HINDUJA NATIONAL POWER CORPORATION LIMITED

Corporate Office : Tower C, Plot C-21, G Block, Bandra Kurla Complex, Bandra (East), Mumbai 400 051
Tel : (+91) 22 61360407.
Plant Office : Palavalasa Village, T.Devada Post, Steel Plant (Sub Office), Pedagantyada Mandal, Visakhapatnam-530 031. A.P. India.
CIN : U40109TG1994PLC017199

HNPCL/VSKP/COMP/Regional/2023-24
Date: 09th August' 2024

Regional Directorate - Bengalure
A – Block, Nisarga Bhavan,
1st and 2nd Floors,
7th D Cross, Thimmaiah Road,
Shivanagar,
Bengaluru-560079

Dear Sir,

Sub: HNPCL – 2X520MW TPP Submission of compliance status report from Oct 2023 - March 2024

Ref: E C Letter No. J-13011/11/90-IA-II(T) dated 3rd September, 1996 &
Letter No: J-13012/92/2008-IA.II(T) dated 10th June, 2010

Hinduja National Power Corporation Ltd. Is here with submitting half-yearly EC compliance report for the period from Oct 2023 - March 2024 for your kind perusal.

Thanking you,

Yours faithfully,
For Hinduja National Power Corporation Limited

Sabyasachi Mukherjee
Sr. Vice President

Encl: as above

ENVIRONMENTAL COMPLIANCE STATUS REPORT

FOR

1040 MW (2 x 520 MW) THERMAL POWER PLANT
VISAKHAPATNAM, ANDHRA PRADESH

OCTOBER 2023 - MARCH 2024

Sponsor:

HINDUJA NATIONAL POWER CORPORATION LIMITED
VISAKHAPATNAM, ANDHRA PRADESH

Prepared by:

VIMTA Labs Ltd.,
142, IDA, Phase-II,
Cherlapally, Hyderabad–500 051, Telangana State
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PREFACE

HINDUJA NATIONAL POWER CORPORATION LIMITED

ENVIRONMENTAL COMPLIANCE STATUS REPORT
FOR
1040 MW (2 x 520 MW) THERMAL POWER PLANT
VISAKHAPATNAM, ANDHRA PRADESH

OCTOBER 2023 – MARCH 2024

For and on behalf of VIMTA Labs Limited

Approved by : **M. Janardhan**

Signed : 

Designation : **Head & Vice President (Environment)**

Date : **8th August, 2024**

This report has been prepared by **Vimta Labs Limited** with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

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Introduction

1.0 INTRODUCTION

1.1 The Background

Hinduja National Power Corporation Limited (HNPCL) is part of Hinduja Group to realize the ambitions of the Group in Power Sector. HNPCL is planning to create a power generation capacity of 10,000 MW over the next ten years at an expected investment of over $10 billion across India. The total projected capacity will be a mix of thermal, hydro, nuclear and renewable energy.

As a first step in power sector, HNPCL is setting up a 1,040 MW coal based merchant power plant and is located on the coast of the Bay of Bengal at Palavalasa, Pedagantyada Mandal, Visakhapatnam District in the State of Andhra Pradesh, India. The project configuration is 2x520 MW.

The earlier Environmental Clearance (EC) has been confirmed from Ministry of Environment & Forests, Consent for Establish (CFE) and Consent for Operation (CFO) from Andhra Pradesh Pollution Control Board (APPCB) has been obtained.

Hinduja National Power Corporation Limited (HNPCL) has retained M/s **VIMTA LABS LIMITED, Hyderabad** to undertake Environmental Data Generation for various environmental factors on monthly and seasonal basis, which may be affected due to the likely impact arising out of the existing Power plant. Environmental data has been collected for various environmental components viz. Air, water, Noise and Soil quality during October 2022 to March 2023 and prepared compliance to Environmental clearance involved by MOEF vide Letter No:J-13011/11/90-IA-II(T) dated 3rd September, 1996, No: J-13012/92/2008.IA.II(T) dated 4th March 2009, No. J 13012/92/2008-IA.II(T) dated 10th June 2010 and CRZ Clearance vide letter F. No 11-58/2011-1A-III dated 3rd January 2014, F. No: 11-58/2011-IA-III dated 17/19th March, 2015, Letter No: 245/Env/CZMA/2015, dated 05th June, 2015, F. No: 11-58/2011-IA-III dated 01th October, 2015, F. No: 11-58/2011-IA-III dated 01th 2019, 2015 (Amendment), CFO No: APPCB/VSP/VSP/19/HO/CFO/2020, dated 06th March, 2020.

1.2 Project Setting

The existing plant is located in Palavalasa, Pedagantyada Mandal, Visakhapatnam District of Andhra Pradesh and the same is identified on the survey of India toposheet no 65 O/2, O/6 at the Latitude $17^0$34’30” North and Longitude $83^0$07’30” East at an elevation of 8.5 m above Mean Sea Level (MSL).

The present study of various environmental attributes establishes the post operational characteristics and this will help in identifying the incremental concentrations if any, due to the operation of the existing plant.

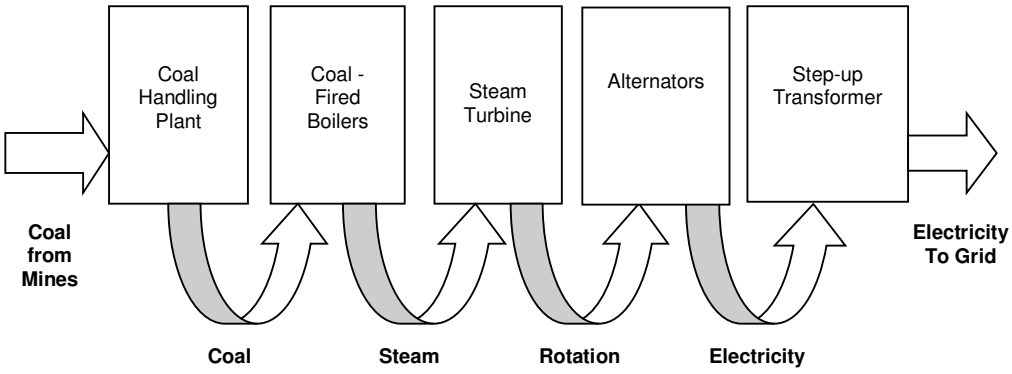
The geographical location of the plant is shown in **Figures-1.1.** The topographical features of the project area (within 10 km radius of plant site) are depicted in **Figures-1.2.**

The long-term data recorded at India Meteorological Center at Visakhapatnam indicates temperature in the range of 15.8°C to 37.7°C. The mean total rainfall is about 1300 mm for the whole year. The relative humidity is generally high during the period from September to January and is least during the summer afternoons.

The predominant wind direction and wind speed as recorded by IMD Visakhapatnam during the winter season are E (32.4%) followed by ESE (19.9 %) and during the Pre monsoon season are SW (42.5%) followed by SSW (35.8%). This variation in wind pattern can be attributed to the hilly terrain prevailing in the region. The Relative Humidity was observed to be in the range of 63 to 80% during the winter and Pre monsoon seasons.

1.3 Process Description

Each of the coal-fired power projects currently in development would employ pulverized coal combustion (PCC) technology. In the PCC process, the coal-handling plants receive coal, crush it to the required size and feed it to the boiler plants. The boiler plants then use coal pulverisers to grind the coal to a finer size before it is fed to the boiler furnace. The boilers are enclosures encased by tubes filled with flowing water. As the boiler furnace heats, the water flowing in the boiler tubes is converted into high pressure and high temperature steam. This steam is conveyed to the turbine through steam pipelines. The steam produced in the boiler drives steam turbines, making the turbines' rotors rotate at high speeds. Alternators are coupled to the steam turbines and rotate with the turbines' rotors. The alternators convert the energy generated by the rotation of the turbines' rotors into electricity. Step-up transformers then step up the voltage of generated electricity before it is fed to the grids for transmission. Transmission of electricity is done at very high voltage to minimize transmission losses.
The coal-fired power process is illustrated below:



The process of generation of power from coal (water steam cycle) essentially entails two main stages. In the first stage, the chemical energy stored in coal is converted into heat energy in the coal-fired boilers. In the second stage, the high-pressure steam, which is generated in the boilers, is passed through turbines (conversion of heat energy into mechanical energy) which in turn is coupled to generators (conversion of mechanical energy into electrical energy), thereby generating electricity.

The water steam cycle essentially contains the coal fired steam generator, the steam turbine with condenser, feed-water tank, low-pressure (LP) heaters and high-pressure (HP) heaters and the connecting pipelines. The superheated steam produced in the steam generator is supplied to the steam turbine, which drives the three-phase AC generator. After leaving the HP turbine, the steam is reheated in the steam generator and fed to the Intermediate Pressure (IP) turbine. In the LP turbine the steam coming directly from the IP turbine expands to condenser pressure and is condensed in the condenser.

Once through system is used for cooling of the condenser. The condensate collected in the condenser hot well is discharged by the condensate pumps and supplied via the LP condensate heaters into the feed water tank. The feed water is further heated by bled steam from turbine and dissolved gases from the feed-water are liberated. The boiler feed pumps discharge feed water from the feed-water tank via the HP heaters to the economizer. Steaming starts from this point onwards. The high temperature steam-water mix is further converted into steam in water walls and finally passed through the super heaters sections for converting the saturated steam into superheated steam.

The power station would be designed with two power generating units of 520 MW each, along with the auxiliaries and common utility services like plant water system, coal handling system, ash handling plant, and switchyard for power evacuation, plant electrical system and workshop.

The main sections of the power generating unit include Steam Generator along with milling system and electrostatic precipitator, integral piping, integral control system, turbine and generator unit, boiler feed pump, regenerative heaters, condensate extraction pump, circulating and auxiliary cooling water pumps and the generator transformer with bus duct. The main sections of the utility system are the coal handling system, ash handling system, fire fighting system, AC & Ventilation system, switchyard and the plant water system. The power generated at lower voltage of 21 KV would be stepped up to 400 KV and will be connected to the proposed 400 KV switchyard for dispatch.

The plant layout is shown in **Figure-1.3**.

1.4 Scope of the Study

Under the scope of the study, an area of 10 km radius from the centre of the existing plant was covered in detail for various environmental components viz Air, water, Noise and Soil based on the guidelines of Ministry of Environment and Forests, Government of India.

1.4.1 Micrometeorological data

The meteorological and micro-climatic parameters were also recorded simultaneously using automatic weather station located within the plant site. Wind speed, Wind Direction, Relative Humidity and Rainfall were recorded on hourly basis during the study period. Minimum and maximum temperatures were also recorded.

1.4.2 Air Environment

The baseline status of the existing ambient air quality within the study region has been assessed through a monitoring network of Eight Ambient Air Quality (AAQ) sampling stations during study period (October 2023–March 2024). The monitoring network has been established depending on the available climatological norms of predominant wind directions and wind speeds of the study region in the Post monsoon, winter and part of Pre monsoon season. The baseline status of air environment was monitored for Fine Respirable Particulate Matter (PM2.5), Respirable particulate matter PM10 (RPM) and gaseous pollutants like Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6) and metals like Benzo(a)pyrene, Lead (Pb), Arsenic (As) and Nickel (Ni).

1.4.3 Fugitive Dust Emission Monitoring

Fugitive dust emission monitoring was carried out at 5 locations within the plant site to assess the uncontrolled emissions from the sources like dust handling areas, construction areas and roads etc.

1.4.4 Water Quality

Information on water resources (ground) was collected during the study period. The parameters of prime importance were selected under physical, chemical, inorganic, chemical organic and heavy metal groups. Samples were collected for basic nutrient demand; toxic parameters and baseline data on bacteriological aspects were also collected from the existing dug and bore wells. Open well and bore well samples were collected within 10 Km around the existing site.

1.4.5 Noise Quality

A detailed survey on noise environment was carried out in and around the project site to study the levels of noise, as the high dB (A) levels may cause adverse effect on human beings and associated environment. Spot noise levels were measured using a precision noise level meter, at residential areas, schools, hospitals, bus stands and commercial centers etc. The major noise generating sources were identified in the existing plant and were monitored to study noise environment. Ambient noise levels were measured at 8 locations in 5 Km radial distance.

1.5 Compliance to Environmental Clearance

Compliance to Environmental Clearance obtained for 2x520 MW Thermal Power Plant near Visakhapatnam. **Vide Letter No: J-13011/11/90-IA-II (T) dated 3rd September, 1996 and**

CRZ Clearance for the Seawater intake & outfall system and Rail line for Coal transport at palavalasa, Visakhapatnam **Vide Letter F.No: 11-58/2011-IA-III dated 3rd January, 2014 and 17/19th March, 2015.**

Consent Order **No: APPCB/VSP/19/HO/CTO/2016,** dated:**21stMarch, 2023**. A compliance Status Report is prepared for 6 months' period from **October 2023-March 2024** is given in **Chapter-2.**

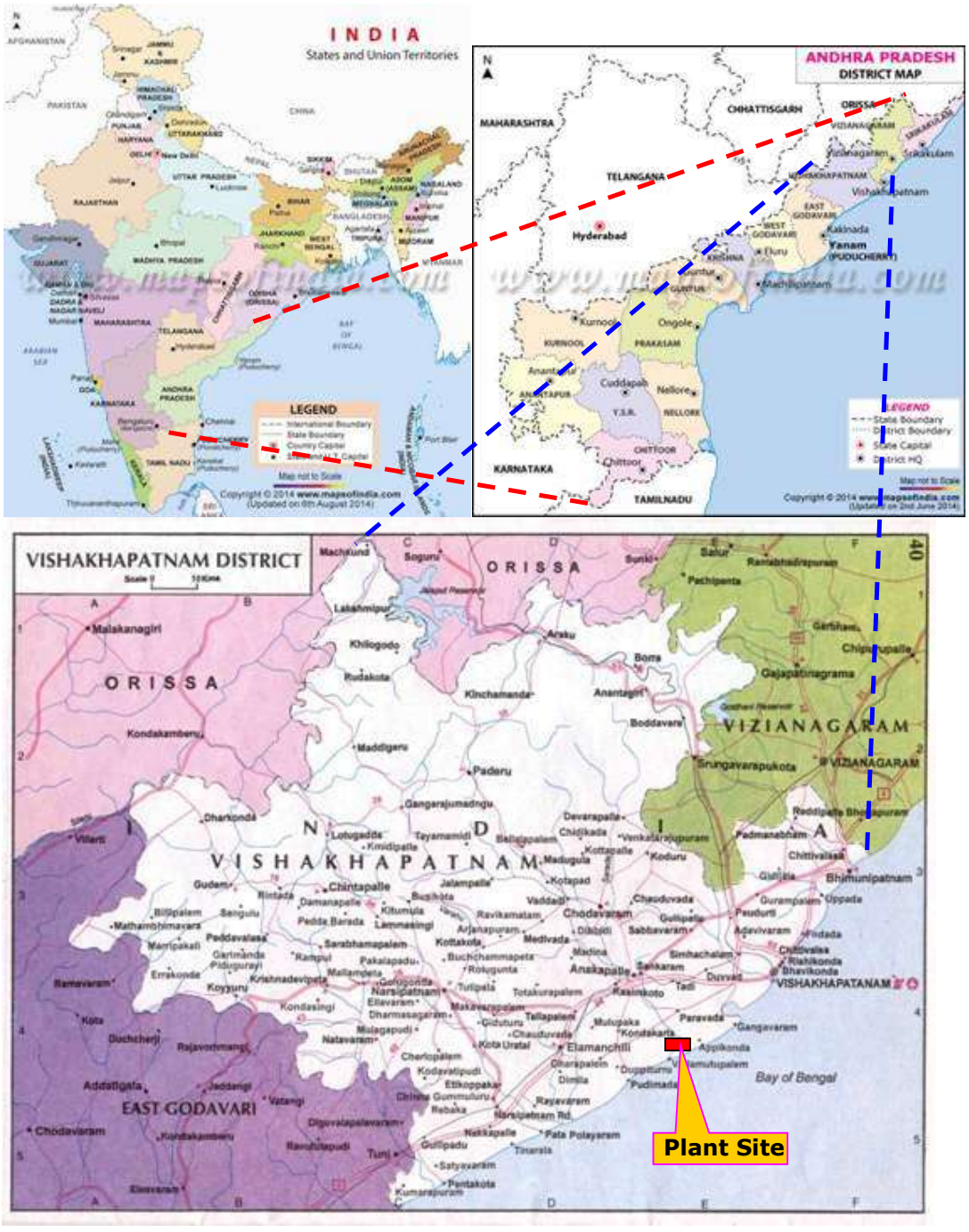


FIGURE-1.1
GEOGRAPHICAL LOCATION MAP

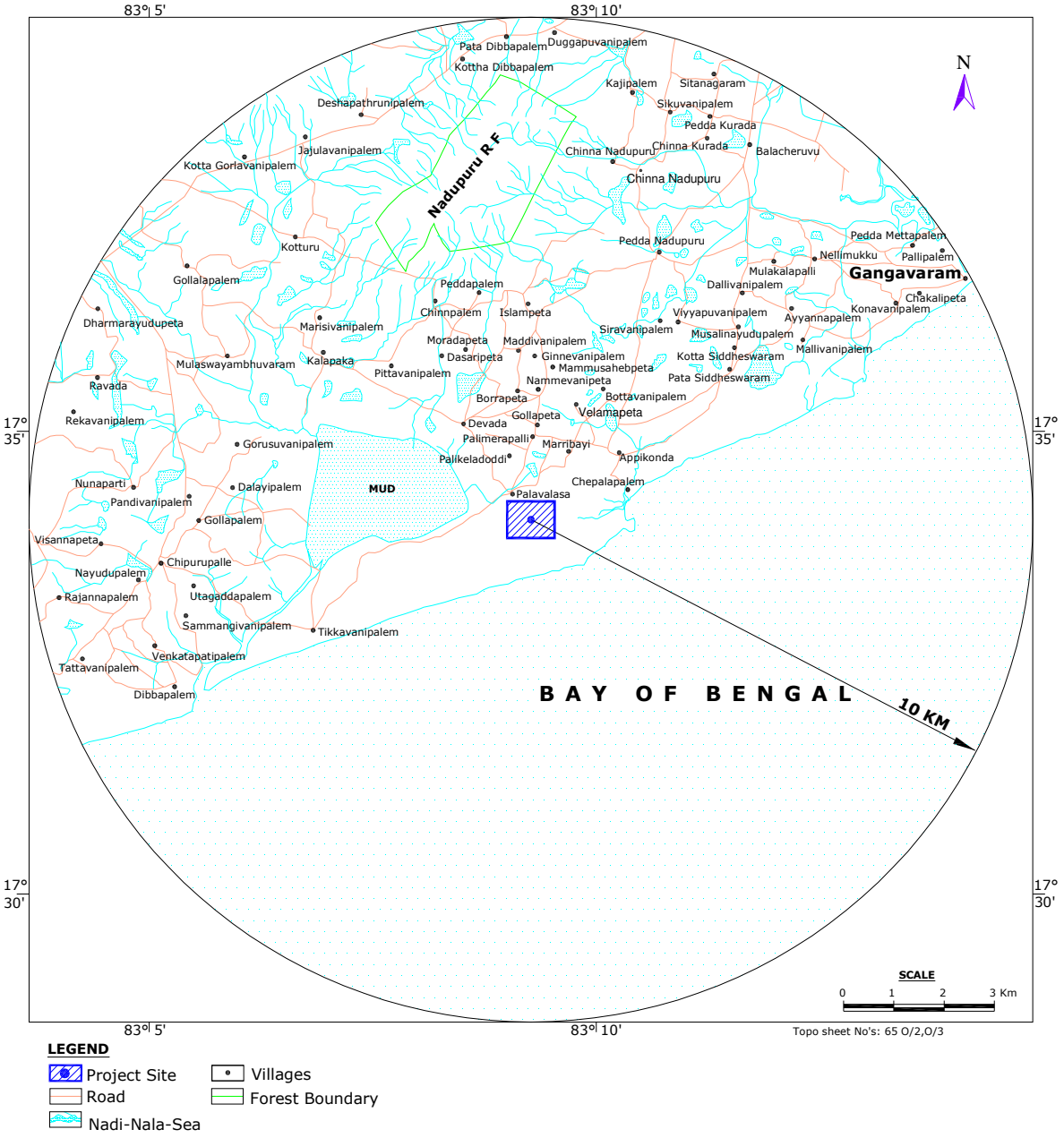


FIGURE-1.2
LOCATION MAP-10KM RADIUS

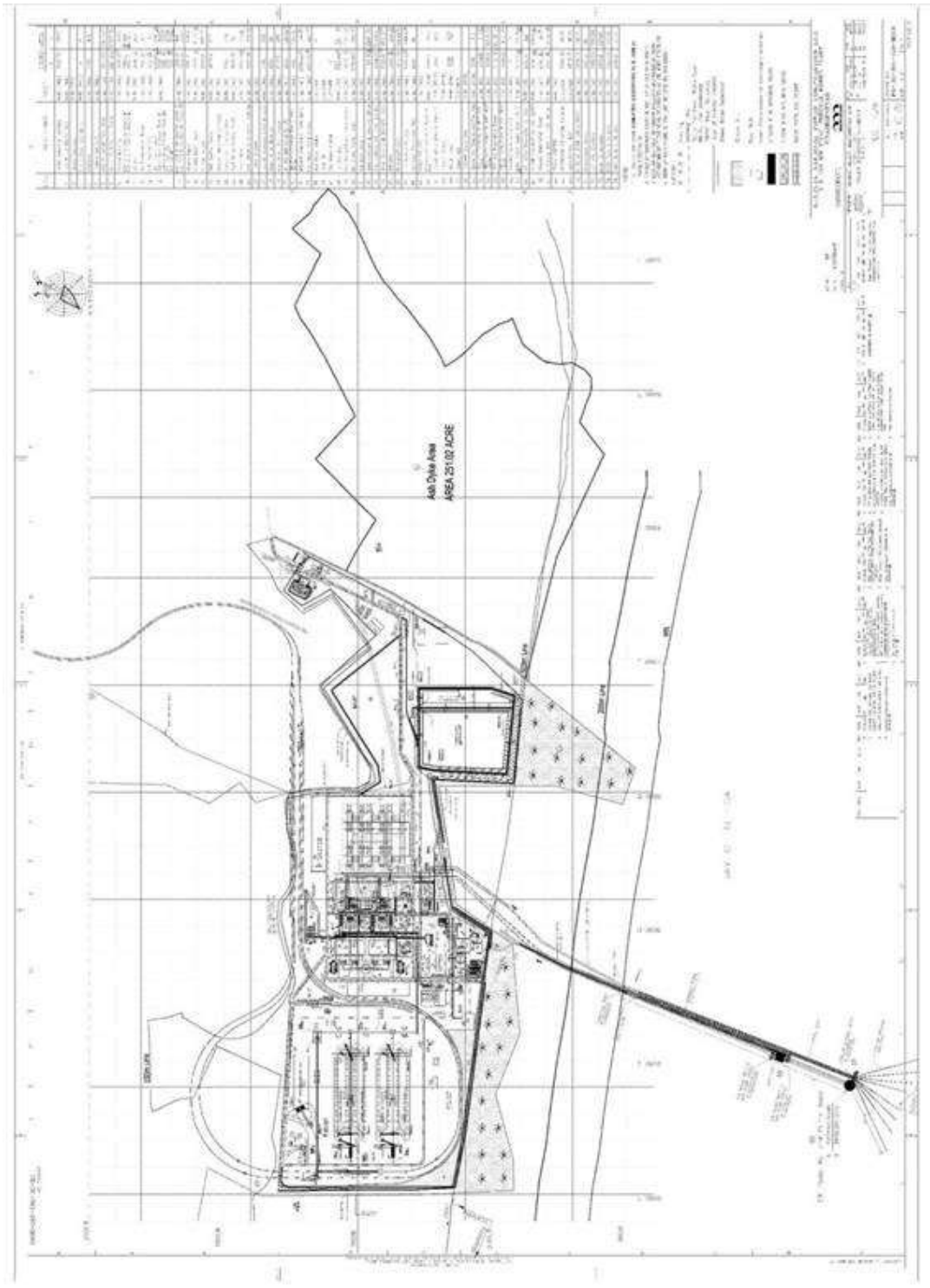


FIGURE-1.3

PLANT LAYOUT FOR HNPCL'S 2 X 520 MW THERMAL POWER PLANT AT VISHAKAPATNAM

Chapter-2
Compliance Status Report

COMPLIANCE STATUS REPORT – OCTOBER 2023 TO MARCH 2024

Ref: **Environment Clearance & Amendments to Environment Clearance Letter and Consent for Operation as mentioned below:**

1. Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996
2. Letter No: J–13011/11/90-IA-II(T) dated 10th September, 1996
3. Letter No: J-13011/11/90-IA.II dated 15th November, 1996
4. Letter No: J-13011/11/90-IA.II(T) dated 20th April, 1999
5. Letter No: J-13012/92/2008.IA.II(T) dated 4th March, 2009
6. Letter No: J-13012/92/2008-IA.II(T) dated 10th June, 2010
7. F. No: 11-58/2011-IA-III dated 3rd January, 2014
8. F. No: 11-58/2011-IA-III dated 17/19th March, 2015
9. Letter No: 245/Env/CZMA/2015, dated 05th June, 2015
10. F. No: 11-58/2011-IA-III dated 01st October, 2015
11. Consent Order No:APPCB/VSP/19/HO/CTO/2016- dated :21st March,2023

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
Specific Conditions		
i)	All the conditions stipulated by Andhra Pradesh Pollution Control board vide their letter No.19/PCB/ C.Estt./RO/VSP/AEE/V111/95-4433 dated 13th November, 1995 should be strictly implemented	Noted and are being complied as applicable. A monthly environmental monitoring report is being submitted to APPCB every month.
ii)	A bi-flue stack of 275 m with continuous stack monitoring system should be installed.	A bi-flue stack of 275 m has been constructed with continuous stack monitoring system.
iii)	Electrostatic precipitator having efficiency of not less than 99.8% should be installed and it should be ensured that particulate emissions would not exceed the prescribed limit of 150 mg/Nm3.	An ESP with 99.8% efficiency has been installed to control the Particulate matter emissions below 50 mg/Nm3.
iv)	Once through cooling system should be provided and the rise in temperature should be maintained within 7 degrees centigrade of the ambient water. The proposed pipeline for sea water intake and outlet should conform to the regulations of the coastal zone notification of February, 1991. Desalination plant should be provided for meeting the water requirement of the power project and other auxiliary activities.	Water balance of the power plant enclosed as **Annexure-II** (Please check with HNPCL Engineering for Latest WBD). We have obtained the CRZ clearance from MoEF has been obtained for sea water intake//outfall system. Once through cooling system has been designed to maintain temperature differential within 7 deg centigrade over and above the ambient temperature of receiving water body and being maintained the same during operation of the Plant. Desalination plant with a capacity of 12.5 MLD has been installed to meet the sweet water requirement.
v)	Adequate space should be provided for installation of flue gas desulphurization plant in future for control of sulphur dioxide.	Space provision for installing FGD if required, has been provided in the plant layout in future for control Sulphur dioxide.

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
vi)	Acquisition of land should be restricted to 2682 acres including 890 acres for ash disposal.	Complied. The plant has been established in an area of 723 acres including ash pond.
vii)	Only beneficiated coal to the tune of 16080 MT/day should be used with ash content not exceeding 34%. Fly ash generated should be collected in dry form in silos and fully utilized in a phased manner. As indicated in the Environmental Management plan, increase in the dyke height above 8 m should be undertaken through use of fly ash. For avoiding contamination of ground water, ash pond area should be suitably lined and dyked. As provided in the layout, adequate space should be earmarked for getting up of ash user plants to avoid long distance transportation to fly ash.	MoEF vide its letter mentioned in Ref:3 has modified this condition to be read as "Only beneficiated coal to the tune of 16080 metric tonnes/day should be used with average annual ash content supplied by Mahanadi Coalfields Limited not exceeding 34+ or - 1-2%. Fly ash generated should be collected in dry form in silos and fully utilized in a phased manner. As indicated in the Environmental Management plan, increase in the dyke height above 8 m should be undertaken through use of fly ash. For avoiding contamination of ground water, ash pond area should be suitably lined and dyked. As provided in the layout, adequate space should be earmarked for getting up of ash user plants to avoid long distance transportation to fly ash." Further vide letter mentioned in Ref:4 MoEF has accorded "no objection to the use of fuel from alternative sources which will have the same coal quality as beneficiated coal". • With respect to the above we confirm that: Total coal expected to be used in a day will be well within the quantity recommended. Fly ash will be fully utilized in a phased manner as mentioned in the condition. • Ash pond is being lined with HDPE to prevent contamination of ground water. Further the Ground water monitoring is being undertaken by a third party on Monthly basis as per the monitored data the levels are within permissible limits. • Pond ash and Fly ash will be utilized by the following Agencies: 1) Simhadri Constructions. 2) Ramco cements 3) My home cements 4) Sagar cements 5) Vipasana 6) Sri Sai Ganesh Transporter 7) Chettinad cements 8) Nagrajuna cements 9) Ultra tech cements 10) Brick industries. 11) Haricharan Logistics- high ways
viii)	Noise level should be limited to 85 dBA and regular maintenance of equipments be undertaken. For people working in the area of generator halls and other high noise areas, ear plugs should be provided.	Noise levels are being monitored by third part at locations within the plant area and the results are within prescribed limits. Requisite personnel protective equipment has already been provided to people working in high

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
		noise areas.
ix)	For controlling fugitive dust, regular sprinkling of water in coal handling and other vulnerable areas of the plant should be ensured.	Dust Suppression system installed and regular sprinkling of water on coal in stock yard and conveyors is being ensured.
x)	Afforestation plan should be formulated in consultation with the local DFO and implemented by creating a greenbelt of 500 m along the sea side from High Tide Line. A strip of greenbelt of 150-200 m should also be created along the ash pond area and about 100 m in available spaces within the colony along the road etc. A norm of 1500-2000 trees per ha should be followed and aftercare and monitoring should also be ensured.	The power project including ash pond is restricted to 533 acres. Presently green belt is being developed in and around the power project area and an area of 249.14 acres has already been developed. Further development of Green belt continues.
xi)	Continuous monitoring of ground water should be undertaken by establishing good network of observation wells in consultation with the Central ground water board. Results and data collected should be analysed to ascertain the status of water quality and findings should be submitted for evaluation.	Continuous ground water monitoring is being carried out at seven locations on Monthly basis and the monthly data is being submitted to APPCB. As per the results the limits are within the prescribed norms. The same has been compiled and is enclosed in **Chapter-3, Section-3.5.**
xii)	All effluents generated in various plant activities should be collected in the Central Effluent Treatment Plant and treated to ensure adherence to specified standards of discharge. The concept of zero discharge should be adopted to a maximum possible extent.	Complied. All the effluents generated are being treated in the Effluent Treatment Plant (ETP). The outflow is being monitored by continuous monitoring system. Zero discharge has been adopted to the maximum possible extent.
	Keeping in view the fact that 2x500 MW thermal power plant by M/s. National Thermal Power Corporation limited proposed in the vicinity of 1040 MW thermal power project, common facilities for coal transportation, laying of rail lines etc. should be worked out with mutual consultation to avoid duplication of facilities and acquisition of additional land.	Noted For coal transportation, the facilities are being explored with NTPC and discussions are under progress.
xiv)	A financial provision of Rs. 250 crores should be provided for implementation of environmental mitigative measures with adequate scope for its enhancement in future. These funds should not be diverted for any other activities and separate account should be maintained.	Noted
xv)	Regular monitoring for SPM, SO_2 and NOx around the power plant may be carried out and records maintained. The data also collected should be properly analysed and submitted to the Ministry every six months.	Monitoring is being carried out at eight ambient air quality monitoring stations within the 10 km radius study area from the existing power plant complex, with two in the predominantly downward wind direction. Data on ambient air quality is being submitted to APPCB on monthly basis and also to the regional office of MOEF. As per the AAQ data, the results are

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
		within limits. The same has been compiled and is enclosed in **Chapter-3, Section-3.2.**
xvi)	Full cooperation should be extended to the Scientists/officers from the Regional Office of the Ministry at Bangalore and also to the State Pollution Control Board who would be monitoring the compliance of environmental status. Complete set of impact assessment report and the Management Plans should be forwarded to the Regional Office for their use during monitoring.	Noted.
xvii)	Monitoring committee should be constituted for reviewing the compliance to various safeguard measures by involving recognized local NGOs, Pollution Control Board experts etc.	Internal Environmental Monitoring Committee is in place.
3	The Ministry reserves the right to revoke the clearance if conditions stipulated are not implemented to the satisfaction of the Ministry	Noted
4	For any deviation or alteration in the project proposed from those submitted to this Ministry for clearance, a fresh reference should be made to the Ministry to assess the adequacy of the conditions imposed and to add additional environmental protection measures required, if any.	Noted
5	The above stipulations would be enforced among others under 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 Impact Assessment Notification of January, 1994 and its amendments.	Noted

S.No.	Conditions	Compliance status
6	Map indicating CRZ area duly certified by the approved agency and authenticated by the state coastal zone management authority may be submitted on Top priority.	Map has already been submitted to MOEF,
7	Compliance status w.r.to stipulated EC conditions should be uploaded in the company web site and updated twice in a year and the same will also be sent by e-mail to the MOEF regional office located at Bangalore.	Six monthly compliance reports are being regularly uploaded on the company web site. The link is as below. http://www.hindujanationalpower.com/images/compliance-status October 2023 - March 2024 -website-version.pdf
8	The ambient levels of criteria pollutants (SO2, NOX & SPM) should be uploaded and displaced on your website and also at a convenient place in the plant premises periodically.	Display is kept at the entrance of power project.

