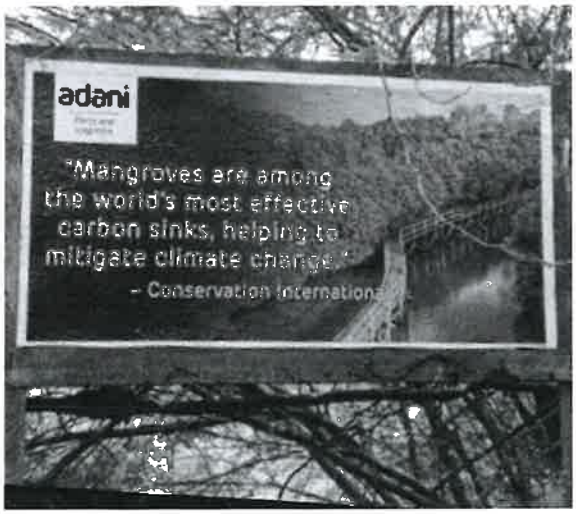
SAVE MANGROVES
SAVE OUR COASTLINES
PLANT NAME : AVICENNIA MARINA

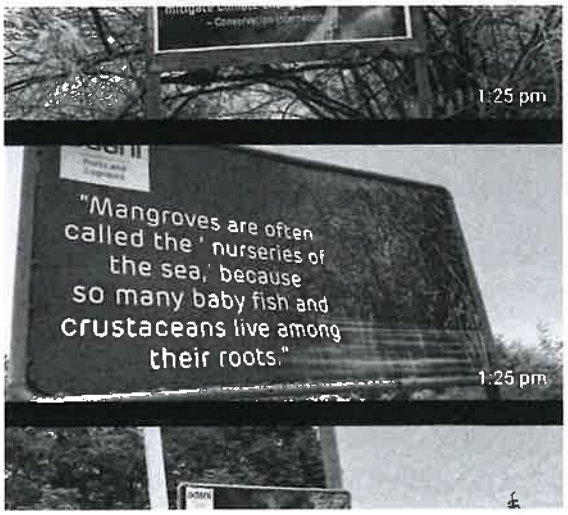
adani
"Healthy mangrove forests can mean the difference between life and death during a cyclone."


adani
Ports and Logistics
"Mangroves are one of nature's most effective tools in the fight against climate change."
– World Wildlife Fund


dani
ngroves, salt marshes,
and seagrass lock
way carbon up to
e times the rate of
ropical forests."
- Frances Beinecke


adani
"The mangrove is the mother tree of the rainforest."
- Tony Rinaudo
12:16 pm


adani
"Mangroves are among the world's most effective carbon sinks, helping to mitigate climate change."
– Conservation International


1:25 pm
"Mangroves are often called the ' nurseries of the sea,' because so many baby fish and crustaceans live among their roots."
1:25 pm

Mangrove Conservation at AKPL

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
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Annexure - 17

Ref: SV/KPCL/26-03/33 Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 380 KVA DG SET (Port Admin Building)

DATE & TIME OF START : 20-03-2026@ 10:15 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	32
6.	Stack temperature	^{0}C	148
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	12.8
9.	Gas Quantity	m^3/hr	921
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.16	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.91	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.43	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.19	1.3	IS:11255

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AUTHORIZED SIGNATORY

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Ref: SV/KPCL/26-03/34

Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 250 KVA DG SET (SS-2)

DATE & TIME OF START : 20-03-2026@ 11:00 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	33
6.	Stack temperature	^{0}C	120
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	12.1
9.	Gas Quantity	m^3/hr	871
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.08	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.74	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.46	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.10	1.3	IS:11255

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Ref: SV/KPCL/26-03/35 Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 320 KVA DG SET (ADMIN BLOCK)

DATE & TIME OF START : 20-03-2026@ 11:45 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	33
6.	Stack temperature	^{0}C	142
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	14.5
9.	Gas Quantity	m^3/hr	1044
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.17	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	1.20	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.49	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.18	1.3	IS:11255

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Ref: SV/KPCL/26-03/36 Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : DG SET (SS-1)

DATE & TIME OF START : 20-03-2026@ 12:30 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	34
6.	Stack temperature	^{0}C	136
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	11.3
9.	Gas Quantity	m^3/hr	813
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.19	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.96	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.38	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.08	1.3	IS:11255

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formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/KPCL/26-03/37

Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 320 KVA DG SET (GUEST HOUSE)

DATE & TIME OF START : 20-03-2026@ 13:20 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	35
6.	Stack temperature	^{0}C	146
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	13.0
9.	Gas Quantity	m^3/hr	936
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.16	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.98	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.49	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.17	1.3	IS:11255

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/KPCL/26-03/38

Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 250 KVA DG SET (GUEST HOUSE)

DATE & TIME OF START : 20-03-2026@ 14:10 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{o}C	35
6.	Stack temperature	^{o}C	124
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	10.7
9.	Gas Quantity	m^3/hr	770
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.18	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.74	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.37	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.08	1.3	IS:11255

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SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/KPCL/26-03/39 Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 250 KVA DG SET (GARRAGE)

DATE & TIME OF START : 20-03-2026@ 15:00 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	34
6.	Stack temperature	^{0}C	120
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	11.5
9.	Gas Quantity	m^3/hr	828
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.15	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	1.07	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.46	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.18	1.3	IS:11255

CHECKED BY

AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/KPCL/26-03/40 Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 500 KVA DG SET (NCT-1)

DATE & TIME OF START : 20-03-2026@ 15:45 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{o}C	33
6.	Stack temperature	^{o}C	158
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	14.8
9.	Gas Quantity	m^3/hr	1065
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.24	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	1.10	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.49	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.13	1.3	IS:11255

CHECKED BY

AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/KPCL/26-03/41

Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICULARS : DG SET EMISSION

SOURCE OF COLLECTION : 500 KVA DG SET (NCT-1)

DATE & TIME OF START : 20-03-2026@ 16:30 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	32
6.	Stack temperature	^{0}C	165
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	15.4
9.	Gas Quantity	m^3/hr	1108
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.17	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.85	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.43	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.11	1.3	IS:11255

CHECKED BY

AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/KPCL/26-03/42 Date: 02-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524 344.

SAMPLE PARTICUARS : DG SET EMISSION

SOURCE OF COLLECTION : 125 KVA DG SET (LIQUID JETTY - L4)

DATE & TIME OF START : 20-03-2026@ 17:15 hr

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT
1.	Diameter of the Stack	mts	0.16
2.	C/s Area of Stack	sq.mt	0.02
3.	Pitot Coefficient	-	0.87
4.	Specific gravity of Fluid	-	1.0
5.	Temperature @ DGM	^{0}C	31
6.	Stack temperature	^{0}C	113
7.	Nozzle Diameter	mm	10
8.	Exit Velocity	m/sec	10.6
9.	Gas Quantity	m^3/hr	763
10.	Duration of Sampling	minutes	30
11.	Fuel used	-	Diesel

EMISSION RATE

S.No.	PARAMETER	UNIT	RESULT	STANDARD	METHOD
1.	Particulate Matter – PM	g/kw-hr	0.10	0.3	IS:11255-P-1
2.	Oxides of Nitrogen – NOx	g/kw-hr	0.57	9.2	IS:11255-P-2
3.	Carbon Monoxide – CO	g/kw-hr	0.34	3.5	IS:11255-P-7
4.	Hydrocarbons - HC	g/kw-hr	0.07	1.3	IS:11255

CHECKED BY

AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

o/c

Annexure - 18

~~ANNEXURE 6~~

adani

Ports and Logistics

Lr. No. AKPL/CORPORATE AFFAIRS/DMP/071-2024-25 **30 AUGUST 2024**

To

The Collector & District Magistrate,
SPSR Nellore District.

Sir,

Sub: *Submission of Revised Disaster Management Plan of Adani Krishnapatnam Port Ltd., – Regarding.*

* * *

In line with our regular practice of updating our Disaster Management Plan (DMP) in order to make Adani Krishnapatnam Port Limited Disaster resilient, achieve substantial disaster risk reduction significantly decrease the losses of the life, livelihoods assets – economic, physical, social, and environmental – by maximizing the ability to cope with disasters at all levels of administration as well as among departments, we herewith submit the revised DMP for your kind perusal.

Sincerely yours,

For **ADANI KRISHNAPATNAM PORT LIMITED.,**

K. M. RAM,
HEAD – CORPORATE AFFAIRS.

Recived by collector Sir "cc"

తేది :....31/8/24.....
తపాల సహాయకులు
జిల్లా కలెక్టరు వారి కా... ...రుము
శ్రీ పొట్టి శ్రీరాము... ...ర్

Adani Krishnapatnam Port Ltd
PO Bag No 1
Muthukur Mandal
SPSR Nellore 524 344
Andhra Pradesh, India
CIN: U45203GJ1996PLC128239

Tel +91 861 237 7999
Fax +91 861 237 7046
www.adaniports.com

Registered Office: Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

adani
Ports and Logistics

ADANI KRISHNAPATNAM PORT LIMITED.
MUTHUKUR MANDAL, SPSR NELLORE
ANDHRA PRADESH.

DISASTER MANAGEMENT PLAN

	Prepared by:	Reviewed by:	Reviewed by:	Reviewed by:	Verified by:	Approved by:
Signature						
Name	Capt. Bibhupada Sahoo	Major. Venkatesh Bhaskar	Mr. G. Venu Gopal Reddy	Capt Rajat Garg	Mr. Rajan Babu	Mr. G. J Rao
Designation	HOS Marine	Head Security	Associate GM - EHS	HOD -Marine	COO	CEO
Date	20/08/2024	20/08/2024	20/08/2024	20/08/2024	20/08/2024	20/08/2024

(Receipt collection & cc)
తేది : 21.8.24.....
తహసీలు సహాయకులు
జిల్లా కలెక్టరు వారి కార్యాలయము
శ్రీ పొట్టి శ్రీరాములు నెల్లూరు జిల్లా

ANNEXURE – 19

FIRST AID & FIRE SAFETY TRAINING TO THE NEAREST COMMUNITIES

38 -10- Annexure 20

GOVERNMENT OF ANDHRA PRADESH

ABSTRACT

Development of Krishnapatnam Port in Nellore District Rehabilitation & Resettlement Package –Affected Zone covered under the project – Implementation of R&R Package – Administrative Sanction – Accorded -Orders – Issued.

TRANSPORT, ROADS AND BUILDINGS (PORTS-1) DEPARTMENT

G.O.Ms.No.250 Dated: 31-8-2007.

Read the following:-

1. G.O.Ms.No.68, Irrigation & CAD (Project Wing-LA-IV-R&R) Department, dated:8-4-2005.
2. From the Joint Collector, Nellore, Letter No. Rc.G5.5864/ 2006, dated: 17.2.2007.
3. From M/s KPCL, Letter dated 14.3.2007.
4. From the Collector, Nellore, Letter No. Rc.G5.5864/ 2006, dated: 30-6-2007.
5. Govt.Lr.No.2736/P.I(1)/2007, TR&B(Ports) Dept.dt.9-7-2007.
6. From M/s KPCL, Lr.No.KP/TR&B/287,dt. 11-7-2007
7. G.O.Ms.No.243, TR&B(Ports) Dept., dt.25-8-2007.

-ooo-

ORDER:

The District Collector, Nellore has reported that the R&R project report for implementation has been prepared in accordance with the guidelines issues vide GO Ms No.68, Irrgn. & CAD (PW) Department, dated 8.4.2005 and that the villages covered under the Project are 1) Basin Ramalingapuram, Adalaprabhakar Reddy Nagar Colony,Padarthipalem H/o Krishnapatnam (v) of Muthukur (M), 2) Midderevu, H/o Tamminaptanam of Chillakur Mandal are the habitation that are going to be affected due to the development of Krishnapatnam Port.

2. A suitable land for Rehabilitation of the displaced families has been identified in Muthukur village located at a distance of about 4 Kms from the area from which the families are getting displaced. The Collector has stated that the tentative requirement of fund for R&R as per the guidelines prescribed in the policy is Rs.25,85,00,000/- which may vary after a detailed survey.

3. M/s KPCL in their Letter third read above, have reported that various works relating to development of Krishnapatnam Port are in brisk progress including construction of Berths, Reclamation, North & South Break Waters, etc. and that the commercial operations are scheduled to commence from March / June 2008. They have also stated that under Phase-I Dredging and other important construction works are to be started immediately by which activity the four villages will be affected and hence requested the Government for early implementation of R&R package to enable shifting of these villages.

(P.T.O)

4. M/s KPCL have come forward with a proposal to meet the entire expenditure towards R&R initially, reimbursable by Government, in view of urgency. Also they have stated that they are taking up certain constructions like Hospital and School etc, on their own. They have also requested that the construction works of R&R package may be entrusted to M/s KPCL (CVR group) to expeditiously complete the work keeping in view the Company's expertise and also due to fact that agencies like Housing Board are busy engaged in equally important assignments. They have also suggested that a Monitoring Officer from Government of the rank of Superintending Engineer / Executive Engineer be nominated to oversee the progress and quality of work on day to day basis.

5. The Collector in his letter 4th read above, has reported that the number of displaced families would be 450 and number of affected families would be 1190. The requirement of funds for R&R package put forth by the Collector is Rs.25.85 crores approximately and the Methodology and procedure will be adopted as per the guidelines issued in R&R policy 2005 issued vide G.O.Ms.No.68, Irrigation & CAD (Project Wing-LA-IV-R&R) Department, dated:8-4-2005 and the instructions issued by the Government from time to time depending upon the release of budget for implementation of R&R package.

6. Government after careful examination of the matter hereby accord administrative sanction for Rs.25,85,00,000/- duly accepting the proposal of M/s Krishnapatnam Port Company Ltd. for incurring expenditure towards R&R package initially which is reimbursable by Government without interest in three equal annual installments commencing from the date of remittance of the full amount to the Government.

7. Government also hereby order that the Civil Works relating to R&R package shall be executed by M/s KPCL (CVR group) Company as proposed by M/s KPCL in the interest of the Project. The Collector shall appoint a Monitoring Officer at the level of Superintending Engineer/Executive Engineer to monitor the progress as well the quality of works being executed by M/s CVR Group on day to day basis and report to the Collector.

8. The District Collector, Nellore shall accordingly take necessary action in the matter.

9. This order issues with the concurrence of Finance Department vide their U.O.No.1974-E/804/A2/Expr.PWD/07, dt.24-7-2007.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

L.V.SUBRAHMANYAM
PRL.SECRETARY TO GOVERNMENT

To
The Collector & District Magistrate, Nellore.
The Joint Collector & Administrator (R&R), Nellore.
The Chairman, M/s Krishnapatnam Port Ltd., Hyderabad.
The Director of Ports, Kakinada.
The Prl. Accountant General, A.P.,Hyderabad.
The Director of Treasuries and Accounts, A.P., Hyderabad.
Copy to Finance (Ex.PW) Department.
Sf/Sc

// forwarded by order //

SECTION OFFICER

GOVERNMENT OF ANDHRA PRADESH
TRANSPORT, ROADS AND BUILDINGS (PORTS-I) DEPARTMENT

Letter No.2736/P.I(1)/2007, Dated:31-8-2007.

From
The Special Secretary to Government,
TR&B Department,
A.P.Secretariat,
Hyderabad.

To
The Director,
M/s Krishnapatnam Port Company Ltd.
Hyderabad.

Sir,

Sub:- Development of Krishnapatnam Port in Nellore District – Implementation of R&R Package –Reg.

Ref:- 1.From M/s KPCL Lr.dt.14-3-2007

2.G.O.Ms.No.250, TR&B(Ports) Dept.,dt.31-8-2007.

-ooo-

I am to inform that in the G.O.cited, Government have issued orders according administrative sanction for Rs.25,85,00,000/- duly accepting the proposal of M/s Krishnapatnam Port Company Ltd. for incurring expenditure towards R&R package initially which is reimbursable by Government without interest in three equal annual installments commencing from the date of remittance of the full amount with the Government.

You are therefore, requested to pay the amount to the Government to facilitate early completion of R&R in connection with the development of Krishnapatnam Port.

Yours faithfully,

for SPL.SECRETARY TO GOVERNMENT

Copy to:
The Collector & District Magistrate, Nellore.
The Joint Collector, Nellore.
The Director of Ports, Kakinada

Annexure 21

GOVERNMENT OF ANDHRA PRADESH
ROADS & BUILDINGS DEPARTMENT

From
Sri V.Surya Rao,M.E.,MIE.,
Executive Engineer, (R&B)
Nellore Division, Nellore.

To
The Chairman,
Krishnapatnam Port Company Ltd.,
HYDERABAD.

Lr.No.182/K.P.Port/ATO/04 Dt.22-7-05.

Sir,

Sub:- Providing road connectivity to Mega Projects of Ports & Air Ports by Govt. - Road connectivity from Venkatachalam to Krishnapatnam Port - Alignment plans of ~~plans~~ proposed rail cum road carrider - Req. - Reg.
Ref:- G.O.Ms.No.166T(R&B)Ports Dept. dt.18-11-04.

-x-

It is to inform that, the Government have accorded administrative sanction for the work of "Forming of two-lane road from Venkatachalam to Krishnapatnam Port from km.0/0 to 23/325 with provision for expansion of road to 6 lane in future" for an amount of Rs.29.02 crores in G.O.Ms.No.166 T (R&B) Ports Department dt.18-11-04. The Chief Engineer (R&B) Roads, Hyderabad in fax Memo.No.20051/TA3/AEE2/05 dt.21-6-05 has given instructions to submit detailed estimates for the above work duly condycting the detailed survey.

In this connection, it is also to inform that, the Government of Andhra Pradesh has handedover the Krishnapatnam port in Nellore Dist to Hyderabad under B.O.S.T. Scheme in G.O.Ms.No.48 T (R&B) Ports Department dt.9-3-96. The M/s.Krishnapatnam Port Company Ltd., Hyderabad has proposed to form a rail cum road carrider from Venkatachalam to Krishnapatnam. For this purpose, 70.00 Mts. width of land is to be acquired along the proposed rail cum road carrider and to form a two lane road. As per Memorandum of understandings entered with M/s.Krishnapatnam Port Company Limited, Government of Andhra Pradesh has to acquire land for a width of 70.00Mts.,

In view of the above facts, for preparing a detailed estimate of the road, railway alignment is to be finalised. Hence, I request you to please depute the concerned staff along with the alignment plans of proposed rail cum road carrider indicating the survey numbers and village combined plan of each village through which the alignment passes at an early date so as to conduct detailed survey for preparation of detailed estimates to form two-lane road.

Yours faithfully,
22.7.05
EXECUTIVE ENGINEER (R&B)
NELLORE

Copy submitted to the Superintending Engineer(R&B)Nellore for favour of information and taking necessary action.
Copy submitted to the Chief Engineer(R&B)Roads, Hyderabad for favour of information with reference to the Fax Memo.No.20051/TA3/AEE2/2005 dt.21-6-05.
Copy submitted to the Director(R)Dept. of Lighthouses& Lighting Ships, Kakinada for information.
Copy to D.E.E.(R&B)Nellore with request to contact the Port authority in the matter.

Annexure 22

M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్

2.5 దశ మిశ్రమిత పర్యావరణ మరియు సీఆర్‌జెడ్ అనుమతి గురించి

ప్రజాభిప్రాయ ప్రకటన

ఇందుమూలంగా ప్రజలకు తెలియజేయునది ఏమనగా మంత్రిత్వ శాఖ/రాష్ట్రస్థాయి అనుమతుల మదింపు మరియు మూల్యాంకనం కొరకు నిపుణుల అంచనా కమిటీ (ఇసి) కి M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్ ప్రస్తుతము ఉన్న 12 దశ మిశ్రమిత పర్యావరణ అనుమతి (ఇసి) కి ఈ దరఖాస్తు ఇందుకు సంబంధించిన ప్రతిపాదన వివరాలు ఈ క్రింది విధంగా ఇవ్వబడినవి.

ప్రాజెక్ట్ వివరాలు 10-18/2018-IA.III

ప్రతిపాదన నంబరు: IA/AP/MIS/108/2020

ప్రాజెక్ట్ ప్రతిపాదకులు, వారి మరియు సంబంధిత వ్యక్తి యొక్క పూర్తి చిరునామా (ప్రభుత్వ ఉద్యోగి అయినట్లయితే హోదా) మరియు కమ్యూనికేషన్ ప్రాంతం: శ్రీ ఎన్. శ్రీనివాసులు, సీఓఓ (పోర్ట్స్), M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్, 5వ అంతస్తు, 40-9-17, వ్యాసులవారిపేట, విజయవాడ-520 010, ఆంధ్రప్రదేశ్.