Sr. No	Condition (Letter No: 11/58/2011 IA.III dated 3rd January, 2014)	Compliance Status
SPECIFIC CONDITIONS		
(i)	"Consent for Establishments" shall be obtained from State Pollution Control Board under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.	"Consent for Establishment" was issued by state pollution control board vide their order no 19/PCB/C.ESTI/RO/VSPI AEE- VIII/95 -4433 signed dated 13/11/1995 and complied with.
(ii)	Shall maintain the existing vegetation cover in the area between HTL and 500m line which is approximately 180 acres, belonging to government, located adjacent to the project area, in consultation with the State Government and there shall be no industrial development with in this area as committed.	Existing plantation is being maintained between HTL and 500 m line. Additional 5 acres of land has been developed.
(iii)	The railway line has been shifted from mud flat area and as per the modified line only 160m is with in mud flat area as against the original plan on 1500m. Railway line in CRZ area shall be on stilt.	Noted. Correction in the design has been done for implementation and as per revised proposal length of Railway line in CRZ3 area is 0.375 Route Km and Railway line does not pass through CRZ1 area or Inter tidal waters of mud flat. The proposal was approved by MOEF&CC vide letter No.F.No.11-58/2011-IA-III

Sr. No	Condition (Letter No: 11/58/2011 IA.III dated 3rd January, 2014)	Compliance Status
		dated:1st October, 2015.
(iv)	There shall be no construction in mudflat except part of railway line on stilt as committed.	Noted.
(v)	Adequate spare diffuser arms for operation and maintenance of the marine outfall systems shall be Provided.	Noted
(vi)	Pipelines shall be laid with more care to minimize the impact to sand dunes	Noted.
(vii)	The double story switchgear, electro chlorination building and two numbers of storage tanks Proposed between 200 and 500 m from HTL shall be located beyond 500 m from HTL as committed.	Complied. The electro chlorination building and the storage tanks have been constructed beyond 500 m from the HTL with in the plant premises.
(viii)	Periodic monitoring of water quality in terms of temperature chlorine content if applicable, salinity etc at the outfall locations shall be carried out. If the impact of temperature and salinity is found significant in future, necessary remediation measures shall be taken by extending the outfall as well as the intake lines and/or providing augmentation in inland cooling facilities.	Periodic monitoring of water quality is going on at outfall location. Agreed.
(ix)	Installation of trash bar/screens shall be put in place at the intake well to avoid fish entrapment	Complied. Trash rack has been installed.
(x)	All the conditions laid by the SCZMA shall be strictly adhered to.	Agreed
(xi)	Construction activity shall be carried out strictly as per the provisions of CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	Agreed
(xii)	The project shall be executed in such a manner that there shall not be any Disturbance to the fishing activity.	Noted. There is no disturbance to fishing activity
	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project	Being followed.
(xiii)	The project proponents shall set up separate Environment management cell for effective implementation of the stipulated environmental Safeguard under the supervision of a Senior executive.	Environment management cell is in place to monitor the implementation on continuous basis.
	The funds earmarked for environment management shall be included in the budget and this shall not be diverted for any other purposes.	Noted.
General Conditions		
Sr.No	**Condition (Letter F.No: 11-58/2011-IA-III dated 3rd January, 2014)**	**Compliance Status**
(i)	Appropriate measures must be take while undertaking digging activities to avoid any likely degradation of water quality.	Noted.
(ii)	Full supports shall be extended to the officer of this Ministry/Regional office at Bengaluru by the project proponent during inspection of the project for monitoring	Noted.

Sr. No	Condition (Letter No: 11/58/2011 IA.III dated 3rd January, 2014)	Compliance Status
	purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environment protection activities.	
(iii)	A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bengaluru regarding the implementation of the stipulated Conditions.	Noted and being complied with.
(iv)	Ministry of Environment & Forests or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	Agreed.
(v)	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
(vi)	In the event of a change in project profile or change in the implementation agency, fresh references shall be made to the Ministry of Environment and Forests.	Noted
(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 and the date of start of land Development work.	Complied.
(viii)	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion /representation has been Made received while processing the Proposal.	Agreed.
(ix)	State Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's Office/ Tehsildar's office for 30 days.	NA

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA.III dated 17/19th March 2015)	Compliance Status
(i)	Railway line, in the CRZ, shall be on embankment with clear openings or on stilt so as to ensure free flow of water.	Noted. Being complied with.
(ii)	PP shall get an expert opinion on the design of alignment on CRZ area on embankment with clear openings or on stilt so as to ensure free flow of water and submit to Ministry prior to commencement of Railway line work in CRZ area.	Noted
(iii)	The water bodies present adjacent to the proposed to the Railway alignment shall not be disturbed.	Noted. Shall be adhered to.

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA-III dated 01th October 2015) (Amendment in CRZ Clearance-reg)	Compliance Status
(i)	All the conditions/recommendation stipulated by Andhra Pradesh Coastal zone Management Authority (APCZMA) vide letter No.245/Env/CZMA/2015 dated 05.06.2015 shall strictly be complied with	Noted. Details are furnished below

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA-III dated 01th October 2015) (Amendment in CRZ Clearance-reg)	Compliance Status
(ii)	All the condition stipulated in the clearance vide letter No.11-58/2011-IA-III dated 3rd January, 2014 and subsequent amendment dated 17th March, 2015 shall remain unchanged.	Noted and complied as detailed above

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA-III dated 01th October 2015) (Interim arrangement for the sea water intake and outfall system-reg)	Compliance Status
(i)	All the conditions/recommendation stipulated by Andhra Pradesh Coastal zone Management Authority (APCZMA) vide letter No.245/Env/CZMA/2015 dated 06.07.2015 shall strictly be complied with	Noted. Details are furnished below
(ii)	All the condition stipulated in the clearance granted by this Ministry vide letter No.11-58/2011-IA-III dated 3rd January, 2014 and subsequent amendment dated 17th March, 2015 shall remain unchanged.	Noted and being complied with
(iii)	The PP shall use multi diffuser in the outfall. As suggested by NCSCM, the thermal water shall be release at 10 m depth from the 8 diffuser.	Noted and being complied with
(iv)	A monitoring system shall be deployed by the PP to assess the movement of thermal plume in and around the outfall coolant water jetty due to the occurrence of thermal plume oscillation in south-north direction during monsoon and also to monitor the impact of hot water discharge in to the sea water flora and fauna. The PP shall comply with at the direction of the APCZMA and take necessary corrective measures wherever required.	Noted and being complied with. Hydro dynamic Studies, dispersion modeling studies for Intake and Outfall discharge studies are being carried out by Environ software(P) Ltd and the same is submitting to the concerned parties
(v)	The PP shall take all necessary clearance from the concerned authorities viz-a-viz from the concerned State Pollution Control Board	Noted and being complied with
(vi)	Care should also be take to ascertain minimal impact on the shore line change due to construction of coastal structures. For this purpose, shoreline change shall be monitored using the satellite imaginary and by beach profile studies at regular intravels.	Noted and being complied with

Sr. No.	Condition (Letter No: 245/Env/CZMA/2015, dated 05th June 2015)	Compliance Status
1	The proposed pipeline shall conform to the norms prescribed in the CRZ Notification issued by the Ministry of Environment and Forests, Government of India S. 0. No.19(E), dated 06-01-2011	Complied
2	No activity on the ground shall be undertaken without obtaining Environmental Clearance from the Ministry of Environment and Forests, Government of India as per S. 0. No.19(E), dated 06-01-2011 and the amendments issued thereof	Noted

Sr. No.	**Condition (Letter No: 245/Env/CZMA/2015, dated 05th June 2015)**	Compliance Status
3	There shall be minimum disturbance to the sand dunes and other vegetation	Noted
4	On account of inversion process occurring along the Vizag coast, wherein the temperature profile gets reversed in such a way that bottom temperature tends to become higher than surface temperature on seasonal basis. Hence, it is suggested that a constant monitoring system shall be established to monitor the physical, chemical and biological activity near the outfall point and its surroundings. The industry shall take necessary steps to attain the safe diffusion of used ballast sea water discharged through outfall system	Temperature is Regularly monitoring at discharge points. All necessary measures has taken for safe discharge of ballast sea water.
5	Marker buoy and light indicators shall be established close to the intake and outfall points to avoid fishing net damage	Maker buoys and light indicators were installed.
6	Residual chlorine in the return water shall be kept at a very low concentration at discharge point. If possible, de-chlorination by hypo may be taken up before disposal of warm water into the sea	Residual chlorine is observed within limit. (<0.2ppm).
7	Additional diffusers shall be installed to enhance the dispersion of the hot water to facilitate the dissipation of temperature	Noted.
8	Regular monitoring of water quality at bottom and surface shall be carried out for pH, TSM, Salinity, DO, BOD, dissolved phosphate, nitrate, ammonia and PHC	Water quality monitoring in sea water is being carried out regularly.
9	Inter-tidal region shall be analyzed for texture, phosphorous, chromium, nickel, copper, cadmium, lead, mercury and PHC	Noted and being complied with
10	Biological characteristics shall be assessed based on primary productivity, phytopigments, phytoplankton populations and their generic diversity, biomass, population and community diversity of benthos, fisheries composition and density as well as species diversity	Noted and being complied with
11	Regular (seasonal) monitoring of temperature at the outfall to take necessary mitigation measures. Online monitoring of salinity and temperature may be implemented	Is being complied
12	Shoreline evolution to be predicted by using Mathematical Model preferably `LITPACK of MIKE.21' due to the impact that may be caused by the piers constructed to carry intake and outfall pipelines	Noted and being complied with
13	Shoreline monitoring shall be carried out regularly by a reputed organization having requisite experience, in order to take up suitable preventive measures.	Noted and being complied with
14	The geographical position of the present HTL, LTL and slope of the beaches shall be maintained i.e. any erosion that may occur need to be prevented. The beach front shall be restored to the normal condition by adopting suitable engineering and vegetative measures	Noted and being followed.
15	The Ash generated shall be utilized as per the norms	Noted and being complied with

Sr. No.	**Condition (Letter No: 245/Env/CZMA/2015, dated 05th June 2015)**	Compliance Status
	stipulated in Fly Ash Notification dated 14-09-1999	
16	Environmental audit shall be taken up periodically by the independent agency and submit the report to the Regulatory Agencies	Noted and Form-V is being submitted

Sr. No.	**Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II**	**Compliance Status**
	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.	Noted and shall be complied when such condition arises.
2	The industry should carryout analysis of waste water discharges or emissions through chimneys for the parameters mentioned in this order on quarterly basis and submit to the Board.	Noted and being complied with
3	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
4	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
5	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	Noted and being complied with
6	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.	Noted
7	The industry 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 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.	Noted
8	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	Noted

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	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.	
9	The industry 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.	Noted
10	The industry may explore the possibility of tapping the solar energy for their energy requirements.	Under review.
11	The industry should educate the workers and nearby public of possible accidents and remedial measures	Noted
	SCHEDULE – B	
	The industry shall comply with the following conditions:	
1	The industry shall complete the installation of FGD by 31.12.2024 as per MoEF &CC G.S.R.No. 682 dated 05.09.2022	HNPCL achieved COD of both the units is 2016. The plant was in reserved shutdown for more than 3 years since COD due to litigation with Discoms. HNPCL plant started operations after Hon'ble Supreme Court's order dated 02-Feb-2022. Meanwhile HNPCL has conducted a Pre-Feasibility Study for FGD by TCE which was sent to CEA for approval 05-05-2018. CEA recommended that the process of tendering and finalization of commercial contracts should be done jointly with procurers, AP Discoms. As per Supreme court order the PPA was approved by APERC in Aug'22. HNPCL has approached AP Discoms for a joint decision on FGD technology and project finalization as per the CEA recommendation. The nomination of a Team from Discom is awaited. Follow-up is being done. Furthermore, HNPCL was categorized in category-A as per the notification dated 31-3-2021 stating that it is under 10KM radius of Visakhapatnam city. HNPCL appealed to MOEF and CPCB for re-categorization of plant to Category-C. As per CPCB the task force decision is final. Meanwhile, HNPCL is in process of pursuing MoP for extension of time on grounds that the project has suffered due to regulatory issues. As per MOEF&CC Notification Dated 05.09.2022, FGD completion time lines have been extended up to 31.12.2024.

<table>
<tr><th>Sr. No.</th><th>Condition
(Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II</th><th>Compliance Status</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>2</td><td>The industry shall transmit the data of CEMS connected to the Stacks to the APPCB website without interruption.</td><td>Online monitoring systems are available and Connected to board through online website.</td></tr>
<tr><td></td><td>WATER POLLUTION</td><td></td></tr>
<tr><td>3</td><td>The effluent discharged shall not contain constituents in excess of the tolerance limits mentioned below
<table>
<tr><th>Outlet</th><th>Parameter</th><th>Limiting Standards</th></tr>
<tr><td>1</td><td>pH</td><td>6.50 — 8.50</td></tr>
<tr><td></td><td>Temperature-not more than 7°C higher than intake water a per MoEF Communication dated 20.04.1999.</td><td></td></tr>
<tr><td></td><td>Total Suspended Solids(at 103—105° C)</td><td>100 mg/I</td></tr>
<tr><td></td><td>Oil and Grease</td><td>20 mg/I</td></tr>
<tr><td></td><td>Free chlorine</td><td>0.5 mg/I</td></tr>
<tr><td></td><td>Phosphate as PO4</td><td>20 mg/I</td></tr>
<tr><td></td><td>Chromium (Total)</td><td>0.2 mg/I</td></tr>
<tr><td></td><td>Copper (Total)</td><td>1mg/I</td></tr>
<tr><td></td><td>Iron</td><td>1 mg/I</td></tr>
<tr><td></td><td>Zinc</td><td>1 mg/I</td></tr>
<tr><td>2</td><td>pH</td><td>6.50 — 8.50</td></tr>
<tr><td></td><td>Oil and Grease</td><td>10 mg/l</td></tr>
<tr><td></td><td>BOD (3 days at 27 °C)</td><td>30 mg/l</td></tr>
<tr><td></td><td>Total Suspended Solids</td><td><100 mg/I</td></tr>
<tr><td></td><td>Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml</td><td><1000MPN /100 ml</td></tr>
</table></td><td>Noted and the effluent is Within the prescribed limits</td></tr>
<tr><td>4</td><td>The industry water consumption shall not exceed the quantities mentioned below:
<table>
<tr><th>S.No</th><th>Purpose</th><th>Quantity (m3/hr)</th></tr>
<tr><td>1</td><td>Condenser & Auxiliary Cooling Water System</td><td>175580</td></tr>
<tr><td>2</td><td>Ash water sump</td><td>2600</td></tr>
<tr><td>3</td><td>Dust Suppression system</td><td>220</td></tr>
<tr><td>4</td><td>For Desalination Plant feed</td><td>1600</td></tr>
<tr><td></td><td>Total</td><td>180000</td></tr>
<tr><td colspan="3">Details of specific consumption:</td></tr>
<tr><td>4 A</td><td colspan="2">From Desalination Plant to Reservoir</td></tr>
<tr><td>4 A 1</td><td>From reservoir to UF/RO System</td><td>503</td></tr>
<tr><td>a</td><td>RO Plant to Boiler Make Up, CPU Regeneration & other utilities</td><td>110</td></tr>
<tr><td>b</td><td>Blow down Quenching</td><td>90</td></tr>
<tr><td>C</td><td>Domestic Water</td><td>30</td></tr>
<tr><td>d</td><td>HVAC & Ventilation</td><td>80</td></tr>
<tr><td>e</td><td>Seal Water</td><td>75</td></tr>
<tr><td>f</td><td>Service water</td><td>52</td></tr>
<tr><td>g</td><td>APH & ESP Wash (As and when required)</td><td>06</td></tr>
<tr><td>h</td><td>RO Plant to Clarifier</td><td>---</td></tr>
<tr><td>i</td><td>UF , RO & EDI reject</td><td>70</td></tr>
<tr><td>4 A B</td><td>Water remain in recovery</td><td>11</td></tr>
</table>
Separate meters with necessary pipe-line shall be maintained for assessing the quantity of water used for each of the purposes mentioned above for Cess assessment purpose.</td><td>Noted and being complied with</td></tr>
<tr><td>5</td><td>The industry shall install and maintain digital electromagnetic flow meters with totalizers for Sea water drawl, water consumption and waste water generation for different streams of effluents and different categories of water usage stipulated in this order</td><td>Noted and being complied with</td></tr>
<tr><td>6</td><td>The industry shall maintain proper arrangements for collection of seepage from ash pond and pumped back</td><td>Noted and being complied with</td></tr>
</table>

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	into the ash water system, so as to avoid ground water pollution in the surrounding area. The run-off water from coal yard shall be treated to on land for irrigation standards before final disposal.	
7	The industry shall discharge the once through cooling water into sea through a suitable sub-marine pipeline. The industry shall discharge off once through cooling effluents from Unit – 1 & 2 at a distance of 900 mts from the shoreline	Noted and being complied with
8	The PP shall use multi diffuser in the outfall. As suggested by NCSCM, the thermal water release shall be release at 10 m depth from the 8 diffuse	Noted and being complied with
9	The industry shall monitor all ground water peizo wells and submit report to RO Visakhapatnam every three months indicating trends	Noted and being complied with
10	The industry shall construct separate storm water drains and provide rain water harvesting structures. No effluents shall be discharged in to the storm water drains	No effluents are discharged into drains. Storm water drains are available in the plant. Harvesting of Rain water will be reviewed.
11	The industry shall maintain Continuous Effluent Quality Monitoring Stations (CEQMS) for the parameters pH, TSS and Temperature data is transmitted to CPCB / APPCB on continuous basis.The industry shall comply with CPCB directions dated 05.02.2014 / 02.03.2015 and guidelines issued regarding online monitoring systems File No.APPCB/VSP/VSP/19/HO/CFO/2017 issued from time to time. The online monitoring system shall be calibrated periodically as per equipment suppliers manual / CPCB guidelines.	Being followed.
	AIR POLLUTION	
12	The emissions shall not contain constituents in excess of the prescribed limits mentioned below. **Chimney No. / Parameter / Emission Standards** 1 / Particulate matter / 50 mg/Nm3 / SO2 / 200 mg/Nm3 / NOx / 450 mg/Nm3 / Mercury / 0.03 mg/Nm3	Noted.
13	The industry shall comply with emission limits for DG sets of capacity upto 800 KW as per the Notification G.S.R.520 (E), dated 01.07.2003 under the Environment (Protection) Amendment Rules, 2003 and G.S.R.448(E), dated 12.07.2004 under the Environment (Protection) Second Amendment Rules, 2004. 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.	Noted and being complied with. The DG sets are standby and used only in the absence of grid power supply.
14	The industry shall comply with ambient air quality standards of PM10 (Particulate Matter size less than 10µm) - 100 µg/m3; PM2.5 (Particulate Matter size less than 2.5 µm)60 µg/m3; SO2 - 80 µg/m3; NO2 - 80 µg/m3 outside the factory premises at the periphery of the industry. Standards for other parameters as mentioned in the National Ambient Air	Noted and being complied with The Ambient air Quality and noise

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	Quality Standards CPCB Notification No.B-29016/20/90/PCI-I, dated 18.11.2009 **Noise Levels**: Day time (6 AM to 10 PM) - 75 dB (A) Night time (10 PM to 6 AM) - 70 dB (A).	parameters with in the stipulated standards and reports are being submitted regularly
15	The industry shall provide a sampling port with removable dummy of not less than 15 cm diameter in the stack at a distance of 8 times the diameter of the stack from the nearest constraint such as bends etc. A platform with suitable ladder shall be provided below 1 meter of sampling port to accommodate three persons with instruments. A 15 AMP 250 V plug point shall be provided on the platform	Noted and being complied
16	The industry shall provide interlocking facility between APC equipment (ESP) and fuel feeding system, in such a way that the feeding of the fuel shall be stopped automatically, in case, the ESP fails/ tripping's are occurred.	Noted Alarm system of ESP fields is hooked up to main plant control room for taking immediate corrective measures.
17	The industry shall maintain suitable control equipment facilities in the coal handling plant and dust suppression in all coal and material handling areas shall be achieved through appropriate methods	Noted and being complied
18	The industry shall maintain 3 CAAQM station at different locations and data File No.APPCB/VSP/VSP/19/HO/CFO/2017 transmitted to APPCB website	3 CAAQMS stations are being maintained.
19	The industry shall not exceed of emissions standards at any point of time. In case the industry exceeds the standards in the CEMS data, environmental compensation will be levied	Noted
	GENERAL:	
20	The industry shall not increase the capacity beyond the permitted capacity mentioned in this order.	Noted
21	.The industry shall maintain permanent mechanical sprinklers for suppression of dust on the haul roads in between the villages and report the compliance to RO-Visakhapatnam	Complied. Mobile water tankers are being used for water sprinkling on roads.
22	The industry shall not use any fuels other than those permitted in this order without prior consent from the Board. They shall maintain log registers on type of fuels & daily consumption, ash content, sulphur content etc., and shall furnish consolidated records to R.O., Visakhapatnam for every three months	Noted
23	The industry shall maintain duly compacted soil cover of requisite thickness as per norms for the ash ponds to avoid dust pollution and report the compliance to RO-Visakhapatnam.	Usually, Abandoned/closed/ not in use ash ponds were compacted with soil cover of requisite thickness. HNPCL is having only two ash ponds, one for filling and one for evacuation. Ash pond for filling is maintained with water curtain and the one which is used for evacuation, is maintained with water sprinklers.
24	The industry shall achieve 100% utilization of fly ash as per the Fly Ash Notification	Noted.

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
25	The industry shall establish a dedicated Environmental cell for continuous monitoring of plant environment to ensure compliance of CFO conditions.	Dedicated Environment Management cell is in place to ensure compliance to CFO Conditions.
26	The industry shall maintain the following records and the same shall be made available to the Board Officials during the inspection. • Daily power generation details. • Quantity of Effluents generated and disposed. • Log Books for pollution control systems. • Daily Fly ash generated and disposed.	Noted and being complied with
27	The industry shall provide truck-tyre washing facility near ash pond area to avoid dust emissions during the movement of the trucks.	Complied.
28	The industry shall dispose fly ash to cement / brick units and export, excess to ash pond	Pond ash and Fly ash will be utilized by the following Agencies: 1) Simhadri Constructions. 2) Ramco cements 3) My home cements 4) Sagar cements 5) Vipasana 6) Sri Sai Ganesh Transporter 7) Chettinad cements 8) Nagrajuna cements 9) Ultra tech cements 10) Brick industries. 11) Hari charan logistics- highway work.
29	The industry shall maintain water curtain in ash ponds as the fly ash is exposing to atmosphere and causing dust emissions during wind blow	Noted and being complied with
30	Thick green belt shall be maintained by the industry covering an area of minimum 33% of total area.	Presently green belt is being developed in and around the power project area in consultation with DFO and an area of 252 acres has already been developed. Further development of Green belt in Progress.
31	A monitoring system shall be deployed by the industry to assess the movement of thermal plume in and around the outfall coolant water jetty due to the occurrence of thermal plume oscillation in south-north direction during monsoon and also to monitor the impact of hot water discharge into the Sea and the flora and fauna. The industry shall comply with at the directions of APCZMA and take necessary corrective measures wherever required	Noted and being complied with
32	The industry shall maintain valid PLI policy which includes Environmental Relief Fund (ERF) and submit copy to RO, Visakhapatnam on yearly basis	Complied.
33	The industry shall comply with SoPs issued by CPCB time	Noted

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	to time for all the wastes.	
34	The industry 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 Vs permitted quantities and validity of CTO; and exhibit the CTO order at a prominent place in the factory premises, as per Hon'ble Supreme Court order.	Display is kept at the entrance of power project.
35	The industry shall submit Half yearly compliance reports to all the stipulated conditions in Environmental Clearance (EC), Consent to Establishment (CTE) and Consent to Operation (CTO) 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 industry 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	Noted and being complied
36	The industry shall comply with conditions stipulated in EC, CRZ, CFE orders & their amendments and Taskforce directions issued by the Board from time to time.	Noted
37	Any other directions / circulars / notices issued by CPCB, MoEF&CC and APPCB shall be followed from time to time.	Noted
38	The conditions stipulated are without prejudice to the rights and contentions of this Board in any Hon'ble Court of Law.	Noted
	Special Conditions	
39	The industry shall posses a valid NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) at concerned Regional Office, APPCB.	Complied.
40	The industry 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	Noted and being complied with
41	The industry shall extend training to the working personnel for the prevention of accidents and necessary antidotes to ensure safety, as per the MSIHC Rules, 1989.	Noted and being complied with
42	The industry shall carryout calibration of safety equipment and leak detection systems at regular intervals and shall certify the same with the Factories Department. That File No.APPCB/VSP/VSP/19/HO/CFO/2017 certified copy shall be submitted to the APPCB, Regional Office	Being complied.
43	The industry shall install fluorescent Wind Vane at the highest point in the industry premises	Fluorescent wind socks are provided at 5 strategic highest locations.
44	The industry shall submit Risk analysis and risk assessment covering worst scenario clearly describing	HARA report is available for hydrogen plant.

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	impact within the industry premises and outside the industry premises and emergency response system.	
45	The industry 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	Onsite emergency plan is available.
	SCHEDULE – C [*see rule 6(2)]*	
	[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]	
1	The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.	Noted and being complied with
2	The authorisation shall be produced for inspection at the request of an officer authorised by the State Pollution Control Board.	Noted
3	The person authorised shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.	Noted
4	Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization.	Noted
5	The person authorised shall implement Emergency Response Procedure (ERP) for which this authorisation 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;	Noted and being complied with
6	The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty".	Noted and being complied with
7	It is the duty of the authorised person to take prior permission of the State Pollution Control Board to close down the facility.	Noted
8	An application for the renewal of an authorization shall be made as laid down under these Rules.	Noted and being complied
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.	Noted
	Specific Conditions:	
10	The industry 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.	Noted and being complied
11	The industry shall not store hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.	Noted and being complied
12	The industry shall store Used / Waste Oil and Used Lead	Noted and being complied

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.	
13	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.	Noted and being complied
14	The industry shall maintain proper records for Hazardous and Other Wastes stated in Authorisation 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.	Noted and being complied
15	The industry shall route all the hazardous waste through M/s. APEMC	Noted and being complied

Chapter-3

Environmental Data Analysis

3.0 BASELINE ENVIRONMENTAL STATUS

3.1 Meteorology

Micro - Meteorological data within the project area during the air quality survey period is an indispensable part of the air pollution study. A meteorological station was installed on the top of Plant Security office, which is about 10 m height from the ground level in plant site free from obstructions to free flow of winds.

Wind speed and Wind direction data recorded during the study period are useful for the calculation of relative percentage frequencies of different wind directions and are plotted as wind roses of sixteen directions Viz. N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW and NNW for twenty-four hours' duration respectively.

Maximum and Minimum temperatures including the percentage relative humidity were also recorded simultaneously.

3.1.1 Wind Pattern during October 2023 - March 2024

The area is marked by high wind speeds in the range of calm to 19 KMPH winds. During the 00-24 hrs, the predominant wind directions were from E (18.4%), NE (16.3%), ENE (11.6%), SW (10.1) %, WSW (7.2) % and NNE (7.0%) of the total time. The calm conditions prevailed for 1.9% of the total time. The winds prevailed for 27.5 % of the total time in other directions. The average wind rose for the study period is shown in **Figure-3.1.**

- ***Temperature and Relative Humidity Levels during October 2023 – March 2024.***

  Maximum and minimum temperatures recorded during the study period were 34.6 °C and 16.8°C respectively. Maximum and minimum relative humidity recorded during the study period was 99 and 42 % respectively. Rainfall was observed during the study period is about 548.4 mm which is given in **Table-3.1.**

TABLE-3.1
METEOROLOGICAL DATA GENERATED AT PROJECT SITE

Sr. No	Parameters	October 2023 – March 2024	
		Min	Max
1	Temperature (°C)	16.8	34.6
2	Relative humidity (%)	42	99
63	Atmospheric Pressure (mb)	1003.2	1020.7
4	Rainfall (mm)	548.4	

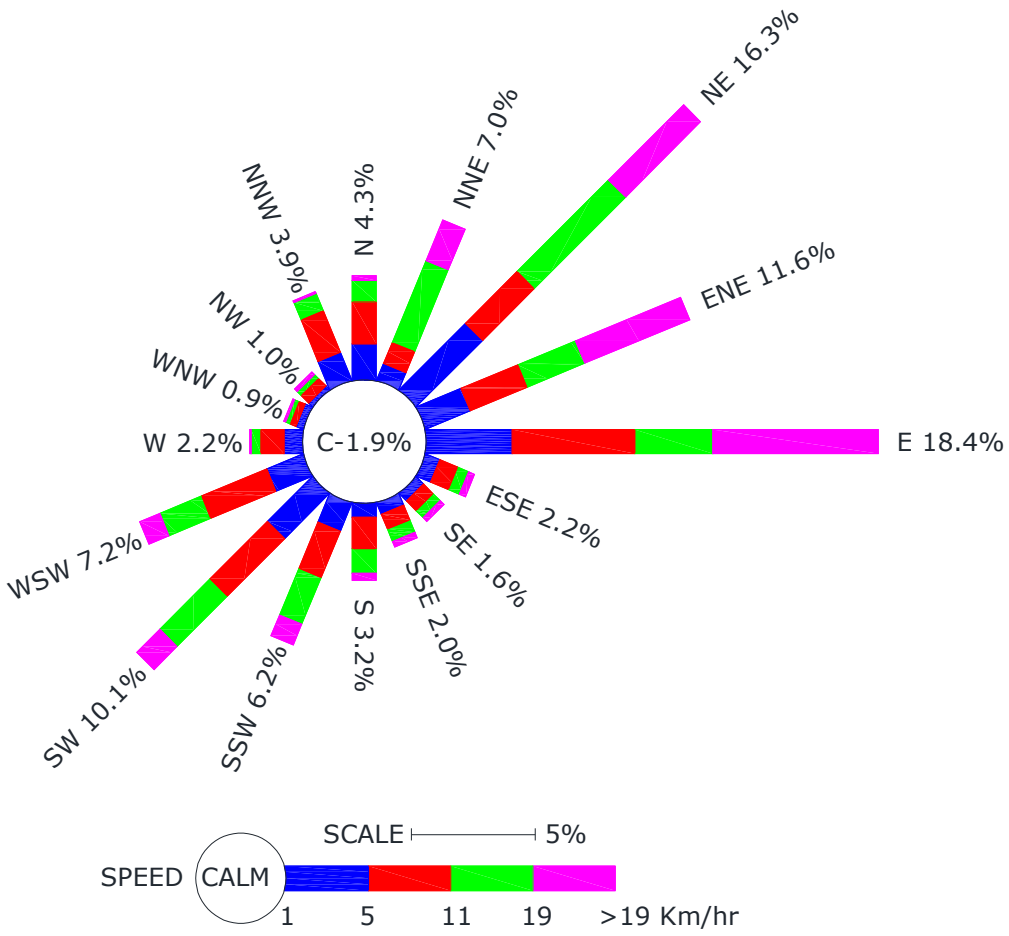


FIGURE-3.1
WINDROSE FOR OCTOBER 2023 TO MARCH 2024

3.2 Ambient Air Quality

Dispersion of different air pollutants released into the atmosphere has significant impacts on neighborhood air environment of an industrial project. The existing ambient air quality status with respect to the study zone of 10 km radial distance from the plant site has been assessed through a monitoring network of 8 AAQ stations during the **October 2023 - March 2024.**

The design of monitoring network in the air quality surveillance program has been based on the GLC's obtained using long term screening model considering the following:

(i) Meteorological conditions on synoptic scale;
(ii) Topography of the study area;
(iii) Representation of regional background levels;
(iv) Representation of plant site; and
(v) Representation of cross sectional distribution in the downward direction.