ప్రతిపాదిత M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్ సంక్షిప్త వివరణ: ఇది (2.5 దశ) విస్తరణ- సంబంధిత మరియు సంబంధిత కార్యకలాపాలు.

తేదీ:

M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్ ఎక్సిస్టింగ్ సెజెడ్ పరిధిలో సెజెడ్ లో (2.5 దశ) విస్తరణ- సంబంధిత మరియు సిఆర్‌జెడ్ క్లియరెన్స్ గురించి 08 ఆగస్ట్ 2020న ఈ ఆఫీసులో జరిగిన సమావేశంలో నిపుణుల అంచనా కమిటీ (ఇసి) వారిచే చేయబడిన చర్చల వివరాలు క్రింద ఇవ్వబడినవి.

1. ప్రాజెక్ట్ ప్రతిపాదకులు ప్రాజెక్ట్ మరియు దాని స్థానం గురించి ప్రజంటేషన్ ఇచ్చారు.

2. శ్రీ పెంట్ర శ్రీనివాసులు (ఎక్సిక్యూటివ్) సెజెడ్ పరిధి 14°16'10" N అక్షాంశం మరియు 80°07' 05" E రేఖాంశం వద్ద ఉన్న కృష్ణపట్నం పోర్ట్ వద్ద M/s కృష్ణపట్నం పోర్ట్ కంపెనీ లిమిటెడ్ ఆన్ షోర్ కంటైనర్ ట్రాన్స్‌షిప్‌మెంట్ టెర్మినల్ (CTT) & లిక్విడ్ బల్క్ టెర్మినల్ (LBT) ప్రాజెక్ట్ ప్రతిపాదన గురించి వివరించారు. ప్రస్తుతం ఉన్న యొక్క 15.2 x 1 మరియు 2 ఇరుప్రక్కలలో ఉపయోగించు 17 బెర్తులలో 12 బెర్తులను ఇంటర్నల్ సరుకుల దామిక మరియు కంటైనర్ రవాణా కార్గో కై 9.0 లోతు/ఎ మరియు లిక్విడ్ కార్గో కై 9.0 లోతు/ఎ మరియు ఇంటర్నల్ ట్రాఫిక్ ఉపయోగాల కొరకు 1940 మిల్లులలో (2004 వరకు) కేటాయించిన భూమిలో అభివృద్ధి చేయబడింది. బొగ్గు/కోక్ లాంటి డ్రై కార్గో ఉపరితల రవాణాను తెరిచిన, కార్గో యొక్క 03 దశ విస్తరణ చేయుటకు ప్రతిపాదించబడింది.

3. ప్రతిపాదిత దశ 2లో 150.2 ఎంబిపిఎం సామర్థ్యం కార్గో నిర్వహణ 1.3 ఎంబిటియు/ఎం యాన్యువల్ అవుట్ ఆపరేషన్లను కలిగిన్చడం కొరకు కార్గో నిర్వహణ లోపల సీవర్ కాంప్లెక్స్‌లో 3 యాంకరేజ్ ప్రాంతాలు ప్రతిపాదించబడినవి. ప్రతిపాదిత విస్తరణ మిక్షిత నేచర్ లో బల్కీయర్ కార్గో కొరకు ప్రత్యేకించి, బల్క్‌ఫ్లో లోతు ప్రాంతాలను పూర్తిస్థాయిలు 14 మరియు పాక్షిక డ్రాఫ్ట్ ప్రత్యేకించి లోతు ఆపరేషన్‌లు/నావిగేషన్‌లను, ఎసిలలో సిద్ధపరుచు వేసుకున్నారు. ప్రతిపాదిత దశ 2 కొరకు ప్రతిపాదించబడిన వివిధ కార్గోల నిర్వహణ కొరకు ప్రతిపాదిత మౌలిక సదుపాయాలు వివరాలు క్రింద ఇవ్వబడినవి.

కార్గో	ప్రతిపాదిత సామర్థ్యం
కంటైనర్	4.0 మిలియన్ టియు/ఎం
లిక్విడ్ బల్క్	30.0 ఎంటిపిఎ
డ్రై బల్క్	30.0 ఎంటిపిఎ
ఇంటర్నల్ ట్రాఫిక్	1.0 ఎంటిపిఎ
ఇతర కార్గో	1.0 ఎంటిపిఎ
మొత్తం	66.0 ఎంటిపిఎ

4. ప్రతిపాదిత ప్రాజెక్ట్ కొరకు ఇసి సోలిడేటెడ్ టోర్ ప్రకారం 7 (i), కేటగిరి A కింద్రకు వస్తుంది. ప్రాజెక్ట్ మొత్తం స్థలం దా. లగాయా భూమి 0.5 ఆఫ్ అధిక (మిలన్) తీర వల. 10-167/2015-IA.III తేదీ 4 మే 2016 జారీ చేయబడింది. తేదీ 24 సంవత్సరం 2017వ తేదీతో సమీక్ష చేయబడింది. ఆ తదుపరి 27 జనవరి 2021వ తేదీన టీఆర్‌లో సంగీత సభ్యుల తీర్మానించింది. దీని ఈ 19-167/2015-IA.III తేదీ 04 సెప్టెంబర్ 2017 చ్యూన్ టీఆర్ ద్వారా ప్రాజెక్ట్ ప్రతిపాదకులకు నీటిని ఇంటి మినహాయించబడినది. అంతే, ప్రాజెక్ట్‌లలో సమీప 100కిలో మీటర్ల ఆపాదించబడిన ఇతర ప్రాజెక్ట్‌లు ఇతర మిన్నాభాలను సమీపించి చేయబడినవి.

5. ప్రతిపాదిత ప్రాజెక్ట్ నిర్మాణంలో ఉన్నట్టి బాణాలను మేరకు రాళ్ళు ఇసుకను కొండి 100 మిలియన్ క్యూబిక్ మీటర్లు అభివృద్ధి చేయబడ్డాయి. ఇ ఇసుకను ఎసిలిపిన తీరం సేకరిస్తుంది. 101.5 మిల్లులు క్యూబిక్ మీటర్లు అభివృద్ధి చేయబడినవి. అభివృద్ధిలోకి ప్రతిపాదిత కార్గో నుండి 4 టగులం లోపేము అభివృద్ధి చేసి సేకరణ సైసి 105 ఆపరేషన్లను లోపేము. స్థానిక భూమి కోసం మేరకు, ఖనిజ ఇసుకపైన్ని సంగీతంలోపు స్థిరపర్చిన పిల్లు పరిశ్రమలు వరకు ఎక్కడ చేయబడింది. పిల్లు మరియు రాళ్ళు అభివృద్ధి చేయబోయే ప్రాంతంలో మొత్తం 10,400 ఇంగా. కొరకుండి 33 పరిమిత ప్రాంతాలు చేపట్టడం తీరంలో ఆపరేషన్లలో అభివృద్ధి ఉన్నట్టులోపల చేయబడింది.

6. ప్రతిపాదిత ప్రాజెక్ట్ యొక్క మొత్తం విస్తీర్ణం 1094 హెక్టార్లు (2700 ఎకరాలు). ఈ ప్రాజెక్ట్‌లో భూ సేకరణలు మరియు అవసరంలేదు లేదు. ఎందుకంటే ప్రతిపాదిత ప్రాజెక్ట్ సమీప ప్రాంతంలో ఉన్న భూమిలో 7,125 హెక్టార్లలోపు మ్యాన్‌గ్రోవ్స్ ప్రాంతం లోపల మాత్రమే చేయబడుతుంది. అటవీ భూమి మళ్ళించు లేదు. ప్రతిపాదిత దశ 2 అభివృద్ధి ప్రాంతంలో ఉన్న ఉనిక

...వాహనం యొక్క యజమాన్య లాభ బదిలీయందుం మరియు అటాచ్ లేదా ఫైనాన్స్ ఇతరులకి ఉన్నట్లయితే అట్టివారి నుండి ధృవీకరణ పత్రం పొందుట తప్పనిసరి. వాహనం రిజిస్ట్రేషన్ కొరకు తేదీ, స్థలం నోటిఫికేషన్, వాహన యజమానులు మరియు ఫైనాన్సర్ నోటిఫికేషన్ 2011 నిబంధనలలో సెక్షన్ 41 ప్రకారం ఆన్‌లైన్ MV రిజిస్ట్రేషన్ కొరకు అవసరమైన పత్రాలు మరియు దరఖాస్తు ఫారం 22 ప్రకారం' లోని వివరాలను తప్పనిసరిగా సమర్పించి వాహనాన్ని రిజిస్టర్ చేయించుకోవాలి. అందుబాటులోకి వచ్చినందున

(i) ప్రతిష్టలు సంస్థలకు మరియు సేవలకు ప్రివెంటివ్ ప్రొటెక్షనగా ఇండ్ సోఫియేటివ్, 2016 సంవత్సరం సెప్టెంబర్ సోసైటీస్, 2011-లోని నిబంధనల మేరకు ఉన్న రిజిస్టర్ చేయబడిన చట్టం/అసంఘటిత/వినియోగదారి మీద వివిధ అంతర్జాతీయ అవసరాలు/సమస్యలు/అనుమతులకు, ఇది సహాయం అవుట. ప్రతిష్టలు సమాచారాన్ని పెట్టిన ఒక చట్టబద్ధ/నమోదుకాబడ్డ లేదా ఇతర ఏ సంస్థలు/వ్యక్తులకు ఏ విధంగా ప్రతిష్టకు భంగం కలిగించకుండా ఉండాలి.

(ii) ప్రభుత్వ -ఇ, బహుళ యజమాన్య ఉపయోగ ప్రయోజనాల మీదుగా అన్నులను సమర్పించడం, ప్రయోజనాలు పొందడానికి మీదుగా సంబంధిత ఆధారిత సంస్థలతో ఆన్‌లైన్ ప్రాసెస్ ప్రవేశపెట్టడం జరుగుతుంది.

(iii) రవాణా సహనంను అభ్యర్థించడం కొరకుగా సంబంధిత రోడ్డు రవాణా, 2016-లోని సంబంధిత ప్రకారం దీక్షలు. రోడ్డులో ప్రమాదాలు/ఘర్షణలు/ఇతర ఏవిధమైన దుర్ఘటనలు జరిగినప్పుడు ప్రాణాలు కాపాడటానికి ఇవ్వబడిన ప్రాణాలు ప్రతిపాదించడం జరుగుతుంది.

(iv) అభ్యుదయకే కోర్టులో ఉన్న కేసులకొరకు సంబంధిత (మోటారువాహనం) చట్టం, 2016-లోని సంబంధిత ప్రకారం ఇన్సూరెన్స్ కొరకు ఇవ్వబడిన ప్రాణాలు ప్రతిపాదించడం జరుగుతుంది. ఇన్సూరెన్స్ కంపెనీ ద్వారా ఇవ్వబడిన ప్రాణాలు ప్రతిపాదించడం జరుగుతుంది.

(v) ప్రాణాలు ప్రతిపాదించడం జరుగుతుంది. ఇన్సూరెన్స్ కంపెనీ ద్వారా ఇవ్వబడిన ప్రాణాలు ప్రతిపాదించడం జరుగుతుంది.

(vi) చాలా అవసరం సంబంధించిన స్థానం మరియు సంబంధ మెకానిజమ్ లేదా చట్టం అమలుకు చేయడం.

(vii) ప్రతిపాదన వర్తించబడ్డ మెట్టిన లేదా ఇన్ సంబంధిత సంస్థలో ఉండే ప్రతిష్ట వర్తించని అన్ని అంశ. ప్రతిపాదించిన సంస్థ, ప్రతిష్టలోని భాగాలు పూర్తిగానీ ఏ మరియు ఇన్ఫర్మేషన్ మీద ఉన్నట్లు లేదా ఇతరులు చేసిన ఇన్ఫర్మేషన్ మరియు ప్రతిష్ట ప్రతిపాదించడం జరుగుతుంది. ఇన్ఫర్మేషన్ ఇవ్వబడిన ప్రతిష్టలు

KRISHNAPATNAM PORT COMPANY LTD.

Ref.No.KP/MOEF/113 Dated: 29th August, 2012

To
The Director (IA-III)
Ministry of Environment and Forests
(I.A. Division)
Paryavaran Bhavan
CGO Complex, Lodi Road
New Delhi – 110 003

Kind Attn: Shri Lalit Kapur

Sub: **Environmental and CRZ Clearance for the development of Krishnapatnam Port in Phase-II at Krishnapatnam, Sri Potti Sriramulu Nellore District, Andhra Pradesh by M/s. Krishnapatnam Port Company Limited – modification to Specific Condition 5 (vii) – Request - Reg.**

Ref: Your Letter F.No.11-62/2009-IA.III dated 13.11.2009

Dear Sir,

(1). We invite your kind attention to Specific Condition No.5.(vii) of the CRZ & Environmental Clearance Order No.11-62/2009-IA.III dated 13.11.2009 of the MoEF above cited.

(2). You may recall that during the public hearing held on the 20th February, 2009 at Krishnapatnam, Nellore District, Andhra Pradesh for Phase–II Development of Krishnapatnam Port, a request was made by one of the public (Jana Vignana Vedika) that a greenbelt of 100 m width may be provided **around the port** in lieu of the proposed 50 m width. KPCL clarified during the public hearing that as per the Phase-II development plan, a minimum of 50m wide Greenbelt would be developed all along port boundary and 20m along the stockyards. With these provisions the likely impact on the air quality was predicted using ISCST3 model and the results are within the standards stipulated by CPCB/MoEF. Our response on the Minutes of the Public Hearing was incorporated in the Final EIA report submitted to the MoEF vide KPCL's Letter dated 06.05.2009 (copy of relevant extract D-3 enclosed for ready reference as **Annexure-I**). In this context we submit that the MoEF in their CRZ & EC stated that "The greenbelt of 100 m width shall be developed **around the coal stack yard** as per the request in the public hearing", while the actual request made during the public hearing relates to "greenbelt of 100 m width **around the port**"

o/c

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Tel: +91-40-4455 7799 Fax: +91-40-23557190 E-mail: info@krishnapatnamport.com www.krishnapatnamport.com

(3). We further submit that the APPCB in its CFE for Phase-II development vide Order No.633/PCB/CFE/RO-NLR/HO/2010/390 dated 08.05.2010 (copy of relevant extract enclosed as **Annexure-II**) directed at Condition 24 that "Green Belt of width 100m shall be developed **along the boundary** of the industry as committed by the proponent". Accordingly a greenbelt of 100 m width is being developed along the boundary of the port and a 20 m wide Green belt alround the iron ore and coal stack yards. The status of compliance was submitted to the Regional Office, MoEF, Bangalore in the first half-yearly compliance report dated 11.06.2010 (copy of relevant extract enclosed as **Annexure-III**). For ready reference, we are enclosing herewith (**Annexure-IV**) a pictorial presentation of the actual field Ambient Air Quality data from the monitoring stations along Port boundary for the period 2010, 2011 and 2012 (upto July) which confirms the findings of the model incorporated in the EIA Report and comply with the AAQ Standards.

(4). During the recent visit of the Senior Officers of the MoEF, Southern Region, Bangalore to Krishnapatnam Port on 24.07.2012, we brought the above anomaly to their notice and they have advised that the MoEF may be addressed to modify the Specific Conditions 5 (vii) of the above cited EC to reflect the actual request made by the public during the hearing held on 20th February, 2009.

We accordingly request you to kindly issue an early order modifying the provision under Specific Condition 5 (vii) of the Environmental Clearance Order cited above as under:-

Existing	Requested
"The greenbelt of 100 m width shall be developed **around the coal stack yard** as per the request in the public hearing".	"The Greenbelt of 100m width shall be developed **along the port boundary** as per the request in the public hearing".

Thanking you,

Yours faithfully,
for **KRISHNAPATNAM PORT CO. LTD.,**

(S.B. PURI)
Director

Encl: As above
Copy to: The Director, MoEF, Southern Region, Bangalore.
Encl: As Above
copy to: CEO, KPCL, Nellore alongwith enclosures

F. No. 11-62/2009-IA.III
Government of India
Ministry of Environment & Forests
(IA.III Division)

Room No. 534,
Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi-110003.

Dated: 2 March 2010

CORRIGENDUM

Subject: Environmental and CRZ clearance for Phase II Development of Krishnapatnam Port at Krishnapatnam, Sri Potti Sriramulu Nellore District, Andhra Pradesh by M/s. Krishnapatnam Port Company Ltd - Reg.

Sir,

This has reference to your letter No KP/MoEF/PH-II/19 dated 19.01.2010 regarding change of the conditions. In this context, attention is invited to this Ministry's letter of even no. dt. 13.11.2009. The condition No (xxii) be deleted and in condition (xxiii), the reference VOC be deleted

The all other terms and conditions clearance letter of even no. dated 13.11.2009 remain unchanged

Yours faithfully,

(Bharat Bhushan)
Director (IA)

Copy to:

1. The Principal Secretary, Director (Environment), Forests & Environment Department, Government of Gujrat, Block No. 14, 8th floor, Sachivalaya, Gandhinagar – 382 010.
2. The Chairman, CPCB, Parivesh Bhawan, CBD cum-Office Complex, East Arjun Nagar, Delhi – 32.
3. The Chairman, Andhra Pradesh State Coastal Zone management Authority & Additional Secretary, Government of Andhra Pradesh, Environment and Forests Science and technology Department, Secretariat, Hyderabad – 500 022
4. The Member Secretary, Andhra Pradesh Pollution Control Board, Hyderabad.
5. The Chief Conservator of Forests, Ministry of Environment and Forests, Regional Office, Western Region, Kendriya Paryavaran Bhawan, Link Road No. 3, Ravishankar Nagar, Bhopal – 462016 (M.P.).
6. Guard File.
7. Monitoring Cel..

(Bharat Bhushan)
Director (IA)

Annexure 23

ADANI CSR FOUNDATION EXPENDITURE (October, 2025 to March, 2026)				
S. No.	Vertical	Expenditure (October, 2025 to March, 2026)		
		Capex	Opex	Total
1	Education	0	101.45	101.45
2	Community Health	0	38.91	38.91
3	Sustainable Livelihood	0	92.55	92.55
4	Community Development	0	173.19	173.19
5	Climate Action	5.60	279.10	284.70
6	General Administration	0	39.81	39.81
	Total	**5.60**	**725.01**	**730.61**

adani
Foundation

2025-26

Annual Progress Report - Krishnapatnam

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Preface

Operating on eastern shore of Bay of Bengal in SPSR Nellore District of the state Andhra Pradesh, Adani Krishnapatnam Port Limited (AKPL) has created economic engagement of about 7000 local villagers including majority working persons from fisherman community.

With its port operation, AKPL had implemented inclusive development approach-based community development projects and programmes well aligned with Sustainable Development Goals and covered 96 villages with more than 113000 population under its development ambit in 7 Mandals of SPSR Nellore district of Andhra Pradesh state during financial year 2025-26.

The peripheral villages of the Adani Krishnapatnam Port Limited are thickly populated with fishing and farming community families who along with other communities derived benefits from development projects and programmes implemented by Adani Foundation, the CSR arm of Adani Krishnapatnam Port Limited under its corporate social responsibility (CSR). The development projects implemented were in the development domain of Education, Health & Nutrition, Sustainable Livelihood, Community Development, Climate Action and Sports & Games.

With the goal to enrich human capital, augment the local economic growth and contribute to environmental sustainability in its project affected and peripheral villages, AKPL through its CSR arm Adani Foundation largely intervened in the target geographic reach at Krishnapatnam site through nation value-based education to the wards of socially and economically backward class families as well as downtrodden families of Scheduled Castes and Tribes. More than 4200 children were benefitted through Adani Vidya Mandir, Adani Evening Education Centres, Utthan Learning Initiative Centres, Enabled learning environment at the target Govt. Primary, Upper Primary & High Schools and Anganwadi Centres and Adani Scholarship scheme. Similarly intensive focus was on providing preventive care for non-communicable diseases, medical & health care services to the community families in need.

In order to boost the local economy, Adani Foundation implemented Project Annapurna to increase average annual income by 20%, Project AMMA for women's economic and social empowerment, Project Kamdhenu to increase milk production for cattle rearing farmers' income enhancement and Model Village Development Initiative for effective sanitation management for creation of hygienic environment in and around houses, roads and village lanes and promoted green energy in form of solar street lights installations for road safety of villagers.

Following the principles of sustainable development, Adani Krishnapatnam Port Limited and Adani Foundation joining hands together will continue the community development campaign in years ahead.