The existing status of Air environment was monitored for PM2.5, PM10, and gaseous pollutants like Sulphur dioxide (SO_2), Nitrogen dioxide (NO2) and Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6) and metals like Benzo(a)pyrene, Lead (Pb), Arsenic (As) and Nickel (Ni).

Ambient Air Quality Monitoring (AAQM) stations were set up at 8 locations with due consideration to the above mentioned points. **Table-3.2** gives the details of environmental setting around each monitoring station. The location of the selected stations with reference to the plant site is given in the same table and depicted in **Figure–3.2**.

3.2.1 Frequency and Parameters for Sampling

The following frequency has been adopted for sampling:

Ambient air quality monitoring has been carried out with a frequency of 2 days per week at 8 locations. (October 2023-March 2024).

The Post monitoring of air environment is generated for the following parameters:

- Fine Respirable Particulate Matter (PM2.5);
- Respirable Particulate Matter (PM10);
- Sulphur dioxide (SO_2);
- Nitrogen dioxide (NO_2);
- Carbon Monoxide (CO);
- Ammonia (NH_3);
- Ozone (O_3);
- Benzene (C_6H_6);
- Benzo(a)pyrene;
- Lead (Pb);
- Arsenic (As) and
- Nickel (Ni).

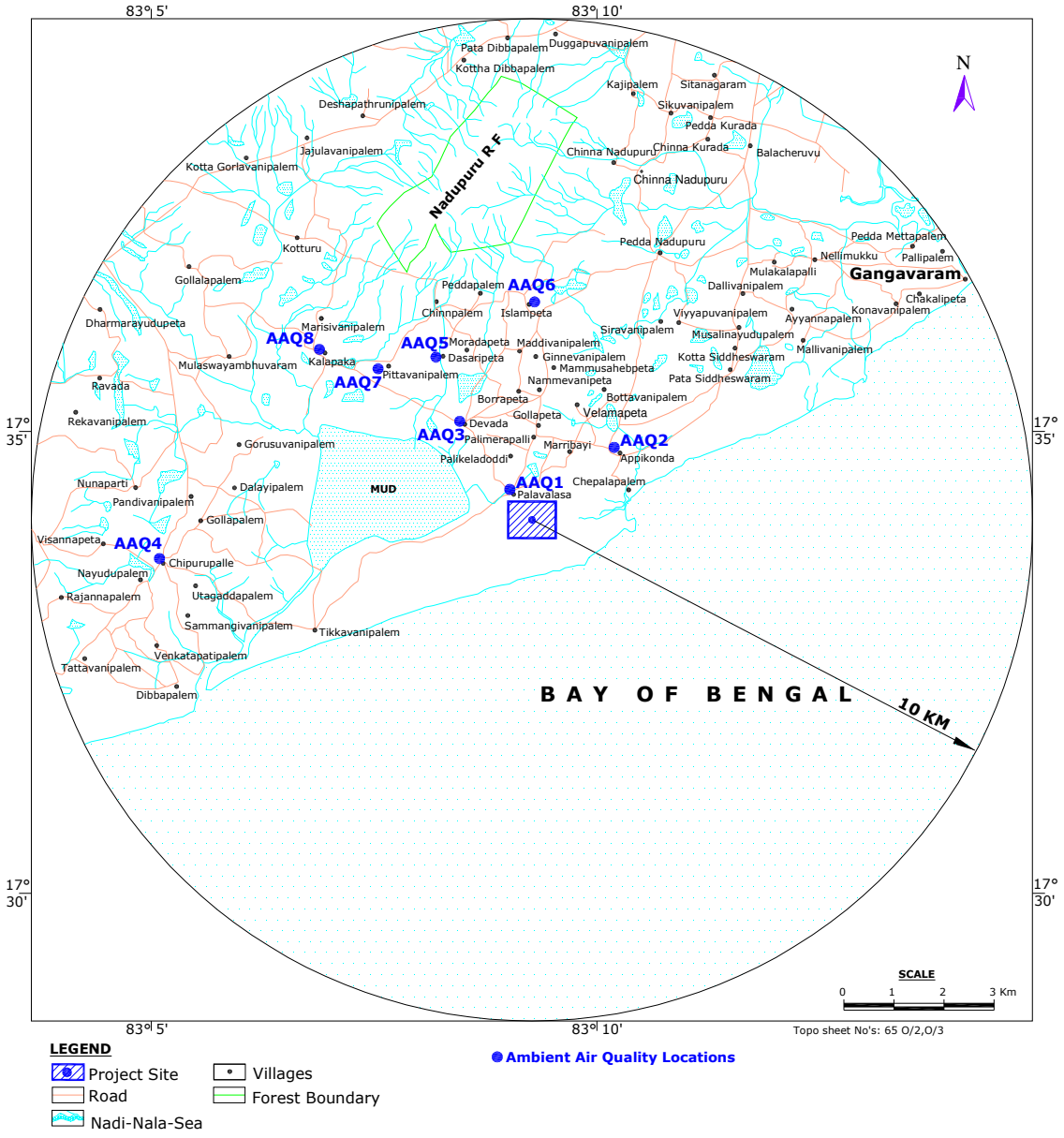


FIGURE-3.2
AIR QUALITY SAMPLING LOCATIONS

TABLE-3.2
DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

Station Code	Name of the Station	Distance w.r.t. site (km)	Direction w.r.t. site	Environmental Setting
AAQ1	Palavalasa	0.5	N	Rural/Residential activities
AAQ2	Appikonda	2.2	NE	Rural/Residential activities
AAQ3	Devada	2.3	NW	Rural/Residential activities
AAQ4	Cheepurupalli	7.4	W	Rural/Residential activities
AAQ5	Dasaripeta	3.7	NNW	Rural/Residential activities
AAQ6	Islampeta	4.3	N	Rural/Residential activities.
AAQ7	Pittavanipalem	4.2	NW	Rural/Residential activities
AAQ8	Kalapaka	5.3	NW	Rural/Residential activities

3.2.2 Duration of Sampling

The sampling duration for Particulate Matter PM2.5, PM10, SO_2, NO2, Ammonia, Benzo(a)Pyrene, Benzene, Arsenic, Nockel and Lead is twenty four hourly continuous sample per day and CO and Ozone is sampled for 8 hours continues thrice a day. This is to allow a comparison with the present revised standards mentioned in the latest Gazette notification of the Central Pollution Control Board (CPCB).

3.2.3 Method of Analysis

The air samples were analyzed as per standard methods specified by Central Pollution Control Board (CPCB) (16th November, 2009); IS: 5182 and American Public Health Association (APHA).

3.2.4 Details of the Sampling Locations

AAQ1: PALAVALASA

The monitoring station was installed on top of a residential building at a height of 4.5 m from ground level at a distance of 0.5 km in the N direction from the proposed plant site. This station was selected to assess the air quality levels in the crosswind direction. This location is situated within rural/residential activities.

AAQ2: APPIKONDA

The monitoring station was installed on top of a residential building at a height of 5.0 m from ground level at a distance of 2.2 km in the NE direction from the plant site. This station was selected to assess the air quality levels in the Down wind direction. This location is situated within rural/residential activities.

AAQ3: DEVADA

The monitoring station was installed on top of a residential building at a height of 4 m from ground level at a distance of 2.3 km in the North West direction from the

plant site. This station was selected to assess the air quality levels in the crosswind direction. This location is situated within rural/residential activities.

AAQ4: CHEEPURUPALLE

The location has been finalized to assess the air quality levels in the Up wind direction to the proposed plant site. The monitoring station is located at a distance of about 7.4 km west of the proposed plant site. The sampler is installed on a residential building at a height of about 4.5 m from ground level. Rural residential activities surround the station.

AAQ5: DASARIPETA

The sampling station has been finalized to assess the air quality levels in the crosswind direction to the proposed plant site. The monitoring station is located NNW of the plant site at about 3.7 km. The sampler was installed on top of residential building at a height of about 5.0 m from ground level free from any obstructions. This location is situated in rural/residential activities with village activities.

AAQ6: ISLAMPETA

The monitoring station was installed on top of a residential building at a height of 4.5 m from ground level at a distance of 4.3 km in the N direction from the plant site. This station was selected to assess the air quality levels in the crosswind direction. This location is situated within rural/residential activities.

AAQ7: PITTAVANIPALEM

The location has been finalized to assess the air quality levels in the downwind direction to the proposed plant site. The monitoring station is located at a distance of about 4.2 km North West of the proposed plant site. The sampler is installed on a residential building at a height of about 6.0 m from ground level. Rural residential activities surround the station.

AAQ8: KALAPAKA

At this monitoring station the sampler was installed on top of a residential building at a height of 5.0 m from ground level at a distance of 5.3 km in the NW direction from the proposed plant site. This station was selected to assess the air quality levels in the cross wind direction. This location is situated within rural/residential activities.

3.2.5 Selection of Instruments for Air Quality Sampling

Respirable Dust Samplers of Envirotech instruments are being used for monitoring Respirable Particulate Matter (PM10), Respirable fraction (<10 microns), Fine Respirable Particulate Matter (PM2.5), Respirable fraction (<2.5 microns), and gaseous pollutants like SO_2 and NO2. Gas Chromatography techniques have been used for the estimation of CO.

3.2.6 Sampling and Analytical Techniques

1] Fine Respirable Particulate matter (PM2.5) and Respirable Particulate matter (PM10)

Fine Respirable Particulate Matter – FRPM (PM2.5) and particles below 10 μ (PM10), which are more likely Respirable (Respirable Particulate matter – RPM). RPM Present in ambient air is measured by Gravemetric method by using Respirable Dust Sampler with a cyclone attachment over a period of 24 hours by sucking known quantity of air through Glass micro fibre filter paper and PM2.5 by Teflon filter paper. Respirable Dust (<10μ) is computed by measuring weight of collected matter in known volume of air sampled (BIS:5182 part IV, 1973; ASTM D-4096 -91).

2] Sulphur Dioxide

The most commonly used method for measuring atmospheric SO_2 is based on colorimetry and is known as modified West - Gaeke method. In this method SO_2 from a measured quantity of air is absorbed in a solution of sodium tetrachloromercurate to form a stable and non-volatile dichlorosulphitomercurate complex. This is then reacted with formaldehyde and bleached pararosaniline, yielding magenta - coloured pararosaniline methyl sulfonic acid. The colour intensity of this acid is detected photometrically at 560 nm (A.P.H.A and BIS: 5182 Part-II, 1969).

3] Nitrogen Dioxide

Concentration of nitrogen dioxide is estimated in ambient air by using Jacob and Hochheiser method. Nitrogen dioxide are collected by bubbling air through a sodium hydroxide solution to form a stable solution of sodium nitrite. The nitrite ion produced during sampling is determined colorimetrically by reacting the exposed absorbing reagent with phosphoric acid, sulfanilamide, and NEDA (1-naphthyl ethylenediamine dihydrochloride) at 540 nm (BIS: 5182 Part-VI, 1975).

4] Carbon Monoxide

A sample of the air containing carbon monoxide is adsorbed on Charcoal plugged into a glass tube. The adsorbed charcoal is eluted using the solvent, which in turn is projected into the gas chromatograph where it is carried from one end of the column to the other. During its movement, the constituents of the sample undergo distribution at different rates and ultimately get separated from one another. The separated constituents emerge from the end of the column one after the other and are detected by suitable means whose response is related to the amount of a specific component leaving the column [CO- IS: 5182 (Part-X)].

The details of the methods used for monitoring studies are presented in **Table-3.3.**

TABLE-3.3
TECHNIQUES USED FOR AMBIENT AIR QUALITY MONITORING

Sr. No.	Parameter	Method of Mesuarement
1	Fine Respirable Particulate Matter	Respirable Dust Sampler (Gravimetric method)
2	Respirable Particulate Matter	Respirable Dust Sampler (Gravimetric method)
3	Sulphur Dioxide	Improved West and Gaeke method
4	Nitrogen Oxide	Modified Jacob & Hochheiser method
5	Carbon Monoxide	NDIR (Non Dispersive Infrared Spectroscopy)
6	Ammonia (NH_3)	Indophenol Blue method
7	Ozone (O_3)	Spectrophotometric method
8	Benzene (C_6H_6)	Gas Chromatography
9	Benzo(a)pyrene	Solvent extraction followed by GC MS
10	Lead (Pb)	AAS / ICP-MS method
11	Arsenic (As)	AAS / ICP-MS method
12	Nickel (Ni)	AAS / ICP-MS method

3.2.7 Presentation of Primary Data

a) Observations of Primary Data (October 2023 - March 2024)

Various statistical parameters like 98th percentile, average, maximum and minimum values have been computed from the observed raw data for all the AAQ monitoring stations.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ1) Palavalasa village

The maximum concentration for PM2.5 is recorded as 51.5 μg/m^3 with minimum concentration as 34.6 μg/m^3. The 98th percentile values are observed as 50.3 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 74.7 μg/m^3 with minimum concentration as 57.3 μg/m^3. The 98th percentile values are observed as 74.6 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 14.5 μg/m^3 with minimum concentration as 10.6 μg/m^3. The 98th percentile values are observed as 14.4 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 16.3 μg/m3 with minimum concentration as 12.1 μg/m^3. The 98th percentile values are observed as 15.7 μg/ m^3 respectively.

The maximum CO concentration is recorded as 254 μg/m3 with minimum concentration as 153 μg/m^3. The 98th percentile values are observed as 249 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.8 µg/m3 with minimum concentration as 2.9 µg/m^3. The 98th percentile values are observed as 7.7 µg/m^3 respectively.
The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ2) Appikonda village

The maximum concentration for PM2.5 is recorded as 47.7 µg/m^3 with minimum concentration at 36.2 µg/m^3. The 98th percentile values are observed as 45.2 µg/m^3 respectively.

The maximum concentration for PM10 is recorded as 67.6 µg/m^3 with minimum concentration as 55.4 µg/m^3. The 98th percentile values are observed as 67.4 µg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.6 µg/m^3 with minimum concentration as 9.3 µg/m^3. The 98th percentile values are observed as 12.5 µg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.1 µg/m^3 with minimum concentration as 11.0 µg/m^3. The 98th percentile values are observed as 14.8 µg/m^3 respectively.

The maximum CO concentration is recorded as 242 µg/m3 with minimum concentration as 126 µg/m^3. The 98th percentile values are observed as 233 µg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.7 µg/m3 with minimum concentration as 3.6 µg/m^3. The 98th percentile values are observed as 10.3 µg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ3) Devada villag5

The maximum concentration for PM2.5 is recorded as 45.8 µg/m^3 with minimum concentration as 32.6 µg/m^3. The 98th percentile values are observed as 45.5 µg/m^3 respectively.

The maximum concentration for PM10 is recorded as 68.0 µg/m^3 with minimum concentration as 54.4 µg/m^3. The 98th percentile values are observed as 66.8 µg/m^3 respectively.

The maximum SO_2 concentration is recorded as 12.1 µg/m^3 with minimum concentration as 9.0 µg/m^3. The 98th percentile values are observed as 11.8 µg/m^3 respectively.

The maximum NO_2 concentration is recorded as 14.5 μg/m^3 with minimum concentration as 10.9 μg/m^3. The 98th percentile values are observed as 14.1 μg/m^3 respectively.

The maximum CO concentration is recorded as 210 μg/m3 with minimum concentration as 128 μg/m^3. The 98th percentile values are observed as 202 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.6 μg/m3 with minimum concentration as 3.3 μg/m^3. The 98th percentile values are observed as 7.4 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ4) Cheepurupalle village

The maximum concentration for PM2.5 is recorded as 48.5 μg/m^3 with minimum concentration as 34.2 μg/m^3. The 98th percentile values are observed as 48.0 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 77.8 μg/m^3 with minimum concentration as 62.7 μg/m^3. The 98th percentile values are observed as 76.1 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.7 μg/m^3 with minimum concentration as 9.6 μg/m^3. The 98th percentile values are observed as 13.21 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 6.2 μg/m^3 with minimum concentration as 11.4 μg/m^3. The 98th percentile values are observed as 15.4 μg/m^3 respectively.

The maximum CO concentration is recorded as 242 μg/m3 with minimum concentration as 165 μg/m^3. The 98th percentile values are observed as 241 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 8.3 μg/m3 with minimum concentration as 4.6 μg/m^3. The 98th percentile values are observed as 8.1 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ5) Dasaripeta village

The maximum concentration for PM2.5 is recorded as 45.3 μg/m^3 with minimum concentration as 33.6 μg /m^3. The 98th percentile values are observed as 45.2 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 71.4 μg/m^3 with minimum concentration as 59.4 μg/m^3. The 98th percentile values are observed as 70.7 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.6 μg/m^3 with minimum concentration as 9.2 μg/m^3. The 98th percentile values are observed as 13.4 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.8 μg/m^3 with minimum concentration as 11.2 μg/m^3. The 98th percentile values are observed as 14.7 μg/m^3 respectively.

The maximum CO concentration is recorded as 231 μg/m3 with minimum concentration as 138 μg/m^3. The 98th percentile values are observed as 215 μg/ m^3 respectivel

The maximum O_3 concentration is recorded as 7.1 μg/m3 with minimum concentration as 3.5 μg/m^3. The 98th percentile values are observed as7.0 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ6) Islampeta village

The maximum concentration for PM2.5 is recorded as 44.3 μg/m^3 with minimum concentration as 33.6 μg/m^3. The 98th percentile values are observed as 43.4 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 67.2 μg/m^3 with minimum concentration as 53.5 μg/m^3. The 98th percentile values are observed as 65.9 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.5 μg/m^3 with minimum concentration as 8.5 μg/m^3. The 98th percentile values are observed as 12.7 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.8 μg/m^3 with minimum concentration as 11.0 μg/m^3. The 98th percentile values are observed as 15.3 μg/m^3 respectively.

The maximum CO concentration is recorded as 222 μg/m3 with minimum concentration as 148 μg/m^3. The 98th percentile values are observed as 220 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 8.1 μg/m3 with minimum concentration as 3.3 μg/m^3. The 98th percentile values are observed as 8.1 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ7) Pittavanipalem village

The maximum concentration for PM2.5 is recorded as 50.8 μg/m^3 with minimum concentration as 33.3 μg/m^3. The 98th percentile values are observed as 49.3 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 72.1 μg/m^3 with minimum concentration as 58.2 μg/m^3. The 98th percentile values are observed as 71.0 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 12.1 μg/m^3 with minimum concentration as 8.8 μg/m^3. The 98th percentile values are observed as 11.9 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 14.3 μg/m^3 with minimum concentration as 10.9 μg/m^3. The 98th percentile values are observed as 14.2 μg/m^3 respectively.

The maximum CO concentration is recorded as 206 μg/m3 with minimum concentration as 137 μg/m^3. The 98th percentile values are observed as 204 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.8 μg/m3 with minimum concentration as 4.3 μg/m^3. The 98th percentile values are observed as 7.8 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ8) Kalapaka village

The maximum concentration for PM2.5 is recorded as 45.4 μg/m^3 with minimum concentration as 35.4 μg/m^3. The 98th percentile values are observed as 45.3 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 66.5 μg/m^3 with minimum concentration as 55.3 μg/m^3. The 98th percentile values are observed as 66.3 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.4 μg/m^3 with minimum concentration as 8.9 μg/m^3. The 98th percentile values are observed as 12.5 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.9 μg/m^3 with minimum concentration as 11.5 μg/m^3. The 98th percentile values are observed as 15.1 μg/m^3 respectively.

The maximum CO concentration is recorded as 208 μg/m3 with minimum concentration as 122 μg/m^3. The 98th percentile values are observed as 204 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.4 μg/m3 with minimum concentration as3.5 μg/m^3. The 98th percentile values are observed as 7.3 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

3.2.8 Regional Scenario

The ambient air quality survey was carried out for at eight locations in the 10 Km radial distance. The monitoring was carried out for **October 2023 - March 2024.** Fine Respirable Particulate Matter (PM2.5), Respirable Particulate Matter (PM10), Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6) and metals like Benzo(a)pyrene, Lead (Pb), Arsenic (As) and Nickel (Ni). The results of monitoring carried out during study period are presented in **Annexure-II** for **October 2023 - March 2024.**

Various statistical parameters like Maximum, Minimum, Average and 98th percentile have been computed from the observed raw data for all sampling stations. The ambient air quality Summary of concentrations of different parameters (PM2.5, PM10, SO_2, NO_2, CO, NH3, O3, C6H6, B(a)P, As, Ni and Pb is presented in **Tables 3.4 and 3.5**

The AAQ levels observed at all the sampling locations were within the limits specified by CPCB for Industrial/Mixed use and Residential/Rural use.

TABLE - 3.4
SUMMARY OF AMBIENT AIR QUALITY DATA (OCTOBER 2023 - MARCH 2024)

Location Code	Location	PM2.5				PM10				SO_2			
		Min	Max	Avg	98% Tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% tile
AAQ1	Palavalasa village	34.0	51.5	44.2	50.3	57.3	74.7	67.0	74.6	10.6	14.5	12.4	14.4
AAQ2	Appikonda village	36.2	47.7	41.0	45.2	55.4	67.6	62.3	67.4	9.3	13.6	10.9	12.5
AAQ3	Devada village	32.6	45.8	38.5	45.5	54.4	68.0	60.1	66.8	9.0	12.1	10.5	11.8
AAQ4	Cheepurupalle village	34.2	48.5	41.8	48.0	62.7	77.8	69.4	76.1	9.6	13.7	11.5	13.2
AAQ5	Dasaripeta village	33.6	45.3	40.3	45.2	59.4	71.4	65.1	70.7	9.2	13.6	10.5	13.4
AAQ6	Islampeta village	33.6	44.3	37.3	43.4	53.5	67.2	59.9	65.9	8.5	13.5	10.9	12.7
AAQ7	Pittavanipalem village	33.3	50.8	43.6	49.3	58.2	72.1	65.0	71.0	8.8	12.1	10.6	11.9
AAQ8	Kalapaka village	35.4	45.4	40.2	45.3	55.3	66.5	60.8	66.3	8.9	13.4	10.7	12.5
	Range	**33.3 – 51.5**				**53.5 – 77.8**				**8.5 – 14.5**			

Location Code	Location	NO_2				CO				O3			
		Min	Max	Avg	98% Tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% Tile
AAQ1	Palavalasa village	12.1	16.3	14.1	15.7	153	254	204	249	2.9	7.8	5.8	7.7
AAQ2	Appikonda village	11.0	15.1	13.0	14.8	126	242	186	233	3.6	7.7	5.9	7.4
AAQ3	Devada village	10.9	14.5	12.8	14.1	128	210	169	202	3.3	7.6	5.7	7.4
AAQ4	Cheepurupalle village	11.4	16.2	13.7	15.4	165	242	202	241	4.6	8.3	6.6	8.1
AAQ5	Dasaripeta village	11.2	15.8	13.3	14.7	138	231	180	215	3.5	7.1	5.5	7.0
AAQ6	Islampeta village	11.0	15.8	13.3	15.3	148	222	182	220	3.3	8.1	6.1	8.1
AAQ7	Pittavanipalem village	10.9	14.3	12.8	14.2	137	206	169	204	4.3	7.8	5.8	7.8
AAQ8	Kalapaka village	11.5	15.9	13.4	15.1	122	208	173	204	3.5	7.4	5.6	7.3
	Range	**10.9 – 16.3**				**122 – 204**				**2.9 – 7.8**			

**Note: (Concentrations are expressed in μg /m³)*

TABLE - 3.5
SUMMARY OF AMBIENT AIR QUALITY DATA (OCTOBER 2023 - MARCH 2024)

Location Code	Location	NH_3				Pb				As			
		Min	Max	Avg	98% tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% tile
AAQ1	Palavalasa village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ2	Appikonda village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ3	Devada village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ4	Cheepurupalle village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ5	Dasaripeta village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ6	Islampeta village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ7	Pittavanipalem village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
AAQ8	Kalapaka village	<20	<20	<20	<20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Range	**<20**				**<1.0**				**<1.0**			

Location Code	Location	Ni				B(a)P				C6H6			
		Min	Max	Avg	98% tile	Min	Max	Avg	98% Tile	Min	Max	Avg	98% tile
AAQ1	Palavalasa village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ2	Appikonda village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ3	Devada village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ4	Cheepurupalle village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ5	Dasaripeta village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ6	Islampeta village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ7	Pittavanipalem village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
AAQ8	Kalapaka village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<1.0	<1.0	<1.0	<1.0
	Range	**<1.0**				**<0.1**				**<1.0**			

**Note: (Concentrations are expressed in μg /m³ except As, Ni and B(a)p are ng /m³)*

3.3 Fugitive Dust Emission Monitoring

Fugitive dust emission monitoring has been carried out eight hours monitoring during the **October 2023–March 2024**. The monitoring has been carried out in five locations. The analysis results of fugitive dust monitoring are represented in **Table-3.6.**

TABLE-3.6
FUGITIVE DUST MONITORING RESULTS

All values are in ($\mu g/m^3$)

Sr.No	Location Name	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024
	Sampling Date	18.10.23	25.11.23	20.12.23	17.01.24	14.02.24	13.03.24
1	Plant Main gate	89.5	92.3	87.6	107.2	93.4	85.3
2	Power Plant service building	113.4	101.2	114.4	125.8	138.8	119.3
3	Coal handling plant	137.4	143.2	157.8	141.9	162.4	177.4
4	Work shop building	124.2	130.4	146.1	127.4	135.7	120.7
5	Ash handling plant	146.2	152.8	160.3	155.6	167.2	183.5

3.4 Ambient Noise Quality

Eight locations were monitored for ambient noise levels within the 10-km radius of the Thermal power plant and three locations for Inside the Plant. The monitoring will be carried out every month and details of presented in **Table-3.7** and are shown in **Figure-3.3.**

TABLE-3.7
AMBIENT NOISE MONITORING LOCATIONS

Sampling Code	Name of the Location	Direction w.r.t to Plant
N1	Palavalasa village	N
N2	Appikonda village	NE
N3	Devada village	NW
N4	Cheepurapalli village	W
N5	Dasaripeta village	NNW
N6	Islampeta village	N
N7	Pittavanipalem village	NW
N8	Kalapaka village	NW
	Inside the Plant Area	
N9	Near HNPCL Office	-
N10	Near Boiler Area	-
N11	Near Power Mech Stores	-

Sound Pressure Level (SPL) measurements were measured by noise meter at all the above locations. Noise level monitoring was carried continuously for 24-hours with one-hour interval. During each hour parameters like L_{10}, L_{50}, L_{90}, L_{eq}, L_{day} and L_{night} were directly computed by the instrument based on the sound pressure levels. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am.

3.4.1 Noise Quality

Noise levels were measured in 8 villages and 1 inside the plant area for 24 hours and 2 locations in plant site for source noise levels on monthly basis and the measured noise levels in day time and night time from October 2023 to March 2024 are given below in **Table-3.8 and 3.9.** The noise levels are well within the CPCB norms for Rural Residential zones.

TABLE-3.8
AMBIENT NOISE LEVEL MONITORING RESULTS
(October 2023 TO March 2024)

S.No	Sources	October 2023		November 2023		December 2023		January 2024		February 2024		March 2024	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
1	Palavalasa	52.7	43.5	51.6	42.4	52.1	43.6	53.0	42.5	51.4	43.7	50.5	41.8
2	Appikonda	50.3	42.3	48.3	41.8	51.0	42.1	50.5	40.7	52.7	42.2	49.7	40.4
3	Devada	48.6	41.1	49.1	40.8	50.8	41.6	51.7	41.3	50.3	41.8	52.1	41.4
4	Cheepurupalle	53.1	42.8	52.0	43.1	51.4	42.4	53.2	41.8	52.5	42.6	51.8	43.1
5	Dasaripeta	51.4	40.8	49.7	41.8	50.2	40.3	52.0	42.6	50.1	41.5	49.3	42.0
6	Islampeta	50.8	42.2	51.8	40.7	49.5	42.7	50.6	41.7	49.1	40.5	51.4	40.7
7	Pittavanipalem	49.2	41.5	50.7	42.0	51.5	41.8	51.4	40.8	52.8	41.4	53.0	42.1
8	Kalapaka	48.6	40.7	49.4	41.5	50.6	42.7	52.1	41.6	50.3	40.8	51.2	42.8
CPCB Limits		**55**	**45**	**55**	**45**	**55**	**45**	**55**	**45**	**55**	**45**	**55**	**45**

TABLE-3.9
NOISE LEVEL MONITORING RESULTS INSIDE THE PLANT

S.No	Sources	October 2023		November 2023		December 2023		January 2024		February 2024		March 2024	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
1	Near Plant main gate	56.3	48.7	58.3	46.3	59.6	48.3	56.8	46.3	58.4	47.6	61.8	50.5
CPCB Limits		**75**	**75**	**70**	**75**	**70**	**75**	**70**	**75**	**70**	**75**	**70**	**70**
2	Near Boiler area	84.0		83.1		84.6		83.4		84.2		83.4	
3	Near Turbine area	83.5		84.2		82.4		84.1		83.8		82.9	
CPCB Limits		**90**		**90**		**90**		**90**		**90**		**90**	

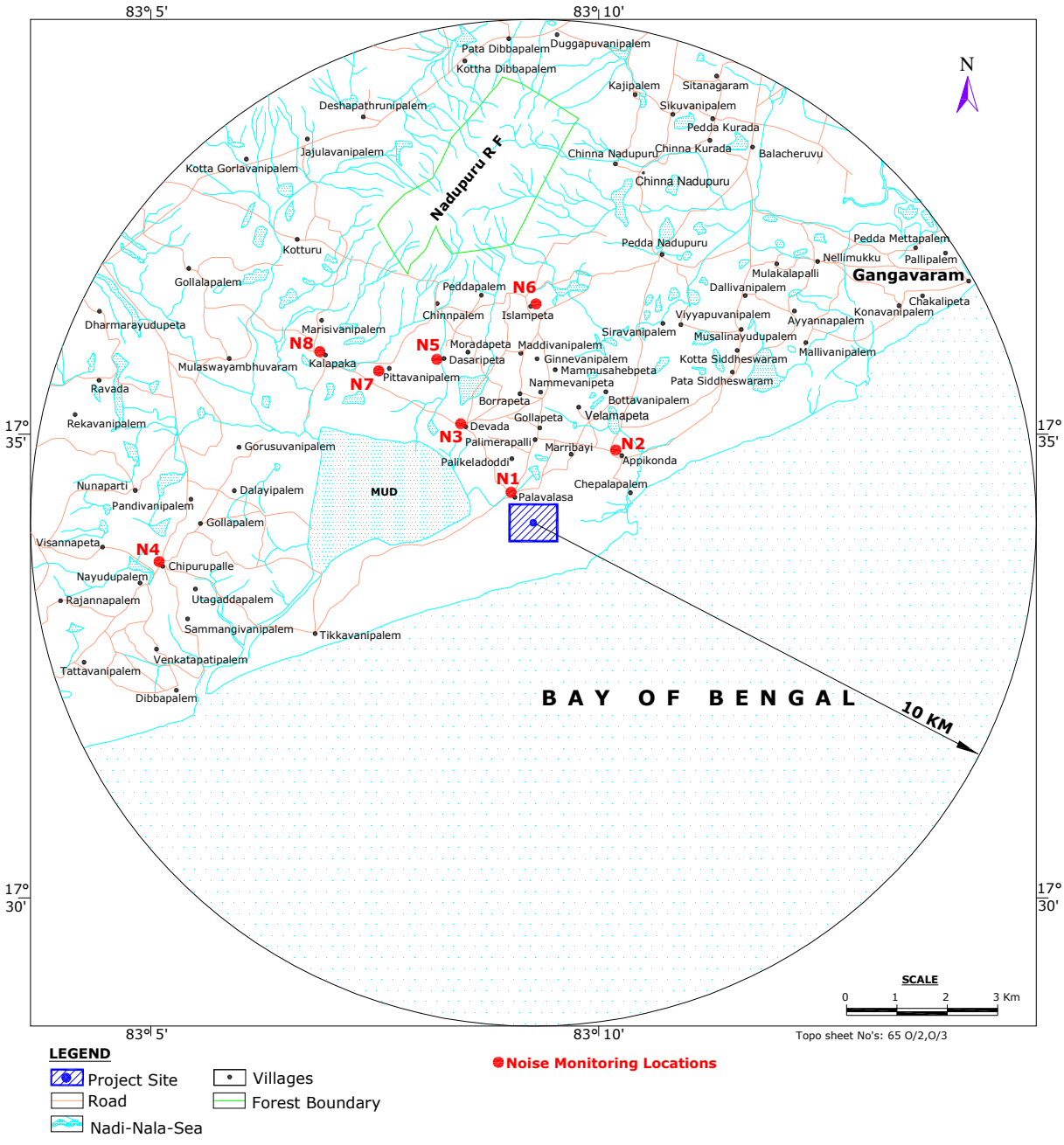


FIGURE-3.3
NOISE MONITORING LOCATIONS

3.5 WATER QUALITY

Water quality of ground water samples is collected to assess the quality of water with in the 10Km radius. Water samples were collected from six Ground water locations and four Surface water locations.

These samples were taken as grab samples and preservation and transportation of the samples are done as per the standard sampling procedures and analyzed in laboratory. The details of the sampling locations are given below in **TABLE-3.10** and shown in **Figure-3.4**

TABLE-3.10
WATER QUALITY SAMPLING LOCATIONS

Sampling Code	Name of the Location	Direction w.r.t to Plant
I	**Ground Water Samples**	
GW1	Devada village	NW
GW2	Islampeta village	N
GW3	Velama Appikonda village	NNE
GW4	Dasaripeta village	NNW
GW5	Palavalasa village	N
GW6	Rajiv Nagar	NE
GW7	Gouruvanipalem village	N
III	**Creek Water Samples**	
SW1	At Vade cheepurapalli	WSW
II	**Surface water Samples (**Marine Water)	
SW2	Appikonda beach	ENE
SW3	Tikavanipalem beach	SW
III	**Waste Water Samples**	
SW4	ETP Outlet	-
SW5	Outfall water at diffusion point	SE

The details of the Water Quality Analysis of **(October 2023 to March 2024)** are given below in **Table-3.11 to Table-3.19.**

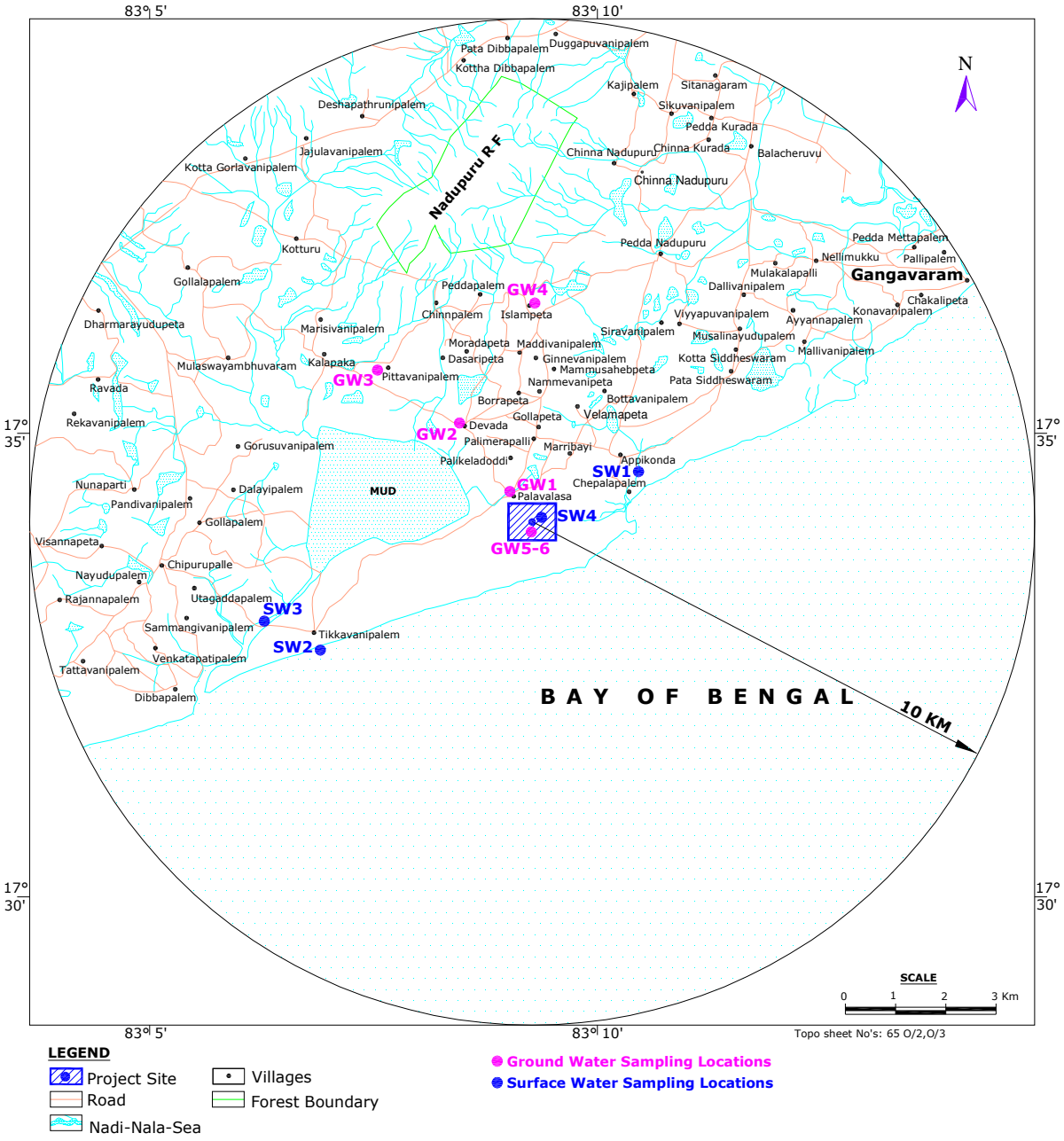


FIGURE-3.4
WATER SAMPLING LOCATIONS

TABLE-3.11
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW1 - Devada village						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.51	7.38	7.43	7.31	7.53	7.42	6.5–8.5 (NR)
2	Colour	Hazen	1	1	1	1	1	1	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeabla
5	Conductivity	µS/cm	1507	1733	1960	2087	2176	1988	$
6	Turbidity	NTU	1	1	1	1	1	1	1(5)
7	TDS	mg/l	965	1092	1274	1377	1415	1290	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	395	480.8	552.7	594	605	556	200(600)
9	Total Alkalinity	mg/l	375	398	442.0	456	487	449	200(600)
10	Calcium as Ca	mg/l	78.5	89.7	97.8	106.2	101.2	92.7	75(200)
11	Magnesium as Mg	mg/l	48.3	62.4	74.9	79.7	85.5	78.8	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.05	0.02	0.03	0.06	0.04	0.06	0.5(1)
14	Chlorides as Cl	mg/l	190.0	240.0	273.6	291.5	271.1	248.3	250(1000)
15	Sulphates as SO_4	mg/l	67.5	92.4	118.3	143.3	178.2	158.8	200(400)
16	Fluorides as F	mg/l	0.5	0.7	0.9	0.6	0.7	0.8	1.0(1.5)
17	Nitrates as NO_3	mg/l	42.3	38.4	28.4	30.2	38.2	34.2	45(NR)
18	Sodium as Na	mg/l	159.2	172.3	188.7	198.4	210.9	191.8	$
19	Potassium as K	mg/l	7.8	8.8	13.3	14.6	19.3	16.6	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.1 (0.3)
29	Iron as Fe	mg/l	0.12	0.14	0.19	0.15	0.12	0.14	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.41	0.28	0.031	0.045	0.38	0.35	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.12
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW2 – Islampeta village						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.68	7.72	7.61	7.55	7.67	7.55	6.5–8.5 (NR)
2	Colour	Hazen	1	1	1	1	1	1	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeble
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeble
5	Conductivity	µS/cm	1288	1407	1544	1306	1690	1756	$
6	Turbidity	NTU	1	1	1	1	1	1	1(5)
7	TDS	mg/l	813	915	988	847	1099	1123	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	334	376.5	420.2	353	466	476	200(600)
9	Total Alkalinity	mg/l	294	353	367.0	322	391	403	200(600)
10	Calcium as Ca	mg/l	69.2	77.2	84.3	69.5	86.5	85.4	75(200)
11	Magnesium as Mg	mg/l	39.2	44.6	50.9	43.6	60.6	63.8	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.03	0.04	0.05	0.04	0.07	0.09	0.5(1)
14	Chlorides as Cl	mg/l	182.5	165.8	198.4	159.4	207.7	226.4	250(1000)
15	Sulphates as SO_4	mg/l	58.7	76.6	87.8	79.6	127.4	122.6	200(400)
16	Fluorides as F	mg/l	0.3	0.5	0.7	0.4	0.9	0.6	1.0(1.5)
17	Nitrates as NO_3	mg/l	36.4	43.4	36.7	26.5	31.8	32.4	45(NR)
18	Sodium as Na	mg/l	138.7	145.9	155.5	132.8	165.2	174.4	$
19	Potassium as K	mg/l	6.3	7.5	10.8	8.7	15.7	17.8	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.15	0.12	0.15	0.09	0.14	0.11	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.34	0.38	0.42	0.028	0.32	0.42	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.13
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW3 – Velama Appikonda village						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.82	7.44	7.48	7.72	7.37	7.31	6.5–8.5 (NR)
2	Colour	Hazen	2	2	2	2	2	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeble
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeble
5	Conductivity	µS/cm	1820	2085	1867	2137	1933	2107	$
6	Turbidity	NTU	2	2	1	2	1	1	1(5)
7	TDS	mg/l	1185	1335	1232	1388	1257	1370	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	428	508.3	415.2	512	428	574	200(600)
9	Total Alkalinity	mg/l	380	431	412.0	430	403	434	200(600)
10	Calcium as Ca	mg/l	86.3	92.7	79.5	92.3	81.6	96.2	75(200)
11	Magnesium as Mg	mg/l	51.6	67.2	52.6	68.4	54.4	81.2	30(100)
12	Free Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.06	0.04	0.03	0.04	0.06	0.08	0.5(1)
14	Chlorides as Cl	mg/l	237.6	258.7	224.3	285.9	246.2	255.5	250(1000)
15	Sulphates as SO4	mg/l	145.8	184.5	158.2	195.8	183.6	223.4	200(400)
16	Fluorides as F	mg/l	0.7	0.9	0.6	0.8	0.5	0.9	1.0(1.5)
17	Nitrates as NO3	mg/l	48.3	63.7	47.8	34.7	29.3	30.3	45(NR)
18	Sodium as Na	mg/l	212.8	234.5	228.6	245.1	234.5	209.1	$
19	Potassium as K	mg/l	14.6	19.3	16.6	18.2	22.5	19.1	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.1 (0.3)
29	Iron as Fe	mg/l	0.08	0.11	0.13	0.11	0.08	0.16	0.3(NR)
30	Chromium as Cr+6	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.27	0.34	0.37	0.40	0.36	0.28	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.14
GROUND WATER QUALITY

Sr.No	Parameters	Unit	GW4 – Dasaripeta village						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.65	7.80	7.67	7.43	7.58	7.61	6.5 – 8.5 (NR)
2	Colour	Hazen	2	1	2	1	2	1	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeble
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeble
5	Conductivity	µS/cm	1266	1378	1408	1518	1746	1848	$
6	Turbidity	NTU	1	1	1	1	1	1	1(5)
7	TDS	mg/l	799	883	901	970	1135	1200	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	340	373.8	371.7	409	507	513	200(600)
9	Total Alkalinity	mg/l	320	304	328.0	344	362	391	200(600)
10	Calcium as Ca	mg/l	55.9	61.8	66.7	74.8	92.7	90.6	75(200)
11	Magnesium as Mg	mg/l	48.8	53.3	49.8	53.9	66.8	69.8	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.05	0.03	0.05	0.02	0.03	0.05	0.5(1)
14	Chlorides as Cl	mg/l	163.5	187.4	177.6	189.3	225.6	238.6	250(1000)
15	Sulphates as SO_4	mg/l	61.6	95.1	101.3	120.3	157.5	159.8	200(400)
16	Fluorides as F	mg/l	0.6	0.6	0.8	0.5	0.8	0.8	1.0(1.5)
17	Nitrates as NO_3	mg/l	18.6	24.5	21.8	26.3	32.5	34.5	45(NR)
18	Sodium as Na	mg/l	129.5	137.4	143.4	151.5	157.8	178.2	$
19	Potassium as K	mg/l	8.2	12.7	15.9	16.4	18.2	17.8	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.12	0.15	0.18	0.07	0.13	0.12	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.36	0.23	0.29	0.33	0.43	0.38	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.15
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW5 – Palavalasa village						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.56	7.34	7.43	7.55	7.82	7.50	6.5–8.5 (NR)
2	Colour	Hazen	2	2	2	2	3	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
5	Conductivity	µS/cm	6291	6038	5873	6041	5904	6194	$
6	Turbidity	NTU	2	2	2	3	1	1	1(5)
7	TDS	mg/l	4156	3986	3817	3986	3838	4080	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	904	836.4	773.4	822	831	927	200(600)
9	Total Alkalinity	mg/l	435	385	372	385	378	446	200(600)
10	Calcium as Ca	mg/l	143.5	142.3	132.4	143.5	154.3	165.4	75(200)
11	Magnesium as Mg	mg/l	132.5	116.8	107.5	112.5	108.1	124.9	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.05	0.07	0.04	0.07	0.05	0.09	0.5(1)
14	Chlorides as Cl	mg/l	1674.5	1647.6	1598.2	1642.1	1606.8	1653.1	250(1000)
15	Sulphates as SO4	mg/l	298.3	273.0	264.8	282.6	270.8	280.6	200(400)
16	Fluorides as F	mg/l	1.0	0.8	0.5	0.3	0.6	0.7	1.0(1.5)
17	Nitrates as NO3	mg/l	38.2	27.6	29.3	29.2	27.7	31.6	45(NR)
18	Sodium as Na	mg/l	1012.2	987.5	980.3	995.6	964.1	984.5	$
19	Potassium as K	mg/l	31.4	27.6	24.7	26.5	19.8	22.6	$
20	Phenolic Compounds	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.1 (0.3)
29	Iron as Fe	mg/l	0.16	0.13	0.16	0.13	0.09	0.18	0.3(NR)
30	Chromium as Cr+6	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.33	0.43	0.35	0.46	0.38	0.47	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.16
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW6 – Rajiv Nagar						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.63	7.81	7.64	7.24	7.43	7.43	6.5–8.5 (NR)
2	Colour	Hazen	1	1	1	1	2	1	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
5	Conductivity	µS/cm	2371	2517	2716	2583	2803	2636	$
6	Turbidity	NTU	1	1	1	1	1	1	1(5)
7	TDS	mg/l	1494	1612	1765	1675	1822	1713	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	413	505.5	595.8	564	704	683	200(600)
9	Total Alkalinity	mg/l	410	427	445	438	472	432	200(600)
10	Calcium as Ca	mg/l	72.4	84.5	95.6	92.6	130.4	126.2	75(200)
11	Magnesium as Mg	mg/l	56.4	71.5	86.7	80.7	91.8	89.3	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.03	0.05	0.07	0.04	0.08	0.06	0.5(1)
14	Chlorides as Cl	mg/l	338.4	352.8	391.3	379.4	419.8	402.6	250(1000)
15	Sulphates as SO_4	mg/l	260.2	286.4	309.4	272.2	294.1	278.4	200(400)
16	Fluorides as F	mg/l	0.9	0.6	0.8	1.2	0.9	0.9	1.0(1.5)
17	Nitrates as NO_3	mg/l	31.4	41.7	45.5	38.6	35.2	32.4	45(NR)
18	Sodium as Na	mg/l	351.4	337.2	339.7	325.4	308.7	280.6	$
19	Potassium as K	mg/l	8.5	15.4	18.6	15.8	20.9	19.8	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.07	0.09	0.11	0.16	0.14	0.09	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.24	0.31	0.37	0.26	0.36	0.40	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pdes	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.17
GROUND WATER QUALITY

SrNo.	Parameters	Unit	GW7 – Gouruvanipalem village						Limits as per IS:10500
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24	
1	pH	-	7.44	7.54	7.61	7.47	7.61	7.72	6.5 – 8.5 (NR)
2	Colour	Hazen	2	1	2	3	3	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
5	Conductivity	µS/cm	4507	4810	4508	4707	4230	4402	$
6	Turbidity	NTU	2	1	2	3	1	1	1(5)
7	TDS	mg/l	2932	3128	2930	3104	2750	2905	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	803	885.6	806.3	851	742	805	200(600)
9	Total Alkalinity	mg/l	480	512	474	482	447	458	200(600)
10	Calcium as Ca	mg/l	124.3	136.3	125.8	136.7	118.8	122.8	75(200)
11	Magnesium as Mg	mg/l	119.8	132.4	119.5	123.8	108.2	121.2	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	0.02	0.03	0.04	0.06	0.04	0.08	0.5(1)
14	Chlorides as Cl	mg/l	1021.0	1075.1	1018.9	1083.3	968.3	996.8	250(1000)
15	Sulphates as SO4	mg/l	285.5	322.3	298.8	301.5	264.3	297.1	200(400)
16	Fluorides as F	mg/l	0.7	0.9	0.7	0.6	0.5	0.8	1.0(1.5)
17	Nitrates as NO3	mg/l	36.6	46.3	36.8	33.6	30.9	32.0	45(NR)
18	Sodium as Na	mg/l	654.4	688.8	655.4	678.5	616.4	629.8	$
19	Potassium as K	mg/l	21.5	19.3	17.8	21.1	25.4	20.4	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.13	0.17	0.14	0.11	0.16	0.11	0.3(NR)
30	Chromium as Cr+6	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.29	0.25	0.33	0.30	0.43	0.37	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.18
SURFACE WATER QUALITY (MARINE WATER SAMPLES) FROM OCTOBER 2023 TO MARCH 2024

S. No.	Parameter	Units	Oct 23		Nov 23		Dec 23		Jan 24		Feb 24		Mar 24	
			SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3
			16.10.23		14.11.23		20.12.23		18.01.24		13.02.24		12.03.24	
1	pH	-	8.05	7.95	7.92	8.12	8.08	8.21	8.13	8.05	7.94	8.10	7.96	8.07
2	Color	Hazen	4	6	7	5	6	8	8	9	11	8	9	12
3	Conductivity	□S/cm	54920	52770	55025	54120	53820	56060	55250	54340	53800	54670	55300	53700
4	Total Dissolved Solids	mg/l	40650	38850	41260	40040	40365	41485	41430	40750	34970	35536	40920	39730
5	DO	mg/l	5.0	5.2	5.3	5.1	5.0	5.2	4.9	5.1	5.2	5.0	5.3	5.0
6	BOD	mg/l	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
7	COD	mg/l	109	118	115	122	108	119	95	105	103	86	93	106
8	Total Hardness as $CaCO_3$	mg/l	3444	3045	3607	3392	3373	3608	3431	3507	2811	3506	2963	3349
9	Total Alkalinity as $CaCO_3$	mg/l	340	398	362	376	350	427	363	416	347	435	514	498
10	Calcium as Ca^{+2}	mg/l	452.2	354.8	476.2	411.6	438.5	468.3	445.2	453.8	361.6	427.6	386.2	410.2
11	Magnesium as Mg^{+2}	mg/l	562.2	524.6	587.3	574.2	553.3	592.4	563.3	576.4	463.4	592.3	485.6	564.8
12	Chlorides as Cl	mg/l	17695.0	16987.4	17598.7	17354.3	17418.4	18008.2	17897.5	17489.4	17476.2	17625.3	17868.2	17415.3
13	Residual free Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
14	Phosphates PO_4	mg/l	7.5	8.1	9.6	11.1	8.7	10.5	9.4	6.2	6.4	8.2	9.2	7.3
15	Sulphates as SO_4	mg/l	1992.5	1789.8	2198.7	2073.2	1874.2	1994.7	1889.4	1965.1	1756.4	1898.8	1824.2	1675.4
16	Fluorides as F	mg/l	1.4	1.1	1.0	0.8	0.9	1.3	1.4	0.9	1.1	0.6	1.1	0.6
17	Nitrates as NO_3	mg/l	29.4	41.2	37.8	48.3	32.2	43.6	40.3	42.2	36.5	35.7	36.5	35.7
18	Sodium as Na^+	mg/l	10946.0	10652.3	10887.3	10800.4	10745.9	11121.3	11051.1	10789.2	11014.3	10848.2	11276.4	10704.5
19	Potassium as K	mg/l	165.0	137.5	178.1	158.7	130.4	183.4	125.2	156.1	105.6	184.7	126.8	172.2
20	Total Boron as B	mg/l	0.07	0.05	0.09	0.07	0.06	0.08	0.04	0.07	0.06	0.05	0.08	0.11
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22	Phenol compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00	<0.001	<0.001	<0.001
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Iron as Fe	mg/l	0.14	0.16	0.19	0.21	0.13	0.17	0.16	0.12	0.11	0.15	0.13	0.11
29	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

S. No.	Parameter	Units	Oct 23		Nov 23		Dec 23		Jan 24		Feb 24		Mar 24	
			SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3
			16.10.23		14.11.23		20.12.23		18.01.24		13.02.24		12.03.24	
31	Zinc as Zn	mg/l	0.28	0.35	0.31	0.27	0.26	0.30	0.32	0.26	0.24	0.29	0.32	0.23
32	Aluminium as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
33	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

SW2- Appikonda beach(marine); SW3-Tikkavanipalem beach(marine);

TABLE-3.19
MARINE WATER SAMPLES RESULTS (INTAKE WATER)

Sr. No.	Parameter	Units	SW4					
	Sampling Date		16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24
1	pH	-	8.23	8.09	8.21	8.12	8.04	7.92
2	Color	Hazen	8	6	4	6	8	11
3	Conductivity	□S/cm	54730	53350	54750	53620	52830	56200
4	Total Dissolved Solids	mg/l	41460	39480	40515	39670	39095	42150
5	DO	mg/l	5.2	5.0	4.7	4.9	5.1	5.3
6	BOD	mg/l	<3	<3	<3	<3	<3	<3
7	COD	mg/l	122	114	109	90	103	114
8	Total Hardness as $CaCO_3$	mg/l	2963	2563	2843	2689	2475	3352
9	Total Alkalinity as $CaCO_3$	mg/l	380	358	393	374	326	610
10	Calcium as Ca^{+2}	mg/l	365	298.7	332.1	325.4	296.3	420.1
11	Magnesium as Mg^{+2}	mg/l	498.3	441.5	489.2	455.7	421.5	559.4
12	Chlorides as Cl	mg/l	17658	17401.2	17765.6	17412.2	17312.5	18128.4
13	Residual free Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
14	Phosphates PO_4	mg/l	3.8	6.2	5.7	7.4	9.4	12.6
15	Sulphates as SO_4	mg/l	1894.6	1673.6	1815.5	1772.6	1562.3	1814.2
16	Fluorides as F	mg/l	1.3	1.1	0.8	0.7	0.9	0.9
17	Nitrates as NO_3	mg/l	37.3	30.6	34.8	28.9	313	36.4
18	Sodium as Na^+	mg/l	11148.4	10994.5	11205.4	11023.8	10949.7	11302.2
19	Potassium as K	mg/l	129.0	105.2	126.1	114.3	98.4	131.1
20	Total Boron as B	mg/l	0.06	0.08	0.05	0.08	0.05	0.08
21	Cyanides as CN	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22	Phenolic compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Iron as Fe	mg/l	0.15	0.13	0.16	0.11	0.17	0.13
29	Total Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
31	Zinc as Zn	mg/l	0.29	0.34	0.28	0.34	0.30	0.26
32	Aluminium as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
33	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
34	Sulphide as H_2S	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
35	Bromide as Br	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
36	Iodides as I	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Sampling Location Name
SW4- Intake sea water;

TABLE-3.20
SURFACE WATER QUALITY (CREEK WATER SAMPLES)
FROM OCTOBER 2023 TO MARCH 2024

S.No	Parameters	Units	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24
1	pH	-	7.88	7.64	7.58	7.82	7.92	7.83
2	Suspended solids	mg/l	43	37	46	37	53	42
3	Conductivity	µS/cm	15235	13088	11730	14360	12730	14150
4	TDS	mg/l	10065	8905	8090	9760	8660	9620
5	DO	mg/l	5.2	5.1	4.9	5.1	5.3	5.5
6	BOD	mg/l	<3	<3	<3	<3	<3	<3
7	Turbidity	NTU	38	28	25	28	22	36
8	Salinity	Ppt	8.5	7.4	6.7	8.2	7.4	8.1
9	Total Alkalinity as $CaCO_3$	mg/l	465	406	381.0	395	303	334
10	Calcium as Ca	mg/l	378.4	321.4	294.2	338.4	284.3	304.2
11	Magnesium as Mg	mg/l	298.7	238.1	217.6	286.5	251.1	277.3
12	Chlorides as Cl	mg/l	4739.6	4111.6	3685.1	4575.3	4120.7	4538.3
13	Phosphates as PO_4	mg/l	10.5	8.6	7.8	10.4	8.3	10.7
14	Sulphates as SO_4	mg/l	398.6	297.5	249.1	286.7	209.7	261.3
15	Fluorides as F	mg/l	1.2	0.8	0.5	1.0	0.8	0.7
16	Nitrates as NO_3	mg/l	39.8	32.6	28.1	36.5	32.4	33.5
17	Sodium as Na	mg/l	2454.7	2151.6	1914.2	2332.6	2093.3	2328
18	Potassium as K	mg/l	82.6	64.5	56.2	65.3	54.3	87.2
19	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
20	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Iron as Fe	mg/l	0.24	0.19	0.16	0.23	0.18	0.15
23	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc as Zn	mg/l	<0.01	0.24	0.31	0.37	0.28	0.37

Creek water in Mud flat area at Vade cheepurapalli.

3.6 Soil Quality

Soil Samples were collected from eight locations around the plant site area, out of which, three locations (S1 to S3) are monthly and the remaining five locations (S4 to S8) are quarterly samples. The soil quality is given below in **Table-3.21** and **Table-3.25.**

TABLE-3.21
SOIL QUALITY RESULTS

S. No	Parameters	Unit	S1 –Palavalasa Village					
			Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24
			16.10.23	14.11.23	14.12.23	18.01.24	13.2.24	12.3.24
1	Texture	--	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
a	Sand	%	49	51	54	56	50	48
b	Silt	%	19	15	13	12	15	14
c	Clay	%	32	34	33	32	35	38
2	Bulk Density	g/cc	1.23	1.19	1.23	1.27	1.25	1.29
3	pH (1:5 Aq.Extraction)	-	7.25	7.52	7.46	7.56	7.38	7.51
4	Conductivity (1:5 Aq.Extraction)	µS/cm	364	512	468	397	502	613
5	Cation Exchange Capacity	(meq/100gm)	22.48	32.6	36.7	38.71	41.37	51.53
6	Exchangeable Calcium	(meq/100gm)	14.92	21.18	22.3	22.90	27.33	31.2
7	Exchangeable Magnesium	(meq/100gm)	6.87	10.14	12.2	13.68	11.43	17.3
8	Exchangeable Potassium	(meq/100gm)	0.33	0.57	1.58	1.50	1.88	2.1
9	Exchangeable Sodium	(meq/100gm)	0.37	0.71	0.68	0.63	0.73	0.93
10	Sodium Absorption Ratio (SAR)	----	0.16	0.18	0.46	0.42	0.45	0.39
11	Available Nitrogen as N	Kg/ha	84.6	104.3	98.6	84.2	96.4	82.3
12	Available Phosphorous as P	Kg/ha	63.8	87.5	74.3	68.4	55.3	60.2
13	Available Potassium as K	Kg/ha	261.4	415.2	396.4	376.6	346.1	315.3
14	Organic Carbon	%	0.36	0.43	0.38	0.41	0.35	0.52
15	Organic Matter	%	0.62	0.74	0.66	0.71	0.60	0.91
16	Water Soluble Chlorides as Cl	mg/kg	78.7	98.3	87.6	76.2	96.4	111.2
17	Water Soluble Sulphates as SO4	mg/kg	37.2	53.4	48.6	32.1	40.3	38.4
18	Aluminium	%	0.89	0.74	0.82	0.96	0.74	0.69
19	Total Iron	%	1.65	1.42	1.56	1.42	1.22	1.77
20	Manganese	mg/kg	341	443	394	356	267	302
21	Boron	mg/kg	25.5	34.2	25.6	28.4	22.7	27.4
22	Zinc	mg/kg	46.7	50.6	62.4	57.4	43.2	37.4

TABLE-3.22
SOIL QUALITY RESULTS

S. No	Parameters	Unit	S2 –Appikonda Village					
			Oct 23	**Nov 23**	**Dec 23**	**Jan 24**	**Feb 24**	**Mar 24**
			16.10.23	14.11.23	14.12.23	18.01.24	13.02.24	12.03.24
1	Texture	--	Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
a	Sand	%	23	45	49	46	48	50
b	Silt	%	16	17	15	20	18	16
c	Clay	%	61	38	36	34	32	34
2	Bulk Density	g/cc	1.18	1.21	1.26	1.29	1.23	1.18
3	pH (1:5 Aq.Extraction)		7.64	7.37	7.28	7.32	7.62	7.87
4	Conductivity (1:5 Aq.Extraction)	µS/cm	548	408	396	416	463	498
5	Cation Exchange Capacity	(meq/100gm)	30.62	24.7	31.2	29.48	37.82	47.11
6	Exchangeable Calcium	(meq/100gm)	19.81	16.25	19.8	19.09	22.8	26.3
7	Exchangeable Magnesium	(meq/100gm)	9.78	7.18	9.9	8.75	13.12	18.5
8	Exchangeable Potassium	(meq/100gm)	0.54	0.44	1.01	1.19	1.32	1.64
9	Exchangeable Sodium	(meq/100gm)	0.49	0.84	0.53	0.45	0.58	0.67
10	Sodium Absorption Ratio (SAR)	----	0.18	0.25	0.39	0.35	0.33	0.35
11	Available Nitrogen as N	Kg/ha	115.8	82.7	102.4	115.3	88.3	91.3
12	Available Phosphorous as P	Kg/ha	95.2	57.2	62.3	74.6	68.2	57.5
13	Available Potassium as K	Kg/ha	392.1	205.3	254.8	298.7	328.3	285.3
14	Organic Carbon	%	0.52	0.38	0.32	0.53	0.46	0.57
15	Organic Matter	%	0.90	0.65	0.55	0.91	0.79	0.99
16	Water Soluble Chlorides as Cl	mg/kg	145.4	123.6	115.3	124.6	105.3	95.3
17	Water Soluble Sulphates as SO4	mg/kg	43.2	38.4	34.3	54.4	37.4	41.6
18	Aluminium	%	1.46	1.12	1.23	1.15	0.81	0.78
19	Total Iron	%	2.73	1.98	1.74	1.85	1.41	1.92
20	Manganese	mg/kg	497	329	345	287	291	256
21	Boron	mg/kg	43.6	27.9	31.2	36.2	29.4	35.8
22	Zinc	mg/kg	56.4	44.7	48.4	35.4	52.3	46.1