Message from Business Head

Owing a great deal to society and being a responsible corporate citizen, Adani Krishnapatnam Port Limited (AKPL) has been endeavouring for all round development of the villagers of the peripheral and project affected villages of AKPL at Krishnapatnam site since starting of its business operation.

While following the principles of sustainable development seeking participation of community in implementation of community development under its corporate social responsibility (CSR), AKPL has aligned the goals and objectives of its community development projects and programmes with the Sustainable Development Goals (SDGs) and got the community development projects implemented through its CSR arm Adani Foundation.

Believing in the **business philosophy Growth with Goodness** of Adani Group, AKPL ensured the involvement of the target community members in projects planning, implementation, community monitoring and supervision. Based on the mapped needs of the communities having majority of population of fisherman community around AKPL Port, the areas of development interventions identified during financial year 2025-26 were Education, Health & Nutrition, Sustainable Livelihood for women, farmers and youths, Community Development, Climate Action and Sports and Games.

It is worth mentioning here that Model Village Development Initiative was a flagship programme in financial year 2025-26 as this programme seeking support and participation of key stakeholders – SPSR Nellore district administration, Muthukur Mandal MPDO office, Muthukur and Krishnapatnam Gram Panchayats, Members of Legislative Assembly of Andhra Pradesh state and the village communities achieved the milestones of keeping Muthukur and Krishnapatnam Gram Panchayats village roads and lanes clean through systematic solid wealth management through constructions of solid wealth processing Centres, providing access of pipeline supply water to houses of Krishnapatnam Gram Panchayats and developing sport ground at Muthukur Gram Panchayat for youths to play for their physical fitness and developing their sports' skills.

Adani Foundation will be continuing its development endeavours in years ahead to enrich human capital, act as enabler for local economic growth and contribute to environmental sustainability.

Jagdish Patel
Chief Executive Officer
Adani Krishnapatnam Port Limited

Demographic Profile

Business Unit	Adani Foundation
Adani Krishnapatnam Port Limited a major economic gateway that caters to the land locked Southern hinterland of India with multi model connectivity. Having deep draft capable of handling capsize and Panamax vessels, it is a two-way traffic for both onshore and offshore logistics. It is located about 190 km North of Chennai Port and 18 km East of Nellore City. The materials that are handled at Adani Krishnapatnam Port are as under 1. Dry Cargo Handling 2. Liquid cargo Handling Adani Krishnapatnam Port has robust logistic infrastructures in form of conveyor belt for material disbursement directly from the port yard to the Power Plants, rail connectivity and road connectivity for transportation of the imported materials to various destinations across the country.	**Adani Foundation** being corporate social responsibility (CSR) arm of Adani Krishnapatnam Port Limited touched the **lives of more than 1,13,000 people** including children, girls, youths, women and senior citizens through community development projects and programmes in **96 villages of 21 Gram Panchayats in 6 Mandals of 1 District i.e. SPSR Nellore** in **Andhra Pradesh state during financial year 2025-26.** **Indukurupet, Thotapalli Gudur, Venkatachalam, Muthukur, Chillakur and Manubolu** were 6 (six) Mandals wherein 96 villages were covered under the ambit of CSR of Adani Krishnapatnam Port Limited for implementation of CSR projects and programmes in participatory manner ensuring active involvement of the target community. Health & Nutrition, Education, Sustainable Livelihood, Community Development, Climate Action and Sports & Games were key areas of development for the needy target community.

Andhra Pradesh (State)

SPSR Nellore (District)
1. Indukurupet Mandal
2. Thotapalli Gudur Mandal
3. Venkatachalam Mandal
4. Muthukuru Mandal
5. Chillakuru Mandal
6. Manubolu Mandal

Adani Krishnapatnam Port Limited (AKPL)

Adani Foundation Krishnapatnam site
Geographic Area

State	1
District	1
Mandals / Blocks	6
Gram Panchayats	21
Villages	96
Population	113919+

113919+
Beneficiaries

52054+ **61865+**

Executive Summary

The **Growth with Goodness** philosophy of **Adani Group** getting fostered at Krishnapatnam site of Adani Krishnapatnam Port Limited (AKPL) ensured participatory approach of development seeking involvement of the target villagers in peripheral and project affected villages of AKPL for their inclusive growth and sustainable development.

Adani Foundation being Corporate Social Responsibility (CSR) arm of AKPL at Krishnapatnam site planned and implemented various CSR projects for promotion of education through UTTHAN project, improvement in health status of the villagers through Village Total Health project, income enhancement of farmers, youths and women through Project Annapurna, Project Pashudhan Vikas and economic empowerment of women through Project Adani Mahila Movement for Advancement (AMMA), environment conservation and protection through Climate Action projects focused on promotion and utilization of green energy, mass plantation, promotion of cleanliness and sanitation in and around houses, village lanes, roads and common public places and promotion of physical fitness for people through sports and games.

Adani Foundation through above mentioned projects implementation impacted the **lives of more than 1,13,000 people** including children, girls, youths, women and senior citizens in **96 villages of 21 Gram Panchayats in 6 Mandals of 1 District i.e. SPSR Nellore** in **Andhra Pradesh state during financial year 2025-26.**

1. **EDUCATION: Children's and youths' education development** has been in focus of the community development efforts made by Adani Foundation at Krishnapatnam site since the year 2021. Adani Foundation implemented **educational Project UTTHAN for more than 3200 students of Class I to X studying at 21 govt. schools.** The students benefited through evening educational coaching classes and scholarship to **pursue higher technical courses such as MBBS course, B. Tech course, B. Pharma course etc.** In addition to that, more than 1000 students at Adani **Vidya Mandir,** Krishnapatnam were imparted cost-free education from Play Class to Class XII in English medium. The building infrastructures of the target govt. schools were renovated, and computer lab and science lab facilities were made available to the students at the schools **resulting in the creation of better learning environment for the students and higher passing percentage of the students in Class X board examinations and Class XII Board examinations.**
2. **HEALTH: About 20000 persons were benefitted through medical treatment free of cost** through clinic called **Adani Chikitsalayam based medical treatment, Mega and Multi-specialty health camps, rural medical camps and fogging operation for mosquitoes control.** 186 urban and rural blood doners voluntarily donated 186 units of blood and more than 500 children underwent handwashing training to keep clean and avoid diseases by eating food through washed hands.
3. SUSTAINABLE LIVELIHOOD DEVELOPMENT: About 800 enterprising persons including farmers, youths and women started earning income in terms of profit on

monthly and annual basis through intervention of sustainable livelihood development projects – Project Annapurna, Project Pashudhan Vikas and Project AMMA (Adani Mahila Movement for Advancement) during financial year 2025-26.

The annual income level in terms of profit of 152 farmers engaged in agricultural and horticultural activities increased from **Rs. 1,71,500/-** in FY 2024-25 to **Rs. 2,12,660/-** in FY 2025-26 with hike of **24%** whereas annual income of 155 youths and farmers engaged in cattle-based enterprises operation increased from **Rs. 78000/-** in FY 2024-25 to **Rs. 94000/-** in FY 2025-26 with hike of **21%**. On the front of women's economic empowerment, the annual income of 43 women operating through women's Company, women's groups and running enterprises individually increased from **Rs. 144000/-** in FY 2024-25 to **Rs. 177120/-** in FY 2025-26 witnessing **23%** hike in annual income level.

4. **COMMUNITY DEVELOPMENT:** Civil Infrastructures being key to augmentation of the pace of community development was in focus and having mapped the community development needs, Adani Foundation constructed renovated drains for free flow of house waste water to from houses to the main sewer and laid water supply pipeline benefitting 10000 villagers, constructed 60000 liters capacity overhead water tank at the premises of the residential govt. DKW College, Nellore to meet drinking and utility water requirement of 2000 girl students hailing from Scheduled Tribe, Scheduled Caste and Backwards Class, extended support to Gram Panchayats for operation and maintenance of 12 RO Water Filter Plants ensuring clean and safe drinking water to about 18000 water users and developed burial infrastructure in Muthukur during FY 2025-26.

5. **CLIMATE ACTION:** The need for protection and conservation of environment by addressing issues of unhygienic surroundings of houses, unhygienic village lanes, roads and plastic garbage and air pollution were acknowledged by Adani Foundation. Adani Krishnapatnam Port Limited through its CSR arm Adani Foundation implemented flagship initiatives titled **Village Sanitation Programme** and **Plantation Campaign** towards addressing above-mentioned environmental issues.

   3 nos. of Material Recovery Facilities developed along with 3 nos. of garbage lifting vehicles 3 nos. of sanitation management awareness campaign vans provided to Muthukur, Krishnapatnam and Thamminapatnam Gram Panchayats as a part of Solid Wealth Processing Centres benefitting 20000 villagers. Environment protection awareness sessions conducted for rural youths, women and school students resulted in voluntary plantation of 5000 saplings in peripheral and project affected villages of AKPL.

6. **SPORTS & GAMES:** Sports & Games activities play an important part in children's and youths' overall development by way of promoting self-esteem and self-confidence, developing discipline and developing social skills in them.

   During FY 2025-26, Adani Foundation promoted cricket, volleyball, Kho-Kho and Kabaddi tournaments for school students and youths to participate in. 484 sport players including girl students from ZPP High Schools, Muthukur and Krishnapatnam and village youths were benefited through sports training and participation in sports tournaments such Cricket, Volleyball and Kabaddi tournaments

1.1 Education

1.1.1 OVERVIEW

Children's and youths' education development has been in focus of the community development efforts being made by Adani Foundation at Krishnapatnam site since the year 2021. Being CSR arm of Adani Krishnapatnam Port Limited, Adani Foundation implemented **educational Project UTTHAN for more than 3200 students of Class I to X studying at 21 govt. schools and Adani Vidya Mandir, Krishnapatnam.**

The following were the **objectives of Project UTTHAN:**

1. Improvement in learning level of slow learner students through customized teaching and learning improvement assessment module.
2. Enabling the students of Class X of the target govt. high schools to pass class x board examinations conducted by Andhra Pradesh State Education Board and achieving the set target of students' passing percentage in class X board examinations.
3. Creating value-based education learning environment for the students at govt. schools by developing adequate infrastructure such as computer labs, science labs, libraries, supporting desk benches, printers and renovation of lavatories for students and teachers at these schools.
4. Helping poor students with high education talent and thirst to enhance higher education for want of monetary requirement to pay College fee etc., **Adani Scholarship provision is introduced by Adani Foundation** to pursue higher professional & technical education courses by these poor community wards and build up their valuable career opportunities.

During **academic year 2025-26**, Adani Foundation conducted **UTTHAN evening education coaching classes and Utthan learning improvement classes regularly** for more than **1450 students** of 21 **govt. primary, middle and high schools** in addition to imparting education free of cost to **1000 students** including majority of fisherman community children at **Adani Vidya Mandir English Medium School** and created quality education environment by providing desk-benches for these schools, establishing computer lab at ZPP High School, Gummaladibba, renovating lavatories at ZPP High School, Krishnapatnam & Gummaladibba as well as Dr. B R Ambedkar Gurukulam, Muthukur, drinking water facilities development in ZPP High Schools at Epuruvenkannapalem, Varagali and Gummaladibba **benefiting more than 3200 students** whereas **76 children under 5 years enrolled at 5 nos. of Anganwadi Centres** at Krishnapatnam site were imparted **basic learning skills in English Medium** under **Project UTTHAN.**

1.1.2 KEY ACTIVITIES & OUTPUT

The **summary of benefits to the target govt. schools and the students** by Adani Foundation through Project UTTHAN by way of **infrastructural development and renovations** done in the schools and **educational support rendered to the students** during FY 2025-26 was as below.

Project UTTHAN

S. No.	Key Activities	Summary of Benefits to Students (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	**ZPP High School, Krishnapatnam**			
1.1	Boy Toilet & Girl Toilet renovations	Number	6	209
1.2	Dining shed construction for students	Number	1	209
1.3	Drinking water tap facility for students	Number	1	209
1.4	School building painting	Number	1	209
1.5	**Adani Evening Coaching Classes** for Social Science, English, Science and Mathematics for Class VIII to X students	Number	1	130
1.6	**English newspaper reading by students Initiative**	Number	1	209
2	**ZPP High School, Muthukur**			
2.1	Science Laboratory Infrastructure development	Number	1	150
2.2	RO Water Filter Plants for drinking water availability for students	Number	1	445
2.3	Drinking water tap facility for students	Number	1	445
2.4	School main gate construction	Number	1	445
2.5	**Adani Evening Coaching Classes** for Social Science, English, Science and Mathematics for Class VIII to X students	Number	1	150
2.6	Distribution of desk-bench sets	Number	10	30
3	**ZPP High School, Epuruvenkennapalem**			
3.1	Distribution of desk-bench sets	Number	10	30
3.2	Deep bore-well for drinking water availability to students	Number	1	175
3.3	**Adani Evening Coaching Classes** for Social Science, English, Science and Mathematics for Class VIII to X students	Number	1	100

Project UTTHAN

S. No.	Key Activities	Summary of Benefits to Students (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
4	**Dr. B R Ambedkar Gurukulam, Muthukur**			
4.1	RO Water Filter Plants for drinking water availability for students	Number	1	400
4.2	Drinking water tap facility for students	Number	2	400
4.3	Girl Students' cloth drying stands installations	Set	2	400
4.4	Girl Toilet renovations	Number	30	400
5	**Govt. Primary School, Krishnapatnam**			
5.1	Verandah fencing with brick wall and iron grills for students' safety	Number	1	70
5.2	Distribution of desk-bench sets	Number	10	30
6	**Govt. Primary School for Tribal Students, Krishnapatnam**			
6.1	Verandah fencing with brick wall and iron grills for students' safety	Number	1	25
6.2	Tables and Chairs distribution	Number	25	25
7	**Govt. Primary School, Gopalpuram**			
7.1	Distribution of desk-bench sets	Number	12	36
8	**Govt. Primary School, Arcotpalem**			
8.1	Solar Night Lights installation	Number	3	36
8.2	Tables and Chairs distribution	Number	10	36
9	**ZPP High School, Gummalladibba**			
9.1	Computer Laboratory Infrastructure Development	Number	1	80
9.2	Computer – 2 Nos. & UPS -10 Nos. & Heavy-Duty Printer (Kyocera) – 1 No. & Electric Bell – 1 No. provided	Set	1	80
9.3	Boy Toilet & Girl Toilet renovations	Number	6	80
9.4	Drinking water tap facility for students	Number	1	80
9.5	School building painting	Number	1	80
9.6	Drinking water and utility water supply system installation in the school premises	Number	1	80
9.7	English newspaper reading by students Initiative	Number	1	80
9.8	School students' assembly stage construction	Number	11	80

Project UTTHAN

S. No.	Key Activities	Summary of Benefits to Students (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
10	**ZPP High School, Varagali**			
10.1	**Adani Evening Coaching Classes** for Social Science, English, Science and Mathematics for Class VIII to X students	Number	1	86
10.2	Drinking water and utility water supply system installation in the school premises	Number	1	120
11	**Govt. Primary School, Gummalladdibba**			
11.1	Distribution of desk-bench sets	Number	20	53
12	**Govt. Primary School, Thamminapatnam**			
12.1	Distribution of desk-bench sets	Number	7	21
13	**Govt. Primary School, Lingavaram**			
13.1	Distribution of desk-bench sets	Number	16	48
14	**UTTHAN Learning Improvement Classes (ULIC) at Govt. Primary Schools**			
14.1	Govt. Primary Schools covered under ULIC	Number	15	986
15	**Anganwadi Centres** children taught in English medium	Number	5	76

Adani Vidya Mandir & Govt. ZPP High Schools' Class X Board Examinations Result Andhra Pradesh State (Academic Year : 2025-26)

S. No.	School Name	No. of Students Appeared at Class X Board Examination			No. of Students Passed			Passing % of Students	Highest Marks Scored Out of Full Marks 600	No. of Students Scored 500 and Above Marks
		Total	Male	Female	Total	Male	Female			
1	Adani Vidya Mandir, Krishnapatnam	49	33	16	46	30	16	93.87%	580	6
2	ZPP High School, Krishnapatnam	40	20	20	37	19	18	92.50%	577	7
3	ZPP High School, Muthukur	93	33	60	67	28	39	72.04%	583	11
4	ZPP High School, Epuruvenkannapalem	49	22	27	38	16	22	77.55%	560	5
5	ZPP High School, Varagali	89	49	40	73	42	31	82.02%	540	6
	Total	**320**	**157**	**163**	**261**	**135**	**126**	**81.56%**	-	**35**

1.1.3 OUTCOME & IMPACT

The initiatives such as conducting special educational coaching classes for the target students and quality learning environment creation through infrastructure development under **UTTHAN project of Adani Foundation brought about following impacts**:

1. **Govt. Schools Ensured Quality Education for Students: 5 students on average per govt. school** out of the **5 Govt. schools** covered under **Project UTTHAN secured 500 and above marks** out of full marks **600** in **Class X Board Examinations of Andhra Pradesh state** in the year **2025.** This clearly underlined the **improvement in quality of education** being rendered to the students with support of **Adani Foundation** through **Project UTTHAN.**

2. **Meritorious Students bagged National Merit – cum – Means Scholarship (NMMS):** A total of 4 students including 2 males and 2 females from 4 govt. schools, namely ZPP High School, Muthukur, ZPP High School, Krishnapatnam and ZPP High School, Varagali passed National Merit – cum – Means Scholarship (NMMS) examination.

3. **Increase in students' average daily attendance:** With the quality education learning environment created through infrastructure development by Adani Foundations at these target govt. schools, the **students' average daily attendance** at these target 19 govt. schools had been significantly **increased by 15%** than last year 2024-2025 i.e., **from 70% to 85%**

4. **Pre-board examination passing percentage of the students was 100%.** All Class X board examinations appearing students of the target 4 nos. of govt. ZPP High Schools passed pre-board examinations and qualified for Class X State Education Board examination of Andhra Pradesh State Government.

5. **Trend of Private School students getting back to govt. ZPP High Schools was witnessed** as the quality education learning environment was created by Adani Foundation through UTTHAN project in Govt. Primary & High Schools. **3 nos. of students studying in private schools returned and sought admission in Govt. ZPP High Schools at Krishnapatnam and Muthukur. This is a remarkable achievement in the minds of parents of their wards came back to attain quality and value-based education in Govt. Schools.**

6. **Andhra Pradesh State Govt. recognized confidence building and personality development of target govt. schools supported through UTTHAN initiative. Ms. K. Poojitha,** student of Class IX in ZPP High School, Krishnapatnam **participated to be as Minister for BC Welfare in Andhra Pradesh State Assembly Hall on 26.11.2025. The Indian Constitution Day and won the hearts Apex State Government authorities.**

7. A total No. of **8 students pursuing MBBS and Engineering as well as** Diploma courses were supported with Adani Scholarship to enable them and continue their higher education successfully.

1.2 Community Health

1.2.1 OVERVIEW

In order to extend medical services to the needy villagers in 20 peripheral villages of AKPL at Krishnapatnam site and make them aware of preventive measures to do away with the health ailments and keeping them abreast of health benefits of keeping clean, **a rural health clinic namely Adani Chikitsalayam manned with qualified MBBS Doctor, Lab Technician, Pharmacist and Nurse** was established in Simhadri Nagar of Muthukur Mandal of SPSR Nellore District of Andhra Pradesh in the year 2020. Whereas rural health camps, health awareness camps and mega multi-specialty health camps for needy poor patients have been key components of Adani Foundation's health management program titled **'Village Total Health'**.

Adani Foundation implemented **Village Total Heath** project during FY 2025-26 with following **objectives** to be met:

1. To raise health awareness level of the villagers to practice preventive measures to stay healthy.
2. To extend basic medical services through Outpatient Department medical consultation, rural medical camps and multi-specialty health camps under curative measures to the needy rural patients for their medical treatment and sustainability of good health.

1.2.2 KEY ACTIVITIES & OUTPUT

The health performance delivered through **Village Total Health** programme was as under:

Village Total Health

S. No.	Key Health Activities	Health Services Benefits to Villagers (Output)		
		FY 2025-26		
		Camps/ OPDs/Day	Beneficiaries	Remarks
1	Outpatient Department (OPD) Patients at Adani Chikitsalayam	216	9360	43.33 patients on average per OPD medical consultation day
2	Fogging operation (days) to control mosquitoes	120	18500	18500 populations in 20 villages
3	General Health Camps	192	6850	35.67 patients on average per camp
4	Rural Health Awareness Camp	192	4830	25.15 villager on average per camp
5	Mega Health Camps (3 No's) and Multispecialty Health Camps (4 No's)	7	1400	200 rural patients on average per camp.
6	Blood donation camp	1	186	186 patients donated blood during blood donation camp organized on June 24, 2025.
7	Hand Washing Camp with 15 Anganwadi Centre Children	35	527	15 children at an average per hand wash camp.

1.2.3 OUTCOME & IMPACT

The health initiative titled 'Village **Total Health'** implemented by Adani Foundation **brought about following impacts**:

1. **Good Health Service increased foot fall of OPD patients at Adani Chikitsalayam:** On average, **43.33 patients per day underwent OPD medical consultancy** and treatment during FY 2025-26 against 30 patients on average per day during FY 2024-25. Thus, there was **44.43% increase in OPD patients who underwent medical treatment** at Adani Chikitsalayam during FY 2025-26.

2. **Decrease in ailment witnessed:** Cases of heat stroke, dengue and malaria were found to **be only 23 during OPD and rural medical camps** during FY 2025-26 as compared to **39 cases of heat stroke, dengue ana malaria** in such medical camps during FY 2024-25. Thus, there was **69.56 % decrease in such patients' number during FY 2025-26 indicating the raised awareness level of preventive measures taken by the villagers.**

3. **Multi-specialty health camps saved lives of rural patients: 146 patients out of 1400 patients undergoing heart check-up, eye check-up, gynecological check-up and skin disease check-up** were identified to be the **patients of heart disease, UTI, cataract and diabetes** during multi-specialty health camps. Before that, the 146 patients were ignorant of these diseases **but after diagnosis of the diseases, they started medical treatment to get rid of the diseases.**

4. **Behavioral changes happened in parents and children for handwashing:** The handwashing campaign for children of 15 Anganwadi Centres at Krishnapatnam site **covering 527 children had facilitated Behavioural changes in the parents of the children and the children to wash hands before and after they eat food and go for natural calls.**

5. **Cost of medical treatment got reduced for rural patients:** The **medical treatment cost of more than 10000 patients got reduced** as they got free of cost medical consultancy and medicines through health services of Adani Foundation during FY 2025-26.

1.3 Sustainable Livelihood

1.3.1 OVERVIEW

In order to facilitate farmers to increase their income level through best agricultural practices, adopting natural farming and organic farming techniques and protocol, increase income through cattle based enterprises development such as dairy and facilitate women to be financially independent by starting micro income generating enterprises in project affected and peripheral villages of Adani Krishnapatnam Port Limited, Adani Foundation had implemented **Project Annapurna for agriculture development, Project Pashudhan Vikas for cattle development and Adani Mahila Movement for Advancement (AMMA) project for women's empowerment at Krishnapatnam site.**

Project Annapurna for income generation through best agricultural & horticultural practices

Project Pashudhan Vikas for cattle breed improvement

Biscuits making training at KVK, Venkatgiri

Groundnuts packaging for sale

Above are Income generating activities for women through Project AMMA

The brief report on each of the above-mentioned sustainable livelihood projects is below.

A. PROJECT ANNAPURNA

The **objectives of Project Annapurna** were as follows:

1. To make farmers aware of importance of best agricultural and horticultural practices in cost effective manner to decrease input cost and increase crop production per unit area of land for income enhancement.
2. To facilitate farmers to shift from chemical fertilizer application-based farming to natural and organic protocol-based farming for good health of the food consumers and increase in income of farmers.

1.3.2 KEY ACTIVITIES & OUTPUT

The **summary of benefits extended to the target farmers** by Adani Foundation through Project Annapurna by way of **their institutionalization in Farmer Producer Companies as well as agricultural and horticultural services rendered to them** during FY 2025-26 was as below.

Project Annapurna

S. No.	Project Annapurna Key Activities	Summary of Benefits to Farmers (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	Total Number of farmers institutionalized in farmer producer companies (As on 31.3.2026)	Number	2	600
2	Total Number of Farmer Producer Companies	Number	2	600
3	Krishnapatnam Farmer Producer Company (KFPCL)	Number	1	517
4	Muthukur Farmer Producer Company (MFPCL)	Number	1	83
5	**Area of land** covered under agriculture & horticulture -2000 acres covering **KFPCL's 517 and MFPCL's 2 farmers**	Acre	2000	519
6	**Area of land** covered under agriculture & horticulture through **MFPCL**	Acre	463	83
7	No. Agricultural Training Programme conducted	Number	20	400
8	No. of Horticultural Training Programme conducted	Number	1	36
9	**Agricultural Inputs Provided to Farmers**			
9.1	Motorized Sprayers	Number	30	30
9.2	Tarpaulin (Size: 40 x 60 Feet)	Number	50	50
9.3	Vegetable seeds	Kits	250	250
9.4	Natural farming manure, insect & pest repellant kits	Number	250	250
9.5	Bio fertilizer(s)	Quintal	100	200
9.6	Gypsum sulphate	Quintal	250	250
10	**Average Annual Income Per Farmer** from Groundnuts, Paddy & Horticultural Crops in **FY 2025-26.**	Rs. / Year	212660	255
11	**Average Annual Income Per Farmer** from Groundnuts, Paddy & Horticultural Crops in **FY 2024-25.**	Rs. / Year	171500	152
12	**Percentage Increase** in Annual Average Income Per Farmer in **FY 2025 -26**	%	24	

1.3.3 OUTCOME & IMPACT

The farmers institutionalized in 2 nos. of farmer producer companies namely Krishnapatnam Farmer Producer Company Limited and Muthukur Farmer Producer Company Limited **under Project Annapurna of Adani Foundation had witnessed following impacts in respect of their sustainable livelihood enhancement**:

1. **Farmers sensitized to get organized in Farmers Producer Company:** Having witnessed the monetary and soil health benefits and leveraging govt. schemes fund leverage through Krishnapatnam Farmer Producer Company Limited, the farmers of Muthukur Mandal got sensitized for sustainable farming and formed Muthukur Farmer Producer Company **with 83 farmer members and started conducting monthly meeting of farmers to explore opportunities to leverage resources from govt. schemes and CSR fund of Corporate entities.**

FPC Member Farmers' Meeting

2. **Increase in farmers' income:** The average annual profit / income of farmers increased by **24% from Rs. 1,71,500/-** in FY 2024-25 to **Rs. 2,12,660/-** in FY 2025-26.
3. **Increase in crop production witnessed:** The **crop production of groundnuts and paddy along with other horticultural crops** per unit area of land **increased by 15% on average as aggregate annual crop production per unit area of land increased** from **50 quintals in FY 2024-25 to 57.50 quintals in FY 2025-26.**
4. **Partial reduction in application of chemical fertilizers:** The farmers covered under Project **Annapurna reduced application of chemical fertilizers, insecticides and pesticides by 25% on average** and applied organic manure such as vermicompost, NADEP compost and organic pest and insect repellants in place of reduced quantities of chemical fertilizers.
5. **Decrease in farmers' cost of agricultural and horticultural inputs by 10%** during procurement of inputs such as **fertilizers, seeds, field preparation and plant maintenance activities of cultivation for farmers associated with the Farmer Producer Companies KFPCL and MFPCL.** This happened **as KFPCL and MFPCL had done bulk purchasing of agricultural inputs and extended subsidized facilities to farmers** under various **govt. schemes** and **corporate social responsibility** based **agricultural initiatives of Adani Foundation** during FY 2025-26.

Bulk Vermicompost Procurement

6. **Shift of farmers from chemical based cultivation to natural farming protocol-based cultivation:** Having saved the agricultural and horticultural input cost over the period of last two years, the farmers associated with KFPCL and MFPCL took decisions to shift to natural farming protocol to improve soil health for sustainable agricultural activities.

Ghanajeevamritam Organic manure

B. PROJECT PASHUDHAN VIKAS

The following were the **objectives of Project Pashudhan Vikas:**

1. To improve breed of cattle (cows and buffaloes) through artificial insemination of sex sorted semen to increase milk production.
2. To increase income of cattle (cows and buffaloes) rearing farmers through cattle's milk and dung-based enterprises.
3. To facilitate cattle rearing farmers for stall feeding of cattle with balanced mixed feed for increase in milk production and good health of the cattle.
4. To facilitate farmers for cultivation of green fodder to feed cattle on daily basis to increase cattle's milk.

Artificial Insemination

Green Fodder Cultivation

1.3.4 KEY ACTIVITIES & OUTPUT

The **summary of benefits extended to the target cattle rearing farmers** by Adani Foundation through Project Pashudhan Vikas during FY 2025-26 is as below.

Project Pashudhan Vikas

S. No.	Project Pashudhan Vikas Key Activities	Summary of Benefits to Farmers (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	Cattle rearing farmers benefitted – 580 cattle & 252 farmers	Number	580	252
2	Artificial Insemination of Sex Sorted Semen	Number	508	298
3	Animal Health Care Camps conducted	Number	2	154
4	Cattle underwent health checkup and medical treatment	Number	6	126
5	Progressive cattle rearing farmers supported with Balanced Mixed Feed	Number	1	18
6	Annual quantity of Balanced Mixed Feed fed to the cattle	Quintal	40	20
7	Cultivating green fodder Super Napier	Plots	15	15
8	Area of land under green fodder – Super Napier grass cultivation	Acre	2	15
9	Average increase in milk production per cattle per day	Litre	2	276
10	Average increase in milk production per cattle per year **(i.e. for 8 months in a year)**	Litre	480	276
11	Female calves got birth	Number	320	152
12	**Average Annual Income Per Cattle Rearing Farmer** during **FY 2025-26.**	Rs. / Year	94000	276
13	**Average Annual Income Per Cattle Rearing Farmer** during **FY 2024-25.**	Rs. / Year	78000	155
14	**Percentage Increase** in Annual Average Income Per Cattle Rearing Farmer during **FY 2025-26**	%	21	

1.3.5 OUTCOME & IMPACT

The farmers institutionalized in 2 nos. of farmer producer companies namely Krishnapatnam Farmer Producer Company Limited and Muthukur Farmer Producer Company Limited **were benefitted under Project Pashudhan Vikas of Adani Foundation. The following impacts in respect of their sustainable livelihood enhancement through cattle development were witnessed:**

1. **Increased income of cattle rearing farmers:** The average annual profit / income of cattle rearing farmers increased by 21% from Rs. **78000/-** during FY 2024-25 to **Rs. 94000/-** in FY 2025-26.

Cattle Milking

2. **Increase in milk production witnessed:** The **milk production per milking cattle** increased **by 10% on average during FY 2025-26.**

3. **Percentage increase in number of cattle rearing farmers developed habit of stall feeding to cattle and percentage increase in number of cattle fed with Balanced Mixed Feed: 50% of cattle rearing farmers** covered under Project Pashudhan Vikas developed the **habit of stall feeding** to the milking cattle and fed them with **Balanced Mixed Feed** whereas **70% of the cattle underwent stall feeding regularly** during FY 2025-26.

Stall Feeding to Cattle

4. **Local self-employment opportunity created through Balanced Mixed Feed Enterprise: 4 persons including local youth and women got self-employment in Balanced Mixed Feed making enterprise** during FY 2025-26.

Cattle Balance Mixed Feed

C. PROJECT AMMA FOR WOMEN'S EMPOWERMENT

The following were the **objectives of Project AMMA for Women's Empowerment:**

1. To equipe women with the enterprise operation-based skills and life skills to live with dignity through their economic and social engagement.
2. To institutionalize women in women's group to mobilize resources to start group based and individual income generating activities at local level.
3. To impart marketing and book-keeping training to the women to ensure cash flow required for operation of micro enterprises and make profits.

The **needy women underwent tailoring, floor cleaner making & spice processing training for their income generation to live life with dignity.**

Self Employed Tailor Krishnapatnam

Liquid Floor Cleaner Making Krishnapatnam - Arcotpalem

Spice Processing Muthukur & Gummalladibba

1.3.6 KEY ACTIVITIES & OUTPUT

The **summary of benefits extended to the target women** by Adani Foundation through Project AMMA for Women's Empowerment during FY 2025-26 is as below.

Project AMMA FOR WOMEN'S EMPOWERMENT

S. No.	Project AMMA Key Activities	Summary of Benefits to Women (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	AMMA awareness programmes (8 nos. of programmes) on income generation led women's economic empowerment.	Number	8	112
	Tailoring training Ocum-production centre – 118 women trained.	Number	1	118
2	Capacity building and marketing linkages	Number	2	45
3	Imparted training on pickle making, food catering, spices making, hand wash and floor cleaners, etc.,	Number	12	128
4	Exposure visit of SHG Women members, women's company members and female sanitation volunteers (Exposure Nos.-22: Solid Wealth Processing Centre based income generating activities- 20, ALEAP enterprises exposure visit – 1 no., horticulture-based exposure visit – 1 no.	Number	22	227
5	**Average Annual Income Per Woman Entrepreneur** during **FY 2025-26.**	Rs. / Year	177120	64
6	**Average Annual Income Per Woman** during **FY 2024-25.**	Rs. / Year	144000	43
7	**Percentage Increase** in Annual Average Income Per Woman during **FY 2025-26**	%	23	

1.3.7 OUTCOME & IMPACT

The outcome and impact of Project AMMA were very encouraging during financial year 2025-26 as they became financially independent and enhanced their livelihood opportunities as well. Key outcomes and impacts witnessed were as below:

1. The average annual income in terms of profit for 43 women increased by 23% during FY 2025-26 in comparison to the income of FY 2024-25. The average annual income per woman out of 43 women was **Rs. 1,44,000/- in FY 2024-25** whereas **it increased to Rs. 1,77,120/- in FY 2025-26 with increase of 23%.**
2. **This impacted other 21 women during FY 2025-26** who came forward to **start and enhance** their own micro **enterprises** such as **grocery shop, catering service, cloth shop, coconut shop etc.** Their average annual income during FY 2025-26 was registered to be **Rs.1,77,120/- per woman.**
3. The women earning Rs.14000/- per month have **got their children admitted at the local English medium private schools** for their education in English medium and at the same time, they started the thrift savings.

1.4 Community Development

1.4.1 OVERVIEW

Infrastructures are the backbone of development of community as it augments the pace of development facilitating the community to live life with dignity through attainment of various educational, health, water, sanitation, economic engagement, physical fitness, sports and games and welfare benefits to the community.

Adani Foundation under corporate social responsibility of Adani Krishnapatnam Port Limited (AKPL) had developed various infrastructures to meet the development requirement of the villagers in the project affected and peripheral villages of AKPL at Krishnapatnam site during FY 2025-26.

The brief report on each of the above-mentioned Community Development projects is below:

The **objectives of Community Development** were as under:

1. To build infrastructures to enable the community to have access to clean and safe drinking water, illuminated streetlights during nighttime and get economic and welfare benefits.
2. To construct and renovate drain for free flow of used water of houses and rainwater to the main sewer to avoid water logging in and around houses.
3. To construct sport stadium and develop sports grounds in villages for young people, girls and children to play sports and games required to keep them physically fit and stress-free.
4. To renovate govt. school building infrastructures and support the school students for creation of stress-free learning and teaching environment for students and the teachers at the schools.

Below are the glimpses of the community development related infrastructures created.

Overhead Water Reservoir Tank
DKW College, Nellore

Drain Construction
R & R Colony, Muthukur

1.4.2 KEY ACTIVITIES & OUTPUT

The **summary of benefits rendered** by Adani Foundation through Community Development initiatives were as below.

Community Development

S. No.	Community Development Key Activities	Summary of Benefits to Villagers (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	RO Drinking Water Filter Plants	Number	12	18000
2	Door to door drinking water supply pipeline with tapping facility – Arcotpalem	Number	380	1860
3	Burial cremation building infrastructure at Burial Ground Muthukur	Number	1	10000
4	Drain Repair & renovation Works in R & R Colony, Muthukur	Meter	1000	6000
5	Repairs and servicing to RO drinking water filter plants and underground water sumps construction & pipeline laying for water supply to houses in Muthukur and Krishnapatnam Gram Panchayats	Number	5	4000
6	Overhead Water Reservoir Tank (60 KL Capacity) construction for Women Students of Government DK Women's College, Nellore	Number	1	2000+

1.4.3 OUTCOME & IMPACT

1. More than 25000 people **got free from drudgery to arrange RO filtered drinking water from distant locations on daily basis** in the target villages at Krishnapatnam site as the drinking water was made available at their villages.

RO Drinking Water Filter Plant Krishnapatnam Site

2. Water scarcity issue of more than 2000 govt. DKW residential college girl students at Nellore got addressed with construction of 60000 liters capacity Overhead Reserve Water Storage (OHRWS) tank in the college premises.
3. The incidences of **mosquitoes breeding tended to zero** in and around the houses of 2 nos. of R & Colonies of AKPL and Krishnapatnam Gram Panchayat villages with construction and renovation of drains in those villages.
4. With development of sport ground at Muthukur Gram Panchayat, the number of youths and school students increased **by 400% as 800 youths and students played at the ground on regular basis** during FY 2025-26 in comparison to 200 youths and students during FY 2024-25.

1.5 Climate Action

1.5.1 OVERVIEW

Climate Action is the need of hour for any responsible institution and individual person in view of the threat of global warming and other environmental threats. Having acknowledged it Adani Foundation under corporate social responsibility of Adani Krishnapatnam Port Limited (AKPL) implemented flagship initiative titled Village Sanitation Programme and Plantation Campaign towards contributing to national initiative of sanitation management and environment protection.

The following were the **objectives of Climate Action:**

1. To promote tree plantation with community participation in the peripheral and project affected villages of Adani Krishnapatnam Port Limited to increase the area of green coverage.
2. To raise awareness level of villagers on long term benefits of plantation and being active practitioners of sanitation management protocols.
3. To extend relief support to cyclone affected persons during cyclone hit time.
4. To develop end-to-end solution mechanism towards keeping roads and village lanes clean and value addition to the waste materials for their recycled usage in community.
5. To ensure solar lights illumination in the peripheral and project affected villages to prevent community from snake bite fear and facilitate the community for safe movement on the roads during nighttime.

The activities under climate action initiative were implemented in participatory manner seeking involvement of govt. and private school institutions, students, rural youths and women to keep the above-mentioned stakeholders sensitized for their responsibility towards environment protection and conservation.

Below are glimpses of the climate action related activities implementation at Krishnapatnam site.

Miyawaki Plantation
Chalivendram village, Muthukur

Material Recovery Facility
Solid Wealth Processing Centre (SWPC)
Krishnapatnam

Solar Street Lights
Krishnapatnam Site

1.5.2 KEY ACTIVITIES & OUTPUT

The **summary of benefits rendered** by Adani Foundation through Climate Action is mentioned below.

Climate Action

S. No.	Climate Action Key Activities	Summary of Benefits to Villagers (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	Observed World Environment Day on 5th June 2026 for sensitization of villagers for environment protection	Number	1	1000
2	Material recovery facility infrastructure development with accessories under Solid Wealth Processing Centre at Krishnapatnam and Muthukur Gram Panchayats benefitting 20000 villagers.	Number	3	20000
3	Bleaching powder distribution to Gram Panchayats	Number	2	6600
4	Training on Village Sanitation Management (4 Nos.) to villagers and Mass level sanitation awareness sessions (75 Nos.) for villagers	Number	79	2080
5	Model Village Development Initiative (MVDI) - Providing Garbage clearance vehicles village sanitation volunteers to Gram Panchayats for road and village lanes cleaning benefitting 20000 villagers.	Number	6	20000
6	Renovation and repairs to Govt., Multipurpose Cyclone Shelters (Arcotpalem, Krishnapatnam & Chalivendram) in community villages and make them to use by Community People – 7000 in numbers.	Number	3	7000
7	Solar Street Lights with installation	Number	300	6500
8	Montha Cyclone Relief Activities – food to 3600 persons	Number	1	3600
9	Health checkup camps – 3 nos. covering 168 cyclone affected persons & medicine distribution to them.	Number	3	168
10	Distribution of Multiple Use Dustbins to villagers for collection and segregation of waste at house level	Number	1500	1500
11	Voluntary plantation of 5000 saplings – Guava, Jackfruits, Neredu, Mango etc. by villagers at backyard of 200 nos. of houses and locations including roads and common places at Krishnapatnam site.	Number	200	5000

1.5.3 OUTCOME & IMPACT

The following **impacts in respect of climate action – Environment Protection and Village Sanitation Management** were witnessed:

1. Installation of more than 300 solar streetlights in vulnerable pockets of poor lighting illumination areas in peripheral and project affected villages removed fear of snake biting or other poisonous insect biting.

   The cases **of snake bites on the street roads in Krishnapatnam were registered to be zero** as the streets were illuminated with Solar Street Lights installed by Adani Foundation.

2. The **senior citizens being hesitant to ply on road during nighttime due to lack of streetlights** started **moving on road illuminated with solar streetlights** during late evening and nighttime to meet their **social interaction needs and personal work**.