TABLE-3.23
SOIL QUALITY RESULTS

S. No	Parameters	Unit	S3 –Devada Village					
			Oct 23	**Nov 23**	**Dec 23**	**Jan 24**	**Feb 24**	**Mar 24**
			16.10.23	14.11.23	14.12.23	18.01.24	13.2.24	12.3.24
1	Texture	--	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
a	Sand	%	48	53	51	48	52	53
b	Silt	%	15	19	17	15	19	20
c	Clay	%	37	30	32	37	29	27
2	Bulk Density	g/cc	1.26	1.24	1.19	1.31	1.28	1.37
3	pH (1:5 Aq.Extraction)		7.31	7.44	7.39	7.44	7.55	7.43
4	Conductivity (1:5 Aq.Extraction)	µS/cm	322	365	412	376	522	546
5	Cation Exchange Capacity	(meq/100gm)	21.33	29.5	34.7	34.94	42.36	46.65
6	Exchangeable Calcium	(meq/100gm)	14.08	19.31	22.0	20.78	24.1	24.2
7	Exchangeable Magnesium	(meq/100gm)	6.65	9.14	11.0	12.37	16.03	19.4
8	Exchangeable Potassium	(meq/100gm)	0.28	0.39	1.36	1.26	1.41	1.92
9	Exchangeable Sodium	(meq/100gm)	0.32	0.62	0.36	0.53	0.82	1.13
10	Sodium Absorption Ratio (SAR)	----	0.14	0.16	0.24	0.38	0.42	0.44
11	Available Nitrogen as N	Kg/ha	73.2	91.5	87.5	92.4	103.2	97.4
12	Available Phosphorous as P	Kg/ha	51.4	66.8	54.3	59.7	81.7	73.1
13	Available Potassium as K	Kg/ha	187.5	282.3	342.4	316.2	293.6	308.3
14	Organic Carbon	%	0.40	0.51	0.46	0.38	0.43	0.48
15	Organic Matter	%	0.70	0.88	0.79	0.66	0.74	0.84
16	Water Soluble Chlorides as Cl	mg/kg	92.3	75.3	72.4	86.1	75.7	89.2
17	Water Soluble Sulphates as SO4	mg/kg	29.7	31.2	37.6	42.8	48.2	52.5
18	Aluminium	%	0.78	0.86	0.74	0.87	0.96	1.01
19	Total Iron	%	1.24	2.05	1.98	1.63	1.56	1.67
20	Manganese	mg/kg	319	286	297	324	347	362
21	Boron	mg/kg	31.7	24.1	29.4	24.7	33.0	29.8
22	Zinc	mg/kg	42.6	37.6	35.7	46.9	61.3	54.3

TABLE-3.24
SOIL QUALITY RESULTS (QUARTERLY)

S. No	Parameters	Unit	S4	S5	S6	S7	S8
	Sampling date		20.12.2023				
1	Texture	--	Sandy	clay	sandy clay	clay	Sandy
A	Sand	%	65	23	50	21	65
B	Silt	%	19	15	15	21	15
C	Clay	%	16	62	35	58	20
2	Bulk Density	g/cc	1.38	1.16	1.28	1.27	1.32
3	pH (1:5 Aq.Extraction)		7.15	7.54	7.25	7.54	7.46
4	Conductivity (1:5 Aq.Extraction)	µS/cm	365	396	424	374	405
5	Cation Exchange Capacity	(meq/100gm)	26.8	42.9	33.9	36.2	28.0
6	Exchangeable Calcium	(meq/100gm)	16.6	26.4	21.7	23.5	16.9
7	Exchangeable Magnesium	(meq/100gm)	8.6	14.1	10.3	10.4	9.5
8	Exchangeable Potassium	(meq/100gm)	1.19	1.68	1.17	1.65	1.13
9	Exchangeable Sodium	(meq/100gm)	0.41	0.67	0.72	0.64	0.49
10	Sodium Absorption Ratio (SAR)	----	0.35	0.41	0.52	0.44	0.40
11	Available Nitrogen as N	Kg/ha	63.5	125.3	64.8	93.6	43.5
12	Available Phosphorous as P	Kg/ha	48.6	87.6	56.4	78.6	53.2
13	Available Potassium as K	Kg/ha	298.4	423.5	294.5	415.4	284.5
14	Organic Carbon	%	0.21	0.65	0.24	0.56	0.19
15	Organic Matter	%	0.36	1.12	0.41	0.97	0.33
16	Water Soluble Chlorides as Cl	mg/kg	65.6	142.3	83.5	127.5	91.5
17	Water Soluble Sulphates as SO4	mg/kg	24.5	43.5	39.6	51.5	32.2
18	Aluminium	%	0.62	1.45	1.05	1.53	0.76
19	Total Iron	%	1.02	1.84	2.14	2.34	1.29
20	Manganese	mg/kg	415	537	389	365	288
21	Boron	mg/kg	18.4	35.7	25.8	34.9	19.5
22	Zinc	mg/kg	29.6	52.4	37.5	47.4	24.3

Soil Sampling Locations
S4- Islampeta village
S5- Namidoddi village
S6- Palikiladoddi village
S7- Dasaripeta village
S8- 8th feet road (Near Islampet village)

TABLE-3.25
SOIL QUALITY RESULTS (QUARTERLY)

S. No	Parameters	Unit	S4	S5	S6	S7	S8
			18.03.2024				
1	Texture	--	Sandy	clay	sandy clay	clay	Sandy
A	Sand	%	63	26	47	25	59
B	Silt	%	23	17	20	20	18
C	Clay	%	14	57	33	55	23
2	Bulk Density	g/cc	1.28	1.21	1.32	1.25	1.23
3	pH (1:5 Aq.Extraction)		7.43	7.62	7.53	7.75	7.61
4	Conductivity (1:5 Aq.Extraction)	µS/cm	413	367	482	408	381
5	Cation Exchange Capacity	(meq/100gm)	32.69	47.39	42.66	37.4	35.08
6	Exchangeable Calcium	(meq/100gm)	21.3	28.4	22.8	20.6	24.3
7	Exchangeable Magnesium	(meq/100gm)	9.5	16.3	17.3	14.2	8.7
8	Exchangeable Potassium	(meq/100gm)	1.35	1.97	1.57	1.87	1.54
9	Exchangeable Sodium	(meq/100gm)	0.54	0.72	0.99	0.73	0.54
10	Sodium Absorption Ratio (SAR)	----	0.57	0.62	0.71	0.67	0.64
11	Available Nitrogen as N	Kg/ha	74,3	105.3	82.4	75.1	66.8
12	Available Phosphorous as P	Kg/ha	54.3	71.4	77.9	63.2	47.8
13	Available Potassium as K	Kg/ha	334.5	389.3	325.4	375	408.3
14	Organic Carbon	%	0.38	0.51	0.31	0.49	0.23
15	Organic Matter	%	0.66	0.89	0.54	0.85	0.40
16	Water Soluble Chlorides as Cl	mg/kg	83.2	108.3	72.6	96.4	113.5
17	Water Soluble Sulphates as SO4	mg/kg	31.2	54.6	42.8	36.5	44.8
18	Aluminium	%	0.58	0.83	0.98	1.14	0.81
19	Total Iron	%	1.31	1.75	1.67	1.98	1.54
20	Manganese	mg/kg	378	482	408	437	377
21	Boron	mg/kg	24.3	28.4	31.7	26.2	30.3
22	Zinc	mg/kg	33.7	43.6	29.6	36.4	47.1

Soil Sampling Locations
S4- Islampeta village ,S5- Namidoddi village, S6- Palikiladoddi village
S7- Dasaripeta village, S8- 8th feet road (Near Islampet village)

TABLE-3.26
SEDIMENT QUALITY OF INTER-TIDAL REGION

Sr.No	Parameters	Unit	Sediment Sample			
			Post Monsoon Season		Winter Season	
	Sampling date		18.10.23	14.11.23	20.12.2023	17.01.24
1	Texture	--	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
a	Sand	%	55	57	54	58
b	Silt	%	28	25	27	25
c	Clay	%	17	18	19	17
2	Phosphorous as P	mg/kg	187.5	165.8	158.7	143.6
3	Chromium as Cr	mg/kg	22.7	19.5	17.6	22.3
4	Nickel as Ni	mg/kg	11.8	9.7	7.9	10.4
5	Cadmium as Cd	mg/kg	<1.0	<1.0	<1.0	<1.0
6	Lead as Pb	mg/kg	3.4	5.1	4.7	8.2
7	Mercury as Hg	mg/kg	<1.0	<1.0	<1.0	<1.0
8	Total Petroleum hydrocarbons (TPH)	%	<0.01	<0.01	<0.01	<0.01

TABLE-3.27
SOIL QUALITY OF INTER-TIDAL REGION

Sr.No	Parameters	Unit	Sediment Sample	
			Winter Season	Pre-Monsoon Season
	Sampling date		14.02.24	13.03.2024
1	Texture	--	Sandy Loam	Sandy Loam
a	Sand	%	54	58
b	Silt	%	27	25
c	Clay	%	19	17
2	Phosphorous as P	mg/kg	163.2	137.4
3	Chromium as Cr	mg/kg	18.3	21.6
4	Nickel as Ni	mg/kg	9.3	13.6
5	Cadmium as Cd	mg/kg	<1.0	<1.0
6	Lead as Pb	mg/kg	5.1	9.3
7	Mercury as Hg	mg/kg	<1.0	<1.0
8	Total Petroleum hydrocarbons (TPH)	%	<0.01	<0.01

3.7 Waste Water Quality

3.7.1 Effluent Treatment Plant and Outfall water at diffusion point water Quality

There are one ETP water inside plant and two Outfall water at diffusion point these sample were collected and these were as per analyzed as per the standards to know the quality of water. The Summary of analyzed parameters results is given in **Table-3.28** and **Table-3.26.**

TABLE-3.28
ETP OUTLET ANALYSIS RESULT AT PLANT SITE

Sr.no	Parameters	Unit	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Limiting standards
			18.10.23	14.11.23	20.12.23	17.01.24	14.2.24	14.03.24	
1	Ph	-	7.82	7.58	7.63	7.81	7.53	7.36	6.50—8.50
2	Total Suspended Solids (at 103—105° C)	mg/l	52	59	63	68	50	63	100 mg/l
3	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	20 mg/l
4	Free chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5 mg/l
5	Phosphate as PO4	mg/l	8.12	10.04	11.24	13.82	9.74	12.42	20 mg/l
6	Chromium (Total)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.2 mg/l
7	Copper (Total)	mg/l	0.37	0.47	0.51	0.40	0.56	0.38	1 mg/l
8	Iron	mg/l	0.12	0.15	0.18	0.27	0.22	0.16	1 mg/l
9	Zinc	mg/l	0.41	0.38	0.43	0.36	0.40	0.34	1 mg/l

TABLE-3.29
OUTFALL WATER QUALITY AT DIFFUSION POINT

Sr No	Parameters	Unit	Outfall water at diffusion point					
			Surface area	Bottom area	Surface area	Bottom area	Surface area	Bottom area
			October 2023		November 2023		December 2023	
	Sampling Date		18.10.2023		14.11.2023		20.12.2023	
1	pH	-	7.93	8.10	8.02	7.81	8.14	8.02
2	Temperature	°C	32.8	36.0	31.4	35.6	30.5	34.7
3	Salinity	mg/l	32.5	30.7	31.5	28.7	31.0	29.2
4	DO	mg/l	5.2	4.9	5.4	5.0	5.2	4.8
5	BOD	mg/l	<3	<3	<3	<3	<3	<3
6	Dissolved Phosphate	mg/l	7.4	12.7	14.5	9.7	16.8	12.4
7	Ammonia	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8	Total Petroleum hydrocarbons	%	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE-3.30
OUTFALL WATER QUALITY AT DIFFUSION POINT

Sr No	Parameters	Unit	Outfall water at diffusion point					
			Surface area	Bottom area	Surface area	Bottom area	Surface area	Bottom area
			January 2024		February 2024		March 2024	
	Sampling Date		17.01.2024		14.02.2024		14.03.24	
1	pH	-	8.26	7.92	8.02	7.84	8.13	7.96
2	Temperature	°C	31.6	34.3	31.4	35.4	32.0	36.2
3	Salinity	mg/l	30.6	27.4	29.2	26.2	30.5	25.7
4	DO	mg/l	5.2	5.0	5.1	4.9	5.3	5.0
5	BOD	mg/l	<3	<3	<3	<3	<3	<3
6	Dissolved Phosphate	mg/l	12.8	8.4	15.2	10.3	17.5	13.4
7	Ammonia	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8	Total Petroleum hydrocarbons	%	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

3.8 Stack Emission Monitoring

The power plant has stack of height 275.0-m, which is the major source of air pollution. The stack emission monitoring for Unit–I and Unit-II has been carried out and results are given in **Table-3.31 to 3.34**

TABLE-3.31
STACK EMISSION MONITORING

Sr. No.	Parameters	UOM	Unit-I	Unit-II	Unit-I	Unit-II	Methods of Testing
	Sampling date		07.10.23		25.11.23	06.11.23	
1	Capacity	MW	520	520	520	520	-
2	Stack Height	M	275	275	275	275	-
3	Stack diameter	M	6.8	6.8	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	36.33	36.33	-
5	Flue gas Temperature	^oC	128	122	119	122	-
6	Velocity of the flue gas	m/s	24.44	25.19	23.71	24.08	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	669.33	693.75	673.4	682.6	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	27.52	30.40	25.44	27.38	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	782	743	764	728	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	406	387	375	398	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.006	0.009	0.005	0.007	USEPA 29

TABLE-3.32
STACK EMISSION MONITORING

Sr. No.	Parameters	UOM	Unit-II	Unit-I	Unit-II	Methods of Testing
	Sampling date		11.12.23	16.01.24	11.01.24	
1	Capacity	MW	520	520	520	-
2	Stack Height	M	275	275	275	-
3	Stack diameter	m	6.8	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	36.33	-
5	Flue gas Temperature	^oC	126	122	118	-
6	Velocity of the flue gas	m/s	23.22	22.73	23.01	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	641.49	647.33	665.16	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	27.8	24.36	28.03	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	744	783	804	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	359	384	417	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.006	0.005	0.008	USEPA 29

TABLE-3.33
STACK EMISSION MONITORING

Sr. No.	Parameters	UOM	Unit-I	Unit-II	Methods of Testing
	Sampling date		05.02.24		
1	Capacity	MW	520	520	-
2	Stack Height	M	275	275	-
3	Stack diameter	M	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	-
5	Flue gas Temperature	^oC	119	124	-
6	Velocity of the flue gas	m/s	23.23	22.87	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	663.56	651.44	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	27.42	30.5	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	823	775	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	373	397	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.007	0.005	USEPA 29

TABLE-3.34
STACK EMISSION MONITORING RESULTS

Sr. No.	Parameters	UOM	Unit-I	Unit-II	Methods of Testing
	Sampling date		23.03.2024		
1	Capacity	MW	520	520	-
2	Stack Height	M	275	275	-
3	Stack diameter	M	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	-
5	Flue gas Temperature	^oC	126	120	-
6	Velocity of the flue gas	m/s	22.97	22.33	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	674.22	663.63	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	25.42	28.65	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	794	755	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	384	406	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.006	0.009	USEPA 29

3.9 Pizeo wells Monitoring

Pizeo wells Monitoring of ground water has been carried out for 6 locations around the plant site and the Pizeo wells water level monitoring is given in **Table-3.35.**

TABLE-3.35
PIZEO WELLS MONITORING FOR GROUND WATER

Sr.No.	Location Name	Depth of Water levels (m)	
		20.12.2023	13.03.2024
1	Appikonda village	3.05	4.27
2	Palavalasa village	3.35	3.82
3	Velama Appikonda village	3.80	4.08
4	Gouruvanipalem village	2.36	3.55
5	Islampet village	3.22	3.75
6	Dasaripeta villa	2.87	3.40

3.10 Sewage Treatment Plant Outlet Water Quality (STP)

Two Sewage water samples are collected one is from Plant site and other is Colony and analyzed for various parameters. The survey analytical results are given in **Table-3.36.**

TABLE-3.36
SEWAGE OUTLET WATER QUALITY (OCTOBER 2023 TO MARCH 2024)

Sr.No	Parameter	UOM	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24
	Sampling date		18.10.23	14.11.23	20.12.23	18.1.24	14.2.24	13.03.24
1	pH	-	7.65	7.49	7.54	7.80	7.51	7.65
2	Oil & Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3	Total Dissolved Solids	mg/l	473	458	437	493	446	472
4	Total Suspended Solids	mg/l	25.5	22.8	27.2	24.3	30.7	26.4
5	Bio Chemical Oxygen Demand for 3 day $27^{O}C$	mg/l	14	15	12	17	15	18
6	Fecal Coliform (FC) MPN/100ml	MPN/100ml	430	395	324	539	660	780

3.11 Ground Water Near Ash Pond Area

Ground Water around ash pond area have been collected in four locations and these samples has been collected to know the quality of the water and the results of the same are shown below in **Table-3.37.**

TABLE-3.37
GROUND WATER NEAR ASHPOND AREA

Sr. No	Parameters	MOU	Near Pump house					
	Sampling Date		16.10.23	13.11.23	20.12.23	17.01.24	13.2.24	14.3.24
1	pH	---	7.62	7.43	7.38	7.57	7.62	7.33
2	Colour	Hazen	7	5	4	8	5	8
3	Conductivity	µs/cm	10230	11450	9520	10355	11780	12620
4	Turbidity	NTU	8	7	8	10	13	8
5	TDS	mg/l	6965	7788	6474	7040	8010	8450
6	Total Hardness (as $CaCO_3$)	mg/l	769	851	626	777	1033	1140
7	Total Alkalinity as (as $CaCO_3$)	mg/l	140.4	207	154	165	204.3	277
8	Calcium (as Ca)	mg/l	160.0	173.8	124.5	157.3	185.0	205.3
9	Magnesium (as Mg)	mg/l	89.7	101.2	76.6	93.2	138.6	152.2
10	Boron (as B)	mg/l	1.35	1.01	1.18	1.32	1.55	1.78
11	Chlorides (as Cl)	mg/l	3256.0	3608.3	3026.4	3299.4	3587.3	3803.8
12	Sulphates (as SO_4)	mg/l	316.4	386.1	304.7	331.7	564.2	598.2
13	Fluorides (as F)	mg/l	1.64	1.81	1.54	1.32	1.51	1.82
14	Nitrates (as NO_3)	mg/l	21.5	24.1	17.6	19.5	26.1	21.8
15	Sodium as Na	mg/l	1953.0	2190.4	1860.9	1983.4	2175.2	2311
16	Potassium as K	mg/l	78.5	86.2	67.7	71.5	97.2	112.4
17	Cyanides(as CN)	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Cadmium (as Cd)	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
19	Total Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Copper (as Cu)	mg/l	0.04	0.05	0.03	0.07	0.09	0.11
21	Lead (as Pb)	mg/l	0.02	0.03	0.05	0.03	0.04	0.06
22	Manganese (as Mn)	mg/l	0.07	0.05	0.09	0.15	0.10	0.15
23	Iron (as Fe)	mg/l	0.18	0.20	0.15	0.16	0.11	0.15
24	Total Chromium (as Cr)	mg/l	0.05	0.03	0.04	0.02	0.04	0.06
25	Selenium (as Se)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Zinc (as Zn)	mg/l	0.32	0.24	0.27	0.32	0.26	0.44
27	Aluminum (as Al)	mg/l	0.10	0.04	0.06	0.03	0.05	0.07
28	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE-3.38
GROUND WATER NEAR ASHPOND AREA

Sr. No	Parameters	MOU	North side opp Palavalasa village					
	Sampling Date		16.10.23	13.11.23	20.12.23	17.01.24	13.2.24	14.3.24
1	pH	---	6.73	6.88	7.02	7.33	7.82	7.93
2	Colour	Hazen	5	8	7	5	7	6
3	Conductivity	µs/cm	41800	39270	42010	40250	38620	36820
4	Turbidity	NTU	4	6	7	8	10	13
5	TDS	mg/l	28845	27490	29407	28570	27035	26140
6	Total Hardness (as $CaCO_3$)	mg/l	2328	2127	2459	2261	2105	1995
7	Total Alkalinity as (as $CaCO_3$)	mg/l	210.1	196	211	215	175.3	156
8	Calcium (as Ca)	mg/l	298.7	261.8	283.7	283.4	257.3	241.3
9	Magnesium (as Mg)	mg/l	384.2	357.9	425.3	377.2	355.2	338.7
10	Boron (as B)	mg/l	1.55	1.32	1.27	1.06	1.21	1.56
11	Chlorides (as Cl)	mg/l	12489.4	11887.2	12416.5	12162.2	11562.2	10832.5
12	Sulphates (as SO_4)	mg/l	2784.0	2510.5	3125.4	2700	2633.1	2793.3
13	Fluorides (as F)	mg/l	1.85	1.42	1.69	1.72	1.32	2.13
14	Nitrates (as NO_3)	mg/l	32.4	28.6	23.4	22.7	22.7	25.2
15	Sodium as Na	mg/l	8423.4	7957.2	8414.2	8193.4	7833.2	7483.5
16	Potassium as K	mg/l	196.2	157.3	192.6	147.3	130.7	108.3
17	Cyanides(as CN)	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Cadmium (as Cd)	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
19	Total Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Copper (as Cu)	mg/l	0.07	0.09	0.06	0.04	0.06	0.06
21	Lead (as Pb)	mg/l	0.04	0.05	0.07	0.06	0.03	0.02
22	Manganese (as Mn)	mg/l	0.19	0.15	0.12	0.11	0.14	0.11
23	Iron (as Fe)	mg/l	0.21	0.14	0.19	0.19	0.13	0.10
24	Total Chromium (as Cr)	mg/l	0.03	0.04	0.06	0.04	0.02	0.03
25	Selenium (as Se)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Zinc (as Zn)	mg/l	0.39	0.32	0.37	0.025	0.29	0.37
27	Aluminum (as Al)	mg/l	0.08	0.07	0.05	0.04	0.02	0.06
28	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE-3.39
GROUND WATER NEAR ASHPOND AREA

Sr. No	Parameters	MOU	East side Towards HNPCL Town ship					
	Sampling Date		16.10.23	13.11.23	20.12.23	17.01.24	13.2.24	14.3.24
1	pH	---	6.96	7.04	7.15	7.61	7.45	7.62
2	Colour	Hazen	7	4	5	6	5	9
3	Conductivity	µs/cm	8020	9135	7625	9023	7934	9460
4	Turbidity	NTU	6	4	5	7	9	16
5	TDS	mg/l	5376	6214	5185	6135	5395	635
6	Total Hardness (as $CaCO_3$)	mg/l	792	973	756	1068	868	1135
7	Total Alkalinity as (as $CaCO_3$)	mg/l	170.5	224	184	296	271.4	352
8	Calcium (as Ca)	mg/l	147.5	164.8	105.8	178.3	152.3	198.2
9	Magnesium (as Mg)	mg/l	102.8	136.3	119.4	151.3	118.3	155.0
10	Boron (as B)	mg/l	1.28	0.97	1.06	0.87	0.66	1.06
11	Chlorides (as Cl)	mg/l	2487.2	2807.3	2346.7	2641.0	2301.2	2703.4
12	Sulphates (as SO_4)	mg/l	292.7	347.4	287.2	432.3	408.3	503.7
13	Fluorides (as F)	mg/l	1.23	1.57	1.73	1.24	1.73	1.42
14	Nitrates (as NO_3)	mg/l	13.6	19.5	16.7	25.4	18.6	20.1
15	Sodium as Na	mg/l	1446.8	1607.7	1374.3	1504.3	1356.2	1575.0
16	Potassium as K	mg/l	63.4	77.5	53.4	133.4	118.3	133.4
17	Cyanides(as CN)	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Cadmium (as Cd)	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
19	Total Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Copper (as Cu)	mg/l	0.03	0.02	0.04	0.07	0.05	0.07
21	Lead (as Pb)	mg/l	0.03	0.02	0.04	0.02	0.05	0.04
22	Manganese (as Mn)	mg/l	0.06	0.04	0.07	0.08	0.11	0.24
23	Iron (as Fe)	mg/l	0.16	0.12	0.17	0.09	0.15	0.12
24	Total Chromium (as Cr)	mg/l	0.01	0.02	0.03	0.02	0.03	0.02
25	Selenium (as Se)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Zinc (as Zn)	mg/l	0.25	0.28	0.31	0.28	0.31	0.26
27	Aluminum (as Al)	mg/l	0.08	0.05	0.04	0.06	0.08	0.03
28	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE-3.40
GROUND WATER NEAR ASHPOND AREA

Sr. No	Parameters	MOU	South side Towards sea					
	Sampling Date		16.10.23	13.11.23	20.12.23	17.1.24	13.2.24	14.3.24
1	pH	---	7.22	7.87	7.98	8.04	7.93	8.02
2	Colour	Hazen	9	7	8	9	8	5
3	Conductivity	µs/cm	49250	51300	49180	48260	46170	49470
4	Turbidity	NTU	8	11	9	12	15	12
5	TDS	mg/l	35970	37450	35901	35230	32320	36110
6	Total Hardness (as $CaCO_3$)	mg/l	3880	4344	3825	4055	3742	4013
7	Total Alkalinity as (as $CaCO_3$)	mg/l	290.4	254	173	231	197.3	215
8	Calcium (as Ca)	mg/l	503.1	579.5	514.7	540.2	507.2	538.1
9	Magnesium (as Mg)	mg/l	637.2	703.5	616.7	657.3	601.3	648.6
10	Boron (as B)	mg/l	1.76	1.55	1.48	1.28	1.41	1.67
11	Chlorides (as Cl)	mg/l	17165.0	15813.5	15487.2	15004.8	14383.4	15432.1
12	Sulphates (as SO_4)	mg/l	3215.5	2873.6	2446.3	2511.7	2422.4	2581.2
13	Fluorides (as F)	mg/l	1.76	1.88	1.47	2.10	1.96	2.05
14	Nitrates (as NO_3)	mg/l	28.3	25.1	21.3	30.7	26.4	28.3
15	Sodium as Na	mg/l	9453.1	9695.1	9468.5	9118.0	8801.3	9422.3
16	Potassium as K	mg/l	144.3	171.3	136.5	193.2	154.3	180.3
17	Cyanides(as CN)	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Cadmium (as Cd)	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
19	Total Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Copper (as Cu)	mg/l	0.08	0.06	0.08	0.11	0.08	0.06
21	Lead (as Pb)	mg/l	0.06	0.07	0.09	0.07	0.09	0.07
22	Manganese (as Mn)	mg/l	0.43	0.33	0.26	0.18	0.21	0.17
23	Iron (as Fe)	mg/l	0.14	0.16	0.18	0.21	0.18	0.16
24	Total Chromium (as Cr)	mg/l	0.07	0.06	0.07	0.05	0.07	0.05
25	Selenium (as Se)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Zinc (as Zn)	mg/l	0.41	0.37	0.27	0.33	0.42	0.48
27	Aluminum (as Al)	mg/l	0.16	0.13	0.09	0.07	0.06	0.09
28	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

3.12 Beach Profile Study

Hinduja National Power Corporation Limited (HNPCL) is a Hinduja Group company to realize the ambitions of the Group in Power Sector. HNPCL is setting up a 1,040 MW coal-based merchant power plant at Vizag, Andhra Pradesh. Once Through (Open Cycle) Cooling System has been recommended by MoEF for the power plant and Sea Water Intake-Outfall System has been installed.

The present study involves quarterly monitoring of shoreline and beach profile changes as part of environmental monitoring and compliance to MoEF:

1. shoreline within 3 km on either side of HNPCL Sea Water Intake-Outfall System (Jetty) and
2. beach profile at HNPCL Jetty and at 100 m, 250 m and 500 m intervals on either side of Jetty

3.12.1 Shoreline

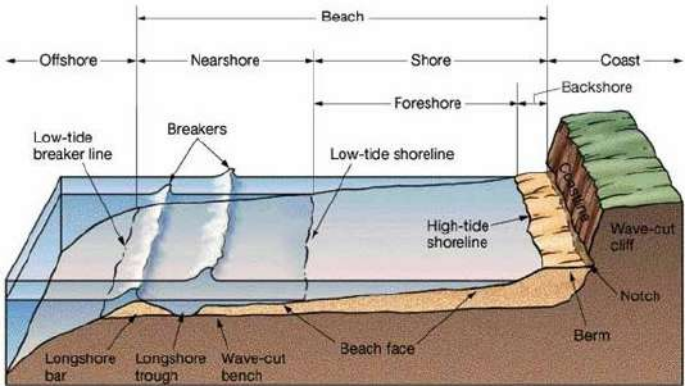
The coastal areas are always physically and ecologically changing that depends on natural and human factors. Monitoring of coastal areas is an important fact in steady development and environment maintenance. To monitor a coastal area, shoreline extraction in various times is an essential task. Shoreline is one the most important linear features on the Earth's surface showing a dynamic nature. It is important to produce shoreline map and to determine the changes for a secure shipping, resource management, environment maintenance, planning and coastal steady-development.

Remote sensing is one of the best and most reliable methods in monitoring and management off environment and resources. Since, the reflection of water in IR bands are almost zero and most of vegetation have a bigger reflection versus water, shoreline can be extracted from even one band of the image.

Cartosat 1 with improved spatial resolution capability, it will provide enhanced inputs for large scale mapping applications and stimulate newer applications in the urban and rural development, land and water resources management, coastal mapping etc. Hence, high resolution satellite data during November 2023 has been proposed to carry out investigation on spatial changes of shoreline monitoring. Since could free 2.5 m resolution data close to field profile study i.e., 11-November-2023 is not available Resourcesat 2 L4FMX multispectral satellite data of 5 m resolution on 13-December-2023 has been procured to draw shore lines during December 2023. The Resourcesat 2 L4FMX satellite data of 5 m resolution of 13-December-2023 obtained from NRSC is geometrically corrected with respect to Survey of India toposheet and GCPs collected from field. To carry out the geo-referencing, ground control points (GCPs) were identified on the maps and raw satellite data. The coefficients for two co-ordinate transformation equations were computed based on polynomial regression between GCPs on map and satellite data. Alternate GCPs were generated till the Root Mean Square (RMS) error was less than 0.5 pixel and then both the images were co-registered.

Shore line and High Tide Shore lines are delineated from processed Resourcesat 2 L4FMX image of 13-December-2023 using visual interpretation technique in conjunction with LTL, HTL and CRZ Map prepared by National Institute of Oceanography and field data provided by VIMTA Labs Ltd. The above-mentioned satellite data covering 3.5 km on either side of Jetty point has been used to present shore line changes. "The line on the land up to which the highest water line reaches during the spring tide" indicated by vegetation line and clear beach is delineated as Shore Line (SL). High Tide Shore Line (HTSL) is plotted following line of moisture indication along the tidal zone on the satellite image. Mapping of SL and HTSL is done on scale of 1:8000.

The observations in respect of SL and HTSL are presented in **Figure-3.5** for 13-December-2023. From the shoreline map, it is observed that there is no major change in SL and no activity or discharge around jetty. The difference in HTSL observed may be due to fluctuations caused by changes in seasonal tides/gravitational forces exerted by the moon and the sun, and the rotation of the Earth.