3. Development of **Solid Wealth Processing Centre** (SWPC) at Krishnapatnam and Muthukur Gram Panchayat and **integration of households to SWPC** brought about behavioural changes in **more than 2000 persons towards keeping their houses and surroundings clean and ensuring proper disposal of kitchen waste and temple used materials.**

4. The renovated Multipurpose Cyclone Shelter of Krishnapatnam had saved the lives of **more than 3000 villagers during cyclone hit time by way of full utilization of the Cyclone Shelter for cooking food for the affected families** and **for their shelter** at the Cyclone Shelter during cyclone hit time.

5. The awareness on long term benefits of plantation among the villagers and the school students turned out to be **a campaign for voluntary plantation by community involving villagers and students of Muthukur and Krishnapatnam Panchayats for plantation of more than 5000 saplings.**

6. Behavioural change in majority of villagers particularly in women was found towards proper management of garbage systematically at house level and keep their house and surroundings clean.

7. As **compared to merely 2 tons of garbage lifted** by Muthukur, Krishnapatnam and Thamminapatnam Gram Panchayats on daily basis during FY 2024-25, a **quantity of 10 tons of garbage lifted** by Muthukur, Krishnapatnam and Thamminapatnam Gram Panchayats on daily basis during FY 2025-26 with **3 nos. of garbage collection vehicles and 3 nos. of sanitation management awareness campaign vans** support extended by Adani Foundation under corporate social responsibility of Adani Krishnapatnam Port Limited.

8. Cyclone relief support – health camp and food were extended to Months cyclone affected villagers at Krishnapatnam site. Health checkup camps – 3 nos. conducted covering 168 cyclone affected persons & medicines were distribution to them.

1.6 Sports & Games

1.6.1 OVERVIEW

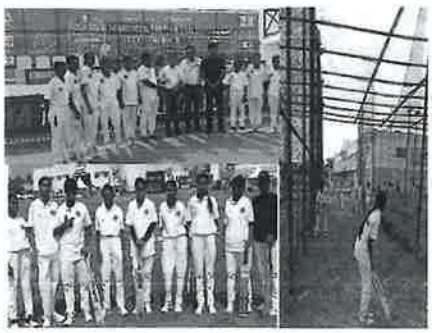
Sports & Games activities play an important part in children's and youths' overall development by way of promoting self-esteem and self-confidence, controlling emotions, developing discipline, developing social skills, patience and perseverance, embracing loss, promoting teamwork, bringing competence in leadership and promoting habit of consistent practices in them. Hence, Adani Foundation under corporate social responsibility of Adani Krishnapatnam Port Limited (AKPL) planned and implemented sports and games activities such as **Cricket, Kabaddi, Kho-Kho, Badminton and Volleyball for school students and rural youths in peripheral and project affected villages of AKPL.**

The following were the **objectives of Sports & Games activities:**

1. To enhance physical fitness of the children and youths by developing motor skills (speed, balance, agility) and muscle strength and facilitate them to carry out the sport activities regularly to combat obesity, improve cardiovascular health and reduce the risk of chronic diseases.
2. To facilitate students and youths to participate in sports activities to develop resilience by learning to handle pressure, manage failure and persevere through challenges resulting in their psychological growth.
3. To promote long term healthy lifestyles among the school students by cultivating a habit or physical activity early in them to ensure adoption of healthy routines, promoting well-being beyond their school years.
4. To facilitate school students and youths to reduce stress, anxiety and depression through sports activities resulting in mental focus memory improvement and classroom academic performance enhancement.
5. To facilitate youths to excel in sports and games activities through participation in district, state and national level sports and games activities and pursue sports and games based professional career for sustainable livelihood.

Below are glimpses of the sports & games activities implementation at Krishnapatnam site.

Prize Distribution to Cricket Tournament Winning Team Muthukur



Girls playing Cricket Tournament Nellore

1.6.2 KEY ACTIVITIES & OUTPUT

The **summary of benefits rendered** by Adani Foundation through Sports and Games activities is mentioned hereunder.

Sports & Games

S. No.	Project Climate Action Components	Summary of Benefits to Villagers (Output)		
		FY 2025-26		
		Unit	Quantity	No. of Beneficiaries
1	ZPP High Schools covered sports and games activities (Muthukur, Krishnapatnam, Epuruvenkennapalem and Gummalladibba)	Number	2	110
2	Sports activities promoted at ZPP High Schools - 3 nos. (Cricket, Kho-Kho, Badminton and Kabaddi)	Number	3	110
3	Kho-Kho sports training sessions in 4 nos. of ZPP High Schools conducted	Number	4	80
4	Cricket sports training sessions in 3 nos. of ZPP High Schools (Krishnapatnam, Muthukur & Epuruvenkannepalem) conducted	Number	3	60
5	Kabaddi sports training sessions in 1 no. of ZPP High Schools (Gummalladibba) conducted	Number	1	20
6	Badminton sports training sessions in 2 no. of ZPP High Schools (Krishnapatnam & Muthukur) conducted	Number	2	60
7	Inter Village Cricket Tournament Conducted	Number	1	64
Total			-	484

1.6.3 OUTCOME & IMPACT

The following **impacts in respect of Sports & Games** were witnessed:

1. 30 girls from ZPP High School, Krishnapatnam and Muthukur played district and inter district level cricket tournament in Andhra Pradesh state.
2. The daily school attendance of students participating in sports and games activities – Kho-Kho and Cricket in their respective schools – ZPP High School, Krishnapatnam and Muthukur was witnessed more than 90%.
3. 200 village youths of Muthukur Mandal participated in cricket tournaments and played cricket matches on the sport ground developed by Adani Foundation. 200 local youths and school students played cricket, volleyball and do physical exercise at the sport ground on daily basis during FY 2025-26 in comparison to merely 30 to 40 youths in FY 2024-25.

1.7 Human interest stories

1.7.1 Community Health

1.7.1.1 Medical assistance transformed M. Thathaiah as Change Maker

M. THATHAIH, a 56-year-old fisherman having daily wage labour occupation hailing from CVR Nagar of Muthukur Panchayath had approached Dr. Suharshan in December 2025 **with lost hope of survival as his health condition was very critical**. In a family of 10 members, Thathaiah was the only bread earner.

Dr. Suharshan is Medical Officer in -charge of Adani Foundation operated Adani Chikitsalayam health clinic situated at Simhadrinagar, Muthukur mandal.

M. Thathaiah reported at Adani Chiktsalayam with complaints of headache, vomiting's, generalized weakness, intermittent giddiness underwent medical tests and treatment. Through **detailed general physical examination, he was diagnosed to be the patient** of **Hypertensive-Emergency (Hypertension Denovo) with Recorded BP-200/100 mm of Hg**. Till that time, he was unaware of his blood pressure. Immediately after diagnosis, his medical treatment was done free of cost at Adani Chikitsalayam. **Blood and urine investigations and ECG, medical consultation, medicine administration were done free of cost.** By evening his blood pressure became normal **with reading of BP-120/70 mm of Hg** and all his initial complaints addressed.

He was advised by the doctor to follow up of his health condition for one week and continuous monitoring of his Blood Pressure and other vitals examination were done at Adani Chiktsalayam, and it came normal after treatment.

Pre-medical and post-medical health management of Thathaiah revealed that he had developed strong willpower and regained his lost hope of surviving. Now, he is leading his family happily and earning income regularly by doing daily wage labour work.

He is very thankful to Adani foundation for **cost-free medical treatment** and has become **active change maker** for propagating **preventive measures of health management awareness in his village** along with the medical team of Govt. Health Department and **Adani Foundation. He conducts health awareness meetings in small group of villagers wherein the medical team members impart health awareness-based information to villagers.**

1.7.2. Sustainable Livelihood

1.7.2.1 Katamgari Geetha, the Change Maker Woman & Inspiration for Others

Geetha says - My effort is my strength.

Mrs. Katamgari Geetha, a 36-year-old woman and resident of Gummalladibba village, Thamminapatnam Gram Panchayat, Chillakur Mandal, SPSR Nellore District in Andhra Pradesh state is an entrepreneur operating **a tiffin shop** at Gummalladibba village to support her family by meeting financial requirement.

Geetha is now a single mother blessed with two daughters. Elder daughter is studying at class IX, and her younger son is pursuing his class VIII study at ZPP High School, Gummalladibba. Her husband had the bad habit of taking liquor and beating her and children whenever he used to be in a drunken condition. Finally, Geetha got separated from her husband to get rid of mental trauma of getting beaten daily and children's education getting compromised.

Due to financial constraints and lack of basic resources, she was struggling hard to operate her tiffin shop efficiently and manage household expenses. During this tough time, she had approached Adani Foundation team at Krishnapatnam site with the request to support her for procurement of essential utensils and tables and chairs to operate **tiffin shop as the number of people earlier going to her tiffin shop started decreasing for want of required numbers of tables and chairs, utensils such as plates and glasses etc. resulted in loss of income.**

Having acknowledged her genuine problem of fund crisis causing operation of tiffin shop in loss, **Adani Foundation provided timely support by providing the required utensils, tables and chairs**. With this support, **her tiffin shop operations improved ensuring visits of a greater number of customers to her tiffin shop which finally resulted in increase in her daily income to the level of Rs.1000.00 per day.**

Now, she is experiencing financial relief and has stability in her tiffin shop business. **Mrs. Geetha expresses her sincere gratitude to Adani Foundation for the support, which helped her sustain livelihood and continue her children's education**. Noe, she says proudly, "**My effort is my strength**" and has turned out to be **inspiration for other women in the village to handle and get rid of problems in life whenever it occurs.**

1.7.2.2 Mavilla Kamalamma, a Determined Differently Abled Woman Entrepreneur

Kamalamma says - Determination matters for empowerment.

Ms. Mavilla Kamalamma, daughter of Mavilla Venkateswarlu and Mangamma, is a 45-year-old physically challenged woman from Gummaladibba Village, Chillakur Mandal, SPSR Nellore District. Despite her condition and being unmarried, she has been independently running a small general store selling homemade snacks, grocery materials etc. for income generation and living a dignified life with financial independency.

Due to financial constraints and limited resources, she was struggling to expand her grocery shop business as her daily earnings were below Rs. 350/. Operating the shop had become challenging due to very little income per day as there were fewer selling materials in her shop and there was no proper shop infrastructure earlier. That apart, her physical limitations used to come in way of her efforts to increase sales of grocery items.

One day she visited Adani Foundation office, Krishnapatnam and explained her poor financial conditions to officials of Adani Foundation and requested for help in form of grocery and general store materials worth selling along with materials displaying racks and shop counters to attract customers to her shop.

Having understood her need and felt her determination to run the shop successfully, Adani Foundation extended support by providing grocery materials and materials keeping and displaying racks for better storage and display in her shop.

With this support, her business improved significantly. Her daily income increased from below Rs. 350/- to around Rs. 1000/- per day, bringing much-needed financial stability and confidence.

Ms. Kamalamma has become a source of inspiration for other youths and women who could do anything, if they are determined to do. Despite all physical challenges, Ms. Kamalamma arranged funds, increased her daily income to increase product sale volume.

Kamalamma extended heartfelt gratitude to Adani Foundation for the timely support and encouragement she had received from Adani Foundation. This intervention had not only reinforced her livelihood enhancement means but also empowered her to continue her journey with dignity and financial independence.

1.7.2.3 Project Pashudhan Vikas Facilitated Farmer to Be Entrepreneur

Rafi says – Learning through training ensures socio-economic empowerment.

Mr. Shaik Rafi, a small farmer from Gummalladibba Village, Chillakur Mandal, SPSR Nellore District, is engaged in agriculture and livestock rearing. He owns 2.4 acres of land where he cultivates paddy and maintains 9 cattle (6 cows and 3 calves). His family depends on both agriculture and dairy for livelihood. He has two children—his son is pursuing Intermediate, and his daughter is studying in 10th class.

Due to the sandy soil conditions in the area, there was a severe shortage of nutritious fodder, which adversely affected the health of his cattle. As a result, milk production had reduced significantly leading to decreased income and financial stress for the family.

During this time, Mr. Rafi attended a **Cattle Balanced Mixed Feed Training Program** conducted by Adani Foundation under the **Project Kamadhenu** in Gummalladibba Village. Through this program, he learned the importance of balanced nutrition for milking cattle and underwent the training of preparing balanced mixed feed for cattle using locally available resources.

Collecting entrepreneurial courage and being confident based on learning from the training on balance mixed feed making, he started preparing balanced mixed feed initially on his own for cattle and started feeding it regularly to his cattle i.e. cows and buffalos. Gradually, he observed a significant improvement in the health of his cattle. The cattle were healthier and more productive, and milk yield increased by approximately **500 ml per day**. The increased milk production contributed to increase in income through sale of milk.

Having witnessed their improvement in milk production, other cattle owners started contacting Mr. Rafi to sell balance mixed feed to them for their cattle. This led to entrepreneurial journey of Rafi to start balanced mixed feed production and Shaik Rafi sells 200 Kgs of the mixed feed per day earning Rs. 1000.00 per day. Rafi has engaged 3 women in production the mixed feed and produced 12 tons of cattle balanced mixed feed during financial year 2025-26. Each of the three women earned Rs.300.00 per day through cattle balanced mixed feed making enterprise of Rafi.

Shaik Rafi extended his sincere gratitude to Adani Foundation for timely support and guidance. With help of Adani Foundation, he was able to overcome the challenges of fodder scarcity and improve his dairy productivity. This initiative had boosted his confidence and served as an inspiration to other farmers in the village.

1.8 Employee Volunteering Program

Program	No. of Employees volunteered	No. of person hours
Blood Donation Camp	186	186 Hours
Natural Farming Awareness for Chemical Free Food to People	48	192 Hours

Adani Krishnapatnam Port Limited through Adani Foundation had offered volunteering opportunities to its employees to align with their personal passions with the social causes at Krishnapatnam site to meet the following objectives:

1. To enhance teamwork and develop collaborative essence in the employees and reinforce shared company values with purpose driven workplace culture.
2. To facilitate employees to alleviate monotonous work fatigue, regain energy and have freshness of mind through social engagement with communities based on skills and knowledge the employees have.
3. To actively meet local community needs through the capability, knowledge pool and skills of the employees.
4. To build a positive reputation of the Company, foster a sense of purpose and improve relations with local communities.

In order to meet the above objectives, Adani Krishnapatnam Port Limited (AKPL) with support of Adani Foundation had conducted social engagement of its employees through **Blood Donation Camp** and **Natural Farming Awareness for Chemical Free Food to People** at Krishnapatnam site.

1. <u>Blood Donation Camp</u>

A blood donation camp was organized at Krishnapatnam site on 24th June 2025 for employees of AKPL, its partnering agencies and Adani Foundation. Red Cross Society and the District Health Department had extended support in collection and preservation of donated blood. 186 employees had donated blood by spending 186 hours @ 1 (one) hour per employee.

2. <u>Natural Farming Awareness for Chemical Free Food to People</u>

On the occasion of **National Farmers Day on 23rd December 2025**, a group of 48 employees of Adani Krishnapatnam Port Limited had volunteered for their social engagement with farmers of Krishnapatnam and Gummalladibba villages and made the farmers aware of importance of doing natural farming for chemical fertilizers free agricultural produce good for people's health. The 48 employees had donated 192 hours @ 4 hours per employee during their engagement with farmers.

1.9 Media coverage (selected news clippings, social media)

మోడల్ విలేజ్‌గా రూపాంతరానికి మూడు స్తంభాలు ఆధారం

పర్యావరణ పరిరక్షణకు ప్రతి ఒక్కరు మొక్కలు నాటాలి

- కృష్ణవట్నం సీనియర్ డిడి నాయకులు రాగల కృష్ణ

ప్రకృతి వ్యవసాయంతో వ్యాధుల నివారణపై శిక్షణ

పశు గ్రాసాల పెంపకంలో శిక్షణ

చిల్లకూరు మేజర్‌న్యూస్: మండలంలోని గుమ్మళదిబ్బ, తమ్మినపట్నం, సమీప గ్రామ పంచాయతీ గ్రామాలైన తమ్మినపట్నం గ్రామ పంచాయతీ గ్రామాలలో అదానీ కృష్ణపట్నం పోర్ట్ లిమిటెడ్ కార్పొరేట్ సామాజిక బాధ్యతలో భాగంగా అదానీ ఫౌండేషన్ ద్వారా కామధేను ప్రాజెక్ట్ చేపట్టారు. పశువుల యజమానులకు ఒక్కో పశువుల యజమానికి 25 అడుగుల 16 అడుగుల విస్తీర్ణంలో సూపర్ నేపియర్ గ్రాస్ సాగుపై క్షేత్ర శిక్షణ ఇచ్చారు.సూపర్ నేపియర్ గ్రాస్ యొక్క విత్తన గెనుపులను పశువుల యజమానులకు ఇందుబాటులో ఉంచారు. కృష్ణపట్నం ఫార్మర్ ప్రొడ్యూసర్ కంపెనీ లిమిటెడ్ ద్వారా లీచు సేద్యం శిక్షణతో పాటు ఫీల్డ్ లేవలింగ్ శిక్షణను లక్ష్యంగా పశువుల యజమానులకు అందించగా, అదానీ ఫౌండేషన్ పశువుల యజమానులకు సేంద్రియ ఎరువును అందించింది. ఈ రకమైన పద్ధతితో పశువుల యజమానులు చాలా సంతోషించారు అదానీ ఫౌండేషన్ అగ్రికల్చర్ ఆఫీసర్ షేక్ షాహుల్ హమీద్, సీతువో-కేఎఫ్‌పీఎల్ సీతువో సీనియర్ వెంకటేశ్వర్లు, కేఎఫ్‌పీఎల్ ట్రైనర్ షేక్ షఫీ, కేఎఫ్‌పీఎల్ ట్రైనింగ్ ఎగ్జిక్యూటివ్ శ్రీ ఎన్.సాయినాథ్‌తో కలిపి సూపర్ నేపియర్ గ్రాస్ కల్టివేషన్ ఫీల్డ్ శిక్షణను నిర్వహించారు.

కొనూర్ మోడల్ గా ముత్తుకూరు

Social Media Links

- https://www.instagram.com/p/DWjTW91kk74/?igsh=MTBkNTk1YjFrZzl2eA==
- https://www.facebook.com/share/p/1CbfLvk67P/?mibextid=wwXIfr
- https://x.com/adanifoundation/status/2038982955755069537?s=46
- https://www.linkedin.com/posts/adanifoundation_at-the-heart-of-the-adani-foundations-efforts-activity-7444748412388020224qZsb?utm_source=share&utm_medium=member_ios&rcm=ACoAADkoFWsBeLhZoh7fsHhO-koBeoy1oBtxRIA

1.10 Appreciation letter from important stakeholder(s)

Appreciation Letters from Gram Panchayat Institutions

నెల్లిపూడి సుబ్రమణ్యం
సర్పంచ్
తమ్మినపట్నం గ్రామ పంచాయతి

చిల్లకూరు మండలం
శ్రీ పొట్టి శ్రీరాములు నెల్లూరు జిల్లా
మొబైల్ : 9441523097
9160734197

తేది :

Gram Panchayat, Thamminapatnam

Dt: 31.03.2026

From
The Sarpanch
Thamminapatnam Gram Panchayat
SPSR Nellore District (AP)

To
The Chief Executive Officer
Adani Krishnapatnam Port Limited
Muthukur Mandal, SPSR Nellore District,
Andhra Pradesh

APPRECIATION LETTER

Our profound thanks to the best support given by Adani Krishnapatnam Port Limited and Adani Foundation, Krishnapatnam, Muthukur Mandal, SPSR Nellore District, A.P for uplifting Thamminapatnam Gram panchayat through CSR Funds and Adani Foundation, the arm of Adani Krishnapatnam Port Limited carried out the below mentioned needful works:

New Tractor given for collecting garbage and creating Sanitation Management Awareness in Thamminapatnam Gram Panchayat Villages,

Support given for conducting Sanitation Management Awareness camps in Thamminapatnam Gram Panchayat Villages Viz. Gummaladibba Pathuru, Gummaladibba Kothuru, Thamminapatnam Dalit Wada and Thamminapatnam Main,

New TATA ACE vehicle is given to Government ZPP High School Gummaladibba to facilitate school students travel from resident villages to the school and vice versa.