East of HNPCL Jetty

West of HNPCL Jetty

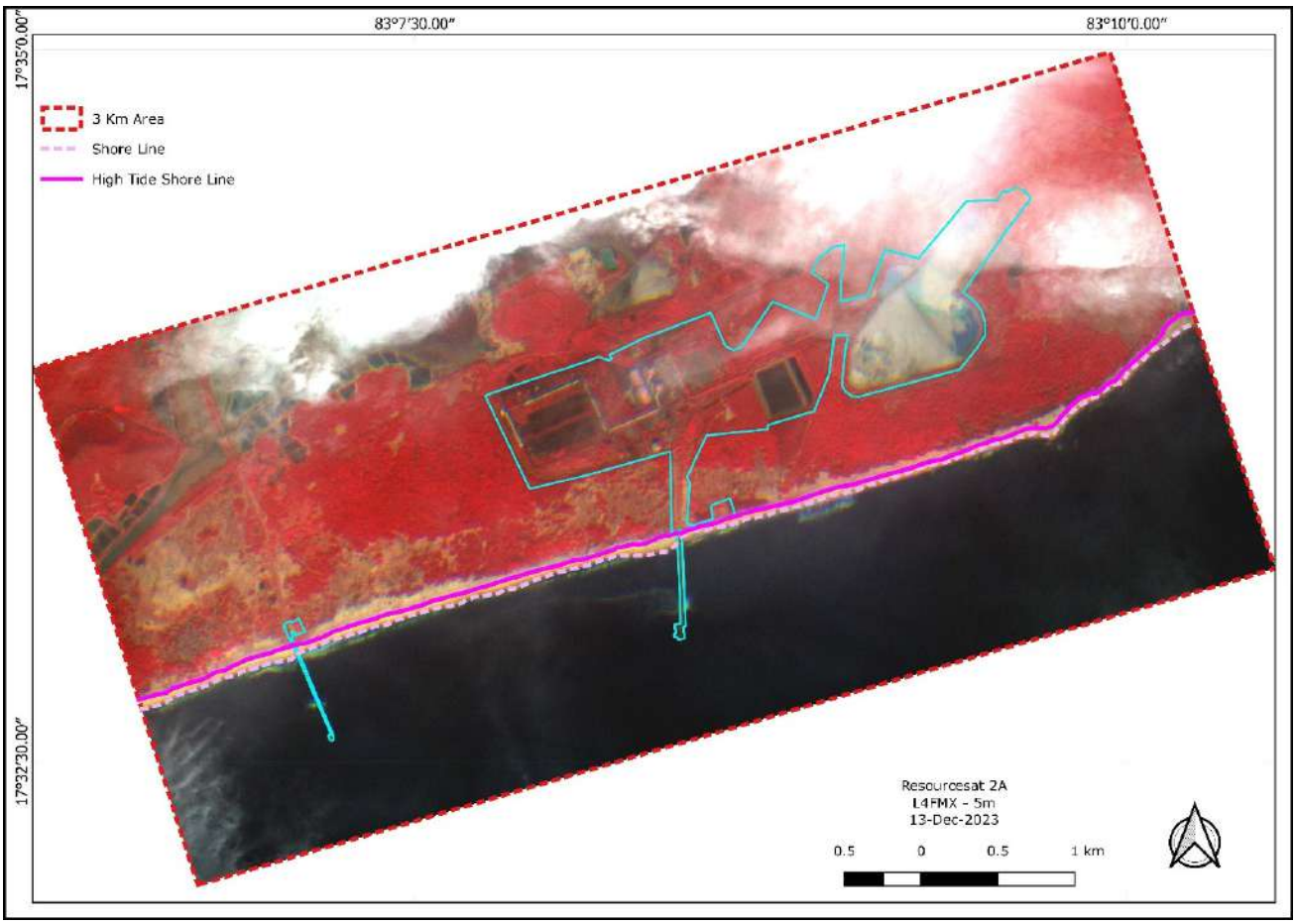


FIGURE-3.5
SHORELINE SATELLITE IMAGERY OF HTSL, RESOURCESAT 2A L4FMX-5M (13 DECEMBER 2023)

3.12.2 Beach Profiles

Measuring beach profiles is an ideal activity for science-based assessments and science fair projects. Beach size often changes so quickly – in a matter of days – those interesting results can be guaranteed in short time period. Furthermore, the information gathered may also be useful for environmental management and planning.

The monitoring consists of surveying the beach profile from a fixed point set up behind the beach. The fixed point is called the reference mark and is the starting point for the measurement. The reference mark is usually painted on a permanent feature like wall or tree or a pillar established. In the absence of any permanent features here, 1'x1'x3' pillar stones are installed (at 7.1 m, 100 m, 250 m & 500 m towards east of Jetty and 8.1 m, 100 m, 250 m & 500 m towards west of Jetty) as reference marks and painted with profile identification numbers. Reference marks, profile sections and profile line along the beach are shown in **Figure-3.41**. Beach profile measurements are run from the installed reference marks at right angles across the beach on 17.11.2023. Beach profile measurements are done using an Abney Level & Clinometer placing ranging poles at each break of slope and ensuring the line of profile follows the fixed orientation. The measurements are continued for a few meters into the sea water beyond low tide.

FIGURE-3.6
HNPCL JETTY AND PROFILE LOCATIONS ON GOOGLE EARTH MAP

High and low tide levels are measured as observed on the day and time of measurements considering the moisture indication and current tide level respectively. Summary of profiles carried out giving the details of length, vertical drop w.r.t reference mark and area of profile are presented in **Table-3.41** and individual profiles are presented in **Figure 3.7 to 3.10**

Total length of profiles ranges from 27.33 m at E7.1 to 98.00 m at W100 from the reference mark in to the offshore with vertical drop w.r.t reference mark ranging from 3.981 m to 5.968 m and sectional profile area ranging from 53.11 sq m to 347.99 sq m.

TABLE-3.41
DETAILS OF PROFILES ON 17.11.2023

Sr.No.	Profile ID	Latitude	Longitude	Elevation at Ref. Mark (m amsl)	Total Length (m)	Vertical Drop w.r.t Ref. Mark (m)	Profile Area (sq m)
1	E7.1	17 0 33' 17.7"N	83 0 08' 26.3"E	3.62	27.33	5.398	95.29
2	E100	17 0 33' 18.6"N	83 0 08' 29.2"E	3.31	27.71	3.981	53.11
3	E250	17 0 33' 20.2"N	83 0 08' 34.0"E	5.32	47.29	5.968	151.01
4	E500	17 0 33' 22.2"N	83 0 08' 42.4"E	3.31	39.88	5.502	117.34
5	W8.1	17 0 33' 17.6"N	83 0 08' 24.9"E	4.54	37.03	4.779	108.88
6	W100	17 0 33' 16.5"N	83 0 08' 21.9"E	4.40	98.00	5.831	347.99
7	W250	17 0 33' 15.2"N	83 0 08' 16.9"E	3.60	42.82	4.473	89.91
8	W500	17 0 33' 13.0"N	83 0 08' 08.6"E	3.50	50.07	5.725	160.33

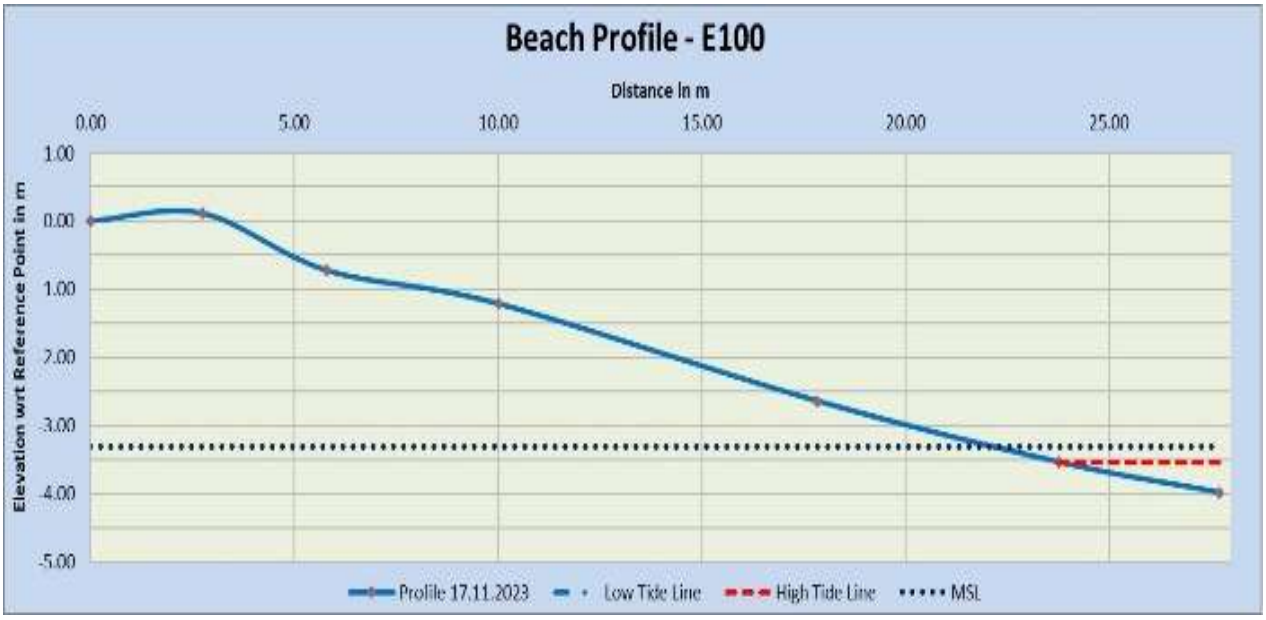
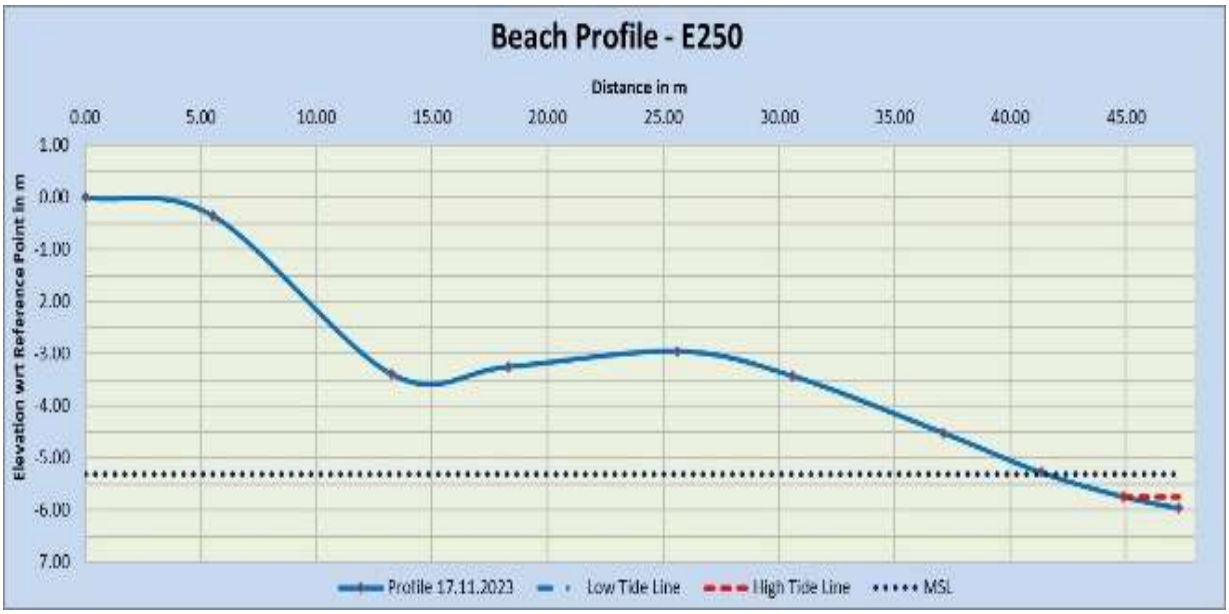


FIGURE-3.7

BEACH PROFILE – EAST 7.1 & EAST 100 METERS FROM JETTY 17.11.2023



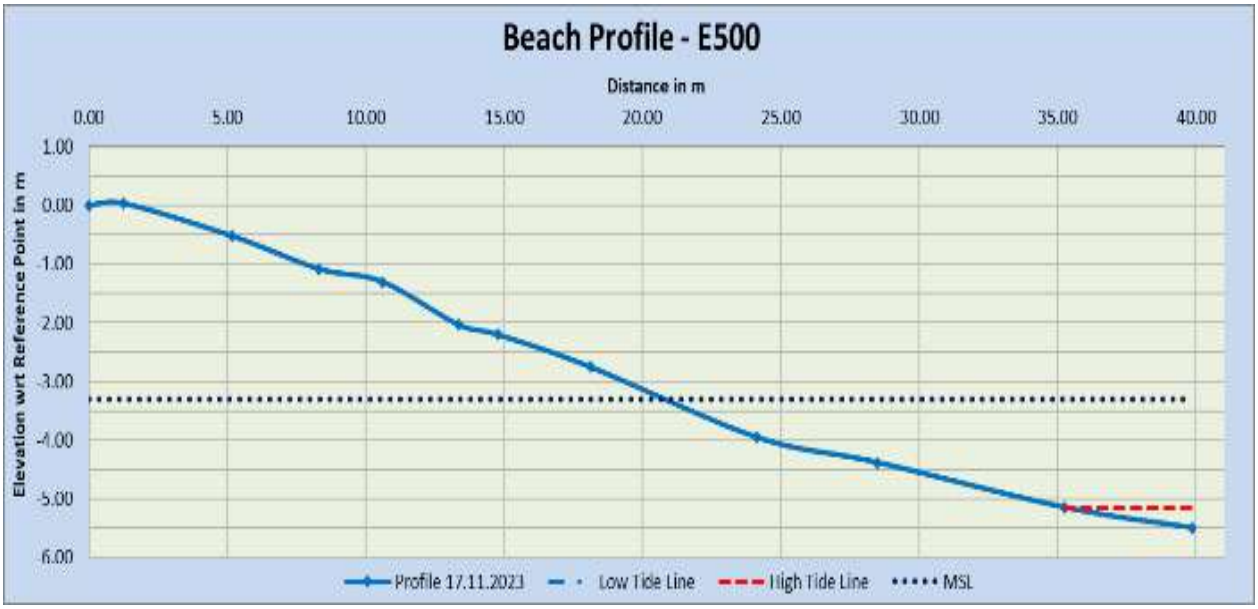


FIGURE-3.8
BEACH PROFILE – EAST 250 & EAST 500 METERS FROM JETTY 17.11.2023

FIGURE-3.9
BEACH PROFILE – WEST 8.1 & WEST 100 METERS FROM JETTY 17.11.2023

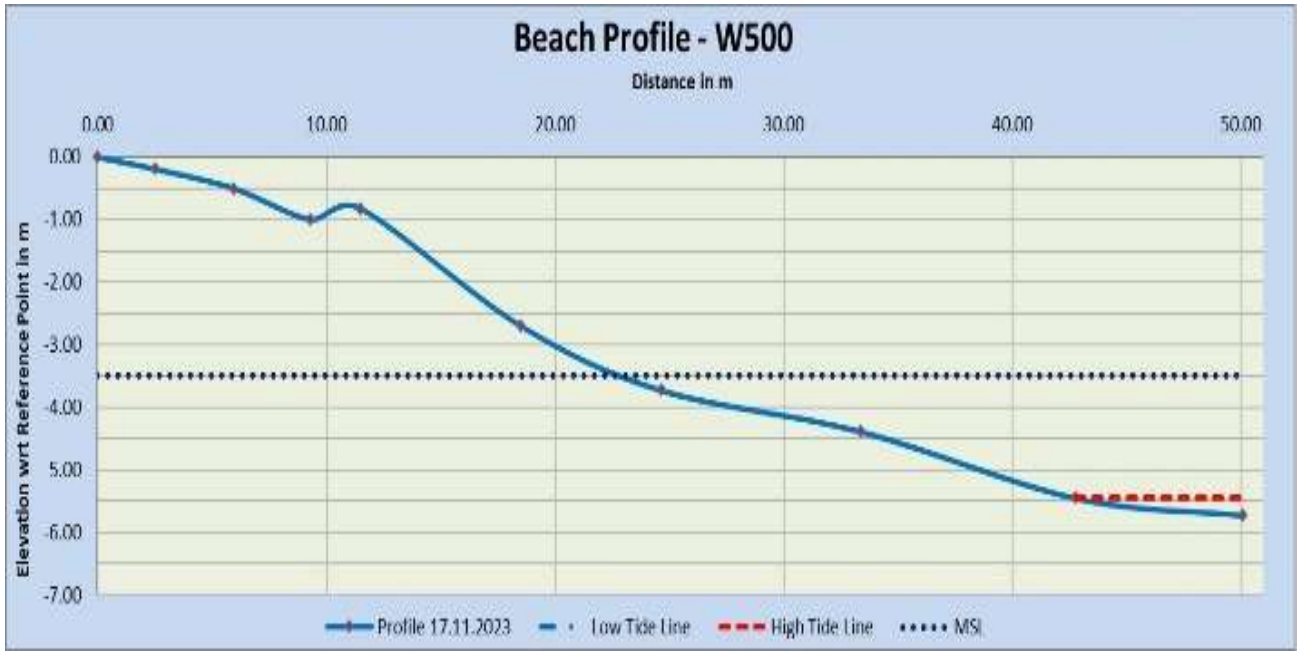


FIGURE-3.10
BEACH PROFILE – WEST 250 & WEST 500 METERS FROM JETTY 17.11.2023

3.13 Biological characteristics

3.13.1 Phytoplankton

Phyto-pigments: Phyto-pigments such as Chlorophyll-a / Chlorophyll-b Chlorophyll-c, Carotenoids / Phaeopigments.

3.13.1.1The Genetic diversity of the Phyto-planktons is presented in the **Table-3.42.**

TABLE-3.42
PHYTOPLANKTON GENETIC DIVERSITY

Phytoplankton Genetic Diversity		
Chlorophyaceae		**Genetic Diversity**
1	*Cosmarium*	20
2	*Chara*	17
3	*Cladophora*	14
4	*Chlorella*	23
5	*Chlamydomonas*	16
6	*Volvox*	17
7	*Hydrodictyon*	29
8	*Spirodictiona*	33
9	*Spirogyra*	35
10	*Zygenema*	21
Cyanophyaceae		
11	*Spirulina*	12
12	*Anabaena*	25
13	*Nostoc*	27
Bacillariophyaceae		
14	*Pinnularia*	28
15	*Navicula*	34
16	*Chaetoceros*	21
Shannon Wiener Diversity Index for Species Diversity		2.71
Species Richness		16

Population of biomass comprises of 16 species of phyto-planktons.

3.13.1.2 The genetic diversity of the Zooplankton is given in the **Table-3.43**

TABLE-3.43
ZOOPLANKTON GENETIC DIVERSITY

Zooplankton Genetic Diversity		
Copepoda		**Genetic Diversity**
1	*Cyclops* sp	30
2	*Nauplius* larvae	17
Rotifera		
1	*Brachionus* sp	18
2	*Allonella* sp	22
3	*Moina* sp	15
Protozoa		
1	*Pinnularia* sp	32
Shannon Wiener Diversity Index for Species Diversity		1.75
Species Richness		6

3.13.2 Benthos

3.13.2.1 Meiobenthos

Community of Benthos are represented by Meiobenthos and Macro benthos. The Meiobenthos communities are represented such as Copepods, and turbellarians, Listed in **Table-3.44.**

TABLE-3.44
MEIOBENTHIC GROUP

Sr. No.	Meiobenthos	Genetic Diversity
1	*Nematodes*	34
2	*Turbellarians*	21
3	*Nemertines*	16
4	*Foraminifera*	30
5	*Kinoryncha*	23
Shannon Wiener Diversity Index - Species Diversity		1.58
Species Richness		5

3.13.2.2 Macro benthos

Represented by Polychaetes, Molluscs, Amphipods, Isopods and Cnidarians listed in **Table-3.45.**

TABLE-3.45
MACROBENTHIC GROUP

Sr. No.	Macrobenthos	Genetic Diversity
1	*Polychaetes*	30
2	*Molluscs*	26
3	*Amphipods*	18
4	*Isopods*	41
5	*Cnidarians*	25
6	*Oligochaetes*	29
7	*Tanaidacea*	13
Shannon Wiener Diversity Index - Species Diversity		1.89
Species Richness		7

3.13.3 Fishes

The list of fish found near the study area, near the plant site listed in **Table-3.46.**

TABLE-3.46
LIST OF FISHES IN THE STUDY AREA

Sr. No	Name of the Species	Number of Individuals	Common Name
Fishes			
1	*Rasterlliger kanagurta*	29	Indian Mackerel
2	*Sardinella longiceps*	22	Indian oil Sardine
3	*Mugil cumera*	21	White Mullet
4	*Nemipterus japonicus*	31	Sea breams
5	*Trichiurus lepturus*	14	Ribbon fish
6	*Leiognathus bindus*	9	Silver bellies
7	*Lutjanus lutjanus*	22	Common snappers
Shannon Wiener Diversity Index - Species Diversity		1.88	
Species Richness		7	

Thus, indicating the Genetic diversity of Phytoplankton, Meiobenthos and Macrobenthos and fishes in the study area.

3.14 Beach Profile Study

Hinduja National Power Corporation Limited (HNPCL) is a Hinduja Group company to realize the ambitions of the Group in Power Sector. HNPCL is setting up a 1,040 MW coal-based merchant power plant at Vizag, Andhra Pradesh. Once Through (Open Cycle) Cooling System has been recommended by MoEF for the power plant and Sea Water Intake-Outfall System has been installed.

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4. beach profile at HNPCL Jetty and at 100 m, 250 m and 500 m intervals on either side of Jetty

3.14.1 Shoreline

The coastal areas are always physically and ecologically changing that depends on natural and human factors. Monitoring of coastal areas is an important fact in steady development and environment maintenance. To monitor a coastal area, shoreline extraction in various times is an essential task. Shoreline is one the most important linear features on the Earth's surface showing a dynamic nature. It is important to produce shoreline map and to determine the changes for a secure shipping, resource management, environment maintenance, planning and coastal steady-development.

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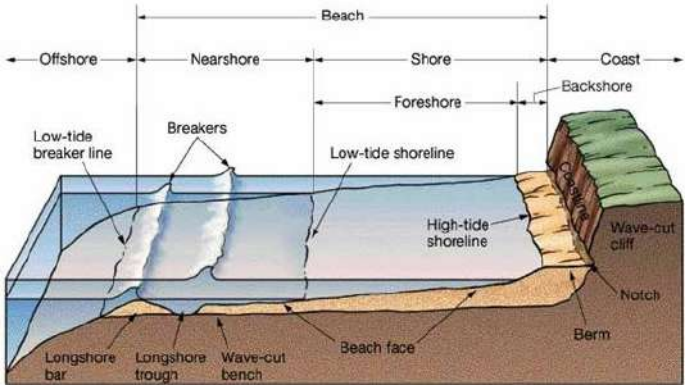
The observations in respect of SL and HTSL are presented in **Figure-3.11** for 11-February-2024. From the shoreline map, it is observed that there is no major change in SL and no activity or discharge around jetty. The difference in HTSL observed may be due to fluctuations caused by changes in seasonal tides/gravitational forces exerted by the moon and the sun, and the rotation of the Earth.



East of HNPCL Jetty

West of HNPCL Jetty

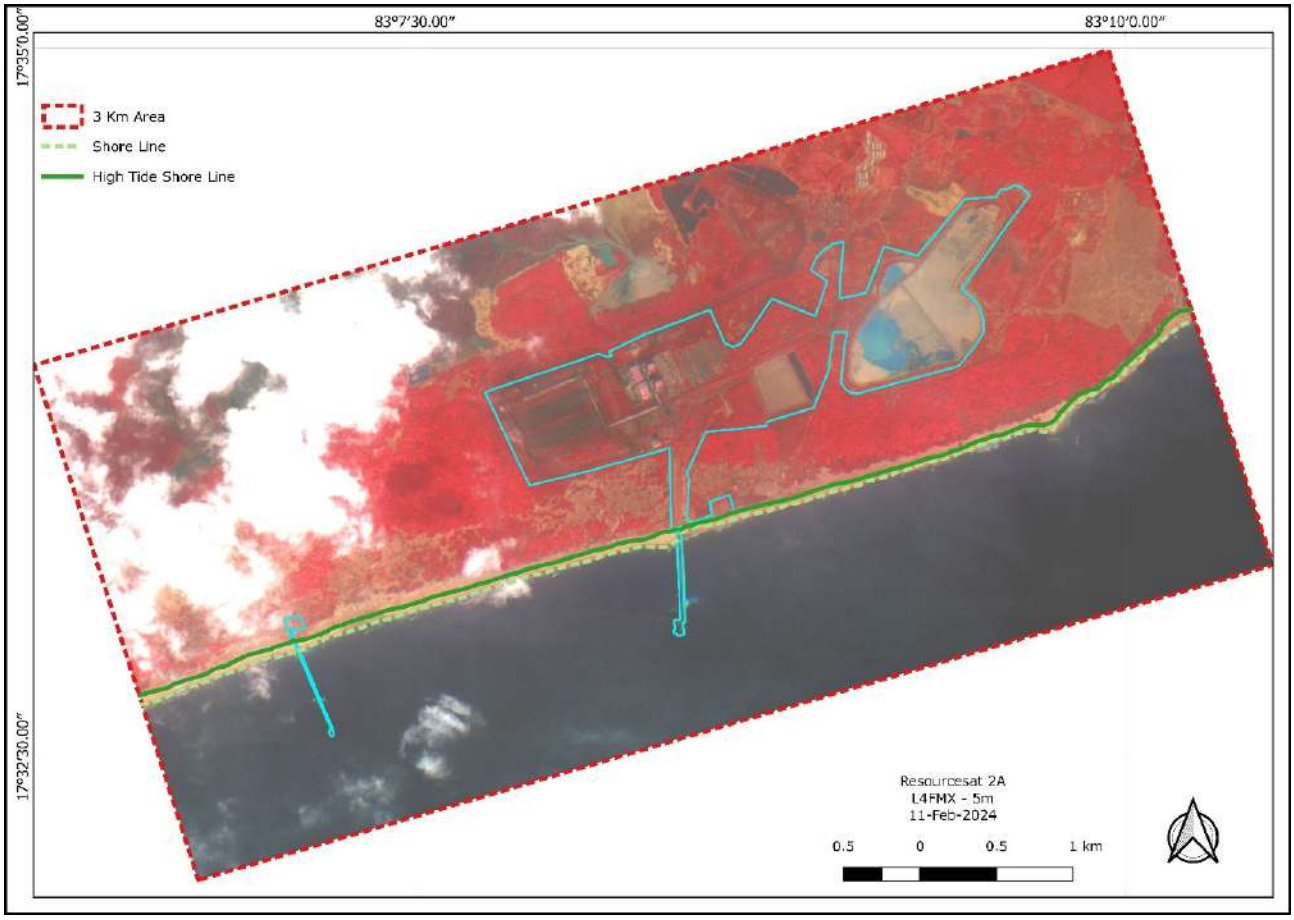


FIGURE-3.11
SHORELINE SATELLITE IMAGERY OF HTSL, RESOURCESAT 2A L4FMX (11 FEBRUARY 2024)

3.14.2 Beach Profiles

Measuring beach profiles is an ideal activity for science-based assessments and science fair projects. Beach size often changes so quickly – in a matter of days – those interesting results can be guaranteed in short time period. Furthermore, the information gathered may also be useful for environmental management and planning.

The monitoring consists of surveying the beach profile from a fixed point set up behind the beach. The fixed point is called the reference mark and is the starting point for the measurement. The reference mark is usually painted on a permanent feature like wall or tree or a pillar established. In the absence of any permanent features here, 1'x1'x3' pillar stones are installed (at 7.1 m, 100 m, 250 m & 500 m towards east of Jetty and 8.1 m, 100 m, 250 m & 500 m towards west of Jetty) as reference marks and painted with profile identification numbers. Reference marks, profile sections and profile line along the beach are shown in **Figure-3.12**. Beach profile measurements are run from the installed reference marks at right angles across the beach on 07.03.2024. Beach profile measurements are done using an Abney Level & Clinometer placing ranging poles at each break of slope and ensuring the line of profile follows the fixed orientation. The measurements are continued for a few meters into the sea water beyond low tide.

FIGURE-3.12
HNPCL JETTY AND PROFILE LOCATIONS ON GOOGLE EARTH MAP

High and low tide levels are measured as observed on the day and time of measurements considering the moisture indication and current tide level respectively. Summary of profiles carried out giving the details of length, vertical drop w.r.t reference mark and area of profile are presented in **Table-3.47** and individual profiles are presented in **Figure 3.13 to 3.16**.

Total length of profiles ranges from 52.42 m at W500 to 98.25 m at W100 from the reference mark in to the offshore with vertical drop w.r.t reference mark ranging from 3.936 m to 5.282 m and sectional profile area ranging from 133.22 sq m to 329.97 sq m.