Distribution Copies:

The Chief Executive Officer, Adani Foundation, Ahmedabad, Gujarat

The CSR Head, Adani foundation, Krishnapatnam Site

Sarpanch

Thamminapatnam Gram Panchayat

సర్పంచ్
తమ్మినపట్నం గ్రామ పంచాయతి
చిల్లకూరు (మం) నెల్లూరు జిల్లా

Gram Panchayat, Muthukur

Dt 10 03 2026

From
The Panchayat Secretary
Muthukur Gram Panchayat
SPSR Nellore District
Andhra Pradesh

To
The Chief Executive Officer
Adani Krishnapatnam Port Limited
Muthukur Mandal, SPSR Nellore District,
Andhra Pradesh

APPRECIATION LETTER

The community families living in the villages of muthukur gram panchayat impressed well of the gram panchayat development activities supported by Adani Krishnapatnam Port limited through its CSR organ M/s Adani Foundation by heart and soul and therefore Honored M/s Adani Krishnapatnam Port Limited and Adani Foundation with this letter of appreciation for the following developments of gram panchayat muthukur

1. Constructed Solid Wealth Processing Centre with Material Recovery Facility Development in Muthukur Gram Panchayat
2. New Sanitation Van provided for creating Sanitation Management Awareness in Muthukur Gram Panchayat Villages
3. New TATA ACE vehicle provided to travel school students of Government ZPP High School Muthukur from their resident villages in Muthukur Gram Panchayat.

Distribution Copies:

The Chief Executive Officer, Adani Foundation, Ahmedabad, Gujarat

The CSR Head, Adani foundation, Krishnapatnam Site

Panchayat Secretary
Muthukur Gram Panchayat

Panchayat Secretary
Gram Panchayat Muthukur,
Muthukur Mandal, SPSR Nellore Dist

Appreciation Letter from Z. P. P. High School, Krishnapatnam

Date : 30.04.2026

Krishnapatnam.

Mr. Jagdish Patel garu,

Chief Executive Officer,

Adani Krishnapatnam Port Limited,

Respected sir,

On behalf of our school, I extend my heartfelt gratitude and sincere appreciation to you for your unwavering support and commitment towards our students' success through the 'ADANI FOUNDATION UTTHAN' project. Under your valued guidance adani foundation supports us in all aspects in Krishnapatnam village through CSR activities of AKPL.

We are delighted to share that in this year's SSC Board Examinations, our school has achieved an impressive 93% pass percentage, with the highest score being 577 marks, which stands as a proud milestone for Krishnapatnam village. 576 marks as second, 575 marks as third and 7 members stands with above 500 marks, 31 students achieve 1st class, 6 only 2nd class.

This remarkable achievement has been possible because of your continuous encouragement and timely support. The facilities and initiatives provided under your guidance, such as arranging AC bus transportation for examinations, installing proper lighting in the school premises for extended study hours, enabling study hours up to 8 PM, appointing additional educators, and regularly monitoring students' academic progress, have significantly contributed to this success.

Your consistent involvement, care, and encouragement, especially towards improving the performance of all students including slow learners, have made a meaningful difference in their academic journey.

We sincerely thank you for your invaluable support and guidance. We place on record appreciation for Adani Foundation and Adani Krishnapatnam Port Limited for extending all support towards academic excellence at our ZPP High school, Krishnapatnam,

With respectful regards,.....

Copy to Adani foundation, Adani krishpatnam port limited.

30/04/2026

Smt. P. Sarala
Gazetted Head Master
Z.P.P. HIGH SCHOOL
Headmistress
[illegible], Muthukuru (M)
SPSR Nellore Dist.
Z.P.H.S KRISHNAPATNAM,

Muthukur mandal.

Adani Foundation's CSR Initiatives Endorsement Quote of Stakeholders

Education

UTTHAN Initiative Benefit Endorsement by the Headmistress of ZPP High School

"Karnam Maheswari was student of class x of ZPP High School, Krishnapatnam **who obtained highest marks 577 out of full marks 600 at Class X Board** Examination of Andhra Pradesh state during academic session 2025-26. That apart, **6 more students scored more than 500 marks in the examination.** A total of **40 students appeared at the Class X Board Examination**. This landmark achievement of ZPP High School, Krishnapatnam became possible with hard work of the teaching staff of the school and the **infrastructural support, teaching and learning materials and special tutor support provided by Adani Foundation through its UTTHAN initiative** under corporate social responsibility of **Adani Krishnapatnam Port Limited."**

- Mrs. P. Sarla, Headmistress, ZPP High School, Krishnapatnam.

Health

Health Service Benefit Endorsement by the Rural Patient

"I am **Ingilala Kotaiah of Thamminapatnam Dalit Wada of Thamminapatnam Gram Panchayat**. I suffered from fever for five days in the month of August '2025 and had undergone medical consultancy and sought medicines from a private medical practitioner at Muthukur and **I spent about Rs.5,000.00, but my ailment was not cured.** After that, Health Animator Mrs. N. Vanaja of Adani Foundation took me to Adani Chikitsalayam for medical treatment where **Dr. Suharshan conducted my** health checkup and I was diagnosed with dengue. Then, ***I got medicines at free of cost under medical consultation of Dr. CH. Suharshan at Adani Chikitsalayam and got fully cured.*** **I am very much thankful to Adani Foundation for my cost-free medical treatment and medicine"**

- Mr. Ingilala Kotaiah, Thamminapatnam

Sustainable Livelihood

Project Annapurna Benefit Endorsement by the Farmer

"I am Shaik Rafi of Gummalladibba village. I joined Krishnapatnam Farmer Producer Company Limited in the year 2024 by subscribing 10 nos. of shares worth Rs.1,000.00. After that I received technical training for best agricultural practices and received subsidized benefits in procurement of fertilizers, organic manure and seeds through KFPCL under Project Annapurna being implemented by Adani Foundation. **During financial year 2025-26, I had record net annual income of Rs. 207000/- from 3 acres of my land in Gummalladibba Village (Two crops) after excluding agricultural expenses.** I had done cultivation of ground nuts only (Three crops) in the same bit of land. The ground nuts cultivation I had done had given me net income of Rs. 171500/- in financial year 2024-25."

- Farmer Shaik Baba Saheb, Gummalladibba

Project Pashudhan Vikas Benefit Endorsement by the Farmer

"Project Pashudhan Vikas provided an opportunity to me to start the enterprise of Balanced Mixed Feed production. I (Shaik Rafi) am producing the cattle feed and have also employed 3 village women and youth who work with me for making cattle feed and they get Rs.300.00 each per day for their work. **I earn Rs.8,000.00 on monthly basis. 12 Tons of cattle feed was prepared and sold by me to cattle rearing farmers during FY 2025-26. Thanks to Adani Foundation for giving this opportunity to me."**

-Shaik Rafi Saheb, Gummalladibba village

Project AMMA Benefit endorsement by the Woman Entrepreneur

"I am Rajyalakshmi and, on my request, Adani Foundation imparted information and training as to how to generate income through self-employment by starting micro enterprises. This helped me in setting up detergent liquid cleaner, floor cleaner etc. towards meeting my and my family members' needs. I started making detergent liquids, floor cleaner liquids on my own and producing 50 units of each once in two days and I am marketing the products on my own and do other service-based income generating activities. **I earned Rs. 14500/- on average every month during financial year 2025-26 in comparison to the monthly average income of Rs. 12000/- in the financial year 2024-25. I am thankful to Adani Foundation to support me in this regard**, and I purchased 150 shares of Rs. 100/- each in Nutricraft Enterprises Private Limited (NEPL), a women's company formed by women like me for enterprise set up and income generation."

- Mrs. Rajyalakshmi, Gummalladibba village

Community Development

Community Development Initiative Endorsement by MLA -Sarvepalli Constituency

"We **appreciate the support extended by Adani Foundation and Adani Krishnapatnam Port Limited for drain construction, making drinking water available to the door steps of the villagers and development of sports ground and other such infrastructures development for the socio-economic and physical fitness benefits of the villagers of Muthukur and Krishnapatnam Gram Panchayats during FY 2025-26 under the CSR participatory Model Village Development Initiatives** of Adani Krishnapatnam Port Limited and Adani Foundation aligned with P4 initiative of Andhra Pradesh Government."

- Somireddy Chandra Mohan Reddy, MLA - Sarvepalli Constituency & Chairman of Community Village Adoption Programme (CVAP) under P4 Policy, A.P. State Govt.

Climate Action

Climate Action Initiative Endorsement by MLA - Sarvepalli Constituency

"The open yard available behind Mandal Development Office, Muthukur converted into Solid Wealth Processing Centre under ownership of Muthukur Gram Panchayat has started contributing to keeping Muthukur Gram Panchayat villages clean and villagers to stay sensitized for proper management of garbage generated at houses. Both Adani Krishnapatnam Port Limited and Adani Foundation deserve appreciation for this landmark contribution to keeping Muthukur and Krishnapatnam Gram Panchayats clean."

- Somireddy Chandra Mohan Reddy, MLA - Sarvepalli Constituency & Chairman of Community Village Adoption Programme (CVAP) under P4 Policy, A.P. State Govt.

Sports & Games

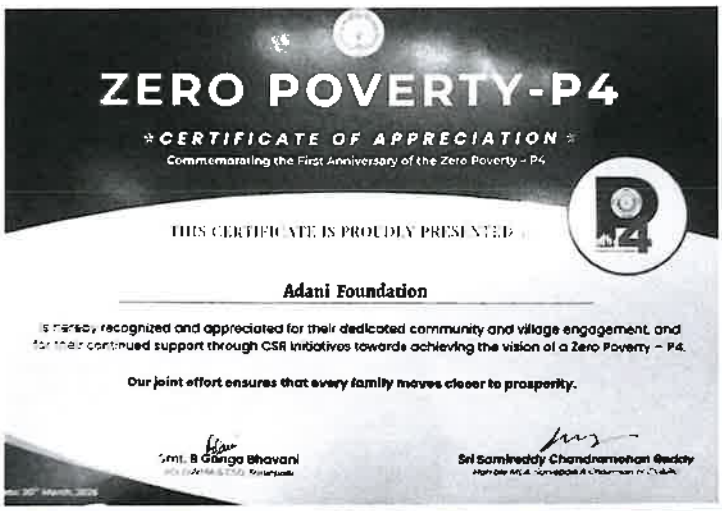
Sports & Games Initiatives Endorsement by Headmaster of ZPP High School

"The sports and games initiative taken up by Adani Foundation is worth appreciating as it has facilitated a good number of students of our ZPP High School to play cricket, badminton and volleyball. Many of the girl students played cricket tournaments at district level and at inter district cricket tournaments.

- Mr. Srinivas, Headmaster of ZPP High School, Muthukur

1.11 Award/ Recognition

Zero Poverty – P4 Award to Adani Foundation for Excellent CSR Initiatives



Somireddy Chandra Mohan Reddy, MLA - Sarvepalli Constituency & Chairman of Community Village Adoption Programme (CVAP) under P4 Policy, A.P. State Govt. felicitated Adani Foundation with Zero Poverty -P4 Award at Muthukur MPDO Office premises on 30.3.2026 for excellent CSR initiatives implemented by Adani Foundation during financial year 2025-26 in project affected and peripheral villages of Adani Krishnapatnam Port Limited in Muthukur mandal of SPSR Nellore district of Andhra Pradesh state.

1.12 Beneficiaries Count

S. No.	Activity Description	Unit	Direct	Indirect	Access	% Marginalized
A	**Education**					
1	Anganwadi English Medium Centers	Students	76	50	20	
2	ULIC - Utthan Learning Improvement Classes	Students	986	792	85	
3	AEEC - Adani Evening Education Centres	Students	486	267	110	
4	Adani Scholarship	Students	8	5	5	
5	Support to Govt. schools	Students	1668	1223	175	
B	**Community Health**					
1	Rural Health Care / Wellness Center (Adani Chikitsalayam)	Persons	9360	1560	264	
2	Fogging Operation	Persons	18500	6458	1079	
3	General Health Camps	Persons	6850	2876	712	
C	**Sustainable Livelihood**					
1	AMMA (Adani Mahila Movement for Advancement)	Women	112	53	26	
2	Tailoring Training –cum-Production Centre	Women	118	84	32	
3	Annapurna – Promotion of Natural Farming	Farmers	519	352	57	
4	Kamadhenu	Cattle Owners	252	142	47	
D	**Community Development**					
1	RO Water Filter Plants	Villagers	18000	4000	1096	
2	Rural Sports	Beneficiaries	484	284	118	
3	Community Drainage renovation, Pipeline water supply to villagers	Beneficiaries	10000	3569	1123	
E	**Climate Action**					
1	Village Sanitation	Villagers	20,000	3875	1048	
2	Green Energy–Solar Lights on strategic locations	Beneficiaries	6,500	1265	542	
3	Model Village Development Initiatives (MVDI) for village Sanitation – Garbage Collection & Processing system	Villagers	20,000	5568	1265	

Adani Foundation team

S. No.	Name	Position
1	Dr. Abhishek Lakhtakia	Chief Executive Officer
2	Mr. Rajesh Ranjan	South Region CSR Head
3	Dr. Ch Ramesh Babu	Senior Project Officer
4	Mr. A. Madan Mohan Reddy	Admin Officer
5	Mr. T. Raveendra	Project Officer
6	Dr. CH. Suharshan Reddy	Doctor
7	Mr. Shaik Shahul Hameed	Agriculture Officer
8	Mr. T. Arun	Health Coordinator
9	Mr. K. Ramesh Babu	Education Coordinator
10	Mr. P. Marali	SLD Coordinator

Site office address:

Adani Foundation
Project Office, 2nd Floor, Gopalpuram
Krishnapatnam, Muthukur Mandal
SPSR Nellore District, Andhra Pradesh

KRISHNAPATNAM PORT COMPANY LTD.

Ref.No.KP/MOEF/113 Dated: 29th August, 2012

To
The Director (IA-III)
Ministry of Environment and Forests
(I.A. Divison)
Paryavaran Bhavan
CGO Complex, Lodi Road
New Delhi – 110 003

Kind Attn: Shri Lalit Kapur

Sub: **Environmental and CRZ Clearance for the development of Krishnapatnam Port in Phase-II at Krishnapatnam, Sri Potti Sriramulu Nellore District, Andhra Pradesh by M/s. Krishnapatnam Port Company Limited – modification to Specific Condition 5 (vii) – Request - Reg.**

Ref: Your Letter F.No.11-62/2009-IA.III dated 13.11.2009

Dear Sir,

(1). We invite your kind attention to Specific Condition No.5.(vii) of the CRZ & Environmental Clearance Order No.11-62/2009-IA.III dated 13.11.2009 of the MoEF above cited.

(2). You may recall that during the public hearing held on the 20th February, 2009 at Krishnapatnam, Nellore District, Andhra Pradesh for Phase–II Development of Krishnapatnam Port, a request was made by one of the public (Jana Vignana Vedika) that a greenbelt of 100 m width may be provided **around the port** in lieu of the proposed 50 m width. KPCL clarified during the public hearing that as per the Phase-II development plan, a minimum of 50m wide Greenbelt would be developed all along port boundary and 20m along the stockyards. With these provisions the likely impact on the air quality was predicted using ISCST3 model and the results are within the standards stipulated by CPCB/MoEF. Our response on the Minutes of the Public Hearing was incorporated in the Final EIA report submitted to the MoEF vide KPCL's Letter dated 06.05.2009 (copy of relevant extract D-3 enclosed for ready reference as **Annexure-I**). In this context we submit that the MoEF in their CRZ & EC stated that "The greenbelt of 100 m width shall be developed **around the coal stack yard** as per the request in the public hearing", while the actual request made during the public hearing relates to "greenbelt of 100 m width **around the port**"

o/c

Regd. Office: 1259, Lakshmi Towers, Road No.36, Jubilee Hills, Hyderabad - 500 033 India
Tel: +91-40-4455 7789 Fax: +91-40-23557190 E-mail: info@krishnapatnamport.com www.krishnapatnamport.com

(3). We further submit that the APPCB in its CFE for Phase-II development vide Order No.633/PCB/CFE/RO-NLR/HO/2010/390 dated 08.05.2010 (copy of relevant extract enclosed as **Annexure-II**) directed at Condition 24 that "Green Belt of width 100m shall be developed **along the boundary** of the industry as committed by the proponent". Accordingly a greenbelt of 100 m width is being developed along the boundary of the port and a 20 m wide Green belt alround the iron ore and coal stack yards. The status of compliance was submitted to the Regional Office, MoEF, Bangalore in the first half-yearly compliance report dated 11.06.2010 (copy of relevant extract enclosed as **Annexure-III**). For ready reference, we are enclosing herewith (**Annexure-IV**) a pictorial presentation of the actual field Ambient Air Quality data from the monitoring stations along Port boundary for the period 2010, 2011 and 2012 (upto July) which confirms the findings of the model incorporated in the EIA Report and comply with the AAQ Standards.

(4). During the recent visit of the Senior Officers of the MoEF, Southern Region, Bangalore to Krishnapatnam Port on 24.07.2012, we brought the above anomaly to their notice and they have advised that the MoEF may be addressed to modify the Specific Conditions 5 (vii) of the above cited EC to reflect the actual request made by the public during the hearing held on 20th February, 2009.

We accordingly request you to kindly issue an early order modifying the provision under Specific Condition 5 (vii) of the Environmental Clearance Order cited above as under:-

Existing	Requested
"The greenbelt of 100 m width shall be developed **around the coal stack yard** as per the request in the public hearing".	"The Greenbelt of 100m width shall be developed along the **port boundary** as per the request in the public hearing".

Thanking you,

Yours faithfully,
for **KRISHNAPATNAM PORT CO. LTD.,**

(S.B. PURI)
Director

Encl: As above
Copy to: The Director, MoEF, Southern Region, Bangalore.
Encl: As Above
Copy to: CEO, KPCL, Nellore alongwith enclosures

Annexure - I

Appendix D

Responses on Minutes of Environmental Public Hearing Meeting

Appendix D Responses on Minutes of Environmental Public Hearing Meeting on Proposed Phase II Development of Krishnapatnam Port

Date of Public Hearing : 20th February 2009

Venue : Mandal Parishat Elementary School, Krishnapatnam, Sri Potti Sriramulu Nellore District

S.No	Public View	Response made by KPCL	Section Reference in Final EIA Report
1.	Environmental Impact Assessment (EIA) should have been written in Colloquial Jargon for better understanding of local people	For better understanding of the local people, the Executive Summary of Environmental Impact Assessment Study Report which details the project development plan (Phase-II), status of baseline environmental conditions, Likely environmental and social impacts due to Phase-II development of Port, environmental management plan (proposed mitigation measures, monitoring plan and greenbelt development) and project benefits etc. are written in local language (Telugu also). In the EIA report, the Colloquial Jargon of some of the species is given to the extent possible. The Executive summary (Telugu & English) was displayed in all the four mandal offices and village panchayats for easy access to the local people and to make them aware about the project details.	Nil
2.	Rationale behind choosing 10 km radius for EIA study	The study area of 10 km is considered as per the Guidelines of MoEF. As per the EIA Manual of MoEF, the impact zone shall be determined through a screening approach and accordingly the monitoring location networks (for Air, water, soil and noise) are developed. As per the EIA manual, the impact region would be about 7-10 km from the periphery of the proposed development area. Hence, a study area of 10 km from the project site centre has been considered and the study was conducted accordingly. In the study area, four mandals are falling. The socio-economic	Section 1.9.1 of Chapter 1

S.No	Public View	Response made by KPCL	Section Reference in Final EIA Report
		conditions in these four mandals have been established.	
3.	Greenbelt of 100 m width may be provided around the Port in lieu of proposed 50 m width. Also, 33 % of total area may be developed as Greenbelt.	As per the Phase-II development plan, a minimum of 50 m wide Greenbelt would be developed all along port boundary especially at places where the villages are in proximity to the port. Also, it is proposed to develop 20 m wide greenbelt along the stockyards. The total area of proposed greenbelt is 80 ha, which is equal to 10% of total area for the Phase-II development of Port. Also, as part of Phase-I development of Port, 60 acres of area is being developed as Green belt. The likely impacts on air quality due to the proposed Phase-II developmental activities of the port have been predicted using ISCST3 model and the results show that the air quality parameters are found to be with in the standards stipulated by CPCB/MoEF. Since port development is a water front based facility and relatively less pollution intensive, it may not be required to allocate 33% of the total area for Green belt development.	Existing greenbelt details are discussed in Section 2.3.7.1 and proposed greenbelt details are provided in Section 2.5.15 of Chapter 2.
4.	Dedicated transportation for Krishnapatnam Port shall be developed to avoid inconvenience to the local people by using village roads.	The Government of Andhra Pradesh (GoAP) has developed a dedicated four lane road cum rail corridor from Venkatachalam on NH-5 to Krishnapatnam Port. This dedicated rail road link to the port will ensure quick movement of goods, safety to the local people and the existing traffic in the region as the NH-5 itself forms a part of the Six Lane Golden Quadrilateral. KPCL will also strictly adhere to the Environmental mitigation measures while transporting the cargo.	Section 2.5.13 of Chapter 2.
5.	Roads were damaged due to transportation of Iron Ore.	The dedicated four lane road now diverted the traffic from the village roads. Road damages, if any are however not directly related to Iron Ore transportation to the port, but due to overall ongoing developmental activities in the region.	Nil
6.	Port authorities have to take	All the fatalities (traffic accidents) caused are not directly related	Nil

Annexure - II

ANDHRA PRADESH POLLUTION CONTROL BOARD
PARYAVARAN BHAVAN, A - 3, INDUSTRIAL ESTATE,
SANATHNAGAR, HYDERABAD - 500 018

Phone: 23887500
Fax: 040 – 23815631
Grams : Kalushya Nivarana
Website :www.appcb.ap.nic.in

REGD.POST WITH ACK.DUE

CONSENT ORDER FOR ESTABLISHMENT

Order No.633/PCB/CFE/RO-NLR/HO/2010 390 Dt.08.05.2010

Sub: PCB – CFE - M/s. Krishnapatnam Port Co. Ltd., Krishnapatnam (V),Tammenapatnam (V), Narikellapalli (V), Pantapalemn (V), Epuru (V), Muthukur (V), Muthukur (M), SPSR Nellore district – Consent for Establishment (Expansion) of the Board under Sec.25 of Water (P & C of P) Act, 1974 and Under Sec.21 of Air (P&C of P) Act, 1981 - Issued - Reg.

Ref:
1) CFE order No. APPCB/VJA/NLR/633/HO/2004, dt. 25.5.2004.
2) Environmental Clearance and CRZ Clearance dt. 13.11.2009 issued by MOE&F, GOI.
3) Industry's application received on 29.12.2009 & addl.information received on 1.2.2010.
4) R.O's inspection report dt. 15.2.2010
5) Industry's lr.dt. 6.4.2010
6) CFE Committee meeting held on 8.4.2010
7) Industry's lr.dt. 19.4.2010

1. In the reference 3rd cited, an application was submitted to the Board seeking Consent for Establishment (CFE) for expansion of Phase-II development of Krishnapatnam Port to handle the cargo as mentioned below, with a project cost of Rs 6000.0 crores (for expansion)

Sl. No	Existing capacity (Phase -I) (as per the CFE order dt.25.05.2004)		Proposed Expansion (Phase –II)	
	Type of Cargo	Quantity	Type of Cargo	Quantity
1	Coal	6 million tons /annum (Coal – 20000 to 30000 TPD)	Dry Bulk Cargo (Coal)	39 MTPA
2.	Iron Ore	18 Million tons/ annum (60,000 to 80,000 TPD)	Container Cargo	3.30 Million TEUs/year
3	Fertilizers, Food grains, Sugar, Cement & Cement clinker, barites, Feldspar, Edible oils.	4 Million tons/annum	General Cargo	5.0 MTPA
4	-	-	Bulk Liquid Cargo (POL)	0.30 MTPA
	Total	28.0 Million tons/annum	Total	44.3 MTPA & 3.3 Million TEUs/year of container cargo

	No. of Berths	2 Nos.	No. of Berths • Coal Berths – 5 Nos. (4 North port & 1 South port) • Container berths – 6 Nos. (1 North side + 5 South side) • General Cargo Berths – 2 Nos • POL berth – 1No.	14 Total length – 4100 m (North port – 2,000 m, South port – 2,100 m)

The developmental works as part of proposed Phase –II development of the port are as follows :-

- Breakwaters will be extended as follows :
  - North Breakwater – Length : 1312 m, Depth : (-) 5.5 m
  - South Breakwater – Length : 1624 m, Depth : (-) 5.8 m.
- Dredging of existing approach channel, berths and turning circle for adequate depths
  - Dredging quantity : 52 million cu.m
  - Dredging material to be used for reclamation : 9 million cu.m
  - Dredge material to be disposed at 20m. depth & beyond : 43 million cu.m.
- Exclusive conveying system of length 12 m for Ultra Mega Power Projects (UMTT), APGENCO Power Plant, Southern side Power Plants.

2. As per the application, the above activity is to be located within the existing port area located at Krishnapatnam (V),Tammenapatnam (V), Narikellapalli (V), Pantapalemn (V), Epuru (V), Muthukur (V), Muthukur (M), SPSR Nellore district.

3. The above site was inspected by the Environmental Engineer, Regional office, Nellore, A.P Pollution Control Board on 9.1.2010 and found that the site is surrounded by

North	:	Vacant lands
South	:	Bay of Bengal
East	:	Kandaleru Creek
West	:	Kandaleru Creek

4. The Board, after careful scrutiny of the application and verification report of Regional Officer, hereby issues CONSENT FOR ESTABLISHMENT for Expansion to your activity Under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made there under. **This order is issued to the activity as mentioned at para (1) only.**

5. This Consent Order now issued is subject to the conditions mentioned in Schedule 'A' and Schedule 'B'.

6. This order is issued from pollution control point of view only. Zoning and other regulations are not considered.

Encl: Schedule 'A'
Schedule 'B'

Sd/-
MEMBER SECRETARY

To
M/s. Krishnapatnam Port Co. Ltd.,
#1259, Lakshmi Towers,
Road No.36, Jubilee Hills, Hyderabad – 500 033

/// T.C.F.B.O///

JOINT CHIEF ENVIRONMENTAL ENGINEER(CFE)

Solid Waste:

18. The proponent shall comply with the following:

Sl. No.	Solid Waste	Quantity	Method of Disposal
1.	Domestic use	250 kgs./day	After composting, Biodegradable waste is proposed to be used as manure. Non Biodegradable waste will be disposed to approved vendors.
2.	STP sludge	-	To be used as manure.

19. The following rules and regulations notified by the MOE&F, GOI shall be implemented.

    a) Hazardous waste (Management, Handling and Transboundary Movement), Rules,2008.

    b) Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.

    c) Coastal Regulatory Zone (CRZ) Notification, 1991.

    d) Municipal Solid Waste (Management & Handling) Rules, 2000 & amendments thereof.

20. The storage facilities of fuel oils shall be made in well designated area where risk is minimum to storage facilities to prevent fire hazard and unauthorized access to unauthorized elements.

21. Fire detection and fire fighting facilities with adequate water storage facility shall be provided in fire prone area in consultation with Directorate of Fire Firefighting.

22. Onsite & offsite Disaster Management plan shall be prepared to meet any eventuality in case of any accident. Mock drills shall be conducted atleat twice a year and modifications required if any shall be incorporated in Disaster Management Plan.

23. In case of any leakage container of hazardous cargo is found, permission shall be obtained from the Board for disposal after establishing type and quantity of the waste.

Other Conditions:

24. Green belt of width 100 m shall be developed along the boundary of the industry as committed by the proponent. The greenbelt shall be under taken in an area of 167.5 ha in phase-II. Green belt development shall be started along with the construction activity.

25. The industry shall implement the commitment given in action plan submitted vide lr.dt. 19.4.2010 with in the scheduled time period and shall submit compliance to the concerned Regional Officer.

Annexure - III

KRISHNAPATNAM PORT COMPANY LTD.

Ref. No. KP/MoEF/90 Date: 11th June, 2010

To

The Director (S)
Ministry of Environment & Forests (MoEF)
Regional Office (Southern Zone)
Kendriya Sadan, 4th Floor
E&F Wings, 17th Main Road
2nd Block, Koramangala
Bangalore – 560 034

Kind Attn: Dr. A. B. Harapanahalli

Sub: Submission of Half Yearly Compliance Reports of Krishnapatnam Port Phase- I & II Environmental Clearances for period – September, 2009 to March, 2010 – Reg.

Ref: 1. MoEF Clearance Letter No. 10 -22/2005-IA.III dated 26.07.2006 for Krishnapatnam Port Phase-I
2. MoEF Clearance Letter No. 11-62/2009-IA.III dated 13.11.2009 for Krishnapatnam Port Phase-II

Dear Sir,

Please find herewith enclosed condition wise compliance reports of above cited MoEF Environmental Clearances for Krishnapatnam Port Phase-I&II respectively. As desired, we are also enclosing results of monthly Environmental Monitoring Reports of Krishnapatnam Port Phase-I for period of six months from September, 2009 to March, 2010.

The analysis of Environmental Monitoring Reports for the quarter ending December, 2009 & March, 2010 are also enclosed.

Thanking you,

Yours faithfully,
for **KRISHNAPATNAM PORT CO. LTD.,**

(M.A.R. ANSARI)
President (Engineering)

Enclosures:-

1. Compliance Reports for Phase-I & II
2. Monthly Progress Reports from September, 2009 to March, 2010
3. Quarterly analysis reports for December, 2009 & March, 2010

DEVELOPMENT OF KRISHNAPATANAM PORT

Environmental Clearance Compliance Report for Phase-II

Period
November 2009 to March 2010

Action taken on MOEF Clearance for Krishnapatnam Port -Phase-II dated 13.11.2009

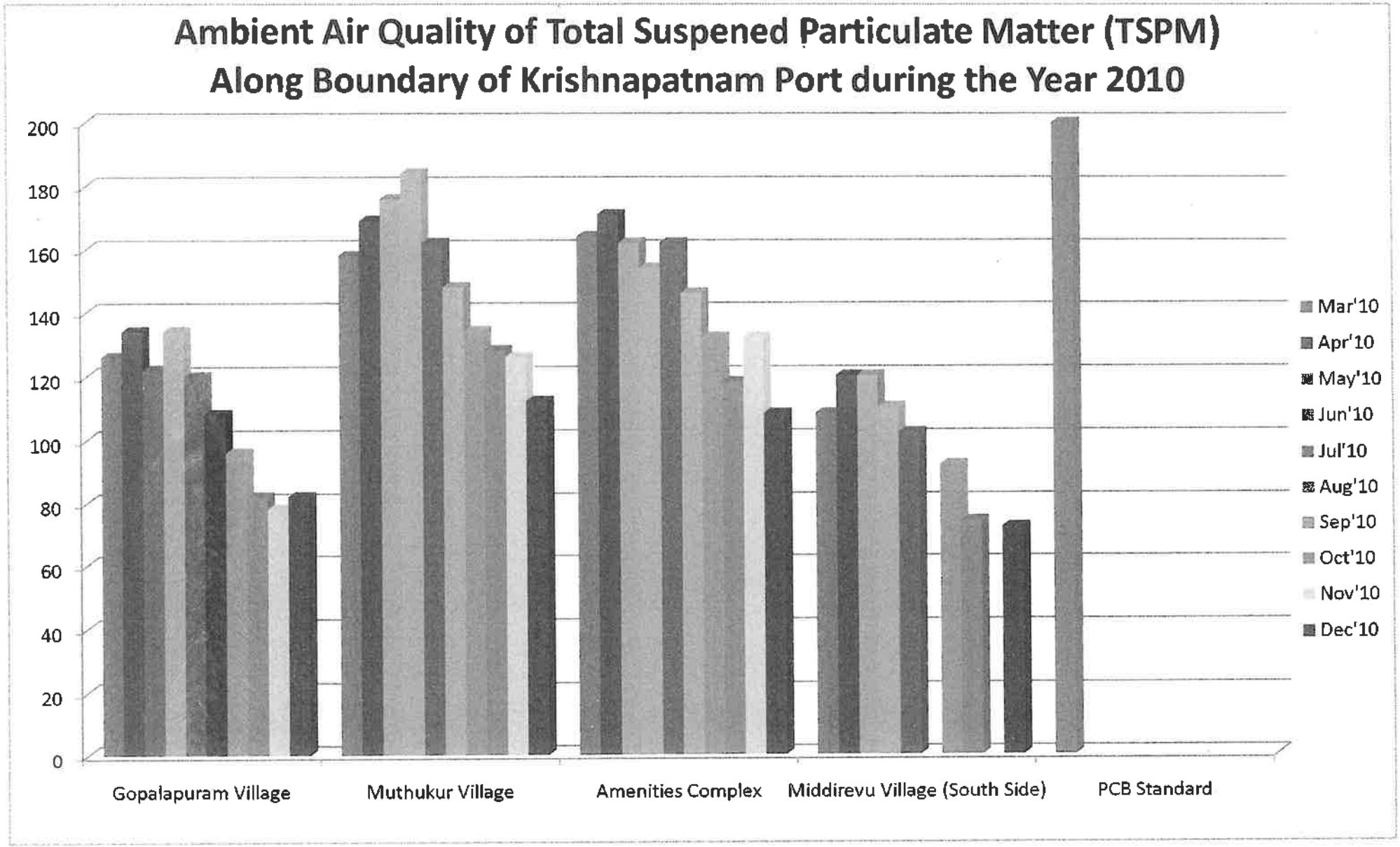
Sl.No.	Observations as per MOEF	Action taken
5. Specific Conditions		
1.	All the conditions as stipulated by the Forests & Environment Department, Govt. of Andhra Pradesh vide letter No.2286/CZMA/2009, dated 11.05.2009 shall be strictly complied.	Noted
2.	All the details / information submitted by the project proponent vide letter No.KP/MOEF/PH-II/174, dated 17.08.2009 shall be strictly complied.	Noted
3.	The hydro-dynamic studies shall be undertaken to ascertain the impact to the shoreline in the stretch and ecologically sensitive areas and the report shall be submitted to the Ministry.	The hydro-dynamic studies to ascertain the impact of port development to the shoreline in the stretch have been carried out through M/s.HR Wallingford, London. No long term impact is noticed due to minimal net drift along the coastline. However as recommended by them in their report dated October, 2007 – 7 Kms. both North and South of the coastline is being monitored through M/s.Indian National Centre for Ocean Information Services, Hyderabad using satellite imagery. From the INCOIS report for the years ending October, 2008 and January 2010 the coastline is found to be stable. Further studies are being continued.

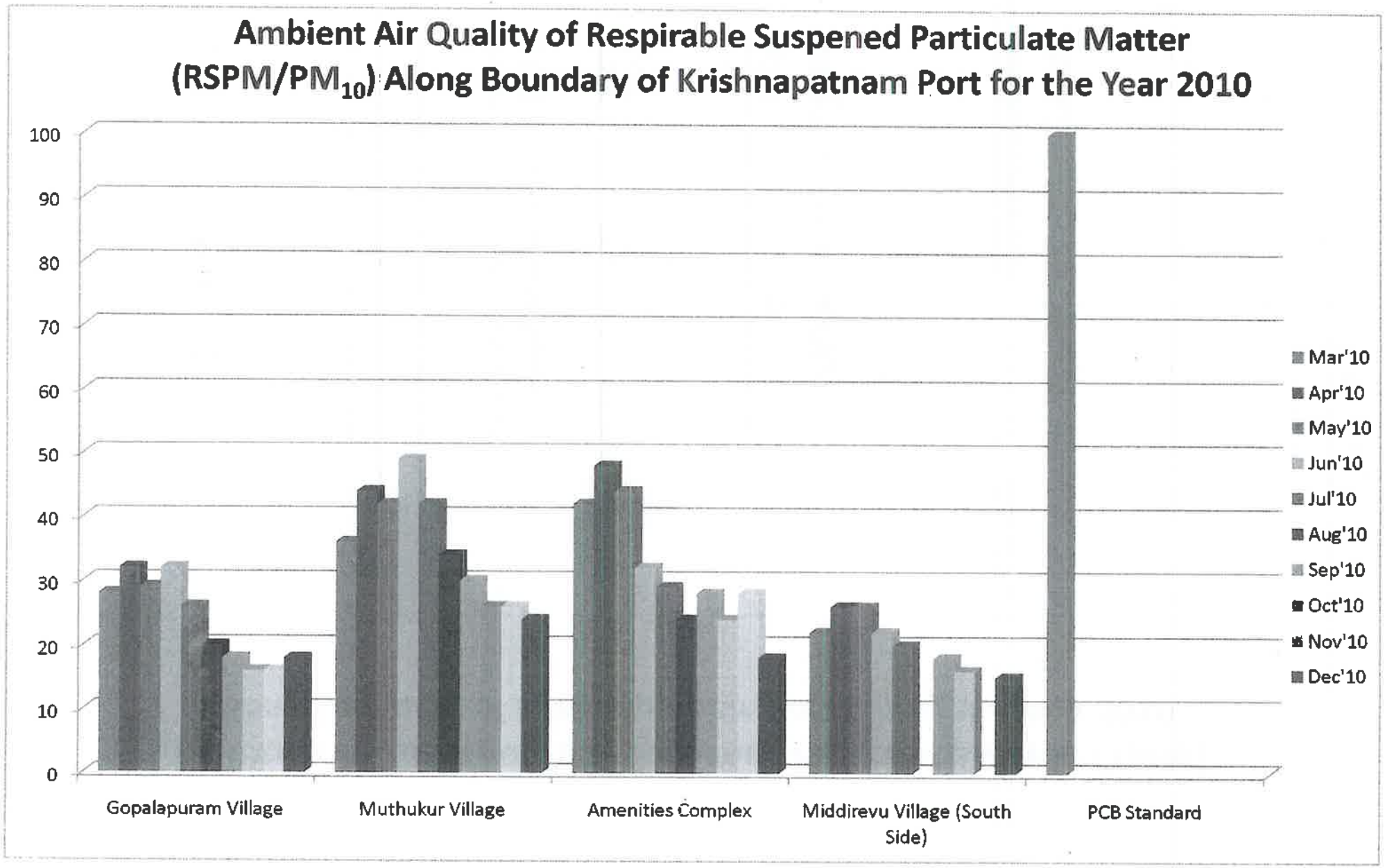
4.	Ministry has taken a decision that the plantation of mangroves shall be undertaken on an area of 50 ha., as the Phase-II of the project spreads over 800 ha.	As the mangroves are highly sensitive to the soil conditions and the tidal and hydrological conditions, suitable areas around the port are being identified through the District Administration for allotment of land for development of mangroves as a part of Phase-II of the project.
5.	Six monthly monitoring shall be carried out and a comparative analysis shall be made to examine for any mitigative measures required.	Periodic monitoring of various parameters is being carried out and six monthly comparative analysis reports are being made to identify mitigative measures required of any
6.	The temperature, salinity and tidal inflow shall be monitored weekly.	These are the studies prescribed for the Intake Pump House. The parameters would be monitored on commissioning of the Desalination Plant.
7.	The greenbelt of 100 m. width shall be developed around the coal stack yard as per the request in the public hearing.	As per the request in the public hearing 100m width of Greenbelt is being developed around the port boundary.
8.	Impact on the drawal of the water from the Kandaleru Creek shall be regularly monitored and report submitted to the Ministry.	The pattern of siltation, currents and impact on Navigation at the Intake Pump House will be monitored on commissioning the facility.
9.	Continuous monitoring on disposal of dredged material shall be put in place for both pre and post monsoon periods.	The dispersion of dredged material at the dumping grounds shall be monitored during the process of capital dredging.
10.	No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	No construction work other than that permitted in Coastal Regulation Zone Notification shall be carried out in CRZ Area. (500m from Coast and 200m from Khandaleru).