TABLE-3.47
DETAILS OF PROFILES ON 07.03.2024

Sr.No	Profile ID	Latitude	Longitude	Elevation at Ref. Mark (m amsl)	Total Length (m)	Vertical Drop w.r.t Ref. Mark (m)	Profile Area (sq m)
1	E7.1	17 ^{0} 33' 17.7''N	83 ^{0} 08' 26.3''E	3.62	80.90	4.172	249.69
2	E100	17 ^{0} 33' 18.6''N	83 ^{0} 08' 29.2''E	3.31	74.49	3.936	237.38
3	E250	17 ^{0} 33' 20.2''N	83 ^{0} 08' 34.0''E	5.32	72.92	4.594	243.96
4	E500	17 ^{0} 33' 22.2''N	83 ^{0} 08' 42.4''E	3.31	66.21	4.470	184.49
5	W8.1	17 ^{0} 33' 17.6''N	83 ^{0} 08' 24.9''E	4.54	88.54	4.633	329.97
6	W100	17 ^{0} 33' 16.5''N	83 ^{0} 08' 21.9''E	4.40	98.25	4.167	259.96
7	W250	17 ^{0} 33' 15.2''N	83 ^{0} 08' 16.9''E	3.60	68.06	4.336	189.14
8	W500	17 ^{0} 33' 13.0''N	83 ^{0} 08' 08.6''E	3.50	52.42	5.282	133.22

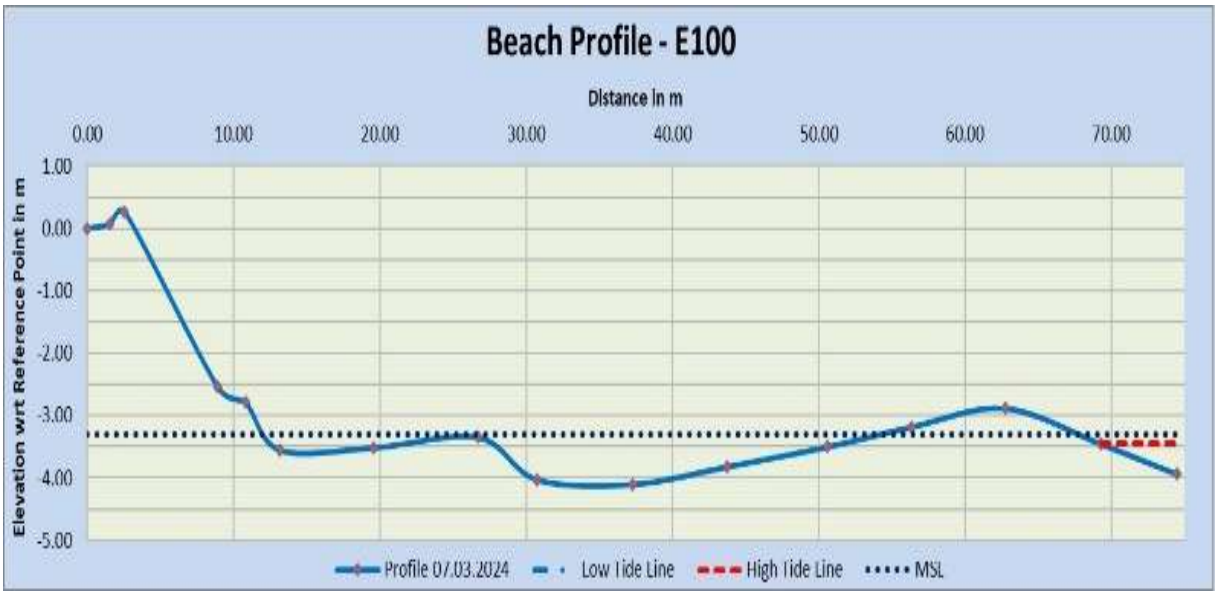


FIGURE-3.13
BEACH PROFILE – EAST 7.1 & EAST 100 METERS FROM JETTY 07.03.2024

FIGURE-3.14
BEACH PROFILE – EAST 250 & EAST 500 METERS FROM JETTY 07.03.2024

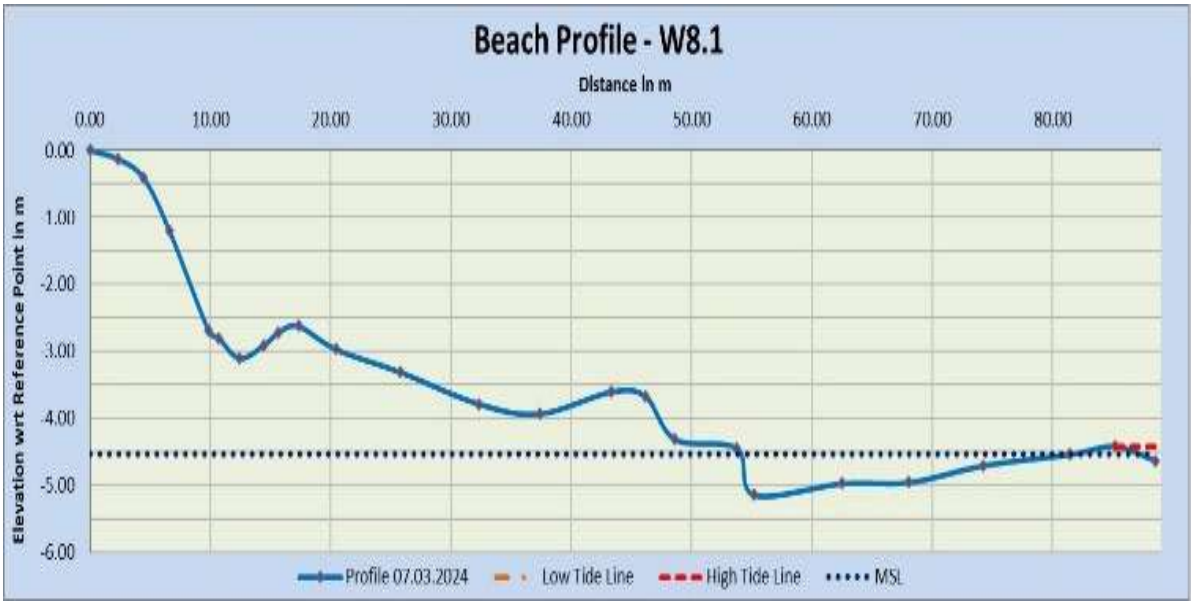


FIGURE-3.15
BEACH PROFILE – WEST 8.1 & WEST 100 METERS FROM JETTY 07.03.2024

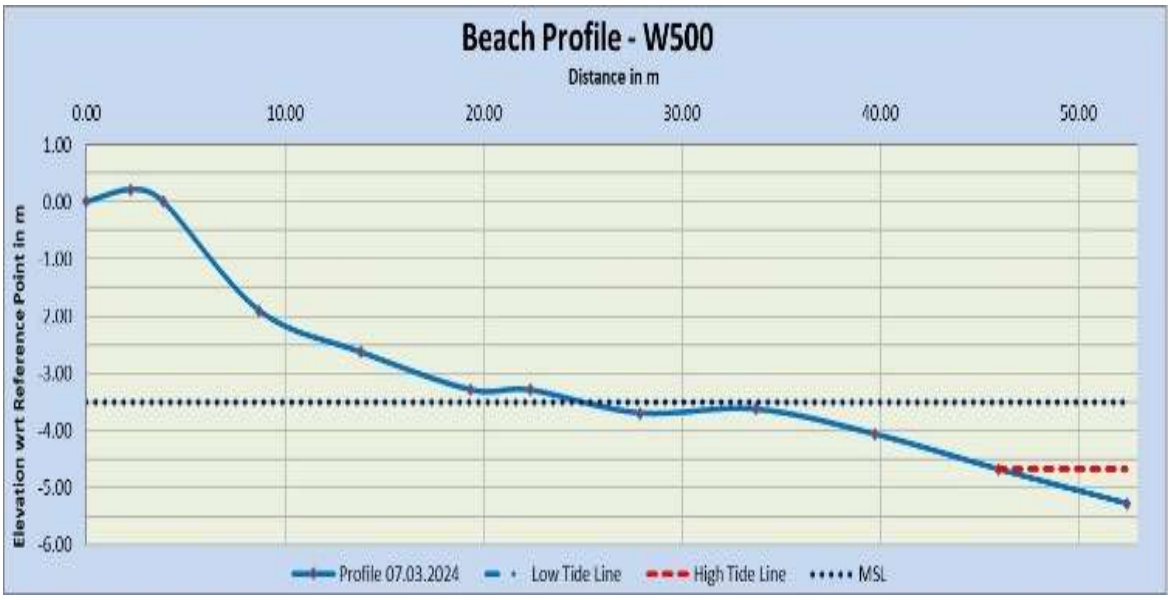


FIGURE-3.16
BEACH PROFILE – WEST 250 & WEST 500 METERS FROM JETTY 07.03.2024

3.15 Biological characteristics

3.15.1 Phytoplankton

Phyto-pigments: Phyto-pigments such as Chlorophyll-a / Chlorophyll-b Chlorophyll-c, Carotenoids / Phaeopigments.

3.15.1.1The Genetic diversity of the Phyto-planktons is presented in the **Table-3.48.**

TABLE-3.48
PHYTOPLANKTON GENETIC DIVERSITY

Phytoplankton Genetic Diversity		
Chlorophyaceae		**Genetic Diversity**
1	*Cosmarium*	31
2	*Chara*	9
3	*Cladophora*	11
4	*Chlorella*	14
5	*Chlamydomonas*	30
6	*Volvox*	24
7	*Hydrodictyon*	22
8	*Spirodictiona*	18
9	*Spirogyra*	22
10	*Zygenema*	17
Cyanophyaceae		
11	*Spirulina*	8
12	*Anabaena*	19
13	*Nostoc*	21
Bacillariophyaceae		
14	*Pinnularia*	19
15	*Navicula*	15
16	*Chaetoceros*	10
Shannon Wiener Diversity Index for Species Diversity		2.70
Species Richness		16

Population of biomass comprises of 16 species of phyto-planktons.

3.15.1.2. The genetic diversity of the Zooplankton is given in the **Table-3.49**

TABLE-3.49
ZOOPLANKTON GENETIC DIVERSITY

Zooplankton Genetic Diversity		
Copepoda		**Genetic Diversity**
1	*Cyclops* sp	22
2	*Nauplius* larvae	28
Rotifera		
1	*Brachionus* sp	27
2	*Allonella* sp	18
3	*Moina* sp	20
Protozoa		
1	*Pinnularia* sp	21
Shannon Wiener Diversity Index for Species Diversity		1.78
Species Richness		6

3.15.2 Benthos

3.15.2.1 Meiobenthos

Community of Benthos are represented by Meiobenthos and Macro benthos. The Meiobenthos communities are represented such as Copepods, and turbellarians, Listed in **Table-3.50.**

TABLE-3.50
MEIOBENTHIC GROUP

Sr. No.	Meiobenthos	Genetic Diversity
1	*Nematodes*	20
2	*Turbellarians*	17
3	*Nemertines*	8
4	*Foraminifera*	18
5	*Kinoryncha*	26
Shannon Wiener Diversity Index - Species Diversity		1.55
Species Richness		5

3.15.2.2 Macro benthos

Represented by Polychaetes, Molluscs, Amphipods, Isopods and Cnidarians listed in **Table-3.51.**

TABLE-3.51
MACROBENTHIC GROUP

Sr. No.	Macrobenthos	Genetic Diversity
1	*Polychaetes*	21
2	*Molluscs*	30
3	*Amphipods*	15
4	*Isopods*	33
5	*Cnidarians*	19
6	*Oligochaetes*	23
7	*Tanaidacea*	17
Shannon Wiener Diversity Index - Species Diversity		1.91
Species Richness		7

3.15.3 Fishes

The list of fish found near the study area, near the plant site listed in **Table-3.52.**

TABLE-3.52
LIST OF FISHES IN THE STUDY AREA

Sr. No	Name of the Species	Number of Individuals	Common Name
Fishes			
1	*Rasterlliger kanagurta*	22	Indian Mackerel
2	*Sardinella longiceps*	18	Indian oil Sardine
3	*Mugil cumera*	26	White Mullet
4	*Nemipterus japonicus*	16	Sea breams
5	*Trichiurus lepturus*	25	Ribbon fish
6	*Leiognathus bindus*	14	Silver bellies
7	*Lutjanus lutjanus*	19	Common snappers
Shannon Wiener Diversity Index - Species Diversity		1.92	
Species Richness		7	

Thus, indicating the Genetic diversity of Phytoplankton, Meiobenthos and Macrobenthos and fishes in the study area.

Annexure-I

Ambient Air Quality Levels

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ1 - Palavalasa village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	05.10.2023	44.2	62.0	11.1	13.6	231	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	06.10.2023	34.0	60.2	12.5	14.8	212	4.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	09.10.2023	40.5	57.3	14.3	13.3	208	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	10.10.2023	35.8	59.8	10.8	14.4	225	3.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	19.10.2023	47.8	71.6	13.9	16.3	243	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	20.10.2023	38.2	74.6	11.5	14.2	203	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	23.10.2023	47.7	63.6	12.2	15.3	248	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	25.10.2023	34.7	64.9	13.2	13.8	218	2.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	02.11.2023	47.7	66.7	12.6	14.8	249	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	03.11.2023	41.4	64.9	13.7	15.1	230	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	06.11.2023	36.2	62.0	11.7	13.8	226	7.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	07.11.2023	42.1	72.1	12.0	15.3	243	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	16.11.2023	48.2	66.4	11.5	14.2	254	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	17.11.2023	41.7	59.5	12.7	13.7	221	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	20.11.2023	39.5	71.7	11.6	12.6	237	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	21.11.2023	48.5	69.6	14.4	15.7	236	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	01.12.2023	45.3	63.7	11.7	13.9	216	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	02.12.2023	48.4	62.5	12.8	14.7	189	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	14.12.2023	44.3	74.7	14.5	15.3	202	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	15.12.2023	47.3	68.7	13.9	14.3	238	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	18.12.2023	46.9	70.4	12.3	13.0	224	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	19.12.2023	50.3	60.1	11.8	14.2	197	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	29.12.2023	38.2	64.5	13.8	12.1	213	4.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	30.12.2023	42.6	67.2	12.1	13.6	200	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	02.01.2024	42.7	71.3	12.3	14.2	178	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	03.01.2024	51.5	65.3	11.9	13.9	198	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	11.01.2024	46.4	67.3	12.8	15.0	173	7.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	12.01.2024	48.9	65.4	11.5	14.7	209	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	17.01.2024	40.7	67.7	10.6	13.3	177	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	18.01.2024	41.5	65.2	11.1	13.4	206	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	25.01.2024	40.6	61.8	13.3	15.2	214	4.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	27.01.2024	39.7	70.3	11.6	13.1	171	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	29.01.2024	44.6	72.4	13.3	14.4	221	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	30.01.2024	47.3	63.7	12.4	15.1	184	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	08.02.2024	44.3	68.8	11.2	13.2	158	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	09.02.2024	40.4	72.8	12.4	14.6	174	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	12.02.2024	46.8	69.3	11.8	13.9	159	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	13.02.2024	48.6	70.4	13.4	13.6	193	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	22.02.2024	46.3	67.6	11.4	14.1	153	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	23.02.2024	43.5	64.4	13.6	13.3	182	4.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	26.02.2024	42.2	65.6	12.3	14.3	190	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	27.02.2024	44.2	63.8	10.9	14.0	180	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	04.03.2024	47.1	71.2	12.5	14.1	182	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	05.03.2024	43.1	68.3	13.5	13.0	168	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	12.03.2024	49.4	71.8	12.6	13.6	198	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	13.03.2024	50.2	73.2	11.7	12.9	184	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	18.03.2024	49.2	70.1	12.6	14.2	211	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	19.03.2024	46.1	67.0	11.7	13.1	176	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	22.03.2024	44.7	68.3	12.8	14.3	184	7.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	23.03.2024	46.9	66.4	13.2	14.1	208	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**34.0**	**57.3**	**10.6**	**12.1**	**153**	**2.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Maximum value		**51.5**	**74.7**	**14.5**	**16.3**	**254**	**7.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Average value		**44.2**	**67.0**	**12.4**	**14.1**	**204**	**5.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
98th Percentile		**50.3**	**74.6**	**14.4**	**15.7**	**249**	**7.7**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ2 - Appikonda village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	02.10.2023	38.0	63.4	10.9	12.2	215	7.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	03.10.2023	44.4	64.3	11.6	14.2	210	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	12.10.2023	37.5	61.6	10.2	11.2	202	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	13.10.2023	42.4	67.4	12.1	13.5	233	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	16.10.2023	39.6	61.3	9.5	12.4	188	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	17.10.2023	42.6	66.6	11.8	14.4	233	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	26.10.2023	41.6	59.3	10.3	12.9	211	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	27.10.2023	43.4	63.8	12.4	15.1	176	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	30.10.2023	36.9	66.1	10.4	12.7	207	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	31.10.2023	47.7	65.8	11.3	13.4	178	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	09.11.2023	42.1	58.3	12.1	14.0	189	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	10.11.2023	37.2	62.4	10.8	12.4	224	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	13.11.2023	41.5	64.2	9.4	13.0	216	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	14.11.2023	36.2	60.8	11.5	14.8	195	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	23.11.2023	42.0	63.9	10.4	14.2	202	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	24.11.2023	40.6	61.3	9.6	12.0	242	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	27.11.2023	38.4	55.7	11.5	13.3	225	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	28.11.2023	41.7	61.8	11.6	14.2	204	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	08.12.2023	39.5	55.4	11.7	13.7	210	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	09.12.2023	43.7	60.6	10.1	13.2	174	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	11.12.2023	37.8	62.4	11.4	14.1	198	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	12.12.2023	41.7	64.7	10.8	13.9	181	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	21.12.2023	44.2	62.1	10.3	12.9	208	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	22.12.2023	37.8	59.5	11.1	14.3	224	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	26.12.2023	41.8	61.8	9.9	12.4	207	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	27.12.2023	39.7	56.7	10.3	12.2	186	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	05.01.2024	45.1	60.3	11.2	13.3	174	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	06.01.2024	37.4	58.8	10.5	12.3	164	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	08.01.2024	40.8	61.4	9.3	13.2	193	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	09.01.2024	42,5	59.7	11.4	14.1	181	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	19.01.2024	39.6	62.4	10.3	13.7	202	4.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	20.01.2024	41.2	60.3	9.6	12.2	168	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	22.01.2024	37.4	61.2	10.7	13.5	188	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	23.01.2024	43.5	62.4	9.9	12.5	179	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	01.02.2024	42.4	59.3	10.4	11.7	150	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	02.02.2024	40.2	65.1	11.2	12.6	148	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	05.02.2024	39.1	57.3	12.0	12.8	177	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	06.02.2024	40.8	62.6	10.9	13.4	185	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	15.02.2024	42.8	65.1	11.6	12.7	186	4.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	16.02.2024	41.7	63.2	9.5	11.5	152	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	19.02.2024	36.4	66.3	11.3	12.8	172	4.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	20.02.2024	41.7	62.6	10.3	11.8	163	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	29.02.2024	38.1	64.8	12.1	13.0	126	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	01.03.2024	45.2	61.7	11.1	12.7	145	4.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	04.03.2024	42.6	67.4	9.5	11.0	142	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	05.03.2024	42.1	59.8	10.1	13.2	173	6.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	14.03.2024	43.2	64.8	13.6	12.3	176	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	15.03.2024	44.7	67.6	10.2	13.0	153	4.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	18.03.2024	39.4	65.8	11.5	12.5	146	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	19.03.2024	42.6	61.7	12.5	13.1	166	3.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
51	28.03.2024	44.4	65.2	11.6	12.5	159	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
52	29.03.2024	40.6	62.4	10.6	13.5	162	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**36.2**	**55.4**	**9.3**	**11.0**	**126**	**3.6**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Maximum value		**47.7**	**67.6**	**13.6**	**15.1**	**242**	**7.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Average value		**41.0**	**62.3**	**10.9**	**13.0**	**186**	**5.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
98th Percentile		**45.2**	**67.4**	**12.5**	**14.8**	**233**	**7.4**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ3 - Devada village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C6H6**
1	02.10.2023	36.4	64.0	9.0	11.8	164	6.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	03.10.2023	40.0	58.3	10.0	12.6	202	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	12.10.2023	34.1	55.3	9.8	11.6	128	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	13.10.2023	45.8	61.1	12.1	13.5	160	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	16.10.2023	40.0	64.6	10.6	11.6	196	7.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	17.10.2023	45.5	68.0	9.7	13.7	188	6.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	26.10.2023	39.3	65.3	10.2	12.6	169	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	27.10.2023	43.3	56.9	10.6	12.0	183	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	30.10.2023	36.9	61.5	11.4	14.1	184	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	31.10.2023	42.9	66.5	9.7	13.8	210	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	09.11.2023	39.9	59.5	10.2	13.7	182	7.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	10.11.2023	37.5	63.0	11.2	14.5	176	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	13.11.2023	40.6	60.0	10.6	13.5	148	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	14.11.2023	34.7	54.7	9.6	12.5	154	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	23.11.2023	38.2	65.7	11.8	13.5	178	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	24.11.2023	35.5	58.3	10.9	12.9	164	7.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	27.11.2023	42.8	63.4	11.4	13.1	187	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	28.11.2023	32.6	61.6	9.4	11.8	193	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	08.12.2023	35.7	54.5	11.8	14.1	185	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	09.12.2023	36.2	60.7	10.4	13.3	148	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	11.12.2023	43.7	66.8	9.8	12.2	154	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	12.12.2023	41.7	56.5	11.1	13.7	189	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	21.12.2023	34.5	57.6	10.9	13.1	171	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	22.12.2023	37.3	59.2	11.7	14.0	166	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	26.12.2023	40.2	60.8	10.6	13.2	141	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	27.12.2023	36.8	65.7	10.0	12.1	165	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	05.01.2024	41.8	63.2	10.6	13.5	163	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	06.01.2024	34.4	58.3	9.7	11.4	174	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	08.01.2024	38.4	56.3	11.2	10.9	180	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	09.01.2024	42.5	60.7	10.4	12.8	192	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	19.01.2024	32.7	55.2	9.6	13.2	182	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	20.01.2024	35.5	56.8	11.0	12.6	158	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	22.01.2024	38.4	63.6	9.9	12.1	166	4.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	23.01.2024	44.3	61.7	10.1	13.2	191	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	01.02.2024	38.3	58.3	9.9	12.3	178	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	02.02.2024	35.3	56.3	11.1	11.6	162	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	05.02.2024	36.7	60.2	10.7	12.8	168	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	06.02.2024	37.6	58.3	10.1	13.7	154	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	15.02.2024	34.4	60.6	9.1	12.6	170	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	16.02.2024	38.3	54.4	10.5	11.9	146	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	19.02.2024	35.2	60.5	9.4	12.9	154	4.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	20.02.2024	39.6	59.3	9.6	11.7	172	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	29.02.2024	37.8	56.7	10.3	12.6	157	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	01.03.2024	41.1	61.4	10.5	13.1	173	4.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	04.03.2024	38.0	59.3	9.4	11.7	156	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	05.03.2024	35.2	56.2	11.4	12.6	164	4.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	14.03.2024	40.0	60.5	10.8	14.0	145	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	15.03.2024	37.3	55.3	11.5	13.3	166	6.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	18.03.2024	40.9	61.5	9.7	11.0	140	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	19.03.2024	37.7	58.5	11.5	12.6	157	3.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
51	28.03.2024	41.6	62.6	10.2	12.7	168	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
52	29.03.2024	37.4	58.2	10.8	13.0	187	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**32.6**	**54.4**	**9.0**	**10.9**	**128**	**3.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Maximum value		**45.8**	**68.0**	**12.1**	**14.5**	**210**	**7.6**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Average value		**38.5**	**60.1**	**10.5**	**12.8**	**169**	**5.7**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
98th Percentile		**45.5**	**66.8**	**11.8**	**14.1**	**202**	**7.4**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-4 Cheepurupalle village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	02.10.2023	38.3	68.4	10.9	13.1	206	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	03.10.2023	41.6	72.3	11.6	13.2	216	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	12.10.2023	34.2	70.4	9.6	14.7	166	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	13.10.2023	41.0	66.7	10.1	12.7	198	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	16.10.2023	42.3	67.3	12.2	14.8	203	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	17.10.2023	48.0	76.1	12.8	15.4	226	8.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	26.10.2023	37.1	68.2	10.6	13.5	207	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	27.10.2023	40.0	70.8	9.6	12.2	165	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	30.10.2023	43.0	74.3	10.7	13.1	193	7.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	31.10.2023	47.3	72.3	13.7	16.2	215	8.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	09.11.2023	44.3	72.4	12.6	14.9	175	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	10.11.2023	36.2	65.3	12.7	13.8	192	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	13.11.2023	40.5	68.1	11.7	13.6	214	7.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	14.11.2023	36.2	73.2	12.2	15.0	231	8.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	23.11.2023	44.7	65.8	9.8	12.6	168	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	24.11.2023	42.8	74.2	11.9	13.5	185	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	27.11.2023	39.5	70.8	13.0	15.1	221	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	28.11.2023	35.8	69.4	11.7	14.0	207	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	08.12.2023	46.6	63.4	10.5	13.0	207	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	09.12.2023	42.3	70.3	12.0	14.1	195	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	11.12.2023	40.6	64.8	10.9	12.8	242	8.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	12.12.2023	42.3	68.2	12.8	13.7	206	7.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	21.12.2023	39.7	71.3	11.6	14.6	188	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	22.12.2023	38.8	69.6	11.2	12.3	212	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	26.12.2023	37.3	65.7	12.3	13.9	190	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	27.12.2023	41.4	66.1	12.7	14.7	176	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	05.01.2024	39.7	65.4	9.6	12.3	192	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	06.01.2024	47.3	67.3	11.1	13.8	207	7.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	08.01.2024	38.2	73.2	10.3	13.2	235	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	09.01.2024	42.4	67.8	11.9	12.5	218	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	19.01.2024	40.8	64.6	12.5	15.1	197	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	20.01.2024	46.3	70.3	10.8	13.0	224	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	22.01.2024	43.7	65.8	12.5	14.1	202	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	23.01.2024	41.6	66.3	10.5	12.9	236	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	01.02.2024	42.8	67.8	10.1	13.2	207	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	02.02.2024	41.3	62.7	9.8	12.6	190	4.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	05.02.2024	44.7	75.3	11.5	14.6	218	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	06.02.2024	39.2	70.4	12.2	13.9	201	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	15.02.2024	45.6	68.9	10.6	12.7	180	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	16.02.2024	43.1	65.7	10.9	13.6	175	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	19.02.2024	40.5	71.4	11.7	12.9	185	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	20.02.2024	38.4	69.3	12.6	14.1	217	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	29.02.2024	39.8	65.8	11.3	13.2	221	7.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	01.03.2024	45.6	70.2	11.5	11.4	225	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	04.03.2024	44.0	65.0	13.2	15.2	176	7.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	05.03.2024	47.3	77.8	12.1	12.9	208	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	14.03.2024	41.6	72.6	10.5	14.1	192	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	15.03.2024	48.5	71.4	12.0	13.3	204	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	18.03.2024	39.7	68.3	12.1	14.5	169	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	19.03.2024	43.0	74.1	10.3	13.7	216	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
51	28.03.2024	43.7	71.9	11.0	12.4	187	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
52	29.03.2024	41.5	74.8	12.7	14.3	241	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**34.2**	**62.7**	**9.6**	**11.4**	**165**	**4.6**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Maximum value		**48.5**	**77.8**	**13.7**	**16.2**	**242**	**8.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Average value		**41.8**	**69.4**	**11.5**	**13.7**	**202**	**6.6**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
98th Percentile		**48.0**	**76.1**	**13.2**	**15.4**	**241**	**8.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-5 Dasaripeta village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	05.10.2023	43.2	62.4	11.0	14.7	210	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	06.10.2023	40.1	64.8	10.3	14.0	161	3.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	09.10.2023	36.8	68.3	9.3	12.6	204	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	10.10.2023	42.1	66.9	11.2	13.2	204	3.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	19.10.2023	40.3	69.8	10.3	15.8	215	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	20.10.2023	42.1	67.3	13.6	14.2	231	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	23.10.2023	37.6	64.4	9.2	13.9	193	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	25.10.2023	40.0	70.3	13.4	14.4	148	4.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	02.11.2023	39.4	59.6	10.2	13.4	195	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	03.11.2023	34.7	62.5	11.5	12.9	179	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	06.11.2023	41.8	59.4	10.5	14.5	194	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	07.11.2023	38.4	62.6	9.8	12.6	178	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	16.11.2023	33.6	64.3	11.5	13.1	198	4.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	17.11.2023	39.3	61.6	9.5	14.0	166	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	20.11.2023	41.1	60.3	10.4	12.8	203	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	21.11.2023	37.4	67.3	11.4	13.9	166	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	01.12.2023	43.6	65.4	11.8	12.9	201	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	02.12.2023	36.8	60.2	9.6	13.1	161	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	14.12.2023	39.3	65.4	9.3	12.0	199	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	15.12.2023	40.8	62.9	10.8	13.8	154	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	18.12.2023	35.2	61.7	10.1	12.5	179	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	19.12.2023	36.8	69.2	9.9	13.2	213	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	29.12.2023	37.9	62.8	11.2	12.7	168	3.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	30.12.2023	42.9	61.5	10.5	12.4	188	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	02.01.2024	38.1	71.4	10.4	13.5	174	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	03.01.2024	45.2	65.2	10.1	12.1	185	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	11.01.2024	42.4	66.8	9.8	13.8	147	6.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	12.01.2024	37.3	64.3	11.3	14.4	163	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	17.01.2024	43.3	70.7	10.6	12.6	203	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	18.01.2024	42.4	63.2	9.6	14.5	181	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	25.01.2024	39.7	59.7	11.7	13.3	192	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	27.01.2024	44.7	60.8	9.9	12.2	167	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	29.01.2024	40.2	61.3	10.9	13.6	185	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	30.01.2024	41.6	70.5	9.5	12.2	208	4.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	08.02.2024	43.2	63.5	11.5	12.6	167	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	09.02.2024	36.2	60.8	9.5	13.4	156	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	12.02.2024	40.3	68.1	10.3	12.9	168	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	13.02.2024	44.2	66.4	10.7	13.7	146	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	22.02.2024	41.2	67.9	11.1	14.1	180	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	23.02.2024	38.2	62.3	9.7	13.1	138	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	26.02.2024	40.7	61.6	10.9	12.4	175	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	27.02.2024	43.6	67.2	9.3	12.3	150	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	04.03.2024	39.8	70.7	10.5	13.2	187	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	05.03.2024	43.2	63.1	11.4	14.6	150	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	12.03.2024	45.3	70.6	10.8	11.2	164	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	13.03.2024	38.4	68.6	10.2	12.6	203	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	18.03.2024	44.1	70.4	9.7	12.8	176	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	19.03.2024	40.8	64.9	11.2	13.7	177	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	22.03.2024	43.2	64.3	9.5	14.2	169	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	23.03.2024	38.2	69.8	10.8	13.1	182	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**33.6**	**59.4**	**9.2**	**11.2**	**138**	**3.5**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**45.3**	**71.4**	**13.6**	**15.8**	**231**	**7.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**40.3**	**65.1**	**10.5**	**13.3**	**180**	**5.5**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**45.2**	**70.7**	**13.4**	**14.7**	**215**	**7.0**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-6 Islampeta village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	05.10.2023	38.2	64	12.1	13.6	206	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	06.10.2023	37.5	60.3	10.2	14.2	152	3.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	09.10.2023	35.5	62.6	11.7	13.3	152	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	10.10.2023	33.8	65.4	12.4	14.0	172	3.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	19.10.2023	39.3	67.2	13.5	14.7	220	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	20.10.2023	41.9	59.3	12.7	15.3	181	7.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	23.10.2023	36.1	65.9	10.6	12.9	204	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	25.10.2023	34.1	61.9	11.1	14.3	159	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	02.11.2023	35.3	61.4	11.8	14.0	186	8.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	03.11.2023	39.9	57.3	12.1	14.3	166	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	06.11.2023	37.9	59.5	9.6	15.1	182	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	07.11.2023	36.2	62.4	11.6	15.8	191	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	16.11.2023	38.5	55.6	10.4	13.4	169	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	17.11.2023	35.4	61.9	11.7	14.9	204	8.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	20.11.2023	38.5	58.4	12.6	13.5	197	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	21.11.2023	36.5	64.5	10.6	12.9	173	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	01.12.2023	36.4	58.3	10.2	12.6	184	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	02.12.2023	35.8	54.8	11.3	13.4	148	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	14.12.2023	33.6	57.4	12.1	14.9	196	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	15.12.2023	37.7	65.2	10.7	13.7	166	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	18.12.2023	36.9	56.7	11.8	14.8	151	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	19.12.2023	34.2	59.8	10.7	14.0	186	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	29.12.2023	36.9	60.6	11.6	12.3	179	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	30.12.2023	37.1	62.4	9.6	13.8	164	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	02.01.2024	34.7	63.2	9.4	12.4	210	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	03.01.2024	38.1	53.5	10.5	14.1	174	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	11.01.2024	39.2	59.3	11.6	13.9	222	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	12.01.2024	38.9	63.9	9.1	12.7	192	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	17.01.2024	37.4	55.4	11.1	13.1	177	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	18.01.2024	38.5	58.5	10.8	12.3	166	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	25.01.2024	35.5	63.2	10.9	15.1	205	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	27.01.2024	37.1	60.8	11.2	12.7	190	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	29.01.2024	35.7	62.7	9.9	13.4	183	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	30.01.2024	38.2	57.8	10.7	13.7	216	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	08.02.2024	37.5	57.4	8.5	11.7	183	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	09.02.2024	35.7	56.8	9.6	12.5	157	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	12.02.2024	40.8	55.9	10.7	13.2	205	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	13.02.2024	34.6	53.6	9.9	11.8	187	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	22.02.2024	33.6	59.8	10.2	13.5	160	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	23.02.2024	36.1	55.1	9.4	12.1	149	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	26.02.2024	34.3	59.8	9.3	12.6	188	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	27.02.2024	41.6	58.6	10.3	11.8	158	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	04.03.2024	40.3	59.8	10.6	12.8	178	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	05.03.2024	38.4	59.1	11.5	13.2	198	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	12.03.2024	43.4	58.4	10.3	11.5	201	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	13.03.2024	37.0	55.8	11.6	12.8	178	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	18.03.2024	36.5	62.3	9.9	11.9	215	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	19.03.2024	38.7	57.7	11.6	13.2	167	4.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	22.03.2024	36.8	62.5	10.8	11.0	182	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	23.03.2024	44.3	61.2	11.1	12.6	177	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**33.6**	**53.5**	**8.5**	**11.0**	**148**	**3.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**44.3**	**67.2**	**13.5**	**15.8**	**222**	**8.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**37.3**	**59.9**	**10.9**	**13.3**	**182**	**6.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**43.4**	**65.9**	**12.7**	**15.3**	**220**	**8.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-7 Pittavanipalem village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C6H6**
1	02.10.2023	38.4	64.5	9.3	12.8	184	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	03.10.2023	43.3	61.2	11.4	12.8	192	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	12.10.2023	33.3	70.2	10.1	10.9	204	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	13.10.2023	44.4	65.0	11.1	13.7	153	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	16.10.2023	40.7	72.1	10.9	11.9	175	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	17.10.2023	47.3	67.4	11.6	14.2	199	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	26.10.2023	43.0	69.2	10.0	13.0	163	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	27.10.2023	41.9	61.3	10.0	12.6	200	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	30.10.2023	40.2	71.0	8.9	14.3	194	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	31.10.2023	46.5	68.4	11.1	13.7	206	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	09.11.2023	41.9	69.2	11.8	13.1	179	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	10.11.2023	38.2	65.9	12.1	14.0	150	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	13.11.2023	44.2	60.2	11.3	12.8	174	7.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	14.11.2023	47.9	69.7	10.8	12.9	166	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	23.11.2023	44.2	70.3	11.4	13.8	193	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	24.11.2023	50.8	67.4	9.5	11.5	167	4.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	27.11.2023	46.5	64.9	11.2	13.6	181	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	28.11.2023	45.4	66.0	9.8	11.9	170	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	08.12.2023	38.3	59.2	10.3	11.9	147	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	09.12.2023	40.7	62.8	11.3	12.5	188	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	11.12.2023	42.1	60.9	9.6	13.2	156	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	12.12.2023	49.3	67.3	11.6	11.2	167	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	21.12.2023	46.8	58.2	10.8	12.9	181	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	22.12.2023	45.8	63.8	10.1	12.1	155	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	26.12.2023	41.7	62.5	9.7	11.5	163	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	27.12.2023	43.3	64.6	11.1	12.7	152	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	05.01.2024	45.2	66.3	11.3	13.8	171	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	06.01.2024	47.3	60.2	11.9	12.7	155	6.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	08.01.2024	46.2	61.4	10.2	13.2	149	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	09.01.2024	40.7	70.3	9.8	12.1	191	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	19.01.2024	44.4	65.2	11.4	13.9	173	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	20.01.2024	43.4	62.1	10.7	12.5	157	5.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	22.01.2024	45.3	59.9	9.5	13.2	187	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	23.01.2024	42.6	63.4	11.7	13.6	138	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	01.02.2024	42.4	62.8	10.3	12.7	162	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	02.02.2024	43.6	64.2	9.9	13.2	141	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	05.02.2024	44.2	68.3	10.4	12.6	151	5.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	06.02.2024	41.6	67.7	11.2	11.7	168	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	15.02.2024	43.6	63.2	10.7	13.3	159	4.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	16.02.2024	40.6	59.5	10.9	11.9	143	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	19.02.2024	42.5	61.3	9.1	12.6	173	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	20.02.2024	39.8	60.8	11.0	13.0	145	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	29.02.2024	43.3	64.5	10.6	12.8	165	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	01.03.2024	45.2	65.2	11.6	13.1	157	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	04.03.2024	46.3	66.5	8.8	12.7	155	7.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	05.03.2024	46.8	70.8	10.8	11.6	147	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	14.03.2024	44.0	69.9	11.1	14.1	159	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	15.03.2024	46.5	65.7	10.8	12.0	189	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	18.03.2024	43.2	62.1	9.0	13.7	137	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	19.03.2024	45.0	64.0	11.4	13.2	167	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
51	28.03.2024	42.5	63.4	9.4	14.0	191	6.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
52	29.03.2024	44.7	66.2	10.7	13.2	174	7.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**33.3**	**58.2**	**8.8**	**10.9**	**137**	**4.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Maximum value		**50.8**	**72.1**	**12.1**	**14.3**	**206**	**7.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Average value		**43.6**	**65.0**	**10.6**	**12.8**	**169**	**5.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
98th Percentile		**49.3**	**71.0**	**11.9**	**14.2**	**204**	**7.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