Annexure - IV

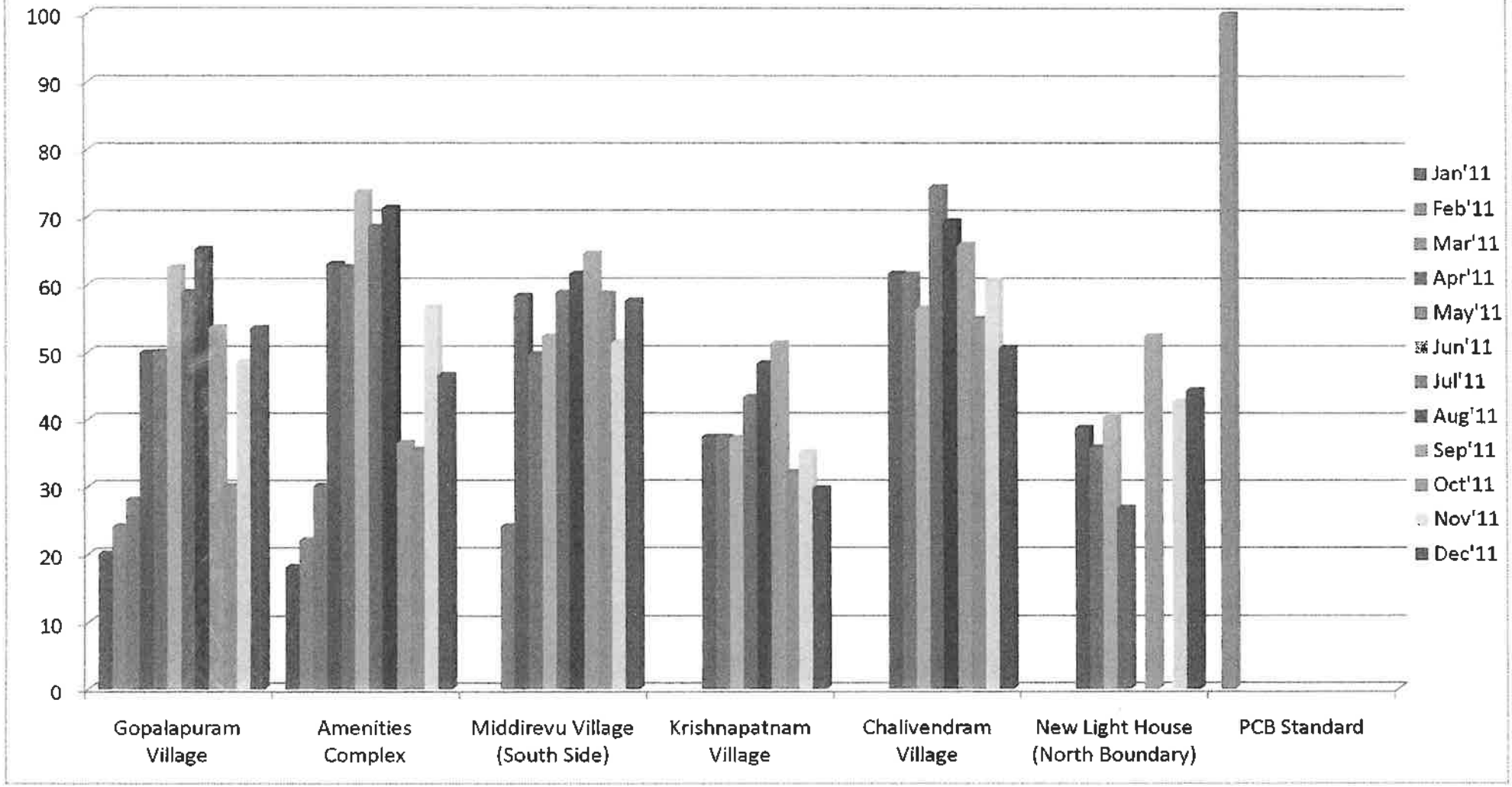
Krishnapatnam Port Company Limited

Pictorial presentation of Ambient Air Quality Monitoring data along the Port Boundary for the period 2010, 2011 and 2012 (upto July)

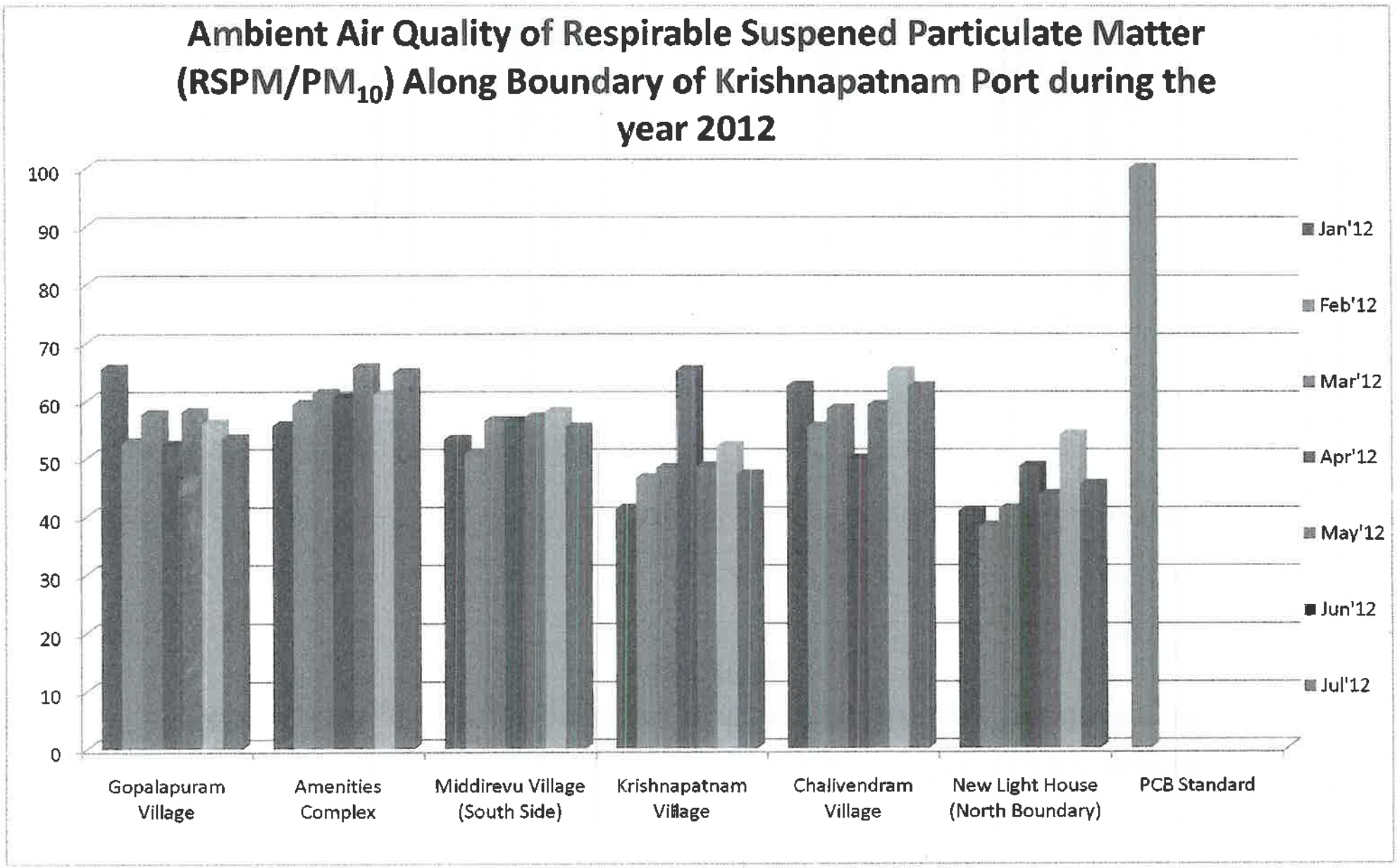

Ambient Air Quality of Total Suspened Particulate Matter (TSPM)
Along Boundary of Krishnapatnam Port during the Year 2010
200
180
160
140
120
100
80
60
40
20
0
Gopalapuram Village
Muthukur Village
Amenities Complex
Middirevu Village (South Side)
PCB Standard
Mar'10
Apr'10
May'10
Jun'10
Jul'10
Aug'10
Sep'10
Oct'10
Nov'10
Dec'10

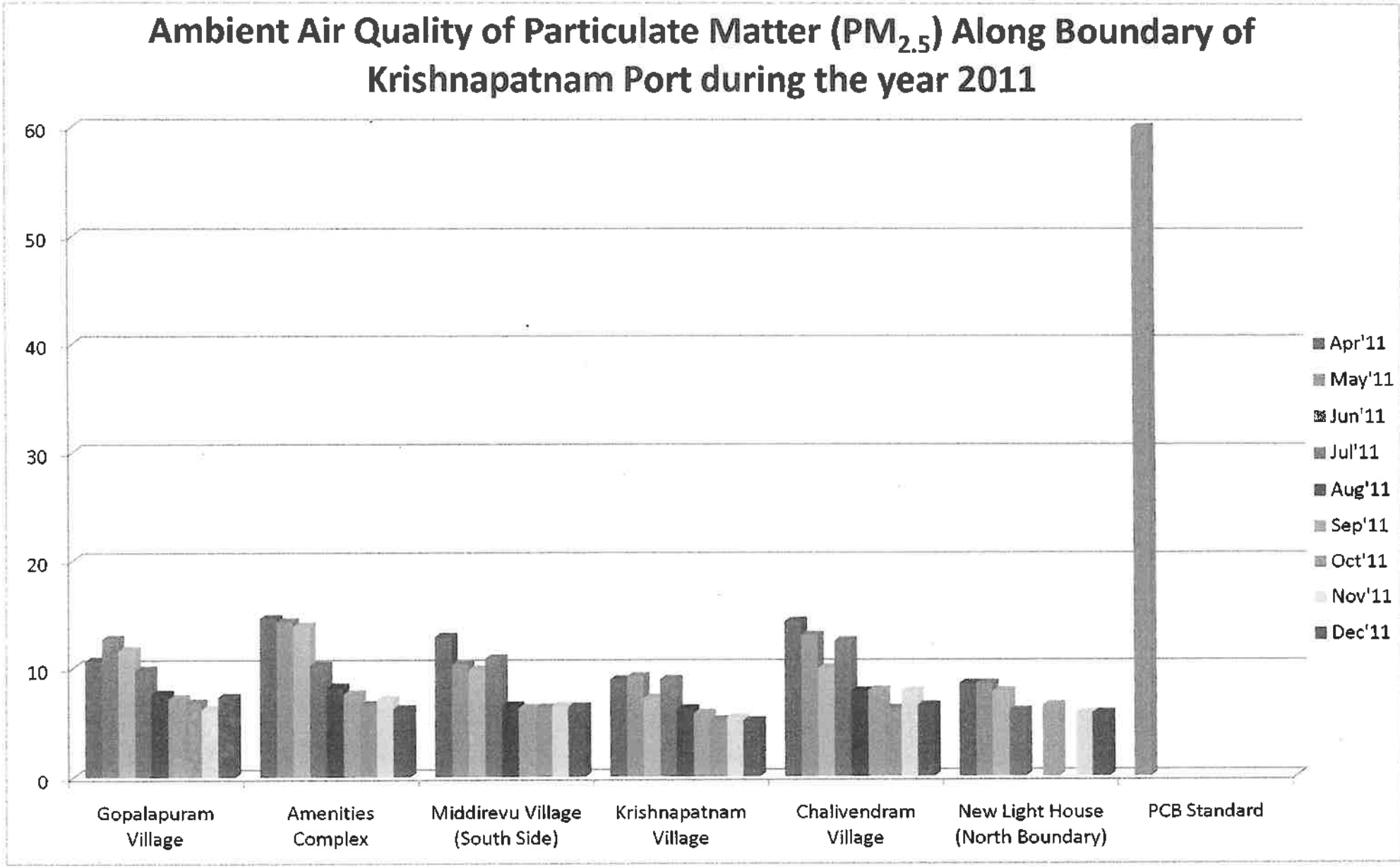

Ambient Air Quality of Respirable Suspened Particulate Matter (RSPM/PM10) Along Boundary of Krishnapatnam Port for the Year 2010
100
90
80
70
60
50
40
30
20
10
0
Gopalapuram Village
Muthukur Village
Amenities Complex
Middirevu Village (South Side)
PCB Standard
Mar'10
Apr'10
May'10
Jun'10
Jul'10
Aug'10
Sep'10
Oct'10
Nov'10
Dec'10

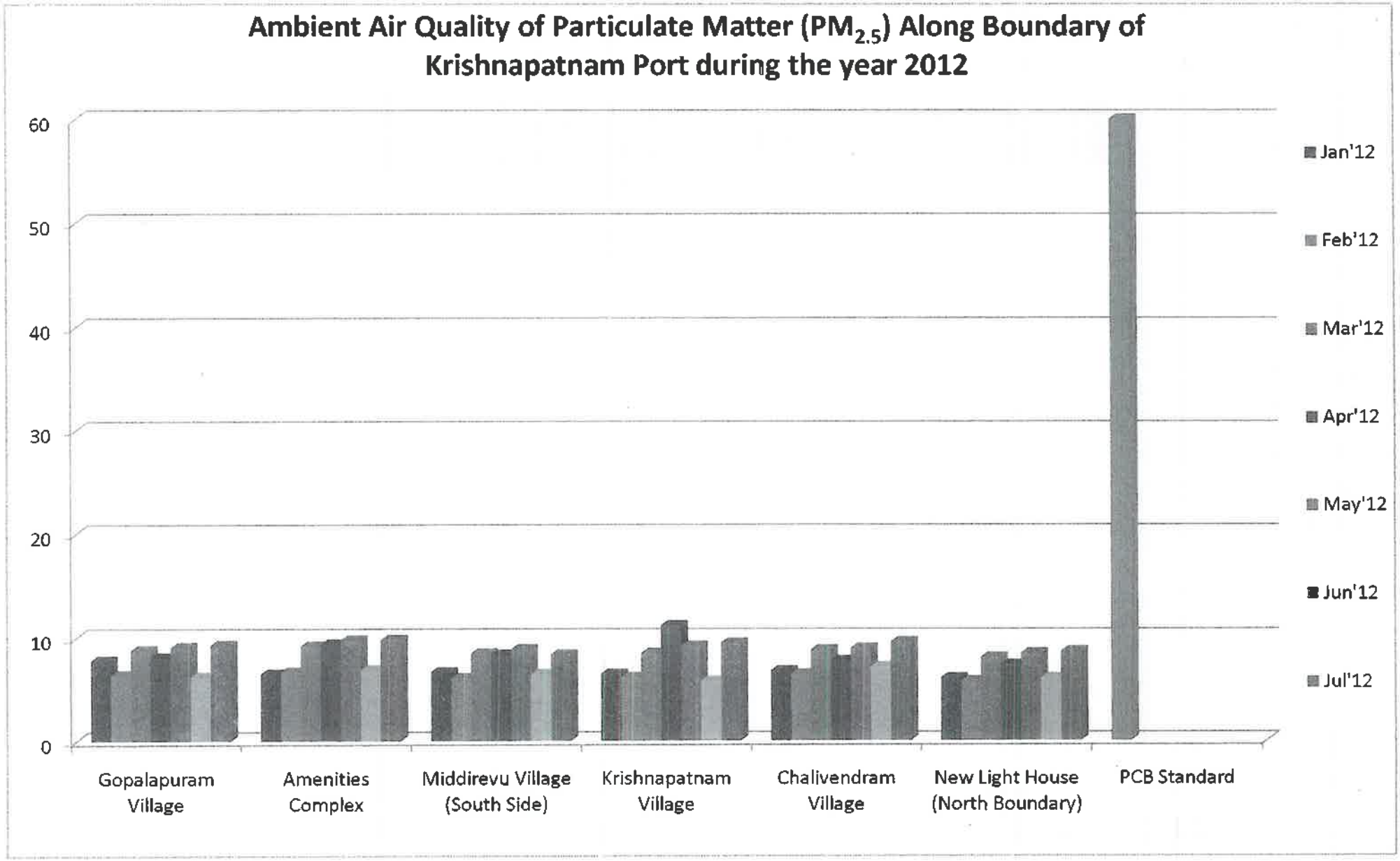
Ambient Air Quality of Respirable Suspened Particulate Matter ($RSPM/PM_{10}$) Along Boundary of Krishnapatnam Port during the year 2011



Ambient Air Quality of Respirable Suspened Particulate Matter (RSPM/PM_{10}) Along Boundary of Krishnapatnam Port during the year 2012




Ambient Air Quality of Particulate Matter ($PM_{2.5}$) Along Boundary of Krishnapatnam Port during the year 2011
60
50
40
30
20
10
0
Gopalapuram Village
Amenities Complex
Middirevu Village (South Side)
Krishnapatnam Village
Chalivendram Village
New Light House (North Boundary)
PCB Standard
Apr'11
May'11
Jun'11
Jul'11
Aug'11
Sep'11
Oct'11
Nov'11
Dec'11


Ambient Air Quality of Particulate Matter ($PM_{2.5}$) Along Boundary of Krishnapatnam Port during the year 2012
60
50
40
30
20
10
0
Jan'12
Feb'12
Mar'12
Apr'12
May'12
Jun'12
Jul'12
Gopalapuram Village
Amenities Complex
Middirevu Village (South Side)
Krishnapatnam Village
Chalivendram Village
New Light House (North Boundary)
PCB Standard

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-03/13 Date: 03-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : SURFACE WATER

DATE OF COLLECTION : 05-03-2026

SAMPLE CODE : 1. Buckingham Canal
2. Khandaleru Creek

TEST REPORT

S.No	PARAMETER	UNIT	1	2
I.	**Physical**			
1.	pH	-	7.93	7.56
2.	Temperature	°C	28.4	27.9
3.	Salinity	ppt	32.8	32.3
4.	Density	gm/ml	1.32	1.43
II.	**Chemical**			
1.	Potassium	mg/l	285	241
2.	COD	mg/l	12.7	13.5
3.	BOD	mg/l	3.1	3.5
4.	Oil & Grease	mg/l	< 0.1	< 0.1
5.	DO	mg/l	5.0	5.2
6.	Nitrates	mg/l	3.62	3.31
7.	Nitrites	mg/l	< 0.1	< 0.1
8.	Ammonia	mg/l	0.034	0.046
9.	Phosphates	mg/l	0.54	0.87
10.	Chlorides	mg/l	18182	17904
11.	Sodium	mg/l	7354	7197
12.	Sulphates	mg/l	2810	2378
13.	Silicates	mg/l	1.42	1.76
14.	Reactive Silica	mg/l	0.39	0.53
15.	Total Phosphorus	mg/l	0.31	0.49
16.	Total Nitrogen	mg/l	12.2	11.3

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

SV ENVIRO LABS & RESEARCH PRIVATE LIMITED
formerly known as SV ENVIRO LABS & CONSULTANTS
Researching for better Environmental Solutions

Ref: SV/AKPL/26-03/13

Date: 03-04-2026

NAME AND ADDRESS : **M/s. ADANI KRISHNAPATNAM PORT LIMITED,**
Krishnapatnam Post, Muthukur Mandal,
SPSR Nellore District,
Andhra Pradesh – 524344.

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION : SURFACE WATER

DATE OF COLLECTION : 05-03-2026

SAMPLE CODE : 1. Buckingham Canal
2. Khandaleru Creek

III.	**Biological**			
1.	Primary Productivity	mgC $m^{-2}d^{-1}$	44	41
2.	Chlorophyll	mg/m^3	2.70	2.23
3.	Phytoplankton			
	a. Numerical abundance	No./ml	252	273
	b. Diversity	-	2.28	2.55
4.	Zooplankton			
a.	Diversity	-	2.51	2.63
b.	Biomass	$ml/100m^3$	11.5	12.3
c.	Coliforms	CFU/100ml	16	12
d.	Fecal Coliforms	CFU/100ml	ND	ND
IV.	**Heavy Metals**			
1.	Lead	mg/l	<0.01	<0.01
2.	Cadmium	mg/l	<0.01	<0.01
3.	Copper	mg/l	<0.02	0.030
4.	Zinc	mg/l	0.035	0.042

CHECKED BY

SV Enviro Labs & Research Pvt. Ltd. VSP-12

AUTHORIZED SIGNATORY

Recognized by GOI - MoEFCC, Accredited by NABL & NABET

F. No. 11-62/2009-IA.III
Government of India
Ministry of Environment & Forests
(IA.III Division)

Room No. 534,
Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi-110003.

Dated: 2 March 2010

CORRIGENDUM

Subject: Environmental and CRZ clearance for Phase II Development of Krishnapatnam Port at Krishnapatnam, Sri Potti Sriramulu Nellore District, Andhra Pradesh by M/s. Krishnapatnam Port Company Ltd - Reg.

Sir,

This has reference to your letter No. KP/MoEF/PH-II/12 dated 19.01.2010 regarding change of the conditions. In this context, attention is invited to this Ministry's letter of even no. dt. 13.11.2009. The condition No. (xxii) be deleted and in condition (xxiii), the reference VOC be deleted.

The all other terms and conditions clearance letter of even no. dated 13.11.2009 remain unchanged.

Yours faithfully,

(Bharat Bhushan)
Director (IA)

Copy to:

1. The Principal Secretary, Director (Environment), Forests & Environment Department, Government of Gujrat, Block No. 14, 8th floor, Sachiyalaya, Gandhinagar – 382 010.
2. The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi – 32.
3. The Chairman, Andhra Pradesh State Coastal Zone management Authority & Additional Secretary, Government of Andhra Pradesh, Environment and Forests Science and technology Department, Secretariat, Hyderabad – 500 022
4. The Member Secretary, Andhra Pradesh Pollution Control Borad, Hyderabad.
5. The Chief Conservator of Forests, Ministry of Environment and Forests, Regional Office, Western Region, Kendriya Paryavaran Bhavan, Link Road No. 3, Ravishankar Nagar, Bhopal – 462016 (M.P.).
6. Guard File.
7. Monitoring Cell.

(Bharat Bhushan)
Director (IA)