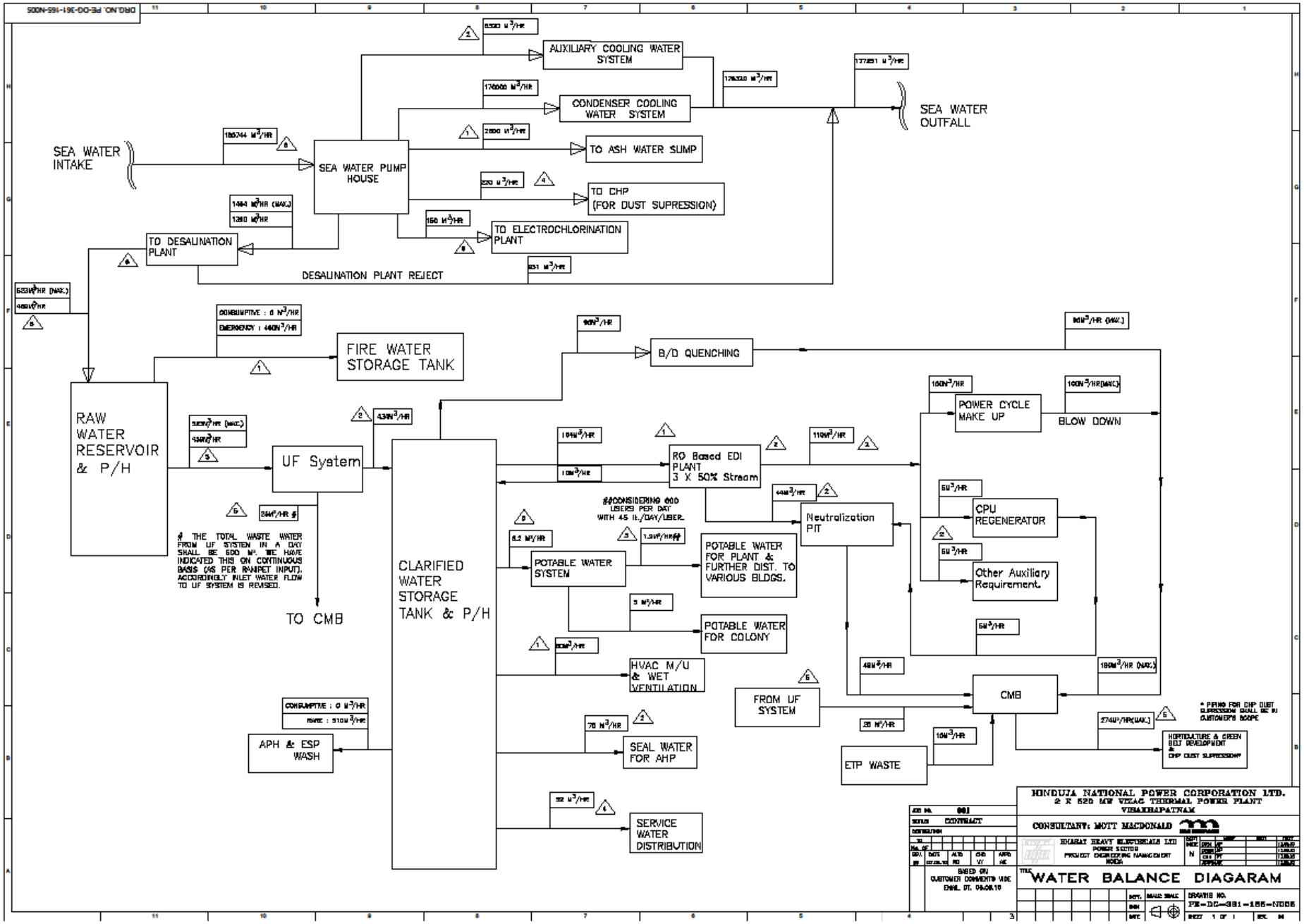
AAQ-8 Kalapaka village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C6H6**
1	05.10.2023	40.4	55.5	10.4	13.8	187	6.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
2	06.10.2023	39.7	57.0	12.1	14.7	164	3.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
3	09.10.2023	42.3	59.6	10.9	14.4	185	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
4	10.10.2023	40.5	60.8	9.3	13.2	160	3.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
5	19.10.2023	39.4	64.3	13.4	15.9	193	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
6	20.10.2023	41.5	63.2	8.9	12.6	175	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
7	23.10.2023	38.7	62.5	11.3	15.1	185	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
8	25.10.2023	41.5	56.9	10.8	14.2	191	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
9	02.11.2023	37.2	58.1	11.1	14.1	201	7.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
10	03.11.2023	35.6	60.2	9.8	12.8	178	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
11	06.11.2023	40.8	56.3	11.7	14.7	165	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
12	07.11.2023	37.2	62.4	10.5	13.5	174	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
13	16.11.2023	36.8	55.3	11.6	13.7	169	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
14	17.11.2023	41.2	59.3	10.4	12.9	189	7.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
15	20.11.2023	35.4	65.1	12.4	15.1	199	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
16	21.11.2023	38.5	61.8	11.5	13.8	168	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
17	01.12.2023	42.7	62.7	9.6	12.6	166	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
18	02.12.2023	37.8	56.4	10.7	14.2	157	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
19	14.12.2023	39.5	63.8	9.9	13.9	172	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
20	15.12.2023	40.3	59.3	11.7	12.7	200	4.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
21	18.12.2023	35.5	64.7	10.3	14.6	208	7.4	<20	<1.0	<1.0	<1.0	<0.1	<1.0
22	19.12.2023	43.1	57.8	11.1	13.1	168	6.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
23	29.12.2023	38.3	63.5	10.9	12.8	178	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
24	30.12.2023	40.6	62.7	10.1	14.3	194	5.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
25	02.01.2024	41.8	59.8	12.1	14.4	184	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
26	03.01.2024	39.8	61.8	11.5	13.4	173	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
27	11.01.2024	45.3	58.2	10.7	13.1	188	5.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
28	12.01.2024	43.8	62.7	12.5	11.7	153	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
29	17.01.2024	44.1	66.5	11.1	13.9	178	6.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
30	18.01.2024	37.8	58.3	9.7	12.3	184	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
31	25.01.2024	39.2	61.1	10.1	12.1	163	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
32	27.01.2024	42.8	60.9	10.9	14.3	132	5.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
33	29.01.2024	36.2	59.1	9.9	13.5	157	6.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
34	30.01.2024	42.6	58.6	10.4	12.6	173	4.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
35	08.02.2024	37.6	62.4	11.3	13.7	175	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
36	09.02.2024	42.7	59.1	9.8	12.8	156	5.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
37	12.02.2024	36.4	61.3	10.1	13.3	194	4.5	<20	<1.0	<1.0	<1.0	<0.1	<1.0
38	13.02.2024	39.7	55.3	11.8	12.2	136	5.2	<20	<1.0	<1.0	<1.0	<0.1	<1.0
39	22.02.2024	41.2	63.8	10.4	11.9	122	6.3	<20	<1.0	<1.0	<1.0	<0.1	<1.0
40	23.02.2024	40.8	62.4	10.7	13.5	167	5.0	<20	<1.0	<1.0	<1.0	<0.1	<1.0
41	26.02.2024	36.3	57.3	9.4	11.5	146	4.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
42	27.02.2024	39.9	60.8	11.4	12.1	182	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
43	04.03.2024	40.4	64.8	9.5	12.9	198	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
44	05.03.2024	45.4	61.4	10.8	13.6	163	4.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
45	12.03.2024	39.0	63.8	11.8	14.1	204	6.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
46	13.03.2024	42.1	57.5	10.1	13.6	144	4.9	<20	<1.0	<1.0	<1.0	<0.1	<1.0
47	18.03.2024	44.1	66.3	9.0	11.8	178	5.8	<20	<1.0	<1.0	<1.0	<0.1	<1.0
48	19.03.2024	43.4	65.0	10.3	12.1	161	6.1	<20	<1.0	<1.0	<1.0	<0.1	<1.0
49	22.03.2024	38.8	60.0	11.5	13.2	140	6.6	<20	<1.0	<1.0	<1.0	<0.1	<1.0
50	23.03.2024	42.6	63.4	9.8	11.9	195	5.7	<20	<1.0	<1.0	<1.0	<0.1	<1.0
Minimum value		**35.4**	**55.3**	**8.9**	**11.5**	**122**	**3.5**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Maximum value		**45.4**	**66.5**	**13.4**	**15.9**	**208**	**7.4**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
Average value		**40.2**	**60.8**	**10.7**	**13.4**	**173**	**5.6**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**
98th Percentile		**45.3**	**66.3**	**12.5**	**15.1**	**204**	**7.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.1**	**<1.0**

All the above values are expressed in $\mu g/m^3$ except As,Ni and Bap are ng/m^3

Annexure-II

Water Balance Diagram

ANNEXURE-II
WATER BALANCE DIAGRAM



Annexure-III

Beach Profile Data

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR WEST 8.1 METERS FROM JETTY (4.54 mt AMSL)

Project Name : HNPCL		**Date : 17/11/2023**	
Profile ID : W 8.1		**Location : HNPCL Jetty W to 8.1 meters**	
Ref.Mark Latitude : N 17^{0}33'17.6''		**Ref.Marl Longitude : E 83^{0}08'24.9''**	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty embankment West side 8.1 meters and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore;	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	3.40	+ 03 ^{0} 20 ^{I}	Reference point- ground cover vegetation
B-C	5.22	+ 11 ^{0} 30 ^{I}	
C-D	6.25	+ 17 ^{0} 10 ^{I}	Backshore with ground cover vegetation up to swash limit
D-E	4.86	+ 10 ^{0} 10 ^{I}	Beach Starting
E-F	2.93	+ 13 ^{0} 50 ^{I}	Beach Sand - Jetty embankment platform
F-G	2.90	- 14 ^{0} 20 ^{I}	Beach Sand
G-H	2.51	- 02 ^{0} 10 ^{I}	Beach Sand
H-I	0.62	+ 25 ^{0} 20 ^{I}	
I-J	2.64	+ 08 ^{0} 30 ^{I}	
J-K	1.80	- 04 ^{0} 40 ^{I}	High tide
K-L	3.90	+ 06 ^{0} 30 ^{I}	Low tide

BEACH PROFILE DATA SHEET FOR WEST 100 METERS FROM JETTY (4.40 mt AMSL)

Project Name : HNPCL		**Date : 17/11/2023**	
Profile ID : W 100		**Location : HNPCL Jetty W to 100 meters**	
Ref.Mark Latitude : N 17^{0}33'16.5''		**Ref.Marl Longitude : E** 83^{0}08'21.9''	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty embankment W 8.1 to 100 meters west and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	4.32	+ 01 ^{0} 40 ^{I}	Reference point- ground cover vegetation around
B-C	7.71	+ 05 ^{0} 30 ^{I}	Backshore with ground cover vegetation up to swash limit
C-D	6.33	+ 11 ^{0} 20 ^{I}	Beach starting
D-E	5.13	+ 05 ^{0} 10 ^{I}	
E-F	5.3	- 00 ^{0} 40 ^{I}	
F-G	5.02	+ 03 ^{0} 10 ^{I}	
G-H	6.44	+06 ^{0} 30 ^{I}	
H-I	8.3	+03 ^{0} 20 ^{I}	
I-J	7.91	+ 03 ^{0} 10 ^{I}	
J-K	8.25	+01 ^{0} 30 ^{I}	
K-L	6.37	+ 0 ^{0} 40 ^{I}	
L-M	7.26	+ 03 ^{0} 40 ^{I}	
M-N	5.8	+ 0 ^{0} 50 ^{I}	High tide
N-O	6.71	+ 02 ^{0} 40 ^{I}	
O–P	7.15	+ 01 ^{0} 58 ^{I}	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR WEST 250 METERS FROM JETTY (3.6 mt AMSL)

Project Name : HNPCL		**Date : 17/11/2023**	
Profile ID : W 250		**Location : HNPCL Jetty W to 250 meters**	
Ref.Mark Latitude : N 17^{0}33'15.2''		**Ref.Marl Longitude : E** 83^{0}08'16.9''	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty W 100 to 250 meters west and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	3.27	- 02 ^{0} 30 ^{I}	Reference point- ground cover vegetation around
B-C	2.64	+ 04 ^{0} 20 ^{I}	
C-D	3.22	- 02 ^{0} 40 ^{I}	Beach sand
D-E	2.55	+ 01 ^{0} 30 ^{I}	Beach sand
E-F	5.96	+ 17 ^{0} 60 ^{I}	
F-G	3.45	+ 19 ^{0} 40 ^{I}	Beach starting
G-H	4.73	+ 02 ^{0} 40 ^{I}	
H-I	5.49	- 01 ^{0} 30 ^{I}	
I-J	6.35	+ 09 ^{0} 40 ^{I}	
J-K	3.04	+ 05 ^{0} 10 ^{I}	High tide
K-L	2.12	+ 02 ^{0} 10 ^{I}	Low Tide

BEACH PROFILE DATA SHEET FOR WEST 500 METERS FROM JETTY (3.5 mt AMSL)

Project Name : HNPCL		**Date : 17/11/2023**	
Profile ID : W 500		**Location : HNPCL Jetty W to 500 meters**	
Ref.Mark Latitude : N 17^{0}33'13.0''		**Ref.Marl Longitude : E** 83^{0}08'08.6''	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty W 250 to 500 meters west and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	2.51	+04 ^{0} 20 ^{I}	Reference point- ground cover vegetation around
B-C	3.44	+05 ^{0} 10 ^{I}	
C-D	3.35	+08 ^{0} 30 ^{I}	
D-E	2.18	- 04 ^{0} 40 ^{I}	
E-F	7.02	+15 ^{0} 30 ^{I}	Beach Starting
F-G	6.15	+9 ^{0} 40 ^{I}	
G-H	8.72	+04 ^{0} 20 ^{I}	
H-I	9.40	+06 ^{0} 30 ^{I}	High tide
I-J	7.30	+02 ^{0} 10 ^{I}	Low Tide

BEACH PROFILE DATA SHEET FOR EAST 7.1 METERS FROM JETTY (3.62 mt AMSL)

ANNEXURE-III
BEACH PROFILE DATA SHEET

Project Name : HNPCL		**Date : 17/11/2023**	
Profile ID : E 7.1		**Location : HNPCL Jetty E to 7.1 meters**	
Ref.Mark Latitude : N $17^0$33'17.7''		**Ref.Marl Longitude : E** $83^0$08'26.3''	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty embankment No ground cover vegetation up to swash limit and clean beach sand in the shore; disturbed ground and construction/removed stone left around reference mark	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	2.85	+ 19 ^{0} 10 ^{I}	Reference Point - construction/removed stone left around Vegitation starts
B-C	4.35	+ 22 ^{0} 20 ^{I}	
C-D	3.25	+25 ^{0} 28 ^{I}	Beach Starting
D-E	2.95	- 03 ^{0} 40 ^{I}	Beach starting Embankment
E-F	5.84	+ 06 ^{0} 20 ^{I}	
F-G	5.43	+ 07 ^{0} 30 ^{I}	High tide
G-H	2.66	+ 05 ^{0} 20 ^{I}	Low Tide

BEACH PROFILE DATA SHEET FOR EAST 100 METERS FROM JETTY (3.31 mt AMSL)

Project Name : HNPCL		**Date : 17/11/2023**	
Profile ID : E 100		**Location : HNPCL Jetty E to 100 meters**	
Ref.Mark Latitude : N $17^0$33'18.6''		**Ref.Marl Longitude : E** $83^0$08'29.2''	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observe : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty embankment E 7.1 to 100 meters East side and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	2.73	- 02 ^{0} 20 ^{I}	Reference Point (Vegitation observed)
B-C	3.07	+ 15 ^{0} 50 ^{I}	Beach Starting
C-D	4.21	+06 ^{0} 40 ^{I}	Beach sand
D-E	7.82	+10 ^{0} 30 ^{I}	
E-F	5.94	+08 ^{0} 40 ^{I}	High tide
F-G	3.94	+06 ^{0} 30 ^{I}	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR EAST 250 METERS FROM JETTY (5.32 mt AMSL)

Project Name : HNPCL	**Date : 17/11/2023**
Profile ID : E 250	**Location : HNPCL Jetty E to 250 meters**
Ref.Mark Latitude : N 17^{0}33'20.2''	**Ref.Marl Longitude : E 83^{0}08'34.0''**
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observer : Mr. D.Tarakeswara rao (Env-Scientist)	**Observations :** Profile runs along jetty embankment E 100 to 250 meters East side and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	5.54	+ 03 ^{0}40 ^{I}	Reference Point - ground cover vegetation around
B-C	7.73	+ 23 ^{0}10 ^{I}	Backshore with ground cover vegetation up to swash limit
C-D	5.03	- 01 ^{0}40 ^{I}	Beach sand (Vegitation ending)
D-E	7.32	- 02 ^{0}20 ^{I}	Beach sand
E-F	4.96	+ 05 ^{0}30 ^{I}	Beach sand
F-G	6.52	+ 09 ^{0}40 ^{I}	
G-H	4.24	+ 10 ^{0}20 ^{I}	
H-I	3.55	+ 07 ^{0}30 ^{I}	High tide
I-J	2.40	+ 05 ^{0}20 ^{I}	Low Tide

BEACH PROFILE DATA SHEET FOR EAST 500 METERS FROM JETTY (3.31 mt AMSL)

Project Name : HNPCL	**Date : 17/11/2023**
Profile ID : E 500	**Location : HNPCL Jetty E to 500 meters**
Ref.Mark Latitude : N 17^{0}33'22.2''	**Ref.Marl Longitude : E 83^{0}08'42.4''**
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observer : Mr. D.Tarakeswara rao (Env-Scientist)	**Observations :** Profile runs along jetty embankment E 250 to 500 meters to East side and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	1.25	- 01^0 40 ^{I}	Reference Point - ground cover vegetation around
B-C	3.93	+08^0 10 ^{I}	Backshore with ground cover vegetation up to swash limit
C-D	3.12	+10^0 20 ^{I}	
D-E	2.31	+05^0 30 ^{I}	Beach sand
E-F	2.74	+15^0 30 ^{I}	Beach starting
F-G	1.42	+06^0 50 ^{I}	
G-H	3.36	+09^0 30 ^{I}	
H-I	6.01	+ 11^0 30 ^{I}	
I-J	4.35	+ 05^0 40 ^{I}	
J-I	6.77	+ 06^0 30 ^{I}	High Tide
I-K	4.62	+ 042^0 20 ^{I}	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR WEST 8.1 METERS FROM JETTY (4.54 mt AMSL)

Project Name : HNPCL, Palavalasa	**Date : 07/03/2024**
Profile ID : W 8.1 meters	**Location : HNPCL Jetty W to 8.1 meters**
Ref.Mark Latitude : N 17^{0}33'17.6''	**Ref.Marl Longitude : E 83^{0}08'24.9''**
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observer : Mr. D.Tarakeswara rao (Env- Sr Scientist)	**Observations :** Profile runs along jetty embankment West side 8.1 meters and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore;

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	2.32	+03° 10'	Reference point- ground cover vegetation
B-C	2.15	+07° 40'	
C-D	2.15	+21° 30'	
D-E	3.24	+27° 20'	
E-F	0.85	+07° 20'	
F-G	1.71	+10° 20'	
G-H	2.05	-05° 30'	
H-I	1.21	-09° 10'	Beach Starting Point
I-J	1.65	-03° 10'	
J-K	3.13	+06° 20'	
K-L	5.34	+03° 40'	
L-M	6.53	+04° 10'	
M-N	5.05	+01°40'	
N-O	5.92	-03° 10'	
O-P	2.86	+01° 20'	
P-Q	2.45	+15° 10'	
Q-R	5.13	+01° 30'	
R-S	1.45	+28° 40'	Water Flow Starting Point
S-T	7.35	-01° 20'	
T-U	5.53	-00° 10'	Water Flow Ending Point
U-V	6.15	-02° 20'	
V-W	7.21	-01° 20'	
W-X	3.76	-01° 50'	High Tide
X-Y	3.35	+03° 40'	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR WEST 100 METERS FROM JETTY (4.40 mt AMSL)

Project Name : HNPCL, Palavalasa		**Date : 07/03/2024**	
Profile ID : W 100 meters		**Location : HNPCL Jetty W to 100 meters**	
Ref.Mark Latitude : N $17^0 33'16.5''$		**Ref.Marl Longitude : E** $83^0 08'21.9''$	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty embankment W 8.1 to 100 meters west and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	1.45	-03° 10'	Reference point- ground cover vegetation around
B-C	2.57	+06° 40'	
C-D	3.11	+04° 10'	
D-E	3.93	+19° 10'	Beach Starting Point
E-F	3.54	+05° 30'	
F-G	3.15	-04° 20'	
G-H	4.73	+04° 10'	
H-I	4.47	-00° 30'	
I-J	2.25	+05° 40'	
J-K	5.01	+02° 40'	
K-L	5.84	-01° 50'	
L-M	3.62	-00° 30'	
M-N	5.45	+04° 30'	
N-O	5.47	+02° 40'	
O-P	4.48	+03° 40'	
P-Q	5.22	+02° 50'	
Q-R	6.14	-02° 10'	
R-S	4.61	-02° 20'	
S-T	4.63	-02° 30'	
T-U	5.45	+05° 50'	
U-V	6.32	+02° 40'	High Tide
V-W	6.81	+02° 50'	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR WEST 250 METERS FROM JETTY (3.6 mt AMSL)

Project Name : HNPCL		**Date : 07/03/2024**	
Profile ID : W 250		**Location : HNPCL Jetty W to 250 meters**	
Ref.Mark Latitude : N $17^0 33'15.2''$		**Ref.Marl Longitude : E** $83^0 08'16.9''$	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty W 100 to 250 meters west and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	3.42	+00° 60'	Reference point- ground cover vegetation around
B-C	3.84	-07° 20'	
C-D	6.41	+20° 30'	Beach Starting
D-E	4.45	+05° 50'	
E-F	3.22	+15° 20'	
F-G	5.93	+00° 50'	
G-H	5.35	-02° 20'	
H-I	4.93	+01° 20'	
I-J	1.12	+15° 10'	
J-K	5.74	+01° 20'	
K-L	5.93	+02° 10'	
L-M	5.81	+02° 20'	
M-N	6.18	+01° 50'	High Tide
N-O	5.73	+01° 30'	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR WEST 500 METERS FROM JETTY (3.5 mt AMSL)

Project Name : HNPCL	**Date : 07/03/2024**
Profile ID : W 500	**Location : HNPCL Jetty W to 500 meters**
Ref.Mark Latitude : N $17^0 33'13.0''$	**Ref.Marl Longitude : E** $83^0 08'08.6''$
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observer : Mr. D.Tarakeswara rao (Env-Scientist)	**Observations :** Profile runs along jetty W 250 to 500 meters west and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	2.23	-05° 30'	Reference point- ground cover vegetation around
B-C	1.62	+07° 30'	
C-D	4.85	+23° 10'	Beach Starting Point
D-E	5.13	+08° 10'	
E-F	5.51	+06° 50'	
F-G	3.03	+00° 10'	
G-H	5.51	+04° 10'	
H-I	5.85	-00° 40'	
I-J	6.02	+04° 10'	
J-K	6.21	+05° 40'	Hihg Tide
K-L	6.46	+05° 20'	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR EAST 7.1 METERS FROM JETTY (3.62 mt AMSL)

Project Name : HNPCL	**Date : 07/03/2024**
Profile ID : E 7.1	**Location : HNPCL Jetty E to 7.1 meters**
Ref.Mark Latitude : N $17^0$33'17.7''	**Ref.Marl Longitude : E** $83^0$08'26.3''
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observer : Mr. D.Tarakeswara rao (Env-Scientist)	**Observations :** Profile runs along jetty embankment No ground cover vegetation up to swash limit and clean beach sand in the shore; disturbed ground and construction/removed stone left around reference mark

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	2.33	+22° 10'	Reference Point - construction/removed stone left around Vegitation starts
B-C	2.17	+27° 10'	
C-D	2.42	+23° 10'	Beach Starting
D-E	3.93	+02° 40'	
E-F	6.82	-03° 10'	
F-G	3.21	+02° 40'	
G-H	6.12	-01° 20'	
H-I	7.13	-01° 30'	
I-J	3.51	+30° 20'	Water flow Starting point
J-K	5.62	-02° 20'	Water flow Ending point
K-L	6.33	-02° 10'	
L-M	7.15	-02° 30'	
M-N	6.22	-02° 10'	
N-O	7.07	-02° 20'	
O-P	6.34	+06° 50'	High Tide
P-Q	4.53	+06° 120'	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR EAST 100 METERS FROM JETTY (3.31 mt AMSL)

Project Name : HNPCL	**Date : 07/03/2024**
Profile ID : E 100	**Location : HNPCL Jetty E to 100 meters**
Ref.Mark Latitude : N $17^0 33'18.6''$	**Ref.Marl Longitude : E** $83^0 08'29.2''$
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observe : Mr. D.Tarakeswara rao (Env-Scientist)	**Observations :** Profile runs along jetty embankment E 7.1 to 100 meters East side and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	1.52	-02° 30′	Reference Point (Vegitation observed)
B-C	1.03	-10° 50′	
C-D	6.34	+26° 10′	Beach Starting
D-E	1.93	+07° 40′	
E-F	2.35	+18° 50′	
F-G	6.38	-00° 20′	
G-H	7.17	-01° 20′	
H-I	4.03	+09° 40′	
I-J	6.54	+00° 40′	
J-K	6.42	-02° 30′	
K-L	6.91	-02° 40′	
L-M	5.73	-03° 10′	
M-N	6.42	-02° 40′	
N-O	6.54	+04° 60′	High Tide
O-P	5.18	+05° 20′	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR EAST 250 METERS FROM JETTY (5.32 mt AMSL)

Project Name : HNPCL	**Date : 07/03/2024**
Profile ID : E 250	**Location : HNPCL Jetty E to 250 meters**
Ref.Mark Latitude : N 17^{0}33'20.2''	**Ref.Marl Longitude : E 83^{0}08'34.0''**
Ref.Mark Height (m) : 0 (Ground level)	**Eye Level from top of Ref.Mark (m) : 1.585**
Observer : Mr. D.Tarakeswara rao (Env-Scientist)	**Observations :** Profile runs along jetty embankment E 100 to 250 meters East side and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore

Beach Segment	Length of Segment (m)	Slope Angle (Deg & Min)	Remarks
A-B	3.81	+01° 50'	Reference Point - ground cover vegetation around
B-C	6.83	+25° 40'	Beach Starting
C-D	2.15	-01° 20'	
D-E	2.31	-09° 30'	
E-F	3.25	+02° 10'	
F-G	2.46	+00° 20'	
G-H	4.51	+10° 40'	
H-I	5.22	+06° 30'	
I-J	4.93	+01° 20'	
J-K	5.54	-03° 10'	
K-L	5.81	-03° 20'	
L-M	3.55	+04° 30'	
M-N	4.57	-02° 40'	
N-O	3.46	-03° 30'	
O-P	6.15	+03° 50'	
P-Q	4.53	+04° 30'	High Tide
Q-R	3.84	+04° 20'	Low Tide

ANNEXURE-III
BEACH PROFILE DATA SHEET

BEACH PROFILE DATA SHEET FOR EAST 500 METERS FROM JETTY (3.31 mt AMSL)

Project Name : HNPCL		**Date : 07/03/2024**	
Profile ID : E 500		**Location : HNPCL Jetty E to 500 meters**	
Ref.Mark Latitude : N $17^0$33'22.2''		**Ref.Marl Longitude : E $83^0$08'42.4''**	
Ref.Mark Height (m) : 0 (Ground level)		**Eye Level from top of Ref.Mark (m) : 1.585**	
Observer : Mr. D.Tarakeswara rao (Env-Scientist)		**Observations :** Profile runs along jetty embankment E 250 to 500 meters to East side and Goat's Foot Creeper & Chicken Weed as ground cover vegetation up to swash limit and clean beach sand in the shore	
Beach Segment	**Length of Segment (m)**	**Slope Angle (Deg & Min)**	**Remarks**
A-B	2.21	+05° 20'	Reference Point - ground cover vegetation around
B-C	3.15	+13° 10'	
C-D	3.08	+05° 30'	
D-E	1.86	+15° 10'	Beach Starting
E-F	2.75	+08° 20'	
F-G	6.42	+11° 40'	
G-H	5.55	-00° 30'	
H-I	5.03	-02° 40'	
I-J	1.81	+08° 10'	
J-K	6.55	-03° 40'	
K-L	7.92	-02° 50'	
L-M	6.23	+05° 40'	
M-N	6.61	+05° 20'	High Tide
N-O	7.04	+05° 30'	Low Tide

